

AVIATION OCCURRENCE REPORT

A99W0036

RUNWAY INCURSION

BETWEEN

AIR CANADA

AIRBUS INDUSTRIE A319-100 C-FZUL

AND

CALGARY FLIGHT TRAINING CENTRE (CFTC)

CESSNA 172 C-GVLO

CALGARY, ALBERTA

27 FEBRUARY 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.

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Summary

Calgary Flight Training Centre Cessna 172, C-GVLO, was cleared to follow another aircraft backtracking on runway 25 at Calgary International Airport, Alberta. The Calgary Tower air traffic controller told the pilot that he was number one for take-off. Following the clearance for C-GVLO to backtrack runway 25, the pilot of an Airbus A319, Air Canada Flight 185 (ACA185), holding on runway 16, was cleared for take-off. At that time, both ACA185 and C-GVLO commenced take-off; C-GVLO without take-off clearance. The pilot of C-GVLO called rolling, and the controller immediately advised him to abort; however, the pilot continued the take-off. At 1818:12 mountain standard time (MST), the controller advised ACA185 to abort the take-off because of the traffic taking off from runway 25. ACA185 was at about 120 knots and came to a stop with about one-half of the runway length remaining. Emergency Response Services (ERS) were requested to respond to ACA185 as a precaution because of possible hot brakes.

Ce rapport est également disponible en français.

Other Factual Information

The pilot of C-GVLO was a licensed private pilot with approximately 75 to 80 hours of flight experience. He had acquired his private licence in November 1998 and was in the process of building his flight time in order to qualify for a commercial licence. He had flown four to five hours in the previous ten days. The flight was planned to be an informal upper air work review flight using a CFTC rental aircraft in a training area to the west of Calgary.

As C-GVLO approached runway 25, the pilot of another aircraft already backtracking the runway advised the tower that he was in no hurry and that C-GVLO could depart first. The controller issued backtrack clearance to C-GVLO, and, after being told that C-GVLO would backtrack only about 400 feet, advised C-GVLO that he was number one because the other aircraft was to backtrack all the way to the end. The distance from taxiway "C", from which both aircraft had entered runway 25, to the button of runway 25 is approximately 3 400 feet, and the distance from taxiway "C" to runway 16/34 is approximately 600 feet. Backtracking 400 feet provided C-GVLO about 1 000 feet from the beginning of his take-off run until reaching the intersection of runway 16/34.

The Calgary Tower air controller had ten years' experience as a controller and had worked in Calgary Tower for five years. He was working the fifth day of his shift cycle and had been on duty for four and a half hours since the beginning of his shift; it had been one hour since his last break. Staffing in the tower met unit requirements for Saturday operations. Because of lower traffic volumes on Saturdays, the tower coordinator position is not staffed, requiring the air controller to manipulate the electronic data strip display and to perform other communications and coordination functions. This required that he divert his attention to functions normally performed by another person and to administrative activities inside the tower cab. These extra requirements reduced the amount of time the controller could devote to monitoring activities outside the tower cab on Calgary's three runways. Traffic at the time was described as light, and visibility was reported to be 40 statute miles.

The NAV CANADA Air Traffic Control (ATC) Manual of Operations (MANOPS) provides authorization for controllers to position aircraft on intersecting runways for take-off as follows:

- 336.2 You may taxi more than one aircraft to position for take-off on the same runway, intersecting runways or non-intersecting runways whose flight paths cross, provided:
- A. the aircraft are sequenced in accordance with 336.1; (N)
336.2 A. Note: Caution should be exercised to prevent confusion among the involved aircraft.
 - B. all aircraft are visible to the airport controller; and
 - C. traffic information is given to the second and subsequent aircraft in the departure sequence.

Article 336.1 specifies the phraseology to be used when sequencing a departing aircraft that is not number one for take-off, as follows:

336.1 If a departing aircraft is not number one, issue a departure sequence number in the following form: (P)

- A. Aircraft Identification.
- B. Number (sequence).
- C. Type and position of preceding departure.

336.1 Phraseology: For intersecting runways/flight paths - NUMBER TWO FOR DEPARTURE, TRAFFIC SEVEN TWENTY SEVEN DEPARTING RUNWAY (number).

After C-GVLO advised the controller that he would backtrack runway 25 for 400 feet, the controller replied that C-GVLO would be number one because the other aircraft on runway 25 was going to the end of the runway. According to the example given in ATC MANOPS, the phraseology used should have been, "Victor Lima Oscar, number two for departure, traffic A319 departing runway 16." No mention was made to C-GVLO that ACA185 would be first to depart. Twenty-one seconds later, at 1817:24¹, after performing the mandatory runway scan to ensure the runway was clear, the controller issued take-off clearance to ACA185. The controller then diverted his attention to the tower console to find the computer mouse used to record departure times in the automated aircraft movement system. The controller did not observe the simultaneous movement of both of the aircraft until the pilot of C-GVLO advised that he was rolling on runway 25 at 1818:06. The angular displacement, when viewed from the tower, between the end of runway 16 from which ACA185 was departing and the point on runway 25 from which C-GVLO was departing, is approximately 135 degrees.

