

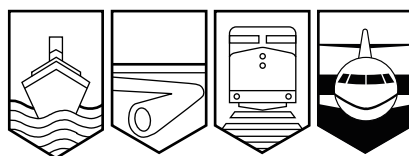
Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

AVIATION OCCURRENCE REPORT

A98W0216



LOSS OF SEPARATION

BETWEEN

AIR CANADA

BOEING 747-238 C-GAGC

AND

AIR CANADA

BOEING 747-400 C-GAGM

55° NORTH LATITUDE AND 10° WEST LONGITUDE

27 SEPTEMBER 1998

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 Occurrence Report

Loss of Separation

Between

Air Canada

Boeing 747-238 C-GAGC

and

Air Canada

Boeing 747-400 C-GAGM

55° North Latitude and 10° West Longitude

27 September 1998

Report Number A98W0216

Summary

Air Canada flight number 003 (ACA003), a Boeing 747-238, departed London, England, at 1255 coordinated universal time (UTC) for Montreal, Canada. Shortly thereafter, Air Canada flight number 857 (ACA857), a Boeing 747-400, departed London, England, for Toronto, Canada. For the oceanic crossing, ACA003 was cleared to flight level (FL) 360 and ACA857 was cleared to FL350; both aircraft attained their assigned altitude. At approximately 1332, Scottish Oceanic En Route air traffic control centre received a separation monitoring function (SMF) alert which showed that ACA003 was descending through FL350, with about two nautical miles (nm) lateral separation from ACA857. Because ACA003 was at the extreme limits of the very high frequency (VHF) radio range, initial attempts to communicate by both the controllers and the flight crew were unsuccessful. At about 1343, ACA003 and Scottish Oceanic Area Control Centre (Scottish Centre) established communications on frequency 121.5 megahertz (MHz) and then on 125.675 MHz. ACA003 was re-cleared to maintain FL320 and separation with other aircraft was established.

Ce rapport est également disponible en français.

Other Factual Information

After departure, ACA003 was initially cleared to FL330, and upon reaching that altitude, the flight crew completed the cruise checklist. The second officer, with concurrence of the captain, contacted Scottish Centre and requested oceanic track Charlie at an altitude of FL350. The centre advised that FL350 was not available, but that FL360 was available if ACA003 could accept it. After the crew reviewed the performance charts, the second officer advised the centre that FL360 was acceptable for the oceanic crossing. ACA003 was subsequently cleared to cross 55 degrees north latitude and 10 degrees west longitude (55° N, 10° W) at FL360, the entry point to the oceanic track Charlie.

Aircraft performance during the climb from FL330 to FL360 was good, with the aircraft climbing at about 500 feet per minute (fpm). At level-off at FL360, the aircraft weight was 679 100 pounds, and the speed was just over Mach 0.85. The cruise target speed was Mach 0.84. The engine thrust levers were set at the pre-determined engine pressure ratio (EPR) values of 1.60, and the speed was seen to be approaching Mach 0.84. The flight crew then continued with various activities on the flight deck. As the captain, who was the pilot flying, was making a passenger address (PA) announcement, the aircraft experienced a slight ripple-type vibration. The captain checked the airspeed which was passing through Mach 0.750/248 knots indicated airspeed (KIAS) and decreasing. The first officer called airspeed, power, and maximum continuous thrust and the captain increased the engine power to maximum continuous thrust (MCT). The airspeed stabilized for a short time and then began to decrease again. The crew requested a descent clearance from Scottish Centre on VHF radio while the captain began a descent to maintain airspeed. ACA857 heard ACA003's attempted calls and relayed the request to Scottish Centre also advising that he had ACA003 visual and was maintaining separation.

ACA857 had observed ACA003 in descent visually and on the traffic collision avoidance system (TCAS), and had moved left of track to remain clear of ACA003's wake turbulence and to maintain some lateral separation. After passing through FL350, ACA003 established communications with Scottish Centre on frequency 121.5 MHz and later with Scottish Control on 125.675 MHz. Once ACA003 passed below the altitude of ACA857, the captain elected to turn left so as to remain clear of other traffic he knew was in the area. As soon as practical, the crew advised Scottish Centre of their offset. After establishing that the flight could continue to Montreal, ACA003 was cleared to maintain FL320. The remainder of the flight was uneventful.

The flight crew of ACA003 met all the training and operational requirements as prescribed for operation of the Boeing 747-238. The captain had been on the aircraft type for about two years, and had flown in the week before the incident. The first officer had been on the aircraft type for about four months, but had not flown for the previous month. The second officer had been on the aircraft type for approximately seven months, and had flown in the week before the incident. The crew had dead-headed to London and the first officer and second officer met each other the day before the flight. The captain met the first officer and second officer in the lobby of the hotel the morning of the flight. The captain and second officer had not met each other before this flight. The captain and first officer had flown together on a previous occasion.

According to the Boeing 747-200 performance charts, the aircraft is capable of maintaining FL360 under the conditions of this occurrence; however, the technique in handling the aircraft while at critical performance limits requires special attention and very careful monitoring until the aircraft is stabilized.

The aircraft departed London with 238 passengers and 10 infants. The estimated take-off weight was 716 100 pounds and the mean aerodynamic chord (MAC) was 5.3 units. The aircraft departed London within the allowable weight and centre of gravity range. On arrival at Montreal, the aircraft cargo was weighed and found to be 1 800 pounds more than indicated on the pre-take-off calculations. This weight discrepancy would not have affected the balance or cruise calculations, and is not considered a factor in this occurrence.

The upper level wind charts available to the crew indicated a veering wind from the south-south-west to generally a westerly flow in the area of 10° W. Wind speed varied from 45 knots in the south-westerly flow to 35 knots in the westerly flow. Temperatures varied from minus 51 degrees Celsius to minus 54 degrees Celsius. The aircraft was operating during daylight in visual meteorological conditions (VMC) from departure to the time of the occurrence.

