Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A99H0004

RUNWAY INCURSION

BETWEEN
ADLER AVIATION
CESSNA GOLDEN EAGLE 421C C-GTGR
AND
NATIONAL FLYING ACADEMY
PIPER SEMINOLE PA-44 C-FPMH
KITCHENER–WATERLOO REGIONAL AIRPORT, ONTARIO
13 JULY 1999

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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Piper Seminole PA-44 C-FPMH
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Summary

The Cessna 421C, serial number 421C-0061, on an instrument flight rules (IFR) flight from Kitchener-Waterloo Regional Airport, Ontario, to Richmond International Airport, Virginia, U.S.A., was cleared to taxi onto runway 25 to position for take-off by the airport controller. Five minutes later, a Piper Seminole, serial number 44-7995002 was cleared by the ground controller to taxi via “B”, “A”, and “C” taxiways to runway 14 for a local visual flight rules (VFR) flight. Taxiway “C” crosses the button of runway 07 (the departure path of runway 25) and continues on to the button of runway 14. The Cessna 421C was cleared to take off on runway 25 by the airport controller and became airborne at the intersection of runways 14 and 25. The Cessna 421C passed over the Piper Seminole as it taxied across the button of runway 07 via “C” taxiway, resulting in a runway incursion.

Ce rapport est également disponible en français.

Other Factual Information

At 1645 eastern daylight saving time (EDT)[1], the pilot of the Cessna 421C contacted Kitchener-Waterloo tower requesting the use of runway 25 and an IFR departure clearance. The ground controller acknowledged the request and, because the active runway was currently runway 14, sought approval for the use of runway 25 from the airport controller. The airport controller is responsible for designating which runways will be in use. On receiving acknowledgement from the airport controller that runway 25 was approved, the ground controller issued the IFR clearance to the Cessna 421C at 1646. The pilot of the Cessna 421C then advised that he was ready to taxi, and the ground controller issued an appropriate taxi clearance.

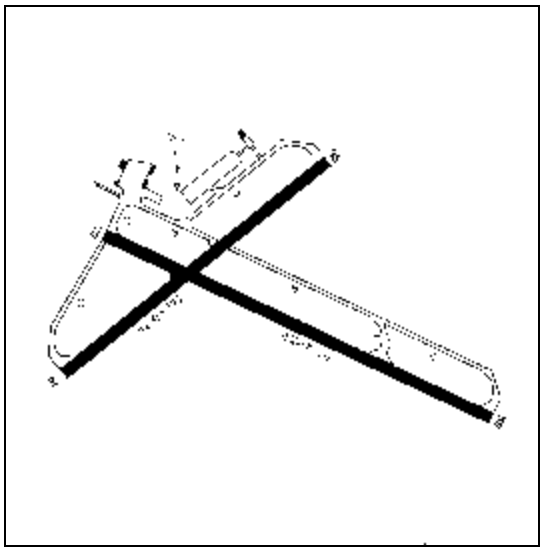

Figure 1 - Kitchener-Waterloo Regional Airport

At 1650, the pilot of the Cessna 421C advised the airport controller that he was ready for departure, and the airport controller instructed him to taxi to position on runway 25 and wait. The air controller was required to receive an IFR release, that is, an IFR clearance validation from the Toronto Area Control Centre (ACC) controller before issuing take-off clearance. Six minutes later, at 1656, the Toronto ACC controller advised the ground controller that the Cessna 421C was released. The ground controller walked over to the airport controller position, advised that the Cessna 421C was released, and stroked out the marking "CVR" (clearance validation required) on the Cessna 421C flight progress strip. The marking CVR is a standard stamp put on the flight progress strips of IFR aircraft at Kitchener-Waterloo tower to remind controllers of the need to obtain an IFR clearance validation from Toronto ACC. Because of heavy VFR traffic using runway 14, the airport controller was required to build in an appropriate space in the traffic to permit the Cessna 421C to safely begin the take-off across runway 14. At 1657, after ensuring that airborne crossing traffic was clear of runway 25, the airport controller issued take-off clearance to the Cessna 421C. In the time between the line-up of the Cessna 421C on runway 25 and the clearance for take-off, there were six aircraft in the circuit being controlled and sequenced by the airport controller, as well as one transient departure and one aircraft calling for landing information. During this interval of 6 minutes and 40 seconds, the airport controller made 32 separate radio and landline transmissions.

