

Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

AVIATION INVESTIGATION REPORT

A04Q0089



RISK OF COLLISION

BETWEEN

AIR CANADA AIRBUS A320 C-FDRP

AND

PRO AVIATION CESSNA 172 C-FGIM

QUÉBEC/JEAN LESAGE INTERNATIONAL AIRPORT, QUEBEC

13 JUNE 2004

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

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Summary

At 0933:44 eastern daylight time, an Air Canada Airbus A320, registration C-FDRP (Flight ACA513), was cleared for take-off on Runway 24 of Québec/Jean Lesage International Airport, Quebec. Sixteen seconds later, the controller instructed the Pro Aviation Cessna 172, registration C-FGIM, to taxi to position on Runway 30. At 0934:50, the controller saw the Cessna 172 roll and take off toward the intersection of runways 30 and 24. Immediately, the controller twice ordered the Airbus A320 to abort take-off. Seeing that the Airbus A320 was continuing its take-off run, he ordered the Cessna 172 three times to turn left. None of these attempts to contact the pilots were successful because the transmit function of the airport control radio had been previously disabled by the controller in an attempt to improve radio reception quality. Approximately 1000 feet from the intersection, at rotation speed, the captain of the Airbus A320 saw the Cessna; he immediately ordered the co-pilot to not take off until they had crossed Runway 30. The Cessna flew over the Airbus A320 about 200 feet above it, at the intersection of the two runways. There were no injuries.

Ce rapport est également disponible en français.

Other Factual Information

ACA513, an Airbus A320 with 2 flight crew, 4 cabin crew and 140 passengers, was on a scheduled instrument flight from Québec/Jean Lesage International Airport, Quebec, to Toronto, Ontario. At 0933:44 eastern daylight time,¹ ACA513 was cleared for take-off on Runway 24. The captain, responsible for communicating with air traffic control, was bilingual. Since the co-pilot was unilingual Anglophone, the crew spoke to the controller in English.

The Pro Aviation Cessna 172 was on a visual flight rules flight from Québec/Jean Lesage International Airport to Trois-Rivières Airport, Quebec, with one pilot and one passenger on board. At 0934, the controller instructed the Cessna 172, which was on taxiway Charlie, to taxi to position on Runway 30. The instructions were given to the Cessna 172 pilot in French. The crew of ACA513 did not hear the controller talking to the pilot of the Cessna 172.

At 0934:34, a Cessna Citation in the parking area called the Québec ground controller. The strength of the transmission was low and the pilot was practically inaudible. To improve reception quality, the controller deactivated the air frequency transmit button. He then realized that the Cessna 172 had started its take-off roll without clearance and was abeam of taxiway Bravo. Immediately thereafter, the controller twice attempted to instruct the crew of ACA513, which was rolling at a speed of 58 knots abeam of

taxiway Alpha, to abort take-off. After realizing that the Airbus A320 was not slowing down, the controller then attempted to instruct the pilot of the Cessna 172 three times to initiate an immediate left turn. Neither the instruction to ACA513 nor to the Cessna 172 could be heard on the air frequency, because the air frequency transmit button had been deactivated.

