

AVIATION INVESTIGATION REPORT
A99H0003

LOSS OF SEPARATION
BETWEEN
PROVINCE OF MANITOBA
PIPER PA-31 NAVAJO C-GRNE
AND
BRANDON FLYING CLUB
MOONEY M20C C-GKGY
WINNIPEG INTERNATIONAL AIRPORT, 5 NM WEST
07 JUNE 1999

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

Between
Province of Manitoba
Piper PA-31 Navajo C-GRNE
and
Brandon Flying Club
Mooney M20C C-GKGY
Winnipeg International Airport, 5 nm West
07 June 1999

Report Number A99H0003

Summary

C-GRNE, a Piper PA-31 Navajo, was on arrival to Winnipeg International Airport (the airport), on radar vectors for a left-hand approach to runway 36. The arrival controller had cleared the aircraft to descend to 3000 feet. C-GKGY, a Mooney M20C departing on an instrument flight rules flight plan off runway 36, was given a left-turn heading of 270 degrees and cleared to climb to 6000 feet by the departure controller. As they passed 5 nautical miles (nm) west of the airport, the separation between the two aircraft was 0.53 nm lateral and 300 feet vertical. The required separation in this area was 3 nm lateral or 1000 feet vertical.

Ce rapport est également disponible en français.

Other Factual Information

The Piper Navajo, C-GRNE, on an instrument flight rules (IFR) flight to Winnipeg, was being vectored to the airport by the arrival controller for a visual approach to runway 36. The aircraft was maintaining 7000 feet when the arrival controller accepted control of the aircraft.¹ At 1211:28 central daylight time the pilot of the Navajo requested descent clearance (see Appendix A – Sequence of Events).² Since the aircraft was flying in the departure controller's airspace, coordination was required with the departure controller for a lower altitude. The arrival controller noted that the departure controller was busy, and so did not initiate coordination at that time. At 1212:08, after receiving approval from the data controller, located between the departure and arrival controllers, the arrival controller cleared the Navajo to descend to 5000 feet. Normally, approval for descent was verbally coordinated directly between the arrival and departure controllers. Then, at approximately 1216, the departure controller advised the arrival controller that descent to 3000 feet without restrictions was approved for the Navajo. The aircraft was 11 nm northwest of the airport at the time, still within the departure controller's airspace.

At 1214:18, the tower requested and received approval from the departure controller to turn C-GKGY, a Mooney M20C about to take off from runway 36 on an IFR flight, early rather than climb runway heading, in an effort to expedite the departure flow. The tower and departure controllers coordinated an initial departure heading of 250 degrees. The Mooney took off at 1216:24 and turned left at about mid-field to 250 degrees. On initial contact with the departure controller, the Mooney was identified and issued a right turn to a heading of 270 degrees and was to continue the climb to 6000 feet.