At 1655, the Piper Seminole requested taxi clearance for a local VFR flight to the south-west of the airport. Clearance was issued by the ground controller for the Piper Seminole to taxi to runway 14 via taxiways "B", "A", and "C". Taxiway "C" crosses the departure end of runway 25. At this time, the Cessna 421C had been waiting in position on runway 25 for approximately five minutes. There was no information in the taxi clearance given to the pilot of the Piper Seminole that runway 25 was an active runway, nor was there any direction given that further authorization was required before crossing or entering any runway en route. The Piper Seminole was on the ground control frequency during this time and did not hear the take-off clearance issued to the pilot of the Cessna 421C, who was on the tower control frequency. As

[1] All times are EDT (coordinated universal time [UTC] minus four hours).

the Piper Seminole approached runway 25, the instructor pilot-in-command reported that, in keeping with his normal practice, he first performed a safety scan left toward the approach to runway 07 in order to search for traffic that might be on approach to that runway. As he entered the runway, he then scanned right and noticed the Cessna 421C lifting off and overflying his position.

The Piper Seminole reached the edge of runway 25 on taxiway "C" at approximately 1658, three minutes after receiving taxi clearance. The Cessna 421C overflew the Piper Seminole at that time, approximately 48 seconds after receiving take-off clearance.

A.I.P. Canada: Aeronautical Information Publication, Rules of the Air and Air Traffic Services, Part 4—Airport Operations, article 4.2.5 details the responsibilities of pilots taxiing at controlled airports.

> Pilots of aircraft equipped with two-way radio are reminded that if authorized to taxi without restriction to the runway in use, no further authorization is required to cross any non-active runway en route. However, under no circumstances may a taxiing aircraft, whether proceeding to or from the active runway, taxi onto an active runway unless specifically authorized to do so.
>
> Upon receipt of a normal taxi authorization, a pilot is expected to proceed to the taxi holding position for the runway assigned for take-off. If, for any reason, the ground or airport controller requires that a pilot request a further authorization before crossing or entering any of the runways en route to this taxi limit, this requirement will be reflected in the taxi authorization.

Kitchener-Waterloo control tower Operations Letter 97-11, dated 13 August 1997, titled *Air/Ground Controller Responsibilities*, specifies, in part, the following:

> 1.0 Air Controller
>
> 1.1 Is responsible for all traffic in the control zone with whom radio contact has been established and/or those aircraft under his responsibility.
>
> 1.2 Is responsible for all traffic on the active runways.
>
> 1.3 Designates which runway(s) will be in use.
>
> 1.6 Is responsible for displaying in a position clearly visible the appropriate runway strip headers.

The NAV CANADA *Air Traffic Control Manual of Operations* (ATC MANOPS) article 308.1 specifies that "Airport and Ground controllers shall visually scan the manoeuvring area thoroughly before issuing clearances or instructions to airport traffic, and, to the extent possible, at other frequent intervals."

Runway strip headers are flight progress strips conspicuously marked with the designation of one of the four runways that may be in use at Kitchener-Waterloo Regional Airport. In

accordance with paragraph 1.3 (above) of Operations Letter 97-11, more than one runway at a time may be designated as the runway in use. Kitchener-Waterloo control tower Operations Letter 91-4, dated 2 January 1991, titled *Status of Manoeuvring Areas*, specifies the following:

1. The active runway shall be coordinated between the airport and the ground controller.

2. The runway alert strip indicating runway active/closed shall be placed in the strip bay above the wind instruments.

The airport and the ground controllers agreed on the use of runway 25 for the departure of the Cessna 421C. However, the runway strip header for runway 25 was not displayed during the occurrence, nor was there any discussion or coordination as to when the runway would be made active. It was reported that when the request for a second active runway originates through ground control, the ground controller often initiates the transfer of responsibility to the airport controller and posts the runway strip header. However, circumstances vary, and either controller may request or offer control of a runway and then post the runway strip header in the strip bay.