The digital flight data recorder (DFDR) was removed and sent for analysis. The data from the DFDR was found to be limited for analysis purposes due to a problem with the acquisition function of the recorder. Most of the engine parameters, including engine thrust settings and altitude readouts, were missing. Airspeed, two fuel flows, pitch, static air temperature, angle of attack, magnetic heading, and some non-relevant parameters were available. The DFDR confirmed the reduction of airspeed which occurred over a period of about six minutes and a change in angle of attack from about 3 degrees nose up to about 5.5 degrees nose up. There were significant fuel flow discrepancies between the No. 1 and No. 2 fuel flow recordings. The flows are, however, indicative of the thrust setting changes which the captain reported.

At the time of the incident, Scottish air traffic control (ATC) was not monitoring the progress of ACA003 as it was beyond the 250 nm range set on its monitors; however, ACA003 was still operating in the area covered by the radar. Radar data recorded by Scottish Centre show ACA003 in level flight with the ground speed slowly reducing. Because of its slower ground speed (decline of airspeed), ACA003 was slowly being overtaken by ACA857, on near identical ground tracks. As ACA003 began to descend and encroach on the protected flight space of ACA857, the separation monitoring function detected the loss of separation and alerted Scottish Centre staff.

Analysis

Because of the limited value of the DFDR data, a reconstruction of the flight was not possible. Crew reports, radar data, and ATC radio transcripts were used to reconstruct events which led to the loss of separation between the two aircraft. Because the weather was clear and the TCAS was operating, the crew members of ACA857 were able to observe and monitor the progress of ACA003 and offset the aircraft track so as to avoid wake turbulence and reduce the risks of proximity flight.

After ACA003 levelled at FL360, the DFDR indicates that about six minutes elapsed before there was a reaction by the flight crew to the loss of airspeed. As the speed decreased and the pitch angle changed to about 5.5 degrees, the captain was making a PA announcement and the first officer and second officer were preparing a position report required for 55° N, 10° W crossing. Thus, there was no effective monitoring of the aircraft performance just after reaching a cruising altitude, which the crew were aware was at or near the performance limits of the aircraft. The better-than-anticipated aircraft performance during the climb to FL360 gave the crew little concern regarding the need to monitor the aircraft's performance after level-off.

Because of the problem of the acquisition function of the DFDR, it could not be determined if the thrust was set at the required levels, nor could it be determined what setting may have been selected to other cockpit systems.

After levelling at FL360, the captain had the thrust levers set to pre-determined levels for the altitude/weight/airspeed configuration. Once the altitude was captured, the autopilot compensated for the reduction in airspeed by increasing the pitch angle. The pitch angle changed slowly and was not perceived by the flight deck crew who were preoccupied with duties not associated directly with the monitoring of aircraft performance. Thus, it was not until the captain noted a slight ripple through the aircraft, which was likely a pre-stall buffet, that his attention was diverted away from the PA announcement he was making to the passengers and refocused on the aircraft. Because of the low airspeed, moving the thrust levers to MCT did not provide sufficient thrust to regain airspeed without descending the aircraft. Further complicating the recovery was the crew's inability to communicate immediately with the appropriate ATC authority. Communications were eventually established, but not until after a loss of separation occurred.

Because of the TCAS indication and because the crew of ACA857 could see ACA003, they were able to offset their track and pass ACA003 with about 2 nm lateral separation. The captain of ACA003 was aware that, by offsetting his track during the descent, he would avoid flight in proximity to other following aircraft.

Findings

1. The flight crew of ACA003 were certified and qualified for the flight.
2. ACA003 was capable of sustaining flight at FL360 under the conditions present during the occurrence.
3. After levelling the aircraft at FL360, the flight deck crew became preoccupied with tasks not associated with monitoring aircraft performance and the airspeed decayed to Mach 0.75; the target speed was Mach 0.84.
4. As the airspeed decreased, the pitch angle increased from about 3 degrees to about 5.5 degrees and buffet was felt through the airframe directing the crew's attention to the aircraft's deteriorating performance.

5. To regain airspeed, the thrust was increased to MCT and the nose was lowered. The lowering of the nose resulted in a loss of altitude.
6. The loss of altitude resulted in a loss of separation with a following aircraft, ACA857.
7. Because of the TCAS indication and because the crew of ACA857 could see ACA003, the crew of ACA857 moved laterally off course to avoid wake turbulence and to provide lateral separation.
8. Communications difficulties resulted in the appropriate ATC agency not being made aware of the intentions of ACA003 until after the loss of separation occurred.
9. The loss of separation was detected and displayed by the ATC separation monitoring function.

Causes and Contributing Factors

After levelling at an altitude which was at or near the performance limits of the aircraft, the crew did not adequately monitor the performance of the aircraft and the airspeed decreased to an unsafe level. The flight crew of ACA003 had to descend the aircraft to increase airspeed and a loss of separation occurred.

Safety Action

Air Canada published an internal *Aircraft Technical Bulletin #405*, dated 98-11-06, which discussed a recent change to the *Canadian Aviation Regulations*. The change requires periodic FDR correlation checks in operation, with each aircraft being checked once per C-check cycle. When a check is due, flight crew perform and record the required correlation checks during flight. Maintenance personnel then retrieve the completed form and the FDR and ensure that the FDR is recording properly.

Although this change is not related to this occurrence, the required correlation checks will ensure that an FDR is more likely to perform properly during flight.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard, and members Jonathan Seymour, Charles Simpson, W.A. Tadros and Henry Wright, authorized the release of this report on 24 November 1999.