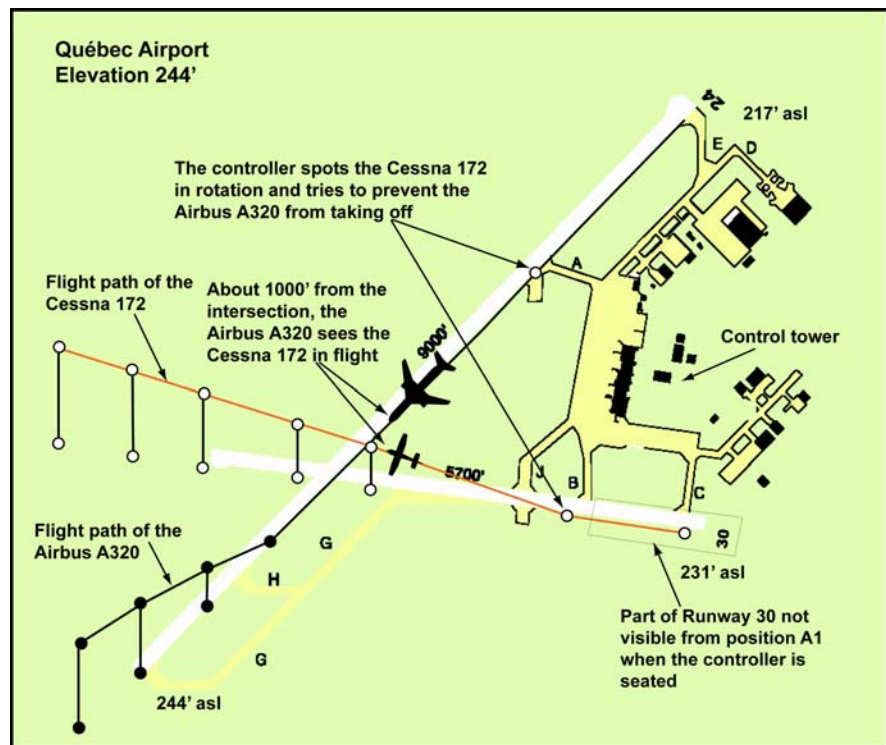


Figure 1. Flight path of the aircraft

¹

All times are eastern daylight time (Coordinated Universal Time minus four hours).

At 0935:20, about 1000 feet from the intersection of runways 24 and 30, when the Airbus A320 had reached its rotation speed (146 knots), the captain saw the Cessna 172 in flight on a converging track. He immediately ordered the co-pilot, who was at the controls, to delay the rotation and to not take off until they had crossed Runway 30. Radar data show that the Cessna 172 flew over the Airbus A320 with 200 feet of clearance above the intersection of the two runways.

The weather was suitable for visual flight. The winds were calm, there were no clouds below 5000 feet, visibility was over six miles and there was no precipitation. The automatic terminal information service (ATIS) message indicated that intersecting runways were active.

The pilot of the Cessna was qualified for the flight in accordance with existing regulations. He had held a private pilot licence since 1981 and had 83 flying hours. In 2002, he had retaken private pilot training at Pro Aviation because he had not flown for over two years. He passed an examination at the end of the training course. The pilot had made 10 flights in 2003 and 3 flights in 2004 before the incident. Six of those flights were made with a Pro Aviation instructor. He thought that the instruction to taxi to position on the runway included clearance to take off. The pilot, who understood English, had not paid attention to the messages between the tower and the Airbus crew.

The controller, who was also the duty supervisor, began his career in 1991. He had been a controller at the Québec/Jean Lesage International Airport since 2000, and was made a shift supervisor in March 2004. His duties as a supervisor included the following:

- ensuring technical services were advised of any equipment defects as reported by personnel on duty;
- assigning work positions;
- managing work schedules;
- authorizing and coordinating the opening and closing of the coordinator's position;
- advising NAV CANADA management of all non-routine operations in accordance with the requirements set out in the *Air Traffic Control Manual of Operations* (ATC MANOPS) and the *Air Traffic Services Administrative and Management Manual* (ATSAMM); and
- evaluating personnel skills.

The supervisor received ATS trainer on-the-job training in 1995 and 2002. That training consisted mainly of improving interpersonal skills and teaching techniques. There are no courses for simulating an emergency or equipment failure. According to his peers, he had above-average skills and knowledge as a controller.

The NAV CANADA ATS Operational Proficiency Program delegates, to immediate supervisors or a qualified delegated evaluator, the responsibility to ensure that controllers' communication skills meet the established standards. All supervisors are automatically recognized as qualified delegated evaluators. Since the manager of the Québec tower is not a controller, the evaluation of the supervisor's communication skills, as for all supervisors in the Québec control tower, is done by another supervisor in the unit. The supervisor's most recent operational communication skills check was carried out on 28 April 2004. The delegated evaluator, also a Québec tower supervisor, noted 2 errors in 80 transmissions. When the incident ATC

communications recording was reviewed, a number of phraseology errors were noted. As a result, the TSB examined the recording of the supervisor's most recent operational communications skills check. That review revealed many instances of incorrect phraseology not noted by the delegated evaluator.