The 15 July 1999 edition of the *Glossary for Pilots and ATS Personnel*, published by Transport Canada, defines "active runway / runway in use" as follows:

runway in use;	Any runway or runways currently being used for take off or landing. When multiple runways are used, they are all considered runways in use. · also called: active runway

Weekday staffing in the Kitchener-Waterloo tower consists of two day-shift controllers on duty from 0645 until 1500, a swing-shift controller on duty from 0915 until 1730, and two evening-shift controllers on duty from 1445 until 2300. During the period from 0915 to 1730, there are three controllers available. The duty of the third controller is to provide relief breaks and to assist in the control of traffic. Throughout the day, it was reported that the third controller had been fully occupied performing spotting duties for the airport controller and keeping the flight progress strips up-to-date. Traffic was described as heavy. Staffing in the tower met the requirements as defined by NAV CANADA. The evening-shift controller, who had come on duty at 1445, was just completing a relief break prior to replacing the swing-shift controller, whose work day was nearly completed. The evening-shift controller was not in the tower during the minutes leading up to the runway incursion.

The Kitchener-Waterloo tower airport controller had 28 years experience as a controller. He was working an overtime swing-shift at the time of the occurrence and had had one day off in the previous seven days. He had been on duty for 7 hours and 45 minutes since the beginning of his shift and for 20 minutes since his last break. He reported that he was fatigued at this late point in his shift after having controlled a heavy traffic day and as a result of the overtime worked in the immediate past. The ground controller had been a controller for four years and was working the third day of her regular shift cycle after having worked three overtime shifts previously. This was her sixth day of work since her last day off. She had been on duty for 2 hours and 15 minutes since the beginning of her shift and had not yet had a break. The controllers were qualified to perform their respective duties.

Communications between Kitchener-Waterloo tower and Toronto ACC is normally accomplished using two separate telephone lines. A dial-up line, called the 406 line, is normally used by the ground controller to coordinate with Toronto ACC for IFR clearances and flow times, to pass arrival messages, and to make requests for control of inbound IFR traffic after having coordinated with the airport controller. This line is generally answered by the data controller in the Satellite sector of Toronto ACC, within whose area Kitchener-Waterloo Regional Airport is located. A hot line, a direct voice-activated telephone line, is also available and is normally used by the airport controller to receive immediate messages, such as clearance validations from the Satellite sector radar controller in Toronto ACC.

The airport controller reported that, in the past, when the clearance validation message was received via the hot line from Toronto and a second runway was being used temporarily, he normally turned to the ground controller and confirmed that the runway had been transferred to his control. He did not receive the clearance validation message directly from Toronto ACC in this occurrence. When the ground controller stroked out the CVR marking on the flight data strip for the Cessna 421C and indicated that it was released, the airport controller reported that he interpreted that message as a transfer of responsibility for the runway as well, and did not perform his normal confirmation.

On the day of the occurrence, it was reported that the data position in the Satellite sector of Toronto ACC was not staffed, and the 406 line was not being answered. Due to the inability to contact Toronto on the 406 line and the heavy traffic being controlled by the airport controller, the ground controller carried out the majority of the communications with Toronto ACC on the hot line, and the ground controller, rather than the airport controller, received the clearance validation for the Cessna 421C from the Toronto ACC Satellite sector controller.

The weather at the time of the occurrence met the requirements for VFR flight. There were no reported weather-related phenomena that impaired visibility on the airport.

Analysis

The airport controller authorized the use of runway 25 for the departure of the Cessna 421C. However, he did not indicate at what point the runway should be made active or ensure the communication of that fact to the ground controller by posting the runway strip header in the flight data strip bay as required by Operations Letter 97-11.

