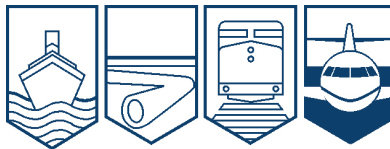


Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

**AVIATION INVESTIGATION REPORT
A07A0025**



LOSS OF SEPARATION

**SERCO FACILITIES MANAGEMENT INC.
GOOSE BAY, NEWFOUNDLAND AND LABRADOR
13 MARCH 2007**

Canada

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

Loss of Separation

Serco Facilities Management Inc.
Goose Bay, Newfoundland and Labrador
13 March 2007

Report Number A07A0025

Summary

Air traffic control services at Goose Bay, Newfoundland and Labrador, are provided by Serco Facilities Management Inc., a company under contract to the Department of National Defence. The inbound Prince Edward Air Beech 1900, operating as Comet 9732, was descending from flight level 210 through 13 000 feet, approximately 65 nautical miles (nm) west of Goose Bay. An outbound Air Labrador de Havilland DHC-8, operating as Labair 8301, was in level cruise flight at 12 000 feet when the crew received a traffic alert and collision-avoidance system resolution advisory. The two aircraft passed each other 50 nm west of Goose Bay with approximately 1.8 nm lateral and 300 feet vertical spacing, where 3 nm lateral or 1000 feet vertical spacing is required. Weather at the time was clear with unlimited visibility. Both aircraft were flying under instrument flight rules, and under the control of Goose Bay terminal control.

Ce rapport est également disponible en français.

Other Factual Information

At 1225:31 Coordinated Universal Time (UTC),¹ Labair 8301 (LAL8301) took off from Goose Bay en route to Wabush and was assigned a heading of 290° magnetic (M), and cleared to climb to 12 000 feet. At 1226:26, Speedair 7901 (SPD7901), a Saab 340, reported airborne off Goose Bay Runway 26 also en route to Wabush, maintaining runway heading (259°M) and climbing to flight level (FL) 200. The separation standard in use for the departure was in accordance with Section 531.2A of the NAV CANADA *Air Traffic Control Manual of Operations* (ATC MANOPS) as adopted by the Canadian Forces. The aircraft were radar-identified after take off within 1 nm of the end of the runway. Radar separation was established from that point by having SPD7901 maintain a runway heading that diverged from the track of LAL8301. Radar separation required in the Goose Bay terminal area is 3 nm. This separation standard was established and maintained between LAL8301 and SPD7901 as they climbed outbound to Wabush.

At 1231:49, Comet 9732 (CME9732), inbound to Goose Bay from Wabush, contacted Goose Bay terminal control, reporting level at FL 210. This cargo flight had departed Wabush about one-half hour earlier than normal, and was not usually in Goose Bay terminal airspace at the same time as were these outbound scheduled flights. The controller issued a descent clearance to 6000 feet and advised the crew to begin descent soon because of the outbound traffic from Goose Bay. CME9732 started descent immediately. The separation plan was to descend CME9732 below the altitude of the two outbound aircraft so that, by the time they were within 3 nm horizontally on their reciprocal tracks, at least 1000 feet of vertical separation would be in force. The plan was initiated when the controller issued the descent clearance to CME9732. All that remained to be done was to monitor the progress of the three aircraft to ensure that the plan evolved as desired.

Approximately three minutes later, at 1234:47, CME9732 requested the altitudes of the opposite direction traffic. The controller replied that one was level at 12 000 feet (LAL8301) and the other was through 13 000 feet, climbing to FL 210. SPD7901 had actually been cleared to FL 200, not FL 210.

¹ All times are Coordinated Universal Time (Newfoundland standard time plus 2 ½ hours).

At 1235:37, the controller dealt with another aircraft operating in the vicinity of Goose Bay. At 1239:26, the controller's attention was drawn back to the west, when the crew of SPD7901 requested a change in final altitude from FL 200 to 16 000 feet. The controller noted that SPD7901 was now above the altitude of CME9732 (which was noted to be below 16 000 feet), and issued descent clearance to 16 000 feet to SPD7901. No mention was made of the whereabouts of LAL8301, nor did the controller notice the proximity of CME9732 and LAL8301.

At 1239:40, after deviating in response to a traffic alert and collision-avoidance system (TCAS) resolution advisory (RA), the crew members of LAL8301 contacted Goose Bay terminal asking if there was other traffic in the area, adding that they were showing traffic on the TCAS.

The controller immediately issued a left turn of approximately 30° to LAL8301, followed by an instruction to CME9732 to fly a heading of 080°. The crew of CME9732 reported LAL8301 in sight passing on the right, and the crew of LAL8301 reported CME9732 in sight. At the point of closest approach, the two aircraft had about 300 feet vertical and 1.8 nm horizontal spacing.

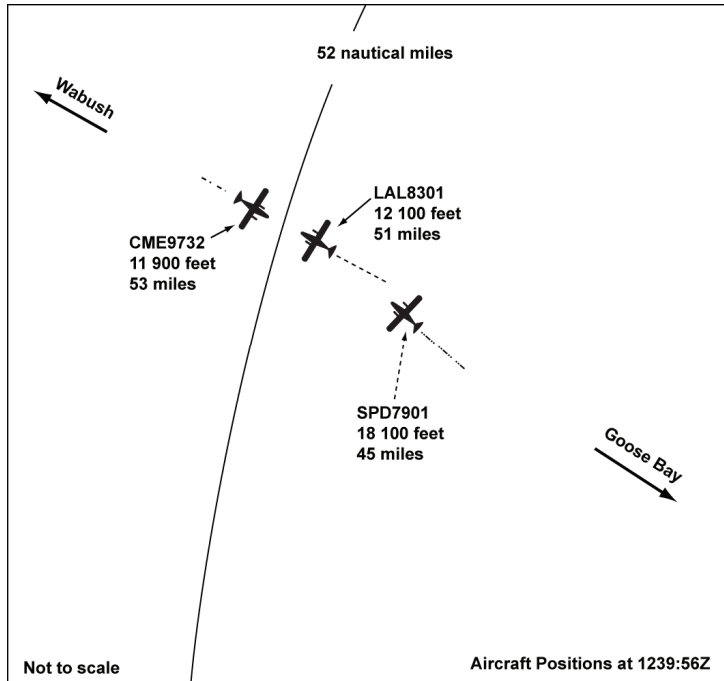


Figure 1. Aircraft positions at 1239:56

There is no conflict warning capability on the Goose Bay radar equipment. There were no impediments to visibility.