The Québec control tower has five operating positions. The ground, air, and coordinator control positions can be combined on one console. The ATC operational support specialist and supervisor positions are complementary to operations. According to the ATSAMM and the Québec control tower manual administrative instructions, the supervisor can give personnel breaks by combining operating positions, provided that the existing and forecast volume of work allows and that employees can be called back promptly.

On the day of the incident, two controllers, one supervisor and one operational support specialist were available for the 0700 shift. At approximately 0645, the supervisor completed the position log. The positions were assigned as follows:

Time	Ground	Coordinator	Air	Supervisor	Break
0700	Combined	None	Controller A	Supervisor	Controller B
0800	Controller A	None	Controller B	Supervisor	None
0900	Controller B	Controller A	Supervisor	None	None

At 0700, when the positions were combined, the duty controller selected the appropriate radio controls to transmit on the ground and air frequencies at the same time. At 0800, the supervisor changed the assignment of the controller tasks as follows:

Time	Ground	Coordinator	Air	Supervisor	Break
0800	Combined	None	Controller B	Supervisor	Controller A
0900	Combined	None	Supervisor	None	Controller A Controller B

At the time of the incident, the supervisor, who was seated at Air 1 position, was working the positions of air and ground control combined; the two controllers were on break at the time. One of them was in the control tower cabin, available if needed; he was not assigned any tasks and was not observing traffic. The hourly aircraft movements (departures, arrivals and overflights) logged at the Québec Airport on 13 June 2004 were: 9 movements between 0700 and 0800, 9 movements between 0800 and 0900, and 15 movements between 0900 and 1000 (7 between 0900 and the time of the incident). NAV CANADA assesses the traffic in each of the 0700, 0800 and 0900 hourly periods as light.

The procedures for controlling air traffic are set out in the NAV CANADA ATC MANOPS. If an aircraft is number 1 in the departure sequence, the controller can instruct it to taxi to position on the runway without specifying that it must wait.² The pilot must wait on the runway for take-off clearance. The ATC MANOPS does not define “number 1 for take-off.” In this occurrence, the controller did not ask the Cessna 172 to wait after instructing it to taxi to position on Runway 30. The controller considered that the Cessna 172 was number 1 in the departure sequence because the Airbus A320 had received clearance to take off.

The controller may clear several aircraft to taxi to position for take-off on intersecting runways provided that

- the aircraft receive a departure sequence number when a departing aircraft is not number 1 for take-off;
- the aircraft that is not number 1 is instructed to “Wait” and inform the aircraft of the reason for the delay³;
- all aircraft are visible to the airport controller; and
- traffic information is given to the second and subsequent aircraft in the departure sequence.⁴

During taxi operations, the controller must receive an accurate read back after issuing an instruction to an aircraft or vehicle to hold or hold short of a runway or taxiway.⁵ Section 4.2.5 of RAC (Rules of the Air and Air Traffic Services) of the *Aeronautical Information Publication* (A.I.P. Canada) states that, to enhance the protection of active runways and to prevent runway incursions, taxi authorizations that contain the instructions “HOLD” or “HOLD SHORT” shall be acknowledged by providing a read back or repeating the hold point. ATC MANOPS does not explicitly include the requirement to obtain a read back of a “taxi to position and wait” instruction.

The investigation has identified similarities between the phraseology used by controllers in Canada and the United States to clear an aircraft onto a runway to hold or wait, and the International Civil Aviation Organization (ICAO) phraseology used to clear an aircraft to hold short of a runway (see Table 1). Although this issue was not shown to have operated in this occurrence, these similarities have the potential to degrade the safety of the air transportation system. The use of the word “position” in Canada and the United States is associated with a position on a runway, whereas the same word is used in ICAO phraseology to indicate a holding position short of the runway.

