

Two's Too Many



Angled taxiways limiting the pilots' view of the runway, clearances issued and read back hastily and incorrectly, and crossed radio transmissions¹ were among the common factors involved in two "critical runway incursions" that occurred two months apart last year at Auckland International Airport, said the New Zealand Transport Accident Investigation Commission (TAIC).

Both incidents involved twin-turboprop regional aircraft, whose pilots took last-minute action to avoid

collision, stopping their aircraft on the runway within a few meters of each other with no damage and no injuries.

The first incident occurred on May 29, 2007, in daytime visual meteorological conditions. Four employees of Airways New Zealand were on duty in the airport traffic control tower, including an aerodrome controller who was responsible for aircraft on the runway and airborne in the control zone, and a ground controller who was responsible for aircraft movements on the ramps and taxiways. Both were qualified for all tower positions.

Auckland has a single runway — Runway 05R/23L, which is 3,635 m (11,926 ft) long and 45 m (148 ft) wide. "Six of the 10 taxiways [join] the runway at an angle of 30 degrees to the runway centerline to form rapid-exit taxiways for landing aircraft," the report said. "For example, Taxiways A4 and A6 [are] rapid-exit taxiways for Runway 23L." The parallel taxiway was used temporarily as a runway during the 1990s when extensive repairs were being performed on Runway 05R/23L; although closed as a runway, the taxiway retains markings as Runway 05L/23R.

The scene was set — twice — for a collision at Auckland.



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The pilots' limited view of the runway while holding on angled taxiways at Auckland International was a factor in two critical incursion incidents.

“The [control] tower was located about 500 m [1,641 ft] north of the intersection of Runway 23L and Taxiway A5,” the report said. “Controllers had an unobstructed view of all the taxiway holding points for Runway 23L/05R.”

Wrong Call Sign

The events leading to the first incursion began when the ground controller cleared the flight crew of an Air Nelson Saab 340A, call sign Link 659, to taxi from the ramp via Taxiway B5 to the runway holding point on Taxiway A5 (Figure 1, p. 39). “The Saab pilots had completed their pre-takeoff checks and had changed to the aerodrome controller’s radio frequency (Tower) as they approached the holding point,” the report said.

The Saab captain told the aerodrome controller, “Link 659 is ready in turn Alpha 5.” The aerodrome controller acknowledged the transmission. The Saab was among seven aircraft that were being handled by the aerodrome controller. A Swearingen Metro was holding for takeoff on Taxiway A1; an aircraft was departing; and four aircraft were arriving. First in sequence for arrival was an Eagle Airways Raytheon Beechcraft 1900D, call sign Eagle 766.

Another Air Nelson aircraft, a Bombardier Q300 with the call sign Link 383, was taxiing to the holding point on Taxiway A3. “The ground controller had instructed its pilots to call Tower when ready, but they had not yet changed frequency,” the report said. “The instruction to call Tower meant that control of the aircraft had passed from the ground controller to the aerodrome controller. Airways [New Zealand] procedures required the

ground controller to pass the flight progress strip for [Link 383] to the aerodrome controller at the same time.”

Each flight progress strip contains essential information, such as aircraft type and call sign. After a controller issues a clearance to the aircraft, he or she writes the clearance and the time the clearance is issued on the strip before passing it to the next controller. “The strips for the Saab, Link 659, and the [Q300], Link 383, were correctly prepared, but the distinction between the handwritten holding points, A5 and A3 respectively, was not clear,” the report said.

After clearing Eagle 766 to land on Runway 23L, the aerodrome controller and the ground controller discussed whether a departure could be conducted between the 1900’s landing and the next arrival. The Metro holding on Taxiway A1 was the likely choice because the crew had announced that it was ready for takeoff before the captain of the Saab announced ready for takeoff from Taxiway A5. “It was not determined why the aerodrome controller had not already decided to depart that aircraft [the Metro] first,” the report said.