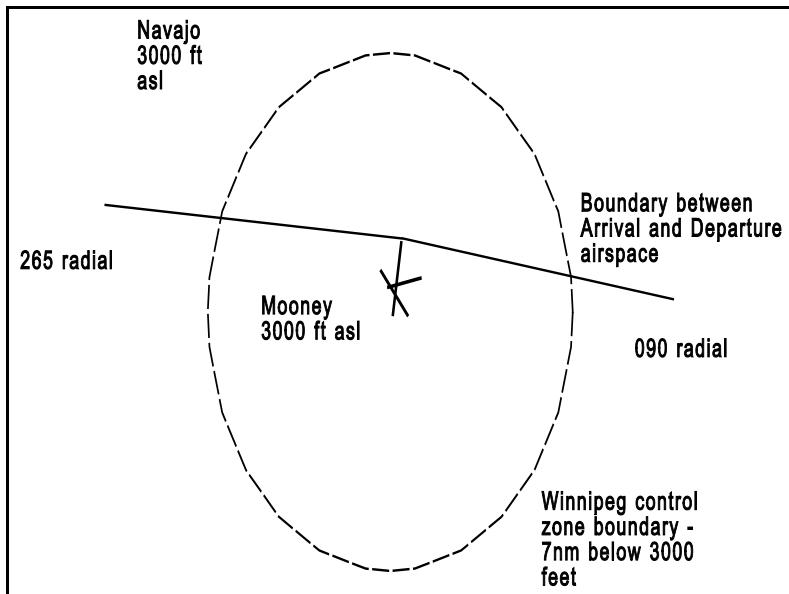
Neither the arrival controller nor the departure controller was aware that the two aircraft were approaching each other at the same altitude with less than the required radar separation (see Figure 1). It was the data controller who alerted the arrival controller to the impending conflict. The arrival controller immediately instructed the Navajo to descend to 2500 feet and, six seconds later, at 1219:33, issued traffic information on the Mooney. At 1219:34 the departure controller issued traffic information on the Navajo to the Mooney. Nine seconds later, the pilot of the Mooney advised the traffic in sight. Analysis of the recorded radar data indicated that the Navajo crossed 0.53 nm directly in front of and 300 feet below the Mooney in an area where 3 nm lateral or 1000 feet vertical spacing is the minimum required separation in accordance with Canadian Aviation Regulation 801.08. There is no functioning conflict-alerting tool available to warn controllers of an impending conflict.

¹ Units are consistent with official manuals, documents, and instructions used by or issued to the crew.

² All times are central daylight time (coordinated universal time [UTC] minus five hours).

Except for the Navajo and the Mooney, there was no other traffic of concern to the west of the airport for the arrival or the departure controller. The departure controller was controlling four aircraft, primarily to the north and east of Winnipeg. The arrival controller was controlling four aircraft to the east and southeast. The arrival controller was concerned with three visual flight rules (VFR) aircraft that had departed eastbound and were traffic for one of the arrivals. For 1 minute 12 seconds before the loss of separation, the arrival controller was busy trying to sort out a request

from another arriving aircraft for a type of approach unfamiliar to the arrival controller. The arrival controller's attention was diverted from his other controlling tasks until the data controller called his attention to the conflict between the Navajo and the Mooney.



Many of the aircraft flying into and out of Winnipeg airport on a daily basis have become familiar with the procedures used by controllers for assigning altitudes to arriving aircraft. Pilots have come to expect descent clearance as early as possible, especially if visual approaches are in effect. In an effort to provide a safe and efficient service, arrival controllers routinely coordinate lower altitudes with the departure controller prior to arriving aircraft reaching the "dump zone"—airspace under the jurisdiction of the arrival controller. In this occurrence, the Navajo was authorized to descend (after coordination) to 5000 feet, then to 3000 feet, while the aircraft was still north of the dump zone.

When the departure controller authorized descent for the Navajo to 3000 feet, he did not advise the arrival controller that there would be traffic departing westbound, climbing to 6000 feet. It was normal practice for the departure controller when approving descent to also coordinate any traffic of concern to the arrival controller, along with any avoidance required.

There were six controllers, including the supervisor, on duty in the Winnipeg Terminal Specialty at the time of the occurrence. Four control positions were active: arrival, departure, data, and VFR traffic advisory. Traffic in the arrival position was reported to be light to moderate with normal complexity. The departure controller was experiencing moderate traffic levels with moderate complexity. The staffing level was in accordance with unit policy and was compatible with the traffic levels.

Arriving and departing traffic is routed into and out of Winnipeg Terminal Control Unit (TCU) airspace via specific entry and exit gates. Arrival and departure controllers therefore are required to coordinate the climb and descent of aircraft on crossing tracks in accordance with standard procedures contained in Operations Letter OL-97-006—Procedures Pertaining to the Terminal Specialty, dated 15 May 1997. This letter specifies the division and coordination of airspace between arrival and departure control.