North American crews operating in parts of the world where ICAO phraseology is used may confuse the term “taxi to holding position” with “taxi to position.” This confusion could result in a crew taxiing onto an active runway when they had been cleared to a point short of the

² ATC MANOPS, Section 336.2, “Example of Phraseology”

³ ATC MANOPS Section 336.1

⁴ ATC MANOPS, sections 336.5 and 336.6

⁵ ATC MANOPS, Section 133.4

runway. In a letter dated 25 April 2003, ICAO stated that flight crew from States unfamiliar with ICAO phraseology have misunderstood “TAXI TO HOLDING POSITION,” as meaning “TAXI TO POSITION AND HOLD,” and proceeded to line up on the runway. These similarities in phraseology have the potential for catastrophic consequences.

	Hold short of the runway	Taxi onto the runway
ICAO	Taxi to holding position	Line Up [and Wait]*
Canada	Hold short of Runway xx	Taxi to position [and Wait]*
United States	Hold short of Runway xx	Position and Hold
* Note: Text in [brackets] is optional		

Table 1. Phraseology used by different agencies

The controller must separate a departing aircraft from an aircraft using an intersecting runway or a non-intersecting runway where the flight paths intersect by ensuring that the departing aircraft does not begin its take-off roll until the preceding departing aircraft has passed the intersection, crossed the take-off runway, or turned to avoid any conflict.⁶

A few months before this incident, technical issues led NAV CANADA to change the Québec tower air frequency twice. Controllers subsequently noticed on occasion that a brief parasite noise momentarily interfered with the tower frequencies. However, this anomaly was not reported to technical services or entered in the deficiency log as it should have been. A check of the tower radios after the incident revealed no deficiency. Also, it was established that the deactivation of the air transmitter had no effect on the reception of the ground frequency.

Review of the ATC tape revealed that, in the 15 minutes preceding the incident and in the 5 minutes after the incident, 62 of the 136 messages on the air and ground frequencies were sent by the controller. Strict application of the ATC MANOPS standards revealed a substantial number of deficiencies in standard phraseology, including omission to identify the station, incorrect information sequence, omission of information, incorrect call-sign on a take-off clearance, and incorrect phraseology and terminology to cancel the take-off clearance of the Airbus A320 and the Cessna 172.

Québec Airport is a controlled airport with two runways: Runway 06/24 is 9000 feet long and 150 feet wide, and Runway 12/30 is 5700 feet long and 150 feet wide. The runways intersect 5800 feet from the threshold of Runway 24 and 4300 feet from the threshold of Runway 30. Because the airport facilities are located between the two runways, a pilot on Runway 24 cannot see the threshold of Runway 30 until the aircraft is approximately 2900 feet from the threshold of Runway 24.

The control tower is to the east of the runway intersection. At the time of the incident, the supervisor was seated at the Air 1 position; Runway 24 was in front of him and was fully visible. To the controller’s left, the work consoles obstruct part of Runway 30 when the controller is

⁶ ATC MANOPS, Section 352.5

seated. To see the threshold up to taxiway Bravo, the controller must rise slightly. Following the evaluation of the unit in June 2004, NAV CANADA concluded that the controllers are able to see all taxiways, all runways and all runway approaches without rising or leaving their main air-ground supervisor position.

In June 2003, Transport Canada performed an audit of the air traffic services at the Québec tower. Transport Canada noted that several reports on operational communications skills contained no comments as to the quality of phraseology. Also, the audit team noted that the bank of questions and the knowledge verification tests for the qualification maintenance program contained very few critical questions in comparison with the number of ordinary questions. Transport Canada found that the Québec tower was in compliance with established standards. A corrective action plan to correct the above-noted non-safety-related deficiencies proposed by NAV CANADA was accepted by Transport Canada.

On a review of the Québec tower from 14 to 18 June 2004, NAV CANADA identified the following deficiencies among others:

- some anomalies relating to communications procedures;
- control personnel did not comply at all times with the ATC MANOPS requirements by not informing all aircraft of traffic, by not ensuring that read backs were correct, and by not informing aircraft of the reason for the delay after clearing them to taxi to position and instructing them to "wait"; and
- some entries resulting in aviation occurrence reports did not indicate whether the report had been forwarded.

