Surfing the unknown break- challenging the status quo

Runway incursion involving a Lancair, VH-VKP, and a BombardierDHC-8-315, VH-TQZ, at Mildura Aerodrome, Victoria on 29 September 2023.

Presented by
Lee Ungermann
Manager Transport Safety

Acknowledgement of Country

The Australian Transport Safety Bureau acknowledges the Traditional Owners of the lands on which we meet today.

We pay our respects to Elders past, present and emerging.

Collision risk at non-towered aerodromes

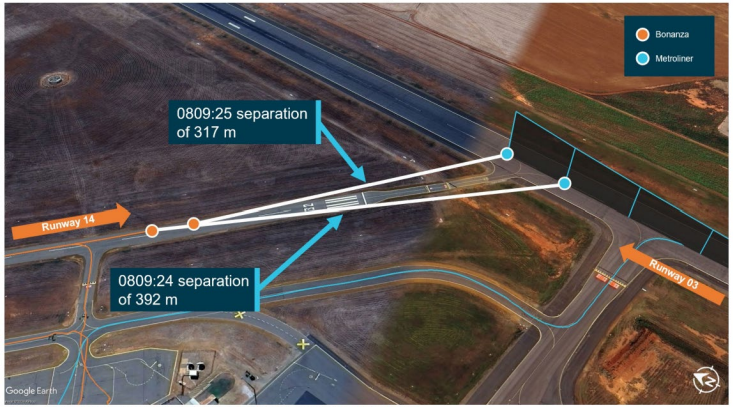
In 2023 and 2024 ATSB identified an increased number of runway incursions and near collision events at non-controlled aerodromes

These included

- 2 January 2024 – Sea world mid-air (AO-203-001)
- 6 June 2023- Near collision between a PA-28 and a Dash -8 at Mildura, Vic (AO-2023-025)
- 29 September 2023- Separation issue between Lancair and Dash 8- Mildura, Vic (AO-2023-050)
- 19 March 2024 – Near collision between a Metroliner and Bonanza at Geraldton, WA (AO-2024-009)
- 15 July 2024 - Runway incursion between a PA-28 and Dash 8 at Wagga Wagga (AO-2024-041)

SafetyWatch

The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry. This investigation report highlights the safety concerns around Reducing the collision risk around non-towered airports.



