

AVIATION INVESTIGATION REPORT

A00H0003

LOSS OF SEPARATION / SAFETY NOT ASSURED

BETWEEN

AIR CANADA BOEING 767-233 C-GAUP

AND

SKYSERVICE AIRLINES INC.

CESSNA CITATION 650 C-FJJC

MONTREAL, QUEBEC 5NM W

27 MAY 2000

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Aviation Investigation Report

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Summary

A Skyservice Cessna Citation 650, registration C-FJJC, was inbound to Montreal International Airport, Dorval, Quebec, on an instrument flight rules flight from Toluca, Mexico, in descent to 6000 feet. Air Canada flight 411, a Boeing 767, registration C-GAUP, had departed runway 28 at Dorval en route to Toronto via Ottawa on an instrument flight rules flight plan and was climbing straight ahead. On initial contact with the Montreal departure controller, the Boeing 767 was cleared to 17 000 feet. The pilot of the Boeing 767 stopped the climb at 5200 feet because of a traffic alert and collision avoidance system traffic advisory showing the Citation directly ahead. The aircraft passed with 1400 feet of vertical spacing and approximately 0.25 mile of horizontal spacing.

Ce rapport est également disponible en français.

Other Factual Information

The Boeing 767 was being controlled by the Montreal Area Control Centre (ACC) controller responsible for the Montreal terminal departure sector. The Citation was being controlled by the terminal south sector controller. The pilot of the Boeing 767 contacted the departure controller at 1212:35 eastern daylight time,¹ on departure from runway 28 at Dorval climbing through 3000 feet. The departure controller radar-identified the aircraft and immediately cleared the flight to maintain 17 000 feet. At 1213:16, as the aircraft reached 5200 feet, the pilot advised the departure controller that he had traffic. The controller immediately cleared the Boeing 767 to maintain 5000 feet and to turn left to a heading of 260 degrees.

The Montreal departure controller had 16 years' experience as a controller and had worked for 10 years in the Montreal terminal specialty of Montreal ACC. He had worked on 24 of the previous 30 days, including 12 of the previous 13 days, and was on the fourth day of his shift cycle. He had been on duty for 6.25 hours on the day of the occurrence; approximately 20 minutes had passed since his last relief break. Workload was described as light and not complex. All necessary equipment was serviceable and being used.

Aircraft present-position symbols displayed on the radar data processing system (RDPS) indicator module (RIM) are identified by full data blocks that contain information about the aircraft, including call sign, altitude, ground speed, and the two-letter controller jurisdiction symbol (CJS). The departure controller's RIM was set up to display full data blocks with the departure CJS for all aircraft under his control. The CJS for the departure controller was the letters "DP". Other radar targets on the RIM are displayed with limited data blocks that include only the target present-position symbol and the CJS of the appropriate control sector. The CJS for the terminal south sector was the letters "TS".

In order to ascertain additional information on other targets displayed on the RIM, such as altitude or ground speed, controllers may operate an RDPS computer function "Quick Look" or "Quick Look All". "Quick Look", selected for a specific CJS, displays the full data block for all aircraft within the display viewing area under the control of the corresponding CJS. "Quick Look All" displays the full data block for all aircraft within the display viewing area. It was the departure controller's habit to initiate the "Quick Look All" on a regular basis to maintain situational awareness concerning other traffic in the vicinity of Dorval. He had done so at some point before the conflict and was aware at that time that C-FJJC was on arrival to Dorval and in descent (see Appendix A). During replay of the RDPS radar tape for this investigation, it could not be determined at exactly what time the "Quick Look All" function was engaged.

The airspace in the vicinity of the Montreal airports is divided both horizontally and vertically in order to assign control responsibilities to sector controllers. The airspace sector off the departure end of runway 28 is divided vertically, as indicated in Appendix A. According to *Montreal Terminal Operational Procedures*, Annex D, the airspace up to and including 5000 feet is in the jurisdiction of the departure controller; the airspace at 6000 feet and above, as in this occurrence, was in the jurisdiction of the terminal south controller.

¹ All times are eastern daylight time (Coordinated Universal Time minus four hours) unless otherwise noted.

In order to expedite traffic, *Montreal Terminal Operational Procedures*, article 4, paragraph 4.1 d, specifies that the controller vectoring a departure in airspace other than that assigned to that controller is responsible for taking whatever action is necessary to assure appropriate separation between the departure and all other traffic. Such activity may be done without coordination with the controller responsible for the airspace. Departure controllers routinely clear aircraft through the airspace assigned to other terminal controllers and provide appropriate ad hoc radar separation vectoring services. Where radar vectors cannot provide the required horizontal radar separation, as occurs when aircraft tracks intersect, controllers impose climb restrictions on departures to assure that appropriate vertical separation is maintained.

At 1212:34, the same time that the departure controller was issuing climb clearance to the Boeing 767 to maintain 17 000 feet, the terminal south controller advised the pilot of the Citation that there was traffic at his one o'clock position: four miles, westbound, a Boeing 767 was climbing to 5000 feet. (The controller assumed the Boeing 767 was going to level off at 5000 feet, in accordance with terminal procedures.) The pilot of the Citation replied that he was under instrument meteorological conditions. The Citation was not equipped with a traffic alert and collision avoidance system (TCAS), nor was it required to be. The pilot of the Citation did not see the Boeing 767.

