



REASSESSMENT OF THE RESPONSE TO AVIATION SAFETY RECOMMENDATION A00-15

Installation and operation of automated conflict prediction and alerting system

Background

On 18 January 1999, Canadian Airlines International flight 987 (CDN 987), a Boeing 767, departed Toronto, Ontario, en route to Vancouver, British Columbia, at flight level (FL) 390. Air Canada Flight 118 (ACA 118), a Boeing 767, departed Calgary, Alberta, en route to Toronto at FL 370. Approximately 55 nautical miles (nm) west of the Langruth, Manitoba, VOR (very high frequency omni-directional radio range), ACA 118 requested and was cleared to climb to FL 410. The pilot of CDN 987, when approximately 35 nm west of the Langruth VOR, advised the controller that he was climbing out of FL 390 because of a traffic alert and collision avoidance system (TCAS) resolution advisory (RA) straight ahead. A loss of separation occurred when the two aircraft passed within 3 nm horizontally with less than 1000 feet of vertical spacing. The required separation is 5 nm horizontally or 2000 feet vertically.

The Board concluded its investigation and authorized the release of report A99H0001 on 13 June 2000.

Board Recommendation A00-15 (August 2000)

Risk-of-collision occurrences between large transport category aeroplanes operating in a radar environment continue to occur in Canadian airspace. There are several ground and airborne layers of defence to prevent midair collisions caused by human errors. The last available ground-based defence that could have prevented this occurrence, human redundancy, was absent because the sector was operated by only 1 controller and the supervisor was actively controlling at another position. The TCAS provided an airborne defence that alleviated this dangerous situation. However, reliance on a TCAS as the sole automated defence against human error leading to midair collisions does not provide protection for all Canadian passenger-carrying aircraft. There are no Canadian regulatory requirements for TCAS installation on domestic, passenger-carrying aeroplanes, and there are no requirements for TCAS on any cargo aeroplanes.

The TSB has investigated other similar loss of separation occurrences (A98H0002, A97H0007, and A99W0064, under investigation) that contain many of the same elements addressed in this report. In the most recent occurrence (A00H0002, under investigation), two Airbus A340 aeroplanes were at the same altitude on undetected collision courses over the Gulf of St. Lawrence when the pilot of 1 aeroplane received a TCAS advisory and alerted the controller. These occurrences raise concerns about the lack of adequate, ground-based, conflict prediction and alerting systems in Canada.

The Canadian Aviation Safety Board (CASB) identified the need to develop and install automated conflict prediction and alerting systems in the Canadian air traffic services system in its recommendation CASB 90-36. Although work has been ongoing over the years by Transport Canada (TC), and most recently by NAV CANADA, there are no definitive commitments to set an implementation date.

There are serious consequences to midair collisions between large transport-category aeroplanes. Additionally, there is a lack of sufficient ground-based defences to contain normal levels of human error, which may lead to losses of separation. Therefore, the Board recommends, for the consideration of both NAV CANADA and the Minister of Transport, that:

NAV CANADA commit, with a set date, to the installation and operation of an automated conflict prediction and alerting system at the nation's air traffic control facilities to reduce the risk of a midair collision.

TSB Recommendation A00-15

NAV CANADA's response to Recommendation A00-15 (October 2000)

As a first step towards implementation of Conflict Alert functionality, we are planning the introduction of this software into an Area Control Centre in a high-level en route environment. This CA operational trial activity is scheduled to occur by the end of the first quarter of 2001.

We have decided upon this method in order to identify where conflict alert software functionality meets operational requirements and to pinpoint areas where CA software needs further improvement. This information is critical to the overall success of the CA functional objective that is to "provide sufficient warning to controllers: a) for corrective action to take place; and b) to advise pilots in advance of TCAS alerts".

Additionally, we will be seeking feedback from our operational control staff, local management and CATCA (Canadian Air Traffic Control Association) representatives on current CA software and possible methods to increase overall CA effectiveness. It is expected that the operational trial period will take a minimum of 60 to 90 days to provide sufficient data to analyze. A national release of the upgraded CA software will follow.