A memorandum from NAV CANADA dated 24 August 2004 indicates that all deficiencies identified have been corrected or were in the process of being corrected.

The investigation found that, at the Québec tower, there were some deviations from operating standards and that some controllers were not fully familiar with the radio system and some ATC MANOPS procedures:

- some controllers do not report unauthorized take-offs;
- some controllers do not know or do not fully know the functions of the buttons on the radio console in the tower;
- according to some controllers, pilots are not required to read back instructions to taxi containing the instruction "WAIT"; and
- inconsistency with regard to the interpretation as to when an aircraft becomes NUMBER 1 in the traffic sequence.

According to current regulations,⁷ NAV CANADA must report all failures to comply with *Canadian Aviation Regulations* (CARs) associated with the use of an aircraft. However, the investigation revealed that unauthorized take-offs were not all reported by the Québec tower. NAV CANADA policy and direction require that all aviation occurrences be reported. The reasons given for not reporting this type of occurrence are as follows:

- the possibility that the report would be prejudicial to a new pilot or a pilot with little experience;
- the low probability that an air safety investigation would be initiated;
- air safety was not compromised; and
- listening to ATS tapes might reveal errors of phraseology.

Transport Canada's Civil Aviation Daily Occurrence Reporting System (CADORS) database was consulted to determine the frequency of take-offs without clearance in Canada. The information in CADORS is summary in nature and is generally not validated. Over the five years preceding the incident, the following unauthorized take-offs were reported:

- 44 occurrences were reported with no details as to the type of ATC clearance or instruction;
- 29 occurrences were reported with clearance to taxi to position on the runway and wait; it is not specified whether the pilot read back the clearance or was asked to do so; and
- 20 occurrences were reported with the instruction to taxi to position on the runway without specifying whether the pilot was instructed to hold.

No occurrences of take-offs without a clearance were reported at the Québec Airport during this five-year period.

Analysis

The incident occurred in daylight in good visibility at a time when airport traffic was light. The decision by the pilot of the Cessna 172 to take off after being instructed to taxi to position on the runway and the manner in which control procedures and administrative procedures are applied at the Québec tower played a significant role in the risk of collision.

Given that the controller was transmitting on the ground and air frequencies before the Airbus A320 took off, the pilots of both aircraft were able to hear what was being said to the other aircraft. In reality, the Airbus A320 was not aware that the Cessna 172 was on Runway 30, and the Cessna 172 was not aware that the Airbus A320 had been cleared for take-off on Runway 24. Since the captain of the Airbus and the pilot of the Cessna 172 were bilingual, the use of both English and French by ATC did not contribute to their failure to be aware of the situation. They were either inattentive to external communications or preoccupied with piloting tasks. In any event, even if he had known that the Cessna 172 was on Runway 30, the pilot of the Airbus A320 could not anticipate the unexpected take-off of the Cessna 172. For his part, the pilot of the Cessna 172 would not have taken off if he had been aware that another aircraft had been cleared

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Canadian Aviation Regulations, Section 807.01

for take-off on the crossing runway. The fact that the pilot of the Cessna 172 believed that the instruction to taxi to position constituted a clearance for take-off suggests a lack of knowledge of ATC procedures on his part. It appears that the theoretical and practical training for his initial private pilot licence and the subsequent refresher training did not correct the pilot's misunderstanding of the meaning of the instruction to taxi to position.

Like the controller on duty at the time of the occurrence, some controllers feel that the number 2 aircraft in the departure sequence becomes the number 1 as soon as the preceding aircraft is cleared for take-off. Other controllers are of the view that an aircraft remains number 1 until its take-off is completed. As a result, there is a lack of consistency among controllers for assigning departure numbers. Because the ATC MANOPS does not clearly indicate at what point an aircraft becomes number 1 in the departure sequence, an aircraft can be on a runway without having been assigned a sequence number at the same time as another aircraft is taking off from an intersecting runway. In this incident, the situational awareness of the Cessna pilot was likely reduced, and the erroneous expectation on his part that he was expected to continue with a take-off immediately was reinforced. Had the Cessna pilot been told that he was number two in the departure sequence, it is reasonable to assume that he would have waited for a take-off clearance before taking off.

