



REASSESSMENT OF THE RESPONSES TO AVIATION SAFETY RECOMMENDATION A04-01

Use of standard weights in small aircraft

Background

On 17 January 2004 at 1638 Eastern standard time, Georgian Express Flight 126 (GGN 126), a Cessna Caravan 208B, C-FAGA, departed Pelee Island, Ontario, en route to Windsor, Ontario. There were nine passengers and one crew member on board. Shortly after take-off, the aircraft struck the ice-covered surface of Lake Erie, fatally injuring all 10 occupants. Although the investigation (A04H0001) is ongoing, there is factual information to suggest that the aircraft's weight was a contributing factor in the accident. The maximum take-off weight in the Cessna aircraft manual is 8750 pounds (cargo pod installed) or 8550 pounds if flying into known icing conditions. The investigation determined that the actual weight of the occurrence aircraft on departure from Pelee Island was approximately 9820 pounds, 1270 pounds over gross weight.

For aircraft under 12 500 pounds, there can be significant deviations from the published standard passenger weights due to the small sample size (nine passengers or fewer). This deviation error is further amplified in small aircraft due to the higher percentage of total aircraft weight that the passengers represent (22% for a Cessna 208 and 9% for a Boeing 747). If a small aircraft is being loaded to maximum gross weight, this discrepancy in passenger weight could result in an overweight condition that adversely affects the safety of the flight.

Although air operators have three options to calculate passenger weight, the most common practice is to use standard weights, as indicated in the Pelee Island operation where standard weights were used for 155 of the 165 flights. The average weight of the passengers on Georgian Express Flight 126 using standard weights was 183.3 pounds (nine men at 188 pounds, one woman at 141 pounds). Using actual weights, the actual average passenger weight was 240 pounds.

There have been numerous accidents in Canada related to overweight aircraft. At least five of these accidents involved small aircraft where discrepancies between the standard and actual weight of passengers contributed to the overweight condition and the accident. Four of these accidents were fatal, involving 24 fatalities.

On 07 October 2004, the Board released interim safety recommendations as part of its investigation (A04H0001) into this occurrence.

Board recommendation A04-01 (07 October 2004)

The existing defences against the risks associated with using standard weights are not adequate for aircraft carrying nine passengers or fewer. The use of actual passenger weights in small aircraft would provide a greater margin of safety. Therefore, the Board recommended that:

The Department of Transport require that actual passenger weights be used for aircraft involved in commercial or air taxi operations with a capacity of nine passengers or fewer.

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Response to A04-01 (22 December 2004)

In its 22 December 2004 letter, Transport Canada (TC) provided the following comments:

- Current regulations make it clear that air operators are to ensure that their aircraft are flown within the limits of the weight and balance envelope and that the standards provide options that may be used but do not override the regulatory requirement to remain within the weight limits of the aircraft.
- TC continues to review the standards with a view to improving the direction provided. One option that is under consideration is the use of actual weights for all operations conducted under subpart 3 (Air Taxi Operations) of Part VII (Commercial Air Services) in the Canadian Aviation Regulations. Once our review, including a risk assessment, is complete, Notice of Proposed Amendments (NPAs) (if required) will be developed and submitted to the Canadian Aviation Regulation Advisory Council (CARAC) for consultation.

Board assessment of the response to A04-01 (18 February 2005)

TC's response states that current regulations clearly place the responsibility for weight and balance control on the air operator, and that current standards do provide for the use of actual passenger weights. TC's response does not address the specific thrust of the Board recommendation that the use of actual passenger weights be mandated for aircraft carrying nine passengers or fewer. Although TC's response indicates that TC is willing to review its standards, and that this review will consider the option of using actual weights for Air Taxi operators, TC's response did not promise a time frame within which this review will be conducted, nor did it contain specific action to improve its oversight of air taxi operators in this regard.

TC has proposed action, which, if implemented in full, will substantially reduce or eliminate the safety deficiency. However, the present risks associated with using standard weights will remain until a new standard is put in place to ensure that actual weights are used for aircraft carrying nine passengers or fewer. The Transportation Safety Board of Canada (TSB) is also concerned that the length of time required to change/modify the standard could be excessive.