Transport Canada's response to Recommendation A00-15 (November 2000)

NAV CANADA is in the process of developing an Air Traffic Control conflict alert system and will begin testing of the system in Toronto Area Control Centre by March 31, 2001. Transport Canada will monitor this testing and assess the necessity of a regulatory approach to address the Board's recommendation.

Further, a Notice of Proposed Amendment (NPA) was presented at a June 2000 Canadian Aviation Regulations Advisory Council (CARAC) Technical Committee meeting. The NPA states "... by 1 January 2003 no person shall conduct a take-off in a turbine-powered aeroplane that has a maximum certificated take off weight of more than 15,000 kg or for which a type certificate has been issued authorising the transport of more than 30 passengers, unless the aeroplane is equipped with an Airborne Collision Avoidance System (ACAS) that conforms to the Aircraft Equipment and Maintenance Standards." The amendment to the *Canadian Aviation*

Regulations (CARs) will exceed the International Civil Aviation Organization (ICAO) standard, which will come into effect in 2003.

Board assessment of NAV CANADA's response to Recommendation A00-15 (March 2001)

In its reply, NAV CANADA did not commit to a date by which an automated conflict prediction and alerting system would be installed and operational. Instead, NAV CANADA noted that the conflict alert software inherited from TC in 1996 contained problems that were so severe that it could not be used in certain environments. Testing of improved conflict alerting software is currently underway and a partial operational test, in the high-level en route environment only, will take place in the Toronto Area Control Centre by 31 March 2001.

NAV CANADA's response indicates acceptance of the requirement for an operational conflict alerting tool for controllers in certain environments only, and it does not commit to a date by which such a system will be operational in the nation's air traffic control facilities. It does, however, indicate that operational testing will commence in a high-level en route environment by 31 March 2001.

The NAV CANADA response is therefore considered to be **Satisfactory in Part**.

Board assessment of Transport Canada's response to Recommendation A00-15 (March 2001)

In its response, TC noted NAV CANADA's intention to test a conflict alert system in the Toronto Area Control Centre by 31 March 2001. Transport Canada made no indication that they concurred with the recommendation, noting only that they would monitor the testing and then assess the necessity of a regulatory approach to address the Board's recommendation. In addition, TC noted that a Notice of Proposed Amendment (NPA) had been presented to the Canadian Aviation Regulations Advisory Council (CARAC) Technical Committee in June 2000 to require the installation of airborne collision avoidance systems (ACAS) in certain aircraft by 01 January 2003.

The TC response indicated that staff would monitor the progress of the testing and assess the necessity of a regulatory approach to address the intent of the recommendation.

The TC response is considered to have **Satisfactory Intent**.

NAV CANADA's response to Recommendation A00-15 (February 2002)

The Conflict-Alert (CA) Functionality was activated in Edmonton area control centre (ACC) during specific shifts in mid-June in the Edmonton En-route specialty, and turned on for continuous use on July 7/02 [*sic*]. The software is performing as per specifications and no problems have been encountered. A significant difference from our trial in Moncton is that the CA adaptation in the Edmonton En-route specialty includes both high and low level airspace, but excluding the airspace from the surface to 9000' ASL around major airports.

Transport Canada's response to Recommendation A00-15 (January 2003)

Medium-Term Conflict Detection (MTCDD) Preliminary analysis of the requirements and scope of a medium-range conflict detection tool is now underway. Similar functionality is in operational use at some FAA facilities and has been extremely well received by control staff. The concept involves trajectory modelling in radar environments to a point 20 minutes into the future. The ideal functionality will be smart enough to correctly interpret direct routings and spacing vectors and their effect on route conformance. Similar in concept to the trial probe functionality currently used in the Gander Oceanic airspace, the radar environment tool is ideally suited to sectors that deal with high-level crossing traffic. Perhaps a TC inspection will be required to confirm the accuracy of the provided information.

