

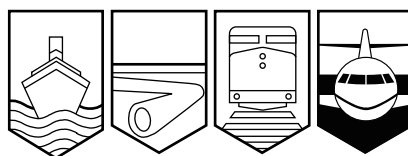
Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

AVIATION INVESTIGATION REPORT

A01H0002



LOSS OF SEPARATION

NAV CANADA
GANDER AREA CONTROL CENTRE
SYDNEY, NOVA SCOTIA, 23 NM SE
05 MARCH 2001

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

Nav Canada
Gander Area Control Centre
Sydney, Nova Scotia, 23 nm SE
05 March 2001

Report Number A01H0002

Summary

Two aircraft were level at flight level 350 (FL350) on reciprocal tracks approximately 23 nautical miles (nm) southeast of Sydney, Nova Scotia. Continental Airlines flight 18 (COA18), a Boeing 767-400, was eastbound en route from Newark, New Jersey, USA, to Gatwick, United Kingdom. Iberia Airlines flight 6283 (IBE6283), a Boeing 767-300, was westbound en route from Barcelona, Spain, to John F. Kennedy International Airport, New York, USA. When the two aircraft had closed to approximately 10 nm, both aircraft responded to traffic alert and collision-avoidance system resolution advisories. COA18 climbed to FL354 and IBE6283 descended to FL335. At the point of passing, the aircraft had achieved 1900 feet vertical spacing with about 0.4 nm lateral separation. The aircraft were operating in an area where the separation required was either 1000 feet vertically or 5 nm laterally.

Ce rapport est également disponible en français.

Other Factual Information

COA18 had been cleared at flight level (FL) 330 through Moncton and Gander Area Control Centre (ACC) controlled airspace on an eastbound route from TUSKY intersection to Torbay VOR (very high frequency omnidirectional RADIO range) navigation aid before entering oceanic airspace. (see Figure 1.) When the Moncton ACC controller solicited a ride report from COA18, the crew advised that they were experiencing continuous light turbulence (chop). Ten minutes later, COA18 advised that the flight was now in continuous light chop, with occasional moderate chop. Based on previous reports of a smoother ride at FL350, the controller offered that altitude to COA18 with a turn off course to accommodate traffic. COA18 requested to maintain its present course at FL330 until clear of conflicting traffic. At 1339:03 Newfoundland standard time (NST)¹ the Moncton ACC controller cleared COA18 to climb to FL350. The change in altitude was not passed to Gander ACC immediately, nor did the Gander/Moncton Agreement specifically require controllers to do so. FL350 was not an appropriate altitude for the direction of flight. Controllers use the term “wrong way” for internal communications with other air traffic control (ATC) sectors to describe this situation.