TC's response to this recommendation is assessed as **Satisfactory Intent**.

Next TSB action (18 February 2005)

The staff will closely monitor TC's actions related to this recommendation and will update this assessment when appropriate.

Response to A04-01 (14 December 2005)

In its update letter of 14 December 2005, TC reported that it had reviewed the regulations and standards related to this specific issue. A risk assessment related to the use of actual passenger weights for 703 (Air Taxi) operations was conducted in May 2005. The risk assessment suggested that NPAs be developed to require the use of actual passenger weights for all 703 passenger-carrying operations. These NPAs are under development and will be submitted to the CARAC for consultation.

Board reassessment of the response to A04-01 (12 July 2006)

TC's update letter dated 14 December 2005 indicates that TC has reviewed the regulations and standards related to this specific issue. A risk assessment related to the use of actual passenger weights for 703 (Air Taxi) operations was conducted in May 2005. The risk assessment suggested that NPAs be developed to require the use of actual passenger weights for all 703 passenger-carrying operations. These NPAs are under development and will be submitted to the CARAC for consultation. The stated action, if fully implemented, will substantially reduce the risks associated with Recommendation A04-01.

Therefore, the assessment remains at **Satisfactory Intent**.

Next TSB action (12 July 2006)

The staff will closely monitor TC's actions related to this recommendation and will update this assessment when appropriate.

Response to A04-01 (07 February 2007)

In its latest update TC is considering harmonizing with FAA Advisory Circular AC 120-27E Aircraft Weight and Balance Control, Table 2-5. TC also mentions that NPAs are under development and will be submitted to CARAC for consultation.

Board reassessment of the response to A04-01 (24 July 2007)

FAA AC 120-27E Table 2-5 provides operators with the option of using segmented weights for adult passengers; the passenger weight increases as the passenger seating capacity decreases. Notwithstanding, the FAA states that it would be unsafe for an aircraft operator to use standard weights or segmented weights in any of the following aircraft:

- All single-engine piston-powered aircraft.
- All multiengine piston-powered aircraft.
- All turbine-powered single-engine aircraft.

As TC's response does not provide details as to whether or not its NPAs will require operators of aircraft carrying nine or less passengers to use actual weights, the stated action, if fully implemented, will substantially reduce the risks associated with Recommendation A04-01. Therefore, the reassessment remains at **Satisfactory Intent**.

Next TSB action (24 July 2007)

TSB staff will liaise with TC to determine the status and content of the NPAs related to this recommendation and update this assessment accordingly.

Response to A04-01 (6 March 2008)

In its 6 March 2008 response, TC reports that Commercial and Business Aviation Advisory Circular 0235 and Policy Letter 168 have been issued to remind air operators that they are responsible for the accuracy of: "weight of passengers, carry-on baggage and checked baggage, determined either by actual weight, by using approved standard weights or by using approved survey weights, and the actual weight of cargo".

To provide the means to satisfactorily meet this regulatory requirements for Subpart 703 operations, an NPA currently being developed will require affected air operators to use either actual passenger weights or segmented weight values derived from acceptable Canadian data sources, similar to Table 2-5 of FAA Advisory Circular AC120-27E, Aircraft Weight and Balance Control.

In addition, TC reports that the notice of intent to draft an NPA has already been approved, that a draft NPA has been circulated, and that Canadian-derived segmented weight values are under development. This NPA, once completed, will be submitted to the Canadian Aviation Regulation Advisory Council (CARAC) for consultation as early as June 2008.

Board reassessment of the response to A04-01 (13 August 2008)

TC's response indicates that it continues to progress safety action that, if fully implemented, will address the deficiencies underlying Recommendation A04-01.

Therefore, the reassessment remains at **Satisfactory Intent**.

Next TSB action (13 August 2008)

TSB Air Branch staff will liaise with TC to monitor the progress of the NPAs related to this recommendation.

Response to A04-01 (15 February 2010)

In its response, TC reports that NPA 2008-058 has been developed, presented and accepted at the June 2008 CARAC. Prior to publication of the standard, the Advisory Circular No. 0235R must be amended.