NAV CANADA's response to Recommendation A00-15 (June 2003)

CA functionality is now operational in high level airspace at Gander, Moncton, Montreal, Toronto, and Winnipeg ACCs, and at all levels above fourteen thousand feet at Edmonton ACC. CA implementation at Vancouver ACC is planned for the fall of 2003.

NAV CANADA's response to Recommendation A00-15 (June 2004)

Currently conflict alert is operational in some en route airspace in all 7 ACCs. In 5 ACCs it is operational in all applicable en route airspace above 14,000'. The other 2 ACCs plan to extend CA coverage down to 14,000' in June 2004.

Board reassessment of Recommendation A00-15 (June 2004)

NAV CANADA advises that the operational conflict alerting tool is now operational in much of Canada's airspace which is served by radar coverage, but is not and likely cannot be instituted in certain low-level and terminal airspaces. However, NAV CANADA's activity since the publication of the recommendation should materially reduce the risk associated with the safety deficiency.

The action response is therefore considered to remain **Satisfactory in Part**.

As such, **Further Action is Unwarranted** with respect to Recommendation A00-15 and the status is set to **Inactive**.

Board review of Recommendation A00-15 deficiency file status (April 2014)

The Board requested that Recommendation A00-15 be reviewed to determine if the Deficiency File Status was appropriate. After an initial evaluation, it was determined that the safety deficiency addressed by Recommendations A00-15 needed to be reassessed.

A request for further information was sent to Transport Canada and a reassessment will be conducted upon receipt of Transport Canada's response.

Therefore, the assessment remains **Satisfactory in Part**.

Consequently, the status of Recommendation A00-15 is changed to **Active**.

Transport Canada's response to Recommendation A00-15 (July 2015)

NAV CANADA is using Conflict Alert (CA) and Minimum Safe Altitude Warning (MSAW) at the following units:

Vancouver ACC:

Medium-Term Conflict Detection (MTCD) in High Level Structure from FL200 and above, Conflict Alert (CA) in high and low level structure but not in the Terminal Control Units (TCU), MSAW Operational Low Level structure in Vancouver ACC.

Edmonton ACC:

MTCD in High Level Structure

Conflict Alert (CA) in high and low level structure but not in the Terminal Control Units

MSAW Operational in Low Level Airspace, Calgary En-route Specialty.

Winnipeg ACC:

MTCD in High Level Structure

Conflict Alert (CA) in high and low level structure but not in the Terminal Control Units,

MSAW not operational.

Gander ACC has enabled MTCD in the low level airspace from 125 – FL270. Vancouver has added MSAW to the airports specialty.

No other update for Moncton, Montreal, Toronto.

Transport Canada believes the objectives of the recommendation have been met.

NAV CANADA's response to Recommendation A00-15 (March 2015)

Montreal ACC:

MTCD in all high level airspace.

Edmonton ACC:

In addition to Transport Canada's response, the Northern airspace version of the Northern Airspace display system (NADS) situational display (NSiT) includes conflict prediction for non-radar targets.

Moncton ACC:

CA from 14,000 feet and above in all specialties except Halifax Terminal. MTCD from FL 200 and above for all specialties except Halifax Terminal.

Toronto ACC:

CA from 14,000 feet and above in all specialties except terminals (TCU, Airports) and is considering future implementation of MTCD, possibly next fiscal year (September 01, 2016 – August 31, 2017).

Board reassessment of Transport Canada's and NAV CANADA's responses to Recommendation A00-15 (March 2016)

Transport Canada and NAV CANADA's responses indicate that all major Air Traffic Control facilities are now using Minimum Safe Altitude Warning (MSAW), Conflict Alert (CA) and/or Medium-Term Conflict Detection (MTCD).

Based on this information, the TSB believes that NAV CANADA has met the requirements of Recommendation A00-15, reducing the risk of midair collisions in Canadian controlled airspace.

Therefore, the response is assessed as **Fully Satisfactory**.

Next TSB action

This deficiency file is **Closed**.