An (approximately) east–west line, based on the 090- and 265-degree radials of the Winnipeg VORTAC (combined very high frequency omnidirectional radio range and tactical air navigation aid), delineates the airspace controlled by the arrival and departure controllers. According to Operations Letter OL-97-006, when runways 31, 36 and/or 07 are active, descent to 5000 feet for aircraft arriving from the west requires prior coordination with the departure controller. However, once an aircraft has crossed the 090- or 265-degree radial southbound, the arrival controller is no longer required to coordinate with the departure controller to descend arriving traffic.

Runway 36 was the active runway, and runway 31 was available for use after coordination between the tower and terminal. Departures were issued published standard instrument departure (SID) procedures in accordance with Operations Letter OL-97-006. The SID for runway 36 requires the aircraft to climb to 4000 feet (or flight-planned altitude, if lower), and to expect radar vectors. A review of communications between the departure controller and departing aircraft in the 10-minute period preceding the occurrence revealed that, on initial contact, the majority of aircraft were being instructed to continue on runway heading. The Mooney, on the other hand, had been instructed to commence an immediate turn to the west after departure, a manoeuvre normally associated with VFR departures.

The data controller is, in part, responsible for receiving and passing estimates, annotating and writing flight progress strips, answering the telephones, and acting as a second pair of eyes and ears for the arrival controller. The data controller may also initiate coordination to assist the arrival and departure controllers. The data controller's position is physically located between the arrival and departure positions. According to information received during the investigation, the data controller is responsive to, and works most closely with, the arrival controller.

Section 507 of the *Air Traffic Control Manual of Operations* (ATC MANOPS) provides phraseology that controllers are to use when issuing safety advisories to aircraft. Neither the arrival nor the departure controller used this phraseology when passing traffic information to the pilots of the Mooney and Navajo aircraft. Previous investigations conducted by the TSB have shown that when non-standard phraseology was used to alert aircrews to impending conflicts, there were delays in response from the aircrew because the sense of urgency to react was not always evident to them.

The *Air Traffic Services Administration and Management Manual* (ATSAMM) states: “managers shall ensure that...operating procedures are in place that will allow the air traffic services unit to function with the highest degree of efficiency.” Standard operating procedures provide a built-in level of safety and reduce the workload for the controller. The Human Factors section of NAV CANADA’s Situational Awareness Training module for Air Traffic Services (ATS) personnel notes:

Regulations and standard operating procedures (SOP) are usually the consequence of past actions. They are pre-made decisions with known outcomes. If we (controllers) depart from regulations or SOPs, we are operating in a gray area, where the outcomes of our actions cannot be predicted with any degree of certainty.

Operations Letter OL-97-006 does not specifically state which controller, arrival or departure, is responsible to maintain his or her aircraft's separation from other traffic. It is generally understood, however, that the departure controller is responsible to keep departing traffic away from arrival traffic if descent is authorized within the departure airspace. The arrival controller had seen the radar target for the westbound departure when it initially appeared on the radar display but determined, based on its observed flight path (immediate turn after departure rather than runway heading), that it was probably a VFR flight. The arrival controller would have expected the departure controller to point out any IFR traffic of concern at the time authorization to descend the Navajo was issued to the arrival controller.

When the VFR radar-monitoring position is active, as it was in this instance, the controller jurisdiction symbol (CJS) associated with that position is displayed beside the radar target and is an indication that the aircraft is a VFR flight. VFR flights are normally restricted to 2500 feet above sea level (asl) or less within 7 nm of the airport. However, if the VFR radar position is combined with the departure position, there is no way to distinguish a VFR radar target from an IFR radar target, because all targets controlled by the departure controller would display the departure CJS.

Procedures have been developed at some NAV CANADA ATS units in which a supplementary character termed a *special function indicator* (SFI) is added to the aircraft identification display. Local procedures can define the SFI to mean, among other things, that a particular aircraft is a VFR flight. Such a procedure can make it easier for controllers to distinguish between IFR and VFR aircraft and has the potential to reduce the need for verbal coordination between arrival, departure, and tower controllers.

