

AVIATION INVESTIGATION REPORT

A02H0002

LOSS OF SEPARATION

NAV CANADA

TORONTO AREA CONTROL CENTRE

TORONTO, ONTARIO 15 nm SE

18 SEPTEMBER 2002

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.

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Summary

C-GLJM, a Canadian Flyers International PA-44-180, was on an instrument flight rules (IFR) flight from Teterboro, New Jersey, to Buttonville, Ontario, at 6000 feet above sea level. On initial contact with air traffic control, the Toronto Area Control Centre (ACC) east satellite sector controller advised the pilot that the Mode C (altitude readout) of the aircraft transponder was not being received. When the pilot recycled the transponder, the radar target and data block was dropped from the radar data processing system situation display (RSiT) and the flight data was transferred to the controller's coast list. Shortly thereafter, the controller inadvertently deleted C-GLJM's flight plan from the coast list. This action caused the radar target to be displayed on the RSiT as an uncorrelated secondary surveillance radar (SSR) target with no Mode C altitude. Subsequently, a controller changeover took place; there was no discussion about C-GLJM. Air Canada Jazz Flight 7868 (JZA7868), a de Havilland DHC-8 on departure from Toronto City Centre Airport to Ottawa, Ontario, was climbing eastbound and passed in front of and below C-GLJM. At approximately 1907, eastern daylight time, the aircraft were at their closest to each other, separated vertically by 800 feet and horizontally by 1.3 nautical miles (nm) in airspace where the required separation was 1000 feet vertically or 3 nm laterally. The second east satellite sector controller became aware of C-GLJM when the aircraft requested descent into Buttonville.

Ce rapport est également disponible en français.

Other Factual Information

The first east satellite sector controller had 24 years experience as a controller with two years in the satellite specialty. He had been on duty for 7 hours 30 minutes since the beginning of his shift and had worked for one hour since his last break. He was the specialty shift supervisor at the time of the occurrence and was working both the radar and data positions. The east satellite sector provides radar control services to aircraft using the airports to the east and north-east of Toronto, Ontario and to visual flight rules (VFR) aircraft transiting the city outside of the arrival areas. Air traffic was light to moderate.

The first east satellite sector controller received the estimate for C-GLJM from Buffalo, New York, approach control at approximately 1848 eastern daylight time (EDT)¹ and passed the estimate to Buttonville. He added the appropriate marking to the flight progress strip to indicate that the estimate had been passed and positioned the strip flush in the flight data bay to indicate that there were no further outstanding actions to complete concerning this aircraft.

At the time that C-GLJM made contact with the east satellite sector controller and thereafter, the primary radar return for C-GLJM was intermittent. There is no known radar blind spot in the vicinity of C-GLJM's inbound track. It could not be determined why the Toronto and Hamilton, Ontario, radar sites serving the sector did not display the primary return more regularly. The Mode C indication of aircraft altitude appeared on only one target update, at 1855:45. The controller queried the pilot as to whether the aircraft's Mode C was serviceable. The pilot indicated that it was working earlier and would recycle the transponder (quick switch to the standby position and back to the normal position) followed shortly thereafter by turning the transponder off for approximately 30 seconds when the first action produced no results). Changing the transponder to the standby position and then to the off position for 30 seconds resulted in the radar losing the transponder information long enough such that the aircraft data was moved to the coast list. The Mode C altitude readout later reappeared for C-GLJM at 1907:49, the approximate time the flight crew asked the second east satellite sector controller for descent into Buttonville. It could not be determined what caused the intermittent operation of the Mode C transponder.

A radar target is automatically correlated with available flight plan information when the aircraft transmits the transponder code assigned on its flight plan. As a result, a data block containing flight number, altitude and speed is attached to the aircraft's radar target. The radar data processing system makes use of a routine called the coast function. This function is designed to ensure that information on a correlated aircraft is not lost if the radar does not detect a target or there is some ambiguity about the detected target. The coast list displayed on the radar data processing system situation display (RSiT) serves to advise the controller that aircraft on the list are no longer visible on the display as correlated targets with associated aircraft information.

As soon as the transponder code is interrupted or lost, the radar system displays a target with appropriate data block information at a computer predicted next target position. In this situation, the target and data block flash on the RSiT to indicate that the target is 'coasting'. In the Toronto Area Control Centre (ACC), a target coasts (flashes) for approximately 18 seconds or six radar update cycles following which the radar target disappears from the RSiT. After this time, provided no target is detected by the radar with the correct transponder code, the aircraft data is entered into a coast list, which is also displayed on the RSiT. Entries are placed in the coast list in order of occurrence. If the aircraft's transponder is re-acquired, the data is then again attached to the radar target.