The ground controller suggested that Link 659 could take off between the 1900 and the next aircraft on approach, and she pointed at



This Air Nelson Saab 340A was among seven aircraft that were being handled by the aerodrome controller when the first incident occurred.

Follash/wikimedia.org



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The second incident involved two Eagle Airways Raytheon Beechcraft 1900D flight crews who accepted a takeoff clearance meant for only one of the airplanes.

the Saab on Taxiway A5. However, the ground controller was not at her normal position in the tower; she had moved to accommodate an electrician who was working on a lighting control panel. As a result, the ground controller was standing almost behind the aerodrome controller, instead of next to her.

The aerodrome controller, who was looking in a different direction, decided to clear Link 383, the Q300 holding on Taxiway A3, for takeoff. “The aerodrome controller said that her normal practice was to read the [flight progress] strips for each aircraft that she controlled, rather than relying on memorizing call signs and types, but whether she had read the strips before issuing the clearance to Link 659 was not determined,” the report said.

The aerodrome controller might have decided to clear the Q300 crew for takeoff because the airplane was still taxiing and would have been able to line up on the runway without having to stop at the holding point, the report said. “An expeditious line-up by the [Q300] would have made good use of the available gap before the next landing aircraft.”

However, the aerodrome controller used the wrong call sign in the takeoff clearance. Instead of addressing Link 383, she radioed, “659, if you can take an immediate, line up Runway 23L.”

The ground controller noticed that the aerodrome controller was looking at Link 383 when she issued the takeoff clearance and reminded her that Link 659 was the Saab on Taxiway A5.

The aerodrome controller attempted to amend the clearance by instructing the Saab crew to line up and wait on the runway after the landing 1900 passed by, but the radio transmission was blocked by the Saab first officer’s read-back of the takeoff clearance.

“The Saab captain said that he thought the aerodrome controller sounded busy and the tone of the line-up instruction meant ‘don’t muck around,’” the report said. “As the first officer read back the clearance, the captain looked left and saw no aircraft on the runway.” He told investigators, however, that it was difficult to see the runway behind his aircraft because of the angle of the taxiway.

“Pilots seated on the left side of aircraft holding on Taxiway A3 or A5 have to look back over their shoulders through almost 150 degrees in order to see the runway threshold and can see less of the runway and approach area when holding on Taxiway A5 than when holding on Taxiway A3,” the report said.

Pilots entering an active runway from an angled taxiway normally turn slightly off the taxiway centerline to improve their ability to visually check the runway and approach area. “However, if told to expect an immediate takeoff clearance, most pilots would stay on the centerline to expedite the line-up, as the *Aeronautical Information Publication* encourages,” the report said. “That was what the Saab captain did, and, as a result, his look up the runway, already limited by the cockpit window design, was probably less searching than normal.”

As the Saab moved toward the runway, the aerodrome controller again tried to amend the takeoff clearance, saying, “Sorry, that’s behind the 1900,” but the transmission was blocked by one of the Q300 pilots, who radioed, “Tower, 383 is ready A3.”

“The Saab captain, after hearing ‘1900,’ at the end of the crossed transmission, looked left

again and saw the landing [1900] bearing down as it turned off the runway towards Taxiway A6,” the report said. “Both aircraft were braked hard and came to a stop ... about 10–15 m [33–49 ft] apart.”

Similar Numbers

None of the aircraft, pilots or controllers involved in the first incident was involved in the second incident the morning of Aug. 1, 2007. Three aircraft were on the aerodrome controller’s radio frequency: an aircraft on departure, another on arrival but not yet on final approach, and an Eagle Airways 1900D, call sign Eagle 979, that was holding for takeoff on Taxiway A2 (Figure 2).

The aerodrome controller told Eagle 979 to line up and wait on Runway 23L. About one minute later, the ground controller told the crew of another Eagle Airways 1900D, call sign Eagle 171, which was nearing the holding point on Taxiway A3, to switch to Tower frequency.