After clearing the Cessna 172 to taxi to position on Runway 30, the controller had to wait until the Airbus A320 passed the runway intersection before clearing the Cessna 172 for take-off. For that reason, the Cessna 172 was second in the departure sequence because it had to wait in position on the runway. In this situation, the controller had to ensure that the Cessna 172 would not start its take-off roll until after the Airbus A320 had passed the intersection of the two runways. The controller should have advised the Cessna 172 that it was number 2 for take-off to an Airbus A320 that was taking off from Runway 24 and could have instructed the Cessna 172 to taxi to position and wait; the Cessna 172 normally would have acknowledged this message by reading back the restriction. As a result, by all indications, the Cessna 172 would probably not have taken off without clearance. Furthermore, as the investigation revealed, some controllers would not have requested a read back of the instruction "ATTENDEZ," depriving themselves in part of the certainty that the pilot clearly understood the instruction to wait.

The difference between the instructions "TAXI TO POSITION" and "TAXI TO POSITION AND WAIT" is that the second requires that the controller inform the pilot of the reason for holding. The instruction "TAXI TO POSITION" therefore reduces the pilot-controller communication workload and may enhance operational efficiency. However, after receiving the instruction "TAXI TO POSITION," the pilot must await clearance for take-off after moving into position on the runway. In fact, it is understood that "TAXI TO POSITION" also means "AND WAIT" if take-off clearance is not given immediately. Because the instruction "TAXI TO POSITION" suggests that the pilot wait without clearly stating it, it is possible that a pilot for some reason would not hold and would take off without clearance, creating a dangerous situation.

Under the current procedure, if there is only one aircraft, the controller could ask it to taxi to position without specifying that it should wait even if a vehicle is on the runway. In that case, the redundancy provided by the instruction to hold is lost, and the pilot could unexpectedly

take off. It is reasonable to conclude that the instruction "TAXI TO POSITION" does not provide the same level of safety to protect aircraft on a runway as the instruction "TAXI TO POSITION AND WAIT."

An examination of the radios in the control tower revealed that the communication problems between the tower and the Cessna did not originate with the tower communication equipment. The controller deactivated the air frequency in an effort to correct the problem. This action, however, had no effect on the quality of reception of the ground frequency. When a faulty radio is suspected, the controller can switch on a backup receiver or a backup transmitter, or both. The action of the controller indicates unfamiliarity with the radio system installed in the tower and the procedures for operating it. On this point, the investigation also revealed that some controllers in the Québec tower had insufficient or incorrect knowledge of the operation of the radio console.

When the controller realized that the Cessna 172 had taken off without clearance, he immediately attempted to contact first ACA513 then the Cessna 172. Since the transmit function had been disabled by the controller, the aircraft could not receive his instructions. The stress generated by the suddenness of the occurrence likely diminished the controller's effectiveness in responding properly to the emergency. It is possible that the lack of simulation of emergency situations and equipment failures in ongoing training contributed to his inability to solve the problem he was confronted with. It was the vigilance of the Airbus A320 pilot and his effective management of an emergency situation that prevented the situation from getting worse.

There have been no reports of take-offs without clearance at the Québec Airport in at least the last five years. The investigation determined that, in fact, incidents involving a take-off without a clearance did occur and were not reported. It appears that some controllers and pilots alike do not understand that it is crucial to report each and every incident or error in the system in order to measure the effectiveness of aviation safety programs, including those that measure risks of collision. NAV CANADA and Transport Canada audits of the Québec tower did not detect this deficiency.

Although the supervisor had the authority to combine control positions and authorize controller breaks, his management of the work schedule contributed to this incident. There was sufficient staff available (counting the supervisor) to operate both control positions separately. Had the ground position not been combined with the air position, the air controller would not have deactivated the transmit button of the air frequency in an effort to solve a problem thought to originate with interference between the airport and ground control frequencies. The airport/ground controller's intervention to stop the Cessna from continuing its take-off roll would most likely have been successful.