¹ All times are EDT (Coordinated Universal Time minus four hours).

Each new data entry in the coast list is coloured green until the controller acknowledges the new entry by clicking on it with the computer mouse, at which time that new entry reverts to white print. Clicking on the entry presents a table of potential actions, one of which is the option to delete the entry. Controllers are encouraged to delete unneeded entries, such as aircraft that have been handed off to another sector and exited the controller's airspace, in order to release transponder codes for potential reassignment to other aircraft or to reduce the clutter and size of the coast list. Aircraft which have landed at specific airports are deleted from the list automatically. Others must be deleted from the list manually. The entry for C-GLJM was deleted manually by the controller.

During the time when the transponder for C-GLJM was in the standby or off mode, and before being turned on again and reacquired by the radar processing system, the controller inadvertently chose the option to delete C-GLJM from the coast list. However, the flight plan for the aircraft was also deleted from the data base. When the radar re-acquired the aircraft, in the absence of flight plan information, the target symbol for the aircraft was presented as an uncorrelated target. The data block for the aircraft was reduced to two potential pieces of information, the transponder code selected and the aircraft altitude. In Toronto, the display of the transponder code is suppressed to reduce clutter on the RSiT. As well, in this occurrence, because the Mode C transponder was inoperative for most of the time that C-GLJM was in the east satellite sector, there was no information displayed on the aircraft altitude. The only indication of the aircraft position, after the first satellite sector controller deleted the entry from the coast list, was the target symbol graphically displayed as * and known as a 'splat' (*).

The first east satellite sector controller was in the habit of closely monitoring the coast list to ensure that it contained only current information. When the radar data processing system lost correlation with C-GLJM and began the coast process, at 1855:50, the first east sector controller noted an unrelated coast list entry which was no longer of concern. He deleted the extraneous entry at 1855:56. Twenty four seconds after beginning to coast, the radar data processing system, having failed to re-acquire C-GLJM, deleted the target from the display at 1856:14, and entered the flight data information in the coast list. The first east sector controller noted the green print of the entry in the coast list and thought that he had missed the first intended deletion with the mouse pointer. Without scrutinizing the detail of the entry, he deleted this entry at 1856:22.

The software for this function does not provide a prompt to confirm that the deletion is intentional. There is also no provision for deleting aircraft from the coast list without at the same time deleting the entire flight plan from the system. Subsequently, at 1856:33, when the radar data processing system re-acquired the target for C-GLJM, the flight plan had been deleted from the data base so the new target displayed was for an uncorrelated secondary service radar (SSR) target with no flight data block and no Mode C altitude readout, a splat. The controller did not notice the loss of radar target from the RSiT, nor the new splat displayed subsequent to the aircraft's target being re-acquired.

At 1904:11, the first east satellite sector controller made contact with JZA7868 and issued a clearance to climb to 3000 feet and join airway Victor 98, on course. This airway crossed the inbound track of C-GLJM to Buttonville. On the assumption that there was no conflicting traffic on the proposed flight track for JZA7868, the controller instructed the flight crew to contact Toronto departure, the next control agency on the route of flight. At this time, the two aircraft were 14 nm apart. The action by the first east satellite sector controller of passing control of JZA7868 to another controller, while still in east satellite airspace, was a tacit confirmation to the subsequent controller (Toronto departure) that there is no known conflicting traffic.

Toronto departure, on making contact with JZA7868, cleared the flight to continue climb to 11 000 feet and, at approximately 1905:40, advised JZA7868 to contact the next control sector for further climb clearance. The aircraft were now approximately 7 nm apart. At approximately 1906:30, JZA7868 contacted Toronto east sector and requested climb to 17 000 feet, which was approved. At this time the aircraft were approximately 3 nm apart. Traffic information was not passed to JZA7868 on the radar target, which was C-GLJM. At 1907:01, JZA7868 passed 1.3 nm in front of C-GLJM and approximately 800 feet below. JZA7868 was climbing at this time.