The crew of Eagle 979 held on the runway for two minutes while the aerodrome controller and the crew of the departing aircraft discussed weather conditions west of the airport. “The controller was concerned that fog was approaching the airport, and he was considering whether to implement newly introduced low-visibility procedures,” the report said. Current conditions at the airport included 30 km (19 mi) visibility and a broken ceiling at 500 ft. The weather deteriorated to 3,000 m (about 1 3/4 mi) visibility and a broken ceiling at 300 ft within the next 15 minutes.

When the discussion between the aerodrome controller and the departing aircraft ended, the first officer of the 1900 holding on Taxiway A3, radioed, “Eagle 171 ready.” The report said that the call sign was “clipped ... and not unmistakably ‘one seven one.’” The aerodrome controller heard the transmission but did not identify the call sign. “He intended to next clear the [1900] waiting on the runway, and so ... he transmitted, ‘Eagle 979, 23L, cleared takeoff,’” the report said.

The first officers of both Eagle 979 and Eagle 171 read back the clearance at the same time. “The aerodrome controller contributed to the holding pilots mistaking the call sign by issuing the takeoff clearance immediately after the pilots of [Eagle 171] had called ready and by not using phonetic pronunciation for the call sign numbers [of Eagle 979],” the report said. The report did not specify how the controller pronounced the call sign but said that it was not “niner seven niner” and noted that the numbers “71” and “79” are similar.

A recording of the crossed transmissions by the first officers indicated that they ended with “seven niner” and “seven one,” in that order.

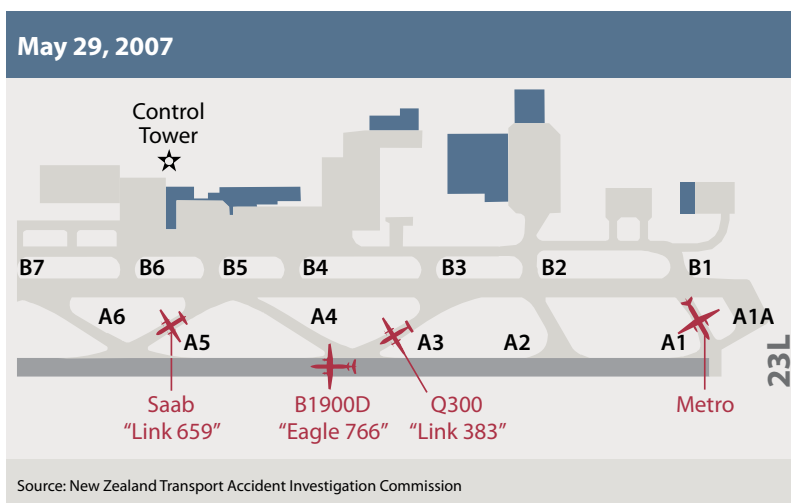


Figure 1

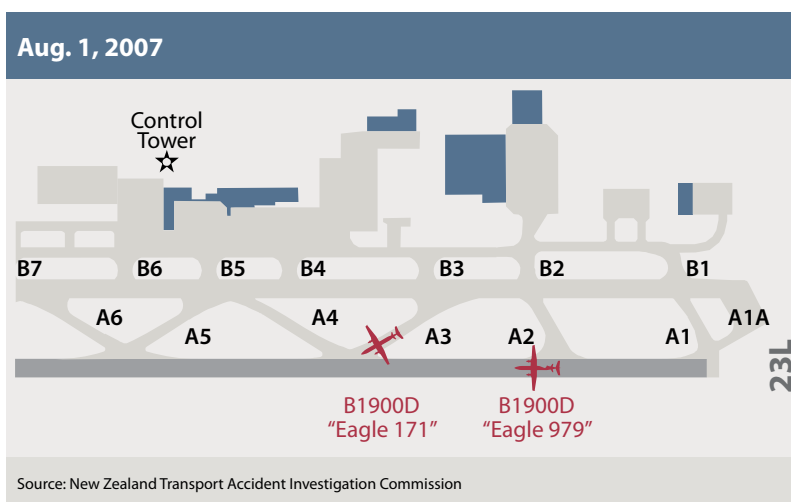


Figure 2

“The first officer of Eagle 979 said that he heard ‘seven one’ after he had finished his read-back, which he thought was strange, but he did not suspect crossed transmissions,” the report said. “The aerodrome controller said that he heard the crossed transmissions, but he did not associate them with either Eagle flight. He had looked away from the runway to assess the weather and then instructed the [departing] aircraft to change frequency. He did not see Eagle 979 start its takeoff or Eagle 171 move towards the runway.”