Board reassessment of the response to A04-01 (28 July 2010)

TC's response indicates that it continues to progress safety action that, if fully implemented, will address the deficiencies underlying Recommendation A04-01

Therefore, the reassessment remains at **Satisfactory Intent**.

Next TSB action (28 July 2010)

TSB staff will liaise with TC to monitor the progress of the NPA and related amendments to Advisory Circular No. 0235R.

Transport Canada response to A04-01 (21 January 2011)

TC's response indicates that NPA 2008-058, along with the associated Advisory Circular, is now being reviewed for final publication. The Advisory Circular is expected to be published by the end of the summer 2011 and once the industry has been informed of the methods available to them to account for passenger weights, the revised standard will be published accordingly. TC also indicates that it will also publish an amendment to the Aeronautical Information Manual, which will give operators the necessary information to comply with the segmented weight requirements upon publication of the revised standard.

Board reassessment of the response to A04-01 (09 March 2011)

TC's response indicates that it continues to progress safety action that, if fully implemented, will address the deficiencies underlying Recommendation A04-01.

Therefore, the reassessment remains at **Satisfactory Intent**.

Next TSB action (09 March 2011)

TSB staff will liaise with TC to monitor the progress of the NPA and related amendments to Advisory Circular No. 0235R.

Transport Canada's response to A04-01 (07 December 2011)

AC 703-004 – Use of Segmented Passenger Weights by Commercial Air Operators Under [Subpart 703](#) of the CARs was published on Nov. 30, 2011.

The next step is to publish, in the CAR Standards, NPA 2008-058 which is expected in June of 2012.

Board reassessment of the response to A04-01 (07 March 2012)

TC's response indicates that it continues to progress safety action that, if fully implemented, will substantially reduce or eliminate the safety deficiency underlying Recommendation A04-01.

The response is considered **Satisfactory Intent**.

Next TSB action (07 March 2012)

The TSB will liaise with TC to monitor the progress of the NPA.

The deficiency file is assigned an **Active** status.

Transport Canada's response to A04-01 (04 December 2012)

On 28 August 2012, TC provided the following information:

Transport Canada has published an amendment to subsection 723.37(3), Weight and Balance Control, of the Commercial Air Services Standard. The amendment can be found at the following link: http://www.tc.gc.ca/eng/civilaviation/regserv/cars/part7-standards-723a-2171.htm#723a_37.

CAR723.37 (3) now states:

Weight of passengers, carry on baggage and checked baggage, where the weight of passengers and carry-on baggage is determined either by actual weight, or by using segmented weight values, either as published, or derived from statistically meaningful data using a methodology acceptable to the Minister, and where the weight of checked baggage and cargo is determined by actual weight

On 04 December 2012, TC provided the following update:

In response to this recommendation, NPA 2008-058 was published and made effective 01 June 2012. TC sent a letter to the TSB on 28 August 2012, recommending that this recommendation be closed.

Board assessment of the response to A04-01 (06 March 2013)

TC has amended the CARs to reflect that actual passenger weights should be used for aircraft certified for less than 5 passengers, and that segmented weights be used for aircraft certified for 5 to 11 passenger seats. [Guidance Material for Regulations & Standards - Part 703 - Air Taxi Operations - Division III - section 743.37\(5\)](#) provides direction on how to compute passenger weights. The segmented weight tables were developed by TCCA for use by subpart 703 of the CARs operators seeking an alternative to actual weights for computing weight and balance for the given number of passengers on board. The above reference also states that the use of segmented weights provide a 95% confidence level and a 1% margin of error tolerance that the actual weight of passengers will not exceed the total weight of passengers obtained by using segmented weights for the given number of passengers on board.

Although TSB Recommendation A04-01 called for using actual weights for aircraft with a capacity of 9 or fewer passengers, the use of actual weights for aircraft certified for less than 5 passengers and segmented weights for 5 to 11 passengers will significantly reduce the deficiencies underlying Recommendation A04-01.

The response is considered **Fully Satisfactory**.

Next TSB action (06 March 2013)

The deficiency file is assigned an **Inactive** status.