The pilot of C-GVLO was not aware that ACA185 was in position on runway 16, and did not hear the take-off clearance issued to that aircraft, even though the clearance was issued on the same frequency that C-GVLO was monitoring. Believing he had authorization to take off, he applied power and began the take-off roll. He had second thoughts, however, and momentarily applied brakes. He looked to his right and saw ACA185, but was unsure whether that aircraft was moving. He convinced himself that he could not stop before runway 16, in any event, and continued the take-off. After advising the tower that he was rolling, he did not hear the instruction to stop or abort his take-off.

Article 337.1 specifies the phraseology to be used when it becomes necessary to cancel a take-off clearance.

337.1 If circumstances require, cancel a previously issued take-off clearance and, when appropriate, inform the aircraft of the reason.(P)(N)

¹ All times are MST (Coordinated Universal Time minus seven hours) unless otherwise noted.

- 337.1 Phraseology: If a clearance to take off is cancelled:
- before the aircraft has started to roll - TAKE-OFF CLEARANCE CANCELLED;
- after the aircraft has started to roll - ABORT TAKE-OFF.
- 337.1 Note: An aborted take-off is an emergency procedure employed in situations where to continue would present a grave hazard to the aircraft. A controller-initiated abort of take-off should be viewed as an extreme measure to be used only where there is no clear alternative course of action.

NAV CANADA Air Traffic Services Information Bulletin 105, dated 09 March 1981, enlarges on the information provided in MANOPS article 337.1 Note above and reminds service providers that:

3. In rare cases, controllers may feel compelled to instruct pilots to abort take-off due to impending collision (runway incursion by vehicles or other aircraft) or potential loss of airborne separation.
4. Regardless of the initiative for such action, an aborted take-off, if executed, will be undertaken with maximum effort. This places tremendous strain on both aircraft and crew and the procedure has potential for hazard which may be greater than that faced by continuing the take-off. This is particularly true in the case of an abort initiated by ATC for reasons of eroded IFR separation.
5. As a controller, when faced with a situation suggesting the need for an aborted take-off there are many factors to consider and little time in which to consider them. It is possible to imagine such a variety of circumstances that to pre-plan a response for each of them would not be practicable. It is, in the final analysis, a matter of instant judgement.

The controller issued urgent instructions to C-GVLO to abort take-off using the phraseology in accordance with ATC MANOPS article 337.1. When he received no response or indication of compliance, he did not know whether C-GVLO would comply, and he was concerned that, if the pilot did stop, the smaller aircraft might stop on runway 16 in the path of ACA185. He then requested ACA185 to abort take-off as well.

The distance from the button of runway 16 to its intersection with runway 25 is approximately 9 800 feet. Under the existing environmental and aircraft conditions, an Airbus A319 taking off at Calgary, assuming normal operations, would require 4 612 feet to become airborne and would cross runway 25 (approximately 9 000 feet from the beginning of the take-off roll) at a height of 600 feet. A Cessna 172, in the conditions of the occurrence, would require approximately 850 feet to become airborne, and 1 000 feet after beginning its take-off roll would be at less than 200 feet above ground.

The pilot of C-GVLO reported that several issues associated with this occurrence were different from his expectations. He was planning on doing his air work in the west practice area and was anticipating having to

contact Springbank Tower on the way to the practice area, an area he had been to only three times previously. He had originally expected to taxi for runway 16, knowing it to be the active runway; when he was offered runway 25, he accepted. On reaching the hold point for runway 25, he was immediately and unexpectedly offered the opportunity to backtrack runway 25 and to depart before the Cessna ahead, which he accepted. This flight was only the second time since acquiring his licence that he had flown with a passenger on board; the one previous time had been in late October 1998, nearly four months prior. His experience was that, normally, when cleared to line up on the runway, but not cleared for take-off, he would hear the expression “taxi to position” or something similar. In this case, to clear C-GVLO onto the runway, the controller used the phraseology, “Victor Lima Oscar, right turn, back track to position runway two five, how far back do you require?” The pilot of C-GVLO reported that he had previously, during the busy few seconds when an *ab initio* pilot is positioning on a runway for take-off, had trouble distinguishing the executive order to take off from all of the other verbiage which is issued by the control agency. In these circumstances, he had been prompted to take off without delay by the instructor. Having taken flying training in Calgary, a busy airport, he was accustomed to expediting the take-off process once on the runway.