The captain of Eagle 171 said that he saw only the arriving aircraft on a wide base leg when he looked back before taxiing onto the runway. Eagle 171 entered the runway about 10 seconds after Eagle 979 began its takeoff roll. The first officer of Eagle 979 saw the registration number ZK-EAH on Eagle 171’s fuselage and radioed, “Eagle alpha hotel, hold. ... Hold! Hold! Hold!”

“The captain of Eagle 979 had already initiated a rejected takeoff from a speed of about 60 kt,” the report said. “He swerved left almost to the runway edge, while the captain of Eagle 171 veered his aircraft to the right. Each aircraft was stopped on its respective half of the runway.” The wing tips were about 8 m (26 ft) apart.

Common Problems

Based on these findings, TAIC concluded that the first runway incursion “was initiated when the aerodrome controller mistook the call sign of the aircraft she intended to line up for takeoff and thereby inadvertently instructed another aircraft to line up in front of the aircraft that was landing.”

The second incursion “was initiated when the pilots of the aircraft holding on a taxiway mistook the clearance for another aircraft to take

off as being for them and entered the runway in front of the aircraft that was taking off.”

The report said the following were among problems that not only contributed to both incidents but increase the risk of runway incursions at other airports:

- “The use of multiple runway-entry points increases the risk of runway incursions by creating more points for potential traffic conflict and a potentially higher workload for aerodrome controllers ...;
- “The use of angled taxiways for runway entry increases the risk to aerodrome operations by further limiting pilots’ view of the runway threshold and of other aircraft ...;
- “[Pilots] do not, or cannot, check that the runway is clear before crossing the holding point ...;
- “Crossed radio transmissions remain a risk to aerodrome operations ...;
- “Pressure to minimize runway-occupancy times occasionally leads to hastily delivered runway line-up and takeoff clearances and too-quick compliance by pilots ...; [and,]
- “The practice of not transferring control of aircraft from the ground controller to the aerodrome controller until they are near the runway holding point reduces the situational awareness of controllers, as less time is available to review aircraft details, and of pilots, because they have less time to listen on the Tower frequency before entering the runway.”

Among actions taken after the two incidents was a revision by Airways New Zealand of its traffic management plan for Auckland, requiring that departures from Runway 23L be conducted only from Taxiways A1A, A1 or A2. The runway-entry point for A1A and A1 is at the approach threshold, and A2 is angled toward the approach end of the runway.²

In addition, the layout of the flight progress board in the Auckland control tower and procedures for placing flight progress strips on the board were revised. The board has separate bays for the takeoff-holding points, and ground controllers are required to place strips in the bays corresponding to the assigned holding points. The revision is a temporary measure, pending implementation of an electronic flight progress strip system that “should give all aerodrome controllers earlier advice of impending departures,” the report said. 🌀

This article is based on TAIC Aviation Occurrence Report 07-005.

Notes

1. The TAIC report said that a *crossed transmission* — also called a blocked transmission — occurs “when two stations transmit at once [and] neither can hear the overlapped transmission but other stations on the frequency hear either a largely unintelligible ‘hash’ or the higher-powered transmitter.” Controllers or pilots who detect a crossed transmission commonly radio “two at once” or “blocked” to alert others on the frequency.
2. The report noted that the International Civil Aviation Organization’s *Manual on the Prevention of Runway Incursions* (Doc 9870) recommends that “when using multiple or intersection departures, do not use oblique or angled taxiways that limit the ability of the flight crew to see the landing runway threshold or final approach area.”