Source: Google Earth, with recorded data overlaid and annotated by the ATSB

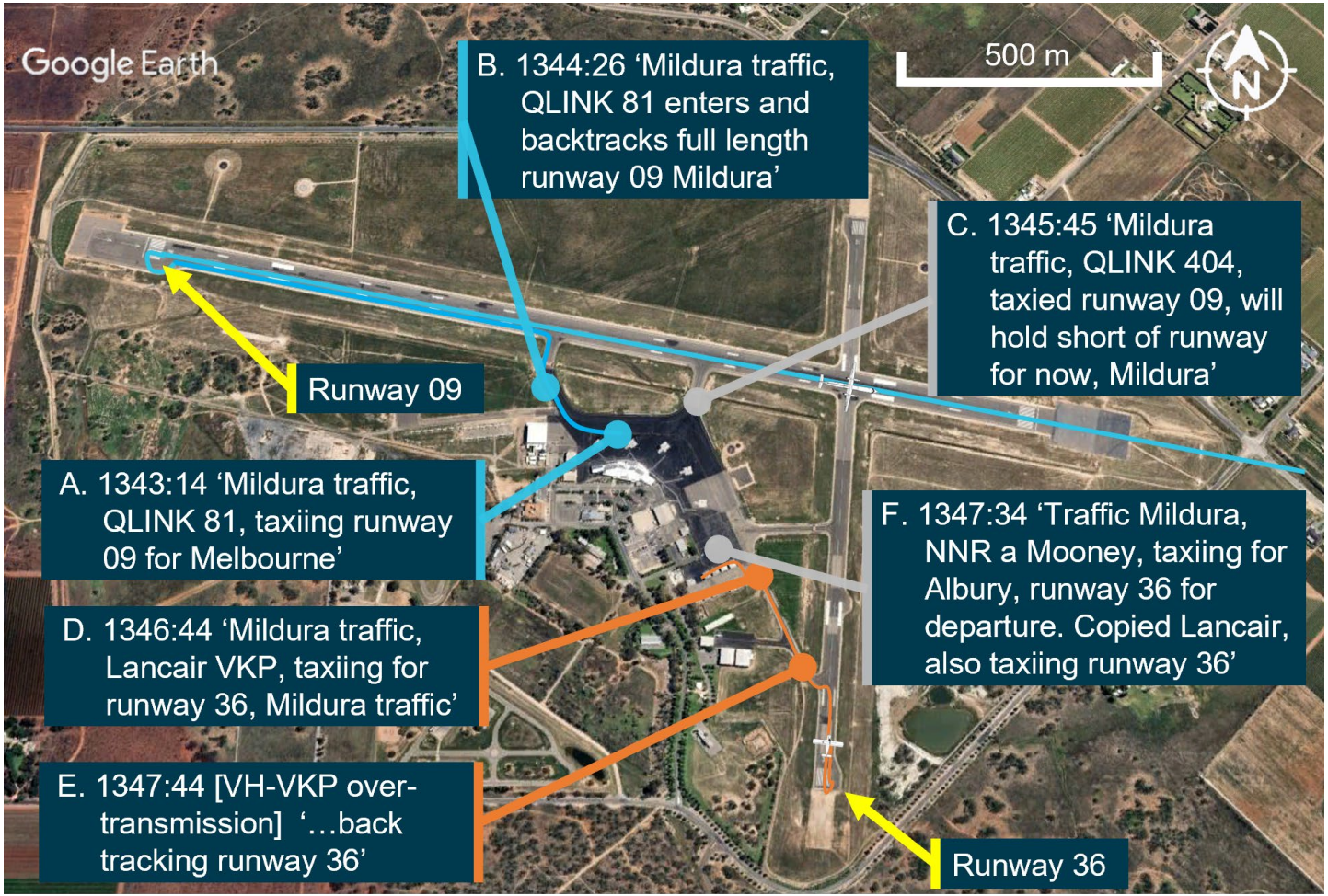
Mildura 1 - What happened

- At about 1203 on 6 June 2023, QLINK 402, a Bombardier DHC-8-315, registered VH-TQH taxied runway 09 at Mildura for a regular passenger transport service to Sydney.
- The crew of VH-TQH commenced their take-off from runway 09.
- A short time later, the pilot of VH-ENL commenced their take-off from runway 36.
- At about rotation speed, the crew of VH-TQH identified a Piper PA-28-161, registered VH-ENL, becoming airborne on Runway 36.
- The pilot of VH-ENL observed VH-TQH airborne and climbing as it crossed runway 36 ahead of them.


C. 12:00:23 Mildura traffic, QLINK 402, at Delta, entering and backtracking runway 09, departure east, Mildura.
Runway 09
B. 11:59:12 Mildura traffic, QLINK 402, Dash 8, Taxing via 'Delta' for runway 09, departure to the east, Mildura
A. 11:58:45 QLINK 402, got the plan, Squawk 3271, no reported IFR traffic. Just confirm rego, TQH
Taxiway Delta
Mildura terminal
A. 11:58:45 Traffic Mildura, ENL taxiing runway 35, departure to the north, traffic Mildura
D. 12:02:16 Mildura traffic, ENL entering and backtracking runway 35
GA apron
E. 12:03:13 Mildura traffic, ENL rolling on runway 36, traffic Mildura
Runway 36
N
Google Earth
500 m

Mildura 2 - What happened

- At about 1444 on 29 September 2023, QLINK 81, a Bombardier DHC-8, registered VH-TQZ taxied runway 09 at Mildura for a regular passenger transport service to Melbourne.
- The crew of VH-TQZ commenced their take-off from runway 09. A short time later, the pilot of VH-VKP gave a rolling call for runway 36. At about rotation speed, the crew of VH-TQZ identified the Lancair registered VH-VKP, about to roll on runway 36. A short sharp call was made to tell the Lancair to stop.
- Another aircraft taxiing behind the Lancair on runway 09, a Mooney, observed the collision pair and radioed the Lancair to hold on the runway due to departing aircraft on 09. The Lancair had not yet begun to roll.
- QLINK 81 did not hear any of the traffic taxiing and entering and backtracking on 09 and was focussed on airborne aircraft, the Lancair did not hear QLINK at all.
- All calls were recorded on the CTAF frequency with mostly readable transmissions