The controller had 14 years of experience in air traffic control and had been qualified in the Goose Bay terminal control position for three years. The controller was on the first day of work after four days off, was well rested, and had been on duty for about one hour.

CME9732 was operating in a cargo configuration and was not equipped with TCAS, nor was it required to be.

In 1995, the Transport Canada Director of Air Traffic Services issued one of a series of air traffic services safety bulletins entitled *Squawk 7700*.² These bulletins are intended to remind controllers of topical safety issues, and are available and distributed together with other publications with the current issue of the ATC MANOPS on compact disc. The title of *Squawk 7700* number 9501 is "Reciprocal Track Syndrome." It describes one of the flaws in the "Plan - Execute - Monitor" cycle as it applies to the resolution of altitude changes for aircraft on reciprocal tracks. In the example cited in the article, the author notes that:

² Transport Canada, *Squawk 7700*, Number 9501.

. . . all involved aircraft . . . were radar identified and being provided with radar service. The specific conflict situations were recognized and the **PLAN**ned (sic) solutions were simple; clear A to climb/descend through the altitude of B who was on a reciprocal track and watch (**MONITOR**) the progress carefully.

Unfortunately, the intention to **MONITOR**, if not supported by any triggering event (altitude report, distance check, etc.) that allows time to initiate an alternate **PLAN** if things aren't going well, is of no benefit if **memory** fails or one succumbs to **distraction**.

. . . The head-on (reciprocal track) situation is very unforgiving. Many controllers are getting trapped by a separation **PLAN** that has no alerting check points and no escape route. Built in checks or an offset track may prevent the worst from happening **if you forget to watch or become distracted**.

In Aviation Investigation Report A01W0160, the TSB determined that

The . . . controller lost situational awareness when his attention became focused on separating two of the five aircraft in his sector, to the detriment of seeing and resolving another separation problem involving [another aircraft].

There are no air traffic control procedures in place that require controllers to indicate potential conflicts on the radar display in a standard manner, similar to that required for flight progress strips. This increases the risk that controllers will forget about a conflict because it may not be evident on the radar display.

Furthermore, in Aviation Investigation Report A01P0127, the TSB determined that there is

. . . an increased risk in directing altitude changes while vectoring aircraft on reciprocal tracks. This type of control plan is considered . . . to be very unforgiving; it increases a controller's monitoring requirement, increases the risk of error from distraction, and makes recovery from any potential error more difficult.

The controller did not ensure that vertical separation was established before lateral separation was lost.

There is no regulation or separation standard within the ATC MANOPS, the *Canadian Aviation Regulations*, or Goose Bay local operating procedures that requires controllers to insert a triggering event, closer in time or space to the potential conflict, to remind them that the plan must be closely monitored and an alternate plan implemented if required.

Section 902.5 of the ATC MANOPS requires the use of warning indicators on the appropriate flight data strip(s) to identify any conflict between aircraft. These warning indicators consist of a red "W" posted on the appropriate flight data strip(s). They are used to attract controller

attention to potentially hazardous or critical situations. No warning indicators were posted on the flight data strips to remind the controller of the potential conflict. The electronic target marker (range/bearing line) on the radar display, which can also be used to identify those aircraft requiring specific attention, was not activated by the controller.

Analysis

Though there was not normally a conflict between these flights because of their different schedules, the controller was aware that the descending aircraft and the two outbound climbing aircraft would need to be separated.

There were sufficient cues offered to the controller to continue to be aware of the potential conflict among the three aircraft. CME9732 asked for the altitudes of the outbound aircraft, requiring the controller to note the positions and altitudes of the three aircraft. Later, SPD7901 requested 16 000 feet as a final altitude, which required the controller to refocus attention to the situation and realize that one altitude conflict had been resolved exactly as it had been planned when CME9732 descended below the altitude of the outbound SPD7901. However, the partial success of the separation plan may have detracted from the realization that there remained yet another altitude conflict to resolve.

The following combination of factors played a role in this occurrence:

- the aircraft were established on reciprocal tracks;
- no vectors or offset headings were given to ensure lateral separation;
- no triggering events or alerting check points were used as reminders;
- there was no conflict warning capability on the Goose Bay radar equipment; and
- no warning indicators were posted on the flight strips.

A separation plan that depends entirely upon memory as a defence in a conflict situation is subject to the dangers of memory failure or distraction. A multi-aircraft plan that provides a partial solution, but that requires further monitoring for complete success is even more subject to error because there may be a sense that the strategy has already been successful.

Findings as to Causes and Contributing Factors

1. The controller created the memory-dependent conflict condition when the descent clearance was given to CME9732.
2. In successfully resolving one conflict using the separation plan, as originally devised, the controller did not remember that there were two potential conflicts in the original plan, and did not take action to resolve the second conflict.

Finding as to Risk

1. There is no conflict warning capability on the Goose Bay radar equipment. Such equipment could have given early warning of the loss of separation.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 13 February 2008.

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