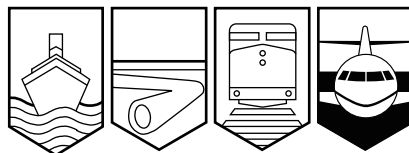


Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

**AVIATION INVESTIGATION REPORT
A99H0005**



OPERATING IRREGULARITY

BETWEEN

AIR NOVA

de HAVILLAND AIRCRAFT DHC-8-100 C-GONN

AND

INTER-CANADIEN

AVIONS DE TRANSPORT RÉGIONAL ATR-42-300 C-FTCP

HALIFAX INTERNATIONAL AIRPORT, NOVA SCOTIA

15 OCTOBER 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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Summary

Air Nova flight 811 (ARN 811), a de Havilland DHC-8 aircraft, was on a flight from Sydney, Nova Scotia, to Halifax, Nova Scotia, and was cleared to land on runway 33. Inter-Canadien flight 2240 (ICN 2240), an ATR 42, was on a flight from Charlottetown, Prince Edward Island, to Halifax and was cleared to land on runway 24. The airport controller's original plan was for ARN 811 to land and hold short of the intersection of runway 24 in accordance with the approved simultaneous intersecting runway operation (SIRO) procedures. He subsequently cancelled the hold short restriction. However, a short time later, the controller decided that ARN 811 would have to hold short in order for ICN 2240 to be able to continue with the landing. Therefore, he asked ARN 811 if they could again comply with the hold short restriction; the pilot replied that he was unable to do so. The controller then instructed the crew of ICN 2240 to initiate a missed approach. The crew of ICN 2240 acknowledged but immediately requested to land beyond the intersection with runway 33. As ICN 2240 approached the intersection, the crew was cleared to land on runway 24. At the time ICN 2240 flew over the intersection, ARN 811 was entering the intersection of runways 33 and 24.

Ce rapport est également disponible en français.

Other Factual Information

ARN 811, an instrument flight rules (IFR) flight from Sydney to Halifax, contacted the Halifax airport controller and was provided with the aircraft's approach sequence for runway 33, landing information, and information indicating that the aircraft would probably have to hold short of runway 24 on landing. The crew acknowledged the information. Shortly thereafter, the controller cleared ARN 811 to land on runway 33 and to hold short of runway 24, and included that traffic would be landing simultaneously on runway 24.

The traffic landing simultaneously on runway 24 was ICN 2240, which was, at the time, number 2 in the approach sequence for runway 24. ICN 2240 was on an IFR flight from Charlottetown to Halifax and had been cleared for a visual approach for runway 24. The radar display indicated that ICN 2240 was turning onto the final approach course at 7.3 nautical miles (nm) from the threshold, and that ARN 811 was closer to runway 33 than ICN 2240 was to runway 24. ARN 811 was also indicating a ground speed approximately 60 knots faster than ICN 2240. As ICN 2240 was flying through the final approach course in a right turn to re-intercept, the aircraft's speed decreased from 170 knots to 100 knots in the turn before increasing to a maximum speed of 140 knots once established on the final approach course.

The airport controller assumed from his observation of the radar display that ARN811 could land before ICN 2240. Therefore, the airport controller offered to cancel the hold short restriction for ARN 811 if the pilot would fly directly to the threshold of runway 33; ARN 811 accepted that clearance. The airport controller then advised ICN 2240 that traffic was landing ahead on runway 33 and not to expect further clearance until 0.5 mile on final approach. ICN 2240 had not received a clearance to land on runway 24.

At 0726.56, the airport controller requested ARN 811, now 1.2 nm from the threshold of runway 33 and 1.8 nm from the intersection with runway 24, to land long if able, in an attempt to ensure that the aircraft would be clear of the intersection of runway 24 prior to ICN 2240 crossing the threshold for runway 24. The airport controller then advised ARN 811 that the other traffic was faster than expected and asked if the pilot could still hold short of the intersection of runway 24, but the pilot was unable to do so. ARN 811 landed and the pilot allowed the aircraft to slow without using reverse thrust or braking. The last radar target for ARN 811 prior to the intersection shows the aircraft on runway 33, 0.3 nm from runway 24 and travelling at approximately 90 knots.