Google Earth
500 m
N
B. 1344:26 'Mildura traffic, QLINK 81 enters and backtracks full length runway 09 Mildura'
C. 1345:45 'Mildura traffic, QLINK 404, taxied runway 09, will hold short of runway for now, Mildura'
Runway 09
A. 1343:14 'Mildura traffic, QLINK 81, taxiing runway 09 for Melbourne'
F. 1347:34 'Traffic Mildura, NNR a Mooney, taxiing for Albury, runway 36 for departure. Copied Lancair, also taxiing runway 36'
D. 1346:44 'Mildura traffic, Lancair VKP, taxiing for runway 36, Mildura traffic'
E. 1347:44 [VH-VKP over-transmission] '…back tracking runway 36'
Runway 36


Google Earth
500 m
N
G. 1348:42 'Mildura, QLINK 81, rolling runway 09 for upwind departure'
I. 1349:14 '…aircraft rolling 36, hold'
Runway 09
K. 1349:24 'VKP'
H. 1349:06 'Mildura traffic, Lancair VKP rolling runway 36 for straight out departure to the north, Mildura traffic'
J. 1349:19 'VKP hold there, aircraft taking off 09'
Runway 36

Initial evidence gathering in Mildura 2 found

- that the operator suspected possible radio shielding due to buildings and conducted testing- which concluded that the aerodrome was the problem.
- The aerodrome operator suspected radio issues with the aircraft from practical experience of on airport operations and provided their testing.

- In order to settle this, ATSB considered that independent testing had to be carried out
- We searched for historical examples of how this had been done in the past. Unable to identify that this style of testing had ever been conducted by ATSB, we were in uncharted territory
- Firstly, we would have to build a methodology for the testing regime, identify and involve affected stakeholders in the testing

Methodology for testing

- No pre-existing methodology for this testing has been identified on such a scale to date
- Re-creation of Mildura 2 with a formulated test plan
  - Use Lancair and a Dash 8
  - VHF radio transmission and reception check of the aerodrome
  - Use radio testing readability scales and any radio signal strength meters to gather data.
- Identify stakeholders
  - QantasLink
  - Mildura Airport
  - Airservices Australia
  - Lancair pilot

For testing to be objective, it needed to formally record data, both through readability scales and electronic measurements