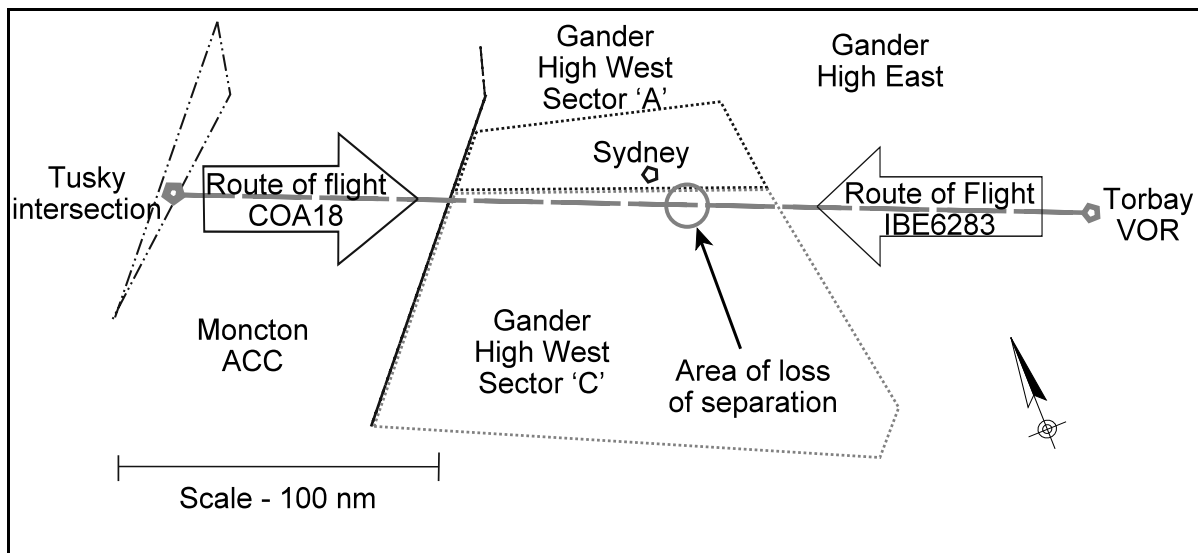


Figure 1 - Route of Flight

At 1351:46, COA18 was verbally handed off from Moncton to Gander ACC control. The Moncton ACC controller advised the Gander ACC controller of the aircraft's flight level (FL350), the fact that it was a wrong-way altitude, and that the flight level was assigned because of turbulence. COA18 checked in on the Gander domestic high west (sector 'C') controller's frequency at 1352:25. Six minutes before accepting COA18 at FL350, the Gander high west controller had accepted an electronic handoff from the Gander high east sector on IBE6283. IBE6283 had been cleared to fly through Gander and Moncton controlled airspace via Torbay direct to TUSKY intersection at FL350.

The domestic high west specialty of Gander ACC can be divided into several sectors to efficiently accommodate expected traffic flows. The controller initially responsible for COA18,

¹

All times are NST (Coordinated Universal Time minus three and one-half hours).

IBE6283, and three other aircraft was controlling high west sector 'C', which is the airspace at the south end of the high west specialty. High west sector 'A' was immediately to the north of high west sector 'C'.

At approximately 1403, the high west supervisor approved the consolidation of sectors 'A' and 'C'. This required the sector 'A' controller to physically move to the sector 'C' position. The sector 'A' controller moved to the sector 'C' position, put his flight progress strip (FPS) tray into the board, unplugged the headset of the sector 'C' controller, and plugged in his own headset. A short handover briefing ensued, in which the sector 'C' controller indicated that COA18 had oceanic clearance. There was no mention of the conflict between COA18 and IBE6283. The relieved sector 'C' controller then left the operations room to start his break.

At 1406:35, COA18 reported traffic straight ahead to the combined sector 'A/C' controller. Eight seconds later, IBE6283 advised that they were in descent out of FL350. The sector 'A/C' controller did not immediately respond to these communications. He was not expecting a call from either COA18 or IBE6283. Since he thought the two aircraft were not in conflict, he did not comprehend the reference to a deviation. The aircrew made no reference that they were initiating avoidance action as a result of a traffic alert and collision-avoidance system (TCAS) resolution advisory (RA). Recorded radar information indicated that IBE6283 started a descent at 1406:47 and COA18 started to climb at 1406:52. Five seconds later, the altitude readouts for the two aircraft indicated they were vertically separated by 700 feet and increasing. At the point of closest horizontal approach, the two aircraft had achieved 1900 feet vertical spacing.

Neither aircrew stated initially that the evasive action was as a result of a TCAS RA. Aeronautical information and ATC manuals in Canada and the United States provide accepted standard phraseology when aircrew respond to a TCAS RA. The recommended phraseology is "(call sign) TCAS climb" or "(call sign) TCAS descend."

At 1407:05, after the aircraft had passed each other, the crew of IBE6283 advised that they had descended out of FL350 because of a TCAS alert that had indicated traffic straight ahead at FL350. The crew of COA18 then informed the controller that they had initiated a climb as a result of a TCAS alert. The sky was clear above cloud, and each aircrew saw the other aircraft after the TCAS RA. IBE6283, as well as descending, commenced a shallow right turn to ensure continued separation between the two aircraft. The peak descent rate achieved by IBE6283 during the TCAS RA manoeuvre was 6000 feet per minute, and the aircraft descended to FL334 before levelling off. Both aircraft were subsequently cleared back to FL350.

Handover briefing checklists were available at each control position in the Gander domestic high specialty. Nav Canada's *Air Traffic Control Manual of Operations* (ATC MANOPS) specifies that the relieving controller is to peruse the checklist before the handover briefing. However, instructions do not require the controller to directly refer to the checklist during the briefing. Neither controller referred to the checklist before or during the briefing, nor were they in the habit of doing so. One of the items on the handover checklist refers to traffic information such as "possible/probable separation problems".

ATC MANOPS states that a controller "shall remain behind for monitoring purposes jointly with the relieving controller" to "reinforce the position relief briefing and assist the relieving controller in becoming familiarized with the position." However, the "post-relief overlap time requirement shall be based on traffic volume and complexity. Each controller is responsible to

exercise the best judgment possible in evaluating the situation and taking the appropriate time to effect a complete exchange of information.” Both controllers felt that the handover briefing had been adequate because there was little traffic and, therefore, no need to discuss each flight in detail or for the relieved controller to remain behind to monitor.