After handing-off JZA7868 to Toronto departure, the first east satellite sector controller began the change of position responsibility briefing with the second east satellite sector controller. In performing the briefing, the first controller referred to each target displayed on the RSiT which contained his controller jurisdiction symbol and cross-referenced each to the associated flight progress strip. The target for C-GLJM did not show the flight number, altitude, or a controller jurisdiction symbol and was overlooked during the handover briefing. The second east satellite sector controller was not aware that C-GLJM was on frequency and under his control. When he later reviewed the flight progress strips, he noticed the strip for C-GLJM but, because the strip was flush in the flight strip bay and had not been mentioned during the handover briefing, he assumed that C-GLJM had not yet been handed over from Buffalo approach, that is it was still a pending or non-active flight.

At 1909:07, C-GLJM contacted the second east satellite controller requesting descent into Buttonville. The second east satellite sector controller re-identified the aircraft and issued the appropriate clearances.

Analysis

The first east satellite sector controller inadvertently deleted the flight plan of C-GLJM while performing normal organizational duties associated with the coast list. The design of the radar processing system is such that the single action required for the deletion of track information from the coast list also deletes all flight plan information on the aircraft. As a result, when the SSR target for C-GLJM was re-acquired, there was no flight plan information available to correlate with the new target. Because the Mode C altitude readout for C-GLJM was not functioning, there was no indication on the RSiT that this aircraft was flying at 6000 feet. The type of radar target displayed on the RSiT was, therefore, similar to other non-identified, uncontrolled targets and was not considered significant by any of the controllers. The east satellite sector relied heavily on radar because of the large number of transient VFR aircraft that ask for temporary radar services and by the generally short time that aircraft are in the sector. Because the radar target for C-GLJM did not correspond to those he normally controls, the controller's situational awareness was reduced to the point that he forgot about C-GLJM.

The change of responsibility briefing by the first east satellite sector controller reflected his reliance on radar displayed information. Because the target for C-GLJM was not shown as known radar traffic, it was not mentioned by the first east satellite sector controller nor was it matched with the flight progress strip. When the flight progress strip was later reviewed by the second east satellite sector controller there was no indication on the strip that C-GLJM had made contact and was active traffic in the sector. The use of radar traffic displayed on the RSiT to cross reference with the flight progress strips meant that the presence of the flight progress strip for C-GLJM without an associated radar target was not noticed. The flight progress strips did not, therefore, serve as a back-up method for tracking active flights.

The presence of uncontrolled VFR targets below and surrounding the controlled airspace in the Toronto area may desensitize controllers to the presence of aircraft with which they are not in contact. As a result, traffic information may not always be passed, under the assumption that these aircraft are not flying within controlled airspace. The practice of handing-off departing aircraft to subsequent controllers prior to the normal airspace

boundaries meant that there was a tacit confirmation from the controller responsible for the airspace that there was no known conflicting traffic for that departing aircraft. Traffic information or avoiding vectors were not issued to the crews of either aircraft.

Findings as to Causes and Contributing Factors

1. The flight plan of C-GLJM was inadvertently deleted from the coast list which resulted in the loss of all displayed flight data for that target on the radar monitor. The aircraft was forgotten because the identifying flight data was not displayed on the radar data processing system situation display (RSiT).
2. There is no provision for deleting data from the coast list, without, at the same time, deleting the entire flight plan. When the radar system re-acquired the secondary surveillance radar (SSR) target for C-GLJM, there was no flight data available to post in the target data block.
3. The target for C-GLJM was not evident on the monitor and was not referenced to the active flight progress strip during the change of responsibility briefing. The method of conducting the change of responsibility briefing, by first referencing traffic on the radar monitor against flight progress strips, led to the flight being overlooked.
4. The radar target for C-GLJM was not recognized as conflicting traffic for JZA7868. Therefore, the flight crews of JZA7868 and C-GLJM were not issued traffic information or vectors to avoid each other.

Findings as to Risk

1. The early handoff to the next sector, may have led to the assumption that unidentified targets in the vicinity would be at low level and of no concern to departing climbing aircraft such as JZA7868.
2. The deletion of the flight data from the coast list also deletes the associated flight plan. The deletion is completed with a single input action without an opportunity for confirmation that the deletion of all the aircraft data, including the flight plan, is the desired course of action.

Safety Action

Procedures in the Toronto Area Control Centre (ACC) have been revised to include the requirement of matching targets to strips as part of sector hand-over procedures, and included in sector checklists. Mandatory verbal briefings will be conducted with all operational personnel on these revised procedures. In addition, the 2003-04 refresher program which is to commence in October 2003 will include this occurrence as an example to emphasize the need for vigilance and target to strip confirmation.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 23 July 2003.

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