- Needed experts in the field of radio signal testing

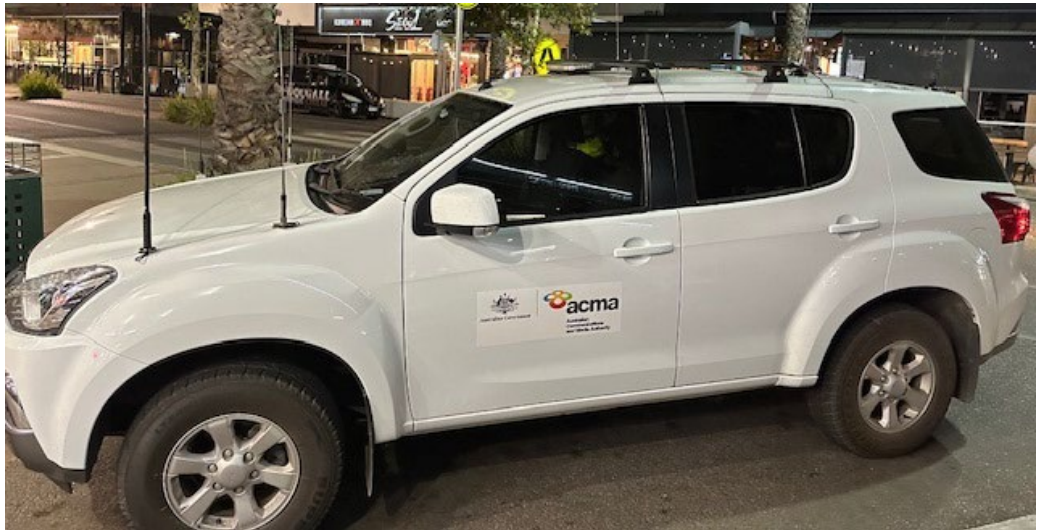
Australian Government

acma

Australian Communications and Media Authority

ACMA assistance to the investigation

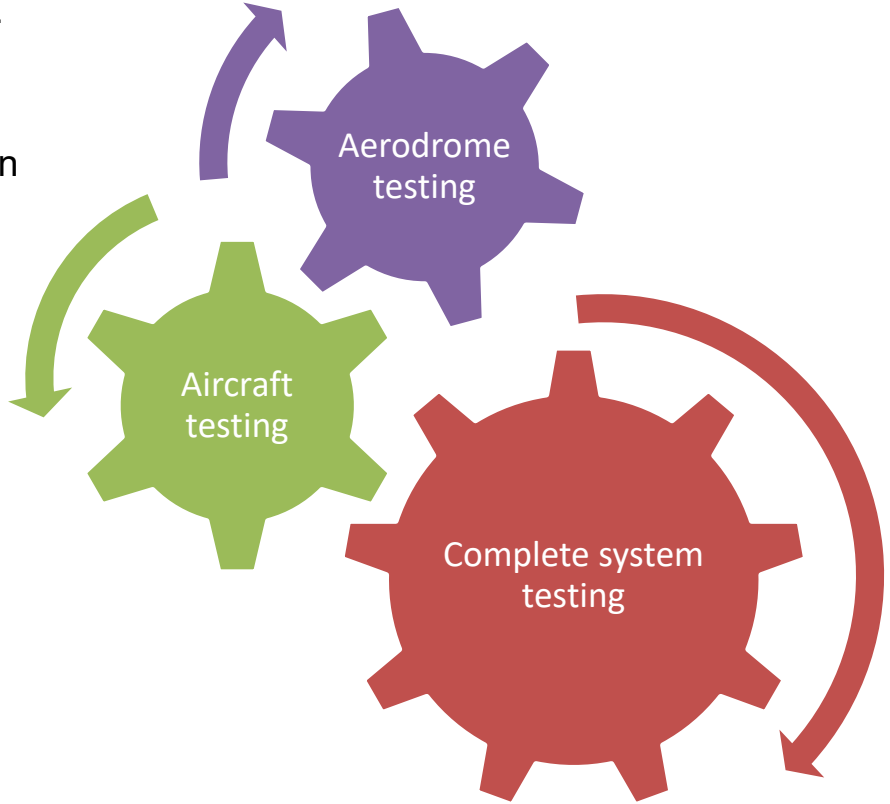
The Australian Communications and Media Authority regulate communications and media to contribute to maximising the economic and social benefits of communications infrastructure, services and content for Australia.



The ATSB conducted VHF signal strength and readability testing, undertaken on 13–14 March 2024 at Mildura Airport.

The testing:

- Aimed to establish if signal strength degradation was occurring due to line of sight limitations and obstacles on the airport or/and if radio signal strength and clarity was aircraft related.
- comprised of signal strength, readability and clarity assessments to and from various locations on the aerodrome.
- focused on the circumstances related to the runway incursion, concentrating on the quality of radio transmissions on the airfield
- Specific to Dash 8 aircraft was conducted on VH-SBI, provided by the operator. This involved reception signal strength testing of aircraft transmissions.
- Testing was broken into 4 schedules



Schedule 1

Involved aerodrome signal reception strength and readability testing.

Schedule 2

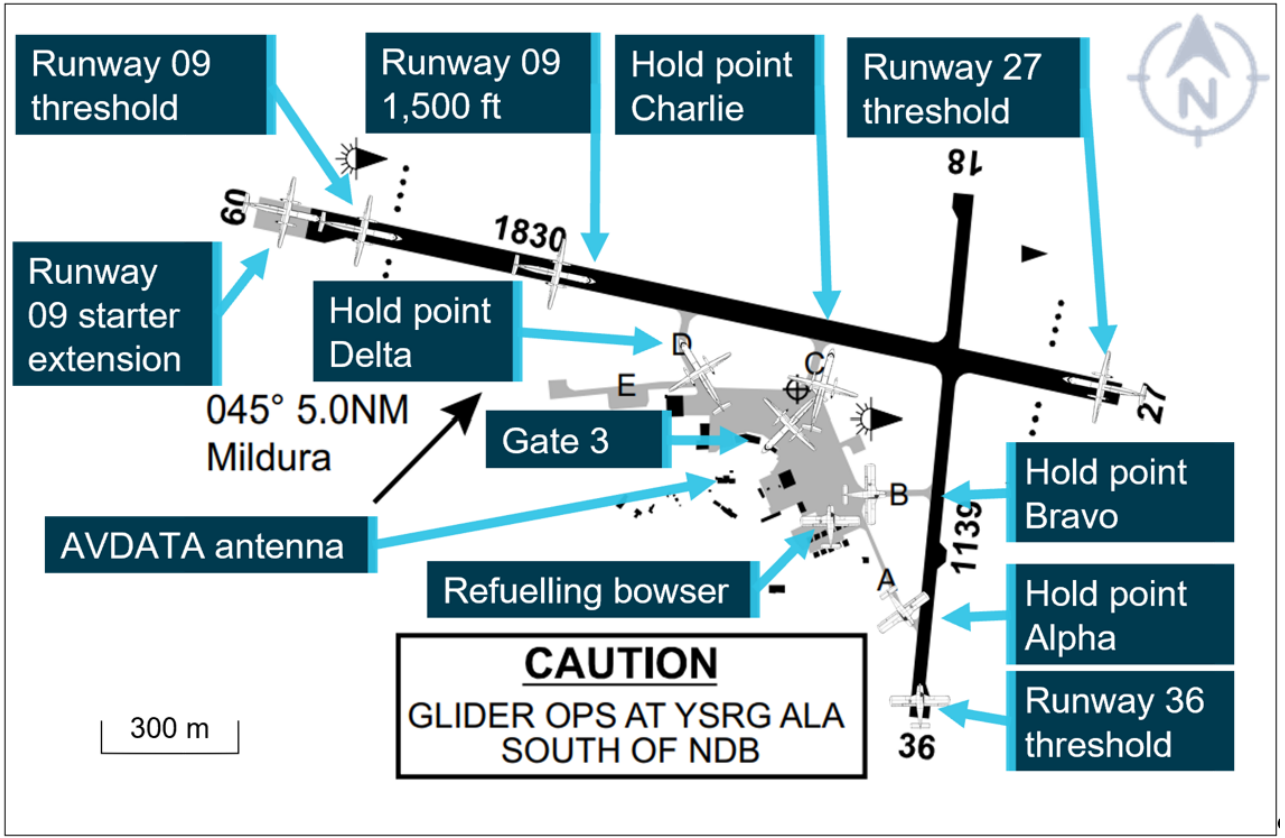
Involved light aircraft signal reception strength and readability testing.