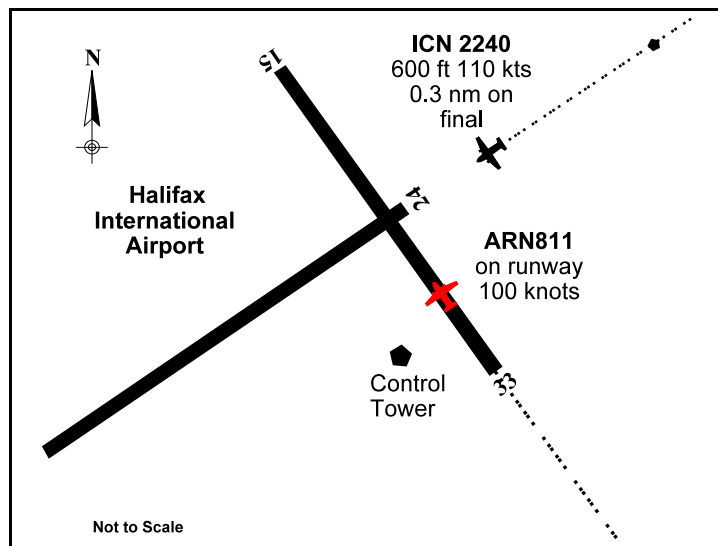


Figure 1 - Halifax International Airport with relative positions of the two aircraft.

Having decided that there was insufficient room to allow ICN 2240 to land, the airport controller instructed ICN 2240 to execute a missed approach. ICN 2240 was approximately 0.3 nm from the threshold of runway 24 (see Figure 1). The pilot acknowledged the instruction and in the same transmission requested permission to land on runway 24 beyond the intersection with runway 33. At 0727.23, the airport controller cleared ICN 2240 to land on runway 24. Radar data indicated that ICN 2240 was now over the threshold of runway 24 and had not commenced a climb in response to the airport controller's instruction to pull-up but had maintained an altitude of approximately 200 feet above the runway. ICN 2240 passed through the intersection of runways 24 and 33 and touched down approximately 2500 feet from the threshold of runway 24.

It was not possible to determine the exact position of ARN 811 in relation to ICN 2240 at the time ICN 2240 crossed the threshold of runway 24 from an examination of the recorded radar data because of gaps in the radar coverage of ARN 811. However, the pilot of ARN 811 indicated that as his aircraft entered the intersection of the two runways he saw, through the front window of the aircraft, ICN 2240 fly by. The pilot of ICN 2240 indicated that he could see, through his left side window, ARN 811 enter the intersection of the two runways. Based on this geometry, it was concluded ARN 811 was approaching or taxiing through the intersection of runways 33 and 24 at the same time ICN 2240 was flying over the same intersection. Radar data does indicate that ICN 2240 remained at approximately 200 feet in the air until reaching the intersection. This was a dynamic situation, and at the speed the aircraft were travelling, it would have taken less than two seconds for them to cross the intersection.

On the morning of 15 October 1999, traffic at Halifax International Airport was reported as light, as the controller provided service to six aircraft in the 10 minutes prior to the occurrence. Staffing was considered to be in accordance with unit procedures and adequate for the workload. The airport controller had relieved the night shift controller at 0700 and had been in position since that time. He was properly qualified and authorized to work the airport control position.

Both runways 24 and 33 were being used for arriving and departing aircraft in order to maximize the use of available runways under the terms of the SIRO procedure. This allows aircraft to land at the same time on intersecting runways, or depart on one and land on the other as long as one of the landing aircraft accepts a restriction to stop before reaching the intersecting runway. The procedures and limitations for this type of operation are described in the *Air Traffic Control Manual of Operations* (ATC MANOPS) and the unit's operations manual. The manuals detail applicable weather and runway conditions and landing distances available for various categories of aircraft and allowable runway combinations. No problems were detected with respect to the SIRO procedure being used by the controllers that morning.