Upon assuming responsibility for the sector, the new sector ‘A/C’ controller spent the next few minutes setting up the radar situational display (RSiT) to his liking. He did not complete a detailed scan of the flight data board nor did he compare the information on the FPS with that displayed on the radar. The sector ‘A/C’ controller was not aware, until the call from COA18 about traffic ahead, that there was a conflict that required action on his part to resolve.

The sector ‘C’ controller had began his shift that day at 0830 and had been controlling in the high west sector ‘C’ for the previous 60 minutes. The sector ‘A/C’ controller had taken over control of sector ‘A’ at 1352, a few minutes before the consolidation with sector ‘C’. His shift had started that day at 1100. The traffic level was light. No data controller was assigned to sector ‘A’ or ‘C’.

ATC procedures are very specific on the type of information that must be included on FPSs. This includes marks to indicate confirmation of altitude on initial contact, clearances issued and confirmed, wrong-way altitudes, and potential conflicts with other aircraft. ATC MANOPS specifies that a wrong-way altitude is to be circled in red on the FPS. For operational reasons, the approved local procedure at Gander ACC is to print ‘WW’ on the altitude block of the FPS. The sector ‘C’ controller did not mark the FPS to indicate that COA18 was flying at an altitude inappropriate for the direction of flight. ATC MANOPS also specifies that when conflicting traffic exists, the flight number for the conflicting traffic is to be entered on the FPS. The sector ‘C’ controller’s normal practice was to not mark FPS for conflicts or wrong-way altitudes that would be solved before handing the aircraft to another sector or ACC. The sector ‘C’ controller did not mark the FPS to indicate conflicting traffic for COA18.

The sector ‘C’ controller had not used any of the available radar display tools to highlight either or both of these aircraft as a reminder that further action would be necessary to ensure separation. Radar, where available, has become the primary system used by controllers to control traffic and to identify conflicts; however, there are no published standard procedures that require controllers to use specific display tools to highlight potential problems or otherwise serve as a memory aid for the controller.

On 31 August 2000, the TSB recommended (A00-15) that Nav Canada commit, with a set date, to the installation and the operation of an automated conflict prediction and alerting system at the nation’s ATC facilities to reduce the risk of midair collisions. Nav Canada began testing of an ATC conflict-alert system on 31 March 2001 at the Toronto ACC; however, testing has since been interrupted because of technical difficulties. Transport Canada is monitoring this testing.

Analysis

The controllers did not apply standard procedures in the Gander high west domestic sector. As a result, the controller who took over the consolidated sector ‘A/C’ did not have an accurate mental picture of the traffic situation. Neither controller referred to the checklist before or during the handover briefing, nor were they in the habit of doing so. Consequently, critical information regarding the altitude and converging flight paths of the two flights was not

specifically mentioned. Handover briefing checklists were available at each control position; however, the prevailing culture among controllers has been to avoid the use of checklists because it was felt that the checklists are either too long, not always applicable in particular situations, or not required during low traffic levels.

The lack of an accurate handover briefing alone should not result in a risk of collision between two aircraft, but it set the stage for this risk of collision. The other defences that should have been present, such as special markings on FPSs, were not used by the controllers. The sector 'A/C' controller did not conduct a detailed flight progress board check after taking over responsibility for the position. A detailed examination of the radar tracks of the two aircraft and/or a comparison of the route and altitude as printed on the FPS might have alerted the controller that action was required on his part to ensure COA18 and IBE6283 would be provided with the required separation. The sector 'C' controller did not remain behind after completion of the handover briefing to observe. He thus missed the opportunity to inform the sector 'A/C' controller of the impending conflict. The relieving sector 'A/C' controller's decision to unplug the relieved controller's headset at the time of the handover might have confirmed in the relieved controller's mind that the traffic situation was fully understood and that there was no need to remain behind to monitor.

The combination of low traffic levels and the lack of information from the handover briefing likely lulled the sector 'A/C' controller into thinking that everything was proceeding without problem. As a result, the controller felt comfortable setting up the RSiT display rather than conducting a detailed review of the FPS and the status of the aircraft under his control.

Written procedures have been developed for marking FPSs to assist the controller in maintaining situational awareness of the traffic situation and to ensure action is taken to maintain the required minimum separation between aircraft. In a radar environment such as in the Gander ACC high west area, controllers concentrate on the radar display and rely much less on information contained on FPSs to detect conflicts. As a result, FPS marking may be seen as less important for detecting conflicts than observing information displayed on the radar. However, unlike FPS marking, memory aids are not standardized on the radar display. Controllers can and have developed personal work practices for highlighting conflicts on the RSiT displays. These unstandardized practices reduce the likelihood that one controller will notice a problem highlighted by another controller. Had standards been in place to mark radar-displayed aircraft in specific ways to highlight conflicts or indicate wrong-way altitudes, the sector 'A/C' controller might have noticed the conflict in time to take appropriate corrective action.