Schedule 3

Involved Dash 8 signal strength testing.

Schedule 4

Involved Dash 8 airframe signal strength and shielding testing.



Testing required

Radio signal readability test.
For this, a qualitative 1–5 readability scale provided by ACMA was recorded at the receiving locations.

To avoid subjectivity, these scores were recorded by ATSB, ACMA and Airservices employees and averaged to arrive at an agreed value to accurately represent the call readability.

Scale	Description
5	Perfectly readable
4	Readable with practically no difficulty
3	Readable with considerable difficulty
2	Readable now and then
1	Unreadable

Signal strength measurement test

Signal power level received from the radio transmission on the ACMA equipment at various locations remote from the aircraft or vehicle.

Signal strength was measured in dBm which represents decibels relative to a milliwatt (mW). This is the power ratio in decibels (dB) of the measured power referenced to one milliwatt.

>-70 dDm

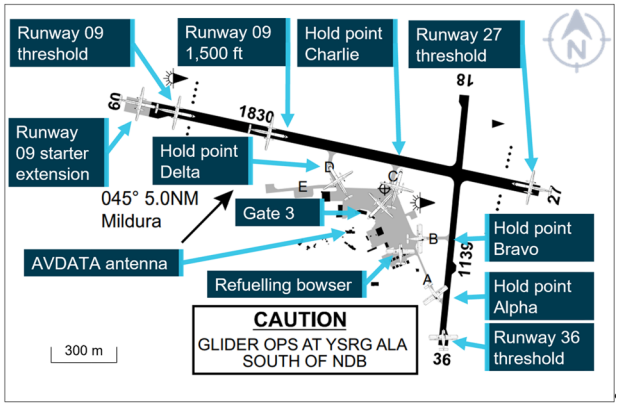
Strong and acceptable signal

Schedule 1 testing - What we found

The testing identified that between the radio transmission points on the aerodrome, the lesser the distance and greater the line of sight, the clearer the radio transmission was with a readability of 4 (readable with practically no difficulty) or more and signal strengths of greater than −70 dBm.

The testing also identified that the most significant reduction in recorded signal strength and readability was received when transmitting greater distances at:

- Runway 36 to 09 thresholds, reduced readability to 3, slightly weaker signal strength
- Runway 27 to 09 thresholds, reduced readability to 3, slightly weaker signal strength
- Runway 09 threshold had slight general reduction in signal readability across all other runway thresholds and holding points but still perfectly readable, signal strength on average slightly reduced.