The use of standard operating procedures is supported in NAV CANADA's own training material. In the human factors section of the situational awareness module, it is stated that:

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.

ATC MANOPS specifies that the airport controller has the responsibility to ensure that an arriving aircraft is separated from another aircraft using an intersecting runway, such that the preceding arriving aircraft has completed the landing roll and will hold short of the intersection or has passed the intersection. There is no specified minimum distance from the runway by which a landing clearance must be issued to an aircraft, only that the controller must ensure that the aircraft is approaching the correct runway for which the clearance is to be issued.

Conversely, there is no minimum distance specified in ATC MANOPS by which point a missed approach instruction must be issued to an aircraft in the event a landing clearance cannot be issued. However, ATC MANOPS, part 3, article 344.9, does specify the requirement for the airport controller to advise an aircraft to continue the approach but to be prepared for a possible pull-up if it appears that the runway may not be clear. It further specifies the phraseology to be used for the warning and the subsequent instruction to pull up and go around.

Analysis

An operating irregularity occurred when the controller cleared ICN 2240 to land on runway 24 beyond the intersection with runway 33, without making sure that the approach path was clear. ARN 811 had not taxied through the intersection at the time ICN 2240 flew by, with a clearance to land on runway 24.

The airport controller was now conducting sequential landing operations using two intersecting runways after having cancelled the hold short restriction (as required for the simultaneous operations) for ARN 811. Once he realized that the runway was not going to be clear for ICN 2240, he instructed ICN 2240, now at 0.3 miles from the threshold of runway 24, to initiate a missed approach. Had ICN 2240 complied with the instruction, no occurrence would have taken place. The request by the pilot to land long instead of carrying out a missed approach forced the airport controller to quickly re-evaluate his own plan. The decision to allow ICN 2240 to land was based on the airport controller's visual perception from his vantage point in the tower that ARN 811 had now passed through the intersection and that ICN 2240 would touch down beyond the intersection, which proved to be erroneous. The short time available to make a change to the original decision combined with the shallow viewing angle from the tower toward the intersection of the two runways did not allow the controller to properly evaluate the situation. Although the controller had indicated to the pilot of ICN 2240 that further clearance would not be issued until the aircraft was at about one-half mile on final, he did not warn the pilot that the runway might not be clear and that a missed approach might need to be initiated.

As a result of the controller's action, the inherent safety of a standard procedure, that is the SIRO procedure, was replaced by a less certain, ad-hoc procedure. The human factors section of NAV CANADA's own training material on situational awareness supports the use of standard procedures. By using a non-standard operating procedure, increased vigilance and additional

safety checks were required to maintain the level of safety as was intended had the standard procedure been followed. Waiting until the last possible moment to make a significant decision, such as instructing an aircraft to execute a missed approach, may not allow enough time for the pilot to initiate action to ensure safe spacing with another aircraft. Even with both aircraft on short final to crossing runways, the controller still hoped to allow both aircraft to land, but without having the SIRO procedure's safety requirements in place.

Findings as to Causes and Contributing Factors

1. The airport controller cancelled the SIRO procedure without ensuring that sufficient separation existed to conduct sequential operations to two intersecting runways.
2. The controller cleared the two aircraft to land sequentially without ensuring that one aircraft would be stopped prior to the intersection or had taxied through the intersection before the other aircraft crossed the landing threshold.
3. The pilot of ICN 2240 did not immediately comply with the controller's instruction to execute a missed approach, which resulted in the two aircraft coming into close proximity at the intersection of the two runways with little vertical spacing.

Safety Action

NAV CANADA has issued to its staff ATS Safety Bulletin *Squawk 7700*, Issue 2000-3. The bulletin outlines the dangers inherent in not abiding by standard operating practices without ensuring there is another type of separation or another minimum established—before the previously used separation becomes insufficient. NAV CANADA will also amend its management and operating manuals by the end of January 2001, directing that appropriate additional defences are to be used 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.