During the period of the occurrence, six other aircraft in the vicinity of Montreal were in communication with the departure controller and carried the "DP" CJS on the RIM. Four of these aircraft were operating under visual flight rules (VFR). At 1212:05, as the Citation approached from the west to the northwest, its present-position symbol and CJS became partially obscured by the present-position symbol and full data block information of one of the VFR aircraft, C-FHTA, en route to Cedars airport west of Montreal. The Citation target remained partially obscured on the departure controller's RIM until 1212:35. The departure controller began to issue climb clearance to the Boeing 767 at 1212:31, the time during which the Citation target was partially obscured.

At 1212:40, after clearing the Boeing 767 to climb through the airspace of the terminal south controller northwest of Montreal, the departure controller issued a traffic advisory to another VFR aircraft, C-FCIF, northeast of Montreal. At 1213:14, 19 seconds after the departure controller concluded the exchange with C-FCIF, the Boeing 767 advised of the TCAS traffic advisory.

The TSB has investigated other loss-of-separation occurrences in which established standard procedures were bypassed because ad hoc solutions were perceived by working controllers as being more effective and expeditious. Investigations into occurrences A99W0064 and A99H0003 (the latter investigation is ongoing) have raised issues similar to those demonstrated in this occurrence. These issues include bypassing established altitude responsibility assignments, issuing a climb clearance to a departing aircraft prior to assuring separation from an aircraft on arrival, less-than-adequate controller coordination, loss of situational awareness, and less-than-adequate radar monitoring.

Analysis

The departure controller was a fully qualified and experienced air traffic controller and supervisor within the Montreal terminal specialty of the Montreal ACC. He was aware that the inbound Citation was in descent on

arrival, he was aware of the vertical division of responsibility within the airspace, and he was aware that it was his responsibility to provide separation between aircraft under his control and other aircraft. However, when he issued the initial climb clearance to the Boeing 767, he did not recall and consider the inbound aircraft, which led to the loss of separation. Since no information was conveyed to the terminal south controller about the departure controller's intentions, no action was taken by the terminal south controller to assure separation.

Though the departure controller had worked a significant number of regular and overtime shifts in the previous 30 days, there is no indication of sleep debt. It cannot be shown that fatigue was a factor in this occurrence.

It is common practice in Montreal to expedite departures by issuing, without coordination, climb clearance through the airspace of the terminal controller and to monitor the departure to assure separation. In this occurrence, the desire to expedite the departure by issuing immediate climb clearance, the lack of coordination between two controllers responsible for two aircraft within the same airspace, not monitoring the climb of the Boeing 767 with sufficient vigilance, and not recalling the presence of the inbound aircraft led to a loss of separation where the safety of the aircraft was not assured. The providing of traffic information to VFR aircraft and the partial obscurity of the Citation's radar target in themselves did not appear to have unduly distracted the departure controller.

With the aim of expediting traffic, controllers are permitted to depart from established and procedurally safe separation criteria and to use ad hoc procedures. In this occurrence, the ad hoc procedure was used to expedite the departing aircraft. As with most, if not all, ad hoc procedures, this one lacked defences, particularly against normally expected levels of human error, such as forgetfulness and loss of situational awareness.

Findings as to Causes and Contributing Factors

1. The departure controller issued climb clearance for the Boeing 767 through airspace assigned to another controller without coordinating the action with that controller. Such coordination is not required by Montreal ACC terminal operational procedures.
2. The departure controller did not recall the presence of the inbound Citation when he issued climb clearance to the Boeing 767.
3. The departure controller did not monitor the climb of the Boeing 767 with sufficient attention to detect the conflict with the Citation.
4. In assuming that the departure controller would follow standard procedures and level the Boeing 767 at 5000 feet, the terminal south controller took no action to ensure the two aircraft were sufficiently separated.
5. Montreal ACC terminal operating procedures permit controllers to bypass established altitude responsibility assignments without providing a replacement defence against normal levels of human error.

Other Findings

1. The present-position symbol and CJS of the Citation were partially obscured by the data block of a VFR aircraft when the departure controller issued climb clearance to the Boeing 767.
2. The departure controller was not unduly distracted by other duties at the time of the Boeing 767 departure.

Safety Action

In August 2000 the TSB forwarded an Aviation Safety Advisory (No. A000035) to NAV CANADA highlighting the risks associated with using ad hoc control practices or altering assigned airspace responsibilities in lieu of using established control procedures that have built-in separation assurance.

NAV CANADA issued an Air Traffic Services Safety Bulletin (No. 2000-3, effective 2000-10-26) pertaining to deviation from established procedures. This publication, entitled *SQUAWK 7700*, points out the risks associated with such action and the importance of taking steps to mitigate any increased risk should deviation from established procedures become necessary. These bulletins are mandatory briefing items.

Montreal Area Control Centre is also conducting a thorough review of procedures used in coordination and interaction between the departure and arrival positions.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 4 January 2001.

Appendix A - Airspace Diagram