Analysis

Controllers have the responsibility to provide safe, orderly, and expeditious movement of traffic under their control. Local and standard operating procedures assist controllers in completing this task. Many procedures also include provision to allow controllers to coordinate out of these procedures to better react to varying circumstances.

If controllers use other-than-standard operating procedures, there is a requirement for increased vigilance and additional safety checks to ensure the level of safety is not compromised. This often results in an increased workload for the controller. With arrival and departure controllers routinely coordinating altitudes below those specified in the standard operating procedure for arriving aircraft, they increase their workload by having to pay extra attention to the aircraft's flight path until any potential conflict has been satisfactorily resolved. When controllers routinely coordinate out of a standard procedure to meet aircrew's requests or to provide an expeditious service, management has a responsibility to review the procedure to determine whether it is still fulfilling its intended purpose. Management must also ensure that the alternate methods used by controllers still provide the equivalent level of safety.

In this occurrence, the arrival controller assumed there was no other traffic of concern to the arriving Navajo, because none had been mentioned to him by the departure controller. The departure controller did not anticipate that the Mooney about to depart to the west would conflict with the arriving aircraft. The standard procedures of leaving the arriving aircraft at 7000 or 5000 feet and limiting departing aircraft to 4000 feet was circumvented without additional checks or defences being put in place. The standard procedure in Operations

Letter OL-97-006 does not define what additional safeguards must be in place if alternate methods are employed, other than to state "as coordinated". Without the defence provided by the arrival and departure controllers exchanging traffic information, neither controller recognized the impending conflict or the requirement to monitor the traffic more closely in an area in which the normal defences provided by the standard operating procedures were circumvented.

Both the arrival and departure controllers had focussed their attention on the area in which most of the traffic under their control was concentrated, that is, to the east of the airport. The arrival controller was specifically focussing his attention on an arriving aircraft to the southeast, where a pilot had requested a type of approach that did not exist. The arrival controller was, therefore, attempting to determine this aircraft's requirements in the seconds before the loss of separation occurred between the Navajo and the Mooney to the west. Focussing attention on one area of the radar display for any length of time results in a breakdown of the defence afforded by effective scanning techniques. With no other defences in place, such as conflict alerting or a request for altitude call-outs from the pilots, neither controller's attention was directed back to the two aircraft involved in the conflict.

The arrival controller had noted the departure of an aircraft (the Mooney) heading westbound from the airport at the time the Navajo was issued descent from 5000 to 3000 feet. He assumed that the target was a VFR flight and, therefore, not of concern to the Navajo. Several pieces of information could have led to the arrival controller's conclusion. First of all, the Mooney had turned almost immediately to the west rather than climbing on runway heading, which had been the normal pattern established by the departure controller that morning. The aircraft's immediate turn was more representative of departing VFR traffic under the tower's control, which are normally restricted to 2500 feet asl or less within 7 nm of the airport, whereas the arrival controller's aircraft (the Navajo) was to maintain 3000 feet.

There was no reliable method for a controller to distinguish between VFR and IFR traffic in the vicinity of the airport by looking at the aircraft's data tag. Since the VFR radar monitoring position was in operation, and the CJS for C-GKGY indicated that it was under departure control and not under VFR monitoring, the arrival controller should have concluded that this aircraft was IFR and provided at least the minimum required spacing of 3 miles lateral or 1000 feet vertical. However, the CJS was not a strong enough signal to alter the controller's perception that—based on his observation of the aircraft's flight path—it was VFR. As a result, the arrival controller saw no special requirement to closely monitor the Navajo, because he thought there were no conflicts in the aircraft's path. Other NAV CANADA units, such as Calgary TCU and Vancouver TCU, use the SFI to indicate that a flight is VFR.

A loss of separation occurred when, as a result of not monitoring the aircraft closely on radar, the arrival and departure controllers allowed the two aircraft to fly closer than the minimum required separation of 3 nm laterally or 1000 feet vertically, as specified in CAR 801.08 and the associated standard.