Neither aircrew advised the controller that the evasive manoeuvres were in response to a TCAS RA until after the aircraft had passed each other and were no longer conflicting. As a result, the controller was caught completely by surprise. He would have been completely unprepared to offer additional instructions to the aircraft had they been required; for example, he would have been unable to provide additional traffic information on other aircraft in the vicinity. The method employed by the crew to notify ATC of avoidance action was likely not a factor in this occurrence because of the short notice of the conflicting traffic. The use of consistent and clear phraseology, including key words such as TCAS, would allow controllers to recognize the problem more quickly and be in a better position to offer appropriate assistance.

Findings as to Causes and Contributing Factors

1. During the position handover process, the controller being relieved did not brief the relieving controller that two aircraft were at the same altitude on reciprocal tracks. The incomplete briefing resulted in incomplete situational awareness on the part of the relieving controller.
2. The controller being relieved had not marked the flight progress strip (FPS) in accordance with published procedures, thereby reducing the possibility that the conflict would be detected from a scan of the FPSs.
3. The relieving controller did not adequately scan the FPSs for air traffic in the sector for which he was assuming control and did not detect the conflict.
4. The relieving controller did not adequately scan the radar display after assuming control of the new combined sector and did not detect the conflict.

Findings as to Risk

1. The change in altitude for COA18 from flight level 330 to flight level 350, which is normally inappropriate for the direction of flight, was not passed by the Moncton Area Control Centre controller to the Gander Area Control Centre controller before handing off the aircraft. Although controllers, in accordance with a provision in the Gander/Moncton Agreement, are not required to pass altitude changes prior to the handoff, passing the information would allow the receiving controller more time to develop a separation plan.
2. The controllers did not refer to the available transfer-of-position-responsibility checklist during the handover briefing. Nav Canada procedures do not require controllers to reference the checklist during the handover briefing.
3. Nav Canada has not developed standards for highlighting a radar target on the radar situational display to indicate potential conflicts requiring control action to resolve.
4. Nav Canada radar situational displays are not equipped with conflict-alert software.
5. The controller being relieved handed over a control sector in which a potential conflict existed and did not remain behind after the handover to assist the relieving controller in becoming familiar with the traffic situation.

Other Findings

1. The aircrew of COA18 and IBE6283 did not state, when initially communicating with the controller, that the reason for evasive action was a traffic alert and collision-avoidance system resolution advisory. As a result, the controller was not able to respond effectively and would not have been able to provide additional traffic information had it been required.

Safety Action Taken

On 18 April 2001, as a result of this occurrence and an occurrence on 11 April 2000 (TSB Report No. A00H0002), the TSB issued Aviation Safety Advisory A000043-1 suggesting that Nav Canada “consider a method to reduce the risks associated with memory dependent transfer of position responsibility briefings.” The letter suggested that “[m]andating the use of standard transfer of position responsibility checklists by controllers may reduce the risk that critical information will be forgotten during position transfers.”

On 25 April 2001, the manager of area control centre (ACC) operations at Gander ACC issued Operations Bulletin 2001-056. The bulletin amended coordination procedures between Moncton and Gander ACCs to ensure that prior coordination is accomplished in accordance with *Air Traffic Control Manual of Operations* 432.2 for aircraft operating at altitudes not appropriate to direction of flight. The bulletin also reiterated the requirement to “place ‘WW’ and the reason (both in red) in the altitude box for all assigned altitudes not appropriate to direction of flight.” Moncton ACC controllers received similar direction regarding this procedure.

As a result of these two occurrences, Gander ACC management has issued directives to controllers to use the available handover checklist during handover briefings. This directive does not extend to other Nav Canada facilities across Canada.

In order to minimize the chance that a similar occurrence will take place in the future, Nav Canada has given a structured briefing to all operational personnel regarding the role of human factors in risk management, with specific references to mandatory use of posted sector checklists during hand-over briefings. Nav Canada has also issued Operations Bulletin 2001-130, directing controllers to put an RSiT halo around any aircraft entering Gander Domestic airspace at an altitude inappropriate to direction of flight.

This report concludes the Transportation Safety Board’s investigation into this occurrence. Consequently, the Board authorized the release of this report on 19 February 2002.