There is a significant disparity between the number of phraseology errors found in the evaluation of the supervisor by the NAV CANADA evaluator and the number of phraseology errors found by the TSB. A phraseology review of the ATC occurrence tape revealed many of the same types of errors that had not been detected by the NAV CANADA evaluator. It should be noted, however, that these errors did not contribute directly to the incident. Nevertheless, this disparity can suggest the following:

- the NAV CANADA quality control program is partly ineffective;
- evaluation of the skills of a supervisor by a fellow supervisor lacks impartiality;
- the controls are not rigorously applied;
- standard phraseology is not always used; and
- Transport Canada supervision is partly inadequate.

Although the errors noted in standard phraseology are minor, they are indicative of some laxity that could eventually interfere with the effective communication of information. It appears that the performance evaluation program does not enable each controller to maintain their skills and knowledge up to date and apply them while complying with prescribed standards.

Findings as to Causes and Contributing Factors

1. The Cessna 172 took off without clearance from Runway 30, causing a risk of collision with the Airbus A320.
2. The controller instructed the Cessna 172 to taxi to position on Runway 30, but did not instruct it to wait and did not advise that the Airbus A320 was taking off on Runway 24. The controller did not anticipate that the Cessna 172 might take off without clearance, causing a risk of collision with the Airbus A320.
3. Given that the controller deactivated the transmit button for the air frequency, neither the Airbus A320 nor the Cessna 172 could hear the controller's instructions to abort take-off.

Findings as to Risk

1. The *Air Traffic Control Manual of Operations* (ATC MANOPS) does not clearly define criteria for numbering aircraft in the departure sequence.
2. Some controllers in the Québec tower misunderstood the operation of some functions of the radio console.
3. Canada and United States phraseologies used to clear an aircraft onto a runway are similar in wording to International Civil Aviation Organization (ICAO) phraseology to hold an aircraft short of a runway. Those similarities open the door to misinterpretation by crews with potential for catastrophic consequences.

Other Findings

1. The absence of simulation of emergency situations and equipment failures in ongoing training contributed to the controller's inability to solve the problem that he was confronted with.
2. A review by the TSB of NAV CANADA's evaluations revealed that the division responsible for NAV CANADA's evaluations did not realize that some controllers were not complying with standard practices and procedures.

Safety Action Taken

NAV CANADA has indicated that the following safety action has been taken since this incident:

1. Improvements have been made in the area of individual competency verifications in the Québec tower in the last year. Observations of operational skills application are to be of a minimum of four hours, based on major operational duties as per the unit task analysis. Any discrepancies identified as being critical result in removal from operational duties followed by retraining as required. Activities related to the monitoring of the application of operational communications skills have also been bolstered, and results are mathematically calculated according to a grid based on the errors detected and the relative seriousness of each error. In all cases where individual controllers do not maintain unit standards, they are removed from operational duties and provided with remedial training as required.
2. As a result of a NAV CANADA Head Office Unit evaluation, the Québec tower manager has issued Operations Bulletin Number 04 40, published on 15 July 2004, outlining the results of the recent Head Office evaluation concerning identified deficiencies in phraseology. In addition, the control tower supervisors were instructed to increase their monitoring and to make direct interventions whenever it was observed that controllers were not conforming to approved phraseology. Supervisors were also directed to be more rigorous in the evaluation of communications skills, and a grid was implemented to facilitate the rating of individual performance in this area and facilitate the establishment of corrective actions when required.
3. Through recent changes implemented in the operations safety investigations reporting process on staff utilization, NAV CANADA will further assess the decision-making processes of operational supervisors and implement changes where necessary.
4. NAV CANADA undertook a major rewrite of the Basic VFR ATC (visual flight rules air traffic control) training course delivered at its training facility and implemented the new curriculum in June 2004. Emergency procedures are taught in instructor-led classroom activities that include the associated phraseology. Non-compliance situations by a pilot are taught in the classroom, and are practised in a number of exercises in the dynamic 360-degree airport simulator throughout the course.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 05 April 2006.