Findings as to Causes and Contributing Factors

1. The arrival and departure controllers did not adequately monitor the flight paths of the two aircraft on radar.

2. The departure controller authorized the arrival controller to descend the Navajo to 3000 feet asl without passing relevant traffic information about the Mooney.
3. The arrival controller assumed the Mooney was a VFR flight and would maintain 2500 feet asl or less. He therefore saw no requirement to take action to provide another form of separation.

Findings as to Risk

1. The arrival and departure controllers used non-standard safety-alerting phraseology, which was not in accordance with the ATC MANOPS, to alert the pilots of the conflict.
2. There is no functioning conflict-alerting tool available to warn controllers of impending air traffic conflicts.
3. Operations Letter OL-97-006 allows controllers to coordinate out of the procedures pertaining to arrival-departure separation without specifying what other specific defences must be in place to provide the appropriate level of safety.
4. It is accepted practice for controllers to routinely coordinate out of standard procedures in order to provide a more expeditious air traffic service, without associated defences being put in place.

Other Findings

1. Just prior to the loss of separation, the arrival controller's attention was diverted from his other controlling tasks while sorting out a request from another arriving aircraft.

Safety Action

On 15 August 2000, the TSB sent Aviation Safety Advisory No. A000035-2 to NAV CANADA regarding the "Use of alternate procedures without built-in defences" which was based on information from this and two other investigations (A99W0064 and A00H0003) in which a similar problem existed, that is, the cancellation by controllers of standard operating procedures in favour of ad hoc procedures. NAV CANADA responded to the advisory and stated that the company's basic principle of separation is that action must be taken to ensure another type of separation exists or another minimum has been established before the previously used separation becomes insufficient. The NAV CANADA safety-related publication *Squawk 7700*, effective 26 October 2000, outlines the dangers inherent in the failure to abide by standard operating practices. NAV CANADA will also amend its management and operating manuals by the end of January 2001 directing that appropriate additional defences are to be utilized when circumstances dictate a deviation from standard operating practices.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 15 November 2000.

Appendix A—Sequence of Events

Time (CDT) hhmm:ss	Time +/- mm:ss	Event
1212:08	-07:16	C-GRNE issued descent by arrival controller from 7000 feet to 5000 feet, approved by data controller
1214:18	-05:06	Tower requests and receives approval to turn C-GKGY, departing runway 36, early to a heading of 250 degrees
1216:11	-03:13	C-GRNE receives descent clearance to 3000 feet from arrival controller on approval of departure controller
1216:24	-03:00	C-GKGY departs Winnipeg airport
1218:22	-01:02	GONZO 4 reports in on arrival frequency and requests a global positioning system (GPS) approach to runway 36 (this approach does not exist)
1219:02	-00:22	3 nm minimum required radar separation lost
1219:03	-00:21	GONZO 4 cleared to the DUNEX fix to maintain 3500 feet with the expectation of conducting a straight-in non-directional beacon (NDB) approach to runway 36
1219:11	-00:13	C-GRNE reports levelling at 3000 feet; C-GKGY is 4.25 nm to the southwest of C-GRNE at 2700 feet heading 270
1219:20	-00:04	Arrival controller coordinates landing sequence with tower for C-GRNE and GONZO 4
~1219:24	0	Data controller points out conflict to arrival controller (time approximate because information not recorded)
1219:27	+00:03	Arrival controller instructs C-GRNE to descend to 2500 feet immediately
1219:34	+00:10	Departure controller passes traffic to C-GKGY on a twin-engine aircraft at C-GKGY's one o'clock position, 3000 feet, southbound
1219:41	+00:17	C-GRNE reports traffic in sight to the arrival controller
1219:45	+00:21	C-GRNE crosses flight path of C-GKGY 0.53 nm in front and 300 feet below
1220:29	+01:05	1000-foot vertical spacing established between C-GRNE and

		C-GKGY, aircraft have passed each other and are 2.4 nm apart
--	--	--