A new chapter (Exercise 30) in the fourth edition (1999) of the Transport Canada (TC) *Flight Training Manual* now covers radio communications in some detail, and the topic is mentioned briefly in the TC *Flight Instructor's Guide*. The *Flight Training Manual* warns pilots that “By keeping a good listening watch on the frequency you maintain situational awareness, which assists in identifying potential traffic conflict.” The CFTC does not target radio procedures in the private pilot syllabus and expects students to pick up the necessary expertise as they progress through the flying training lesson plans.

Analysis

The pilot of C-GVLO, although he met the requirements for the issuance of a private pilot's licence, was relatively inexperienced and not yet completely familiar with the speed and complexity of radio communications and the radio monitoring requirements at Calgary International Airport. His previous experience had prepared him to believe that, once on a runway, he was expected to carry out the take-off procedure without delay. On several occasions in the past, he had also missed the executive portion of the take-off clearance communication, “cleared for take-off,” and had been prompted by the instructor to begin take-off. In this situation, he assumed that he had similarly missed the clearance amid the other verbiage. The runway had just been made available to him, the only other traffic of which he was aware was behind him, and he had been told that he was number one. He assumed that he had been cleared for take-off even though he had not heard the specific words. The information held by the controller, but not conveyed to C-GVLO, that he was actually number two for departure, followed by the identification of the traffic that was number one, would likely have provided a sufficient situational update to the pilot of C-GVLO.

The transmission used to clear C-GVLO onto the runway was, “Victor Lima Oscar, right turn, back track to position runway two five, how far back do you require?” Although the clearance was easy to understand, apparently, the question on backtrack distance took precedence in the student's mind and was the message to which he attended and responded.

There were several factors present during this occurrence that may have distracted the pilot of C-GVLO. The pilot was not accustomed to carrying another person in the aircraft and, other than the instructor, had not done so in nearly four months. The pilot had planned on using runway 16, but was offered runway 25 and accepted. He did not expect to be authorized to follow the other Cessna and did not expect to be offered take-off in front of that aircraft. He was not entirely familiar with the west practice area, having only used it on a few occasions previously, and he was aware that he would have to contact Springbank during transit to that area.

The radio skills and heightened situational awareness necessary to operate on the surface or in the near vicinity of Calgary International Airport are not specifically targeted during private pilot training at the CFTC or mentioned in the CFTC private pilot syllabus, but are expected to be acquired by exposure to the various situations encountered during training. This procedure may not ensure sufficient familiarity with all the common safety-related circumstances or practices of which a student or newly licensed private pilot should be aware. Those situations that are experienced may not be presented with enough emphasis to convince inexperienced pilots to devise methods to assure themselves that all appropriate clearances and instructions have been followed.

Because the controller had to look down to manipulate the mouse to enter take-off information for ACA185, he momentarily diverted his attention from the activity on the runways. Even under the best of conditions, the controller cannot monitor all areas of the airport at the same time, particularly areas separated by nearly 135 degrees of visual field, as was the situation in this occurrence. Additional inside administrative duties, which detract from outside visual monitoring, reduce the level of safety oversight that the controller should provide.

Findings

1. The pilot of C-GVLO took off without take-off clearance from the Calgary Tower.
2. The pilot had previously had difficulty distinguishing the executive portion of the take-off clearance and had been prompted to begin take-off by an instructor.
3. Little emphasis is placed on learning radio requirements and on the need for heightened situational awareness on a busy airport in the TC *Flight Instructor's Guide* and in the CFTC private pilot syllabus.
4. The pilot was dealing with several new and relatively unfamiliar circumstances as he taxied out, which likely distracted from his situational awareness.
5. The Calgary Tower air controller did not use the phraseology recommended in ATC MANOPS for situations in which an aircraft is cleared to position on an intersecting runway, but is not number one for take-off.
6. The Calgary Tower air controller incorrectly advised the pilot of C-GVLO that he was number one for take-off.
7. The controller on duty was current and qualified to perform the duties assigned.
8. Staffing in the tower met NAV CANADA standards.
9. All necessary tower equipment was serviceable and being used.
10. The requirement to manipulate the computer mouse to enter take-off information, a duty normally performed by the tower coordinator, caused the air controller to divert his attention from the activity on the runways.
11. The controller was not aware that C-GVLO had begun the take-off roll until the pilot advised that he was rolling.
12. The controller requested ACA185 to abort the take-off when his instructions to C-GVLO were neither acknowledged nor complied with.

Causes and Contributing Factors

The pilot of C-GVLO took off without clearance and without ensuring that it was safe to do so. Contributing to the unauthorized take-off were the lack of appropriate training concerning the need for communications clarity during unfamiliar situations, the lack of appropriate training concerning the distractions that can diminish situational awareness when operating on a busy airport, and the use of non-standard phraseology by the tower air controller.

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 14 January 2000.