The practice of the ground controller sometimes initiating the transfer of responsibility for the runway and posting the runway strip header offers flexibility in busy situations. However, it also adds uncertainty as to who will do which actions and increases workload by introducing a requirement for additional communication. In this occurrence, both controllers assumed that the other would take action to confirm ownership of the runway. Neither controller performed the required activity. The coordination and teamwork required by Operations Letter 91-4 did not take place during this occurrence. The specific behaviour of the controllers associated with the unsafe issuance of take-off clearance cannot with confidence be tied to behaviours associated with fatigue. The failure to post a runway status strip is attributable more to procedural uncertainty, as to who was responsible for the designation of the active runway, than to the airport controller's subjective feeling of fatigue.

The airport controller's authorization of the Cessna 421C to taxi to position on runway 25 did not serve as a signal that the runway was or should have been made active. There is no

indication that either controller sought to clarify the status of the runway or of the taxiway that crossed it. The mandatory scan of runway 25 prior to issuing take-off clearance would probably not have shown the Piper Seminole in proximity to the runway because that aircraft did not enter runway 25 until 48 seconds later. At the time that the Cessna 421C was issued take-off clearance, the Piper Seminole was likely still on taxiway "A" or "B". The absence of the third controller, who was on a relief break, eliminated the third set of eyes whose duty it was to act as a spotter for the airport controller during the heavy traffic situation being experienced at the time. The controllers on duty did not scan the manoeuvring surfaces in sufficient detail or with sufficient regularity to detect the approaching runway incursion.

The method of communications with Toronto ACC may have hindered the normal internal communications process between the ground and the airport controller. The fact that the ground controller, rather than the airport controller, received the clearance validation message from Toronto may have eliminated one of the personal defences normally exercised by the airport controller. In the past, when the airport controller received clearance validation messages from the ACC, he had been in the habit of confirming ownership of the departure runway if it was other than the one currently being used. It may be that, because he did not receive the clearance validation, which was the first part of the personal defence process, he did not follow on with the second part of the process, the confirmation of runway ownership.

Findings

1. The controllers involved in the occurrence were qualified and current for their positions.

2. The need to use the hot line for communications with the Satellite sector radar controller imposed an added coordination requirement on the ground and airport controllers in that clearance validation information, normally routed directly to the airport controller, had to pass through the ground controller.

3. Local operations letters specify that the active runway must be indicated by posting a runway strip header, and also specify who is responsible for doing so, but do not detail when the runway should be made active.

4. Local practices varied concerning who would initiate the control transfer of an alternate active runway and who would post the runway strip header.

5. There was no overt declaration of the activation of runway 25 by the airport controller, no signal posted to indicate that the status of the runway had changed, and no coordination to ensure mutual awareness of the situation.

6. The airport controller assumed that runway 25 had been transferred to the control of the airport controller when the ground controller advised that the Cessna 421C was released.

7. The ground controller assumed that, since the airport controller had not actively taken control of runway 25, it was still under the control of ground control.

8. The defence provided by the lookout duties of the third controller during heavy traffic periods was eliminated by that controller's need for a break and the absence of a replacement.

9. Staffing met unit standards.

10. The controllers on duty did not scan the manoeuvring surfaces in sufficient detail or with sufficient regularity to detect the approaching runway incursion.

Causes and Contributing Factors

The airport controller cleared the Cessna 421C to take off on runway 25 when the Piper Seminole was cleared to cross the runway, without first actively designating it as an active runway and without taking action to confirm that the ground controller was aware that the runway was active. Contributing to the occurrence were the inconsistent application of a standard procedure for the timing, designation, and posting of temporary active runway information and the lack of a sufficiently detailed scan of the manoeuvring surfaces.

Safety Action

Kitchener-Waterloo control tower Operations Letter 97-11 is now supplemented by Operations Letter 99-6 which clarifies that both controllers have responsibility to ensure that runway status header strips are in place. If the ground controller transfers control of a runway by assigning it to a departing aircraft, then the ground controller must ensure that the runway status display indicates that the airport controller has jurisdiction of the runway and the ground controller no longer has approval to use it.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 14 March 2000.