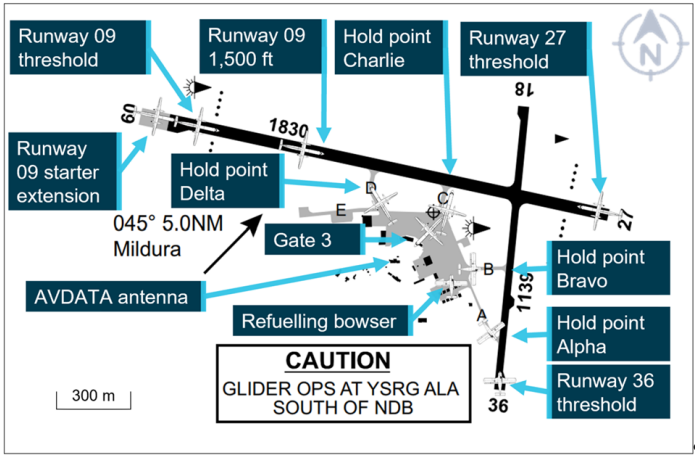
Schedule 2 testing - What we found

The testing identified that the lesser the distance and greater the line of sight, the clearer the radio transmission was with a readability of 4 (readable with practically no difficulty) or more and signal strengths of greater than −70 dBm.

The testing also identified that the most significant reduction in recorded signal strength and readability was received when transmitting greater distances and:

- from the Mildura fuel bowser to the threshold of runway 09, which may be indicative of close proximity hangar shielding
- when receiving from the fuel bowser, a general reduction in signal strength to taxiways and the runway 09 threshold

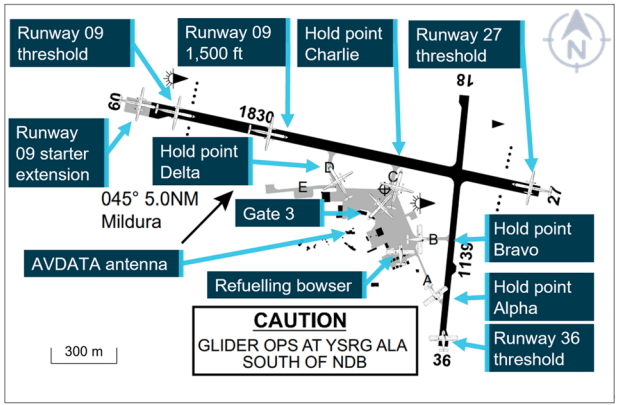
However, the readability scores in this testing did not score less than 3 (readable with considerable difficulty).



Schedule 3 testing - What we found

The testing identified that the most significant reduction in recorded signal strength and readability was received when transmitting greater distances such as:

- receiving and transmitting from the runway 09 starter extension to the runway 36 threshold on VHF COM 2 scored a readability assessment of 2 (readable now and then), and signal strength weaker than the −70 dBm acceptable signal strength limit
- receiving and transmitting from the runway 09 threshold to the runway 36 threshold on VHF COM 2 with a readability of 1 (unreadable), and −85 dBm signal strength, 15 dBm weaker than the acceptable signal strength of −70 dBm
- receiving transmissions from the 09 threshold or starter extension to taxiway Alpha on VHF COM 2 with a readability of 1 (unreadable), and −85 dBm signal strength, 15 dBm weaker than the acceptable signal strength of −70 dBm



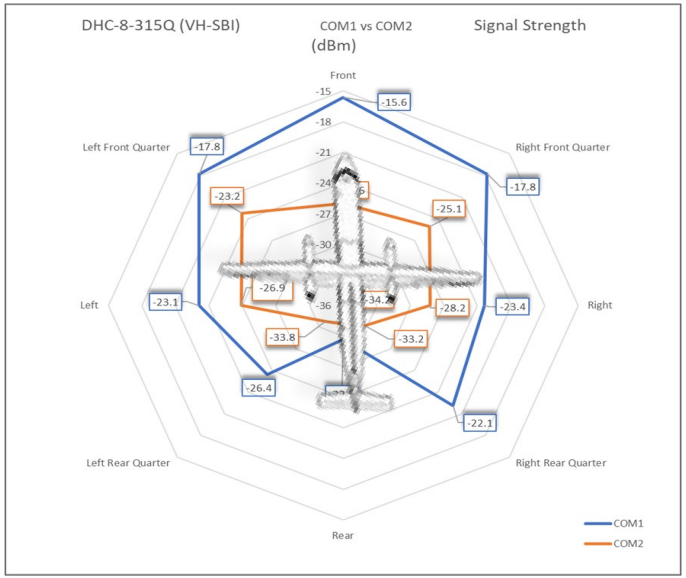
It was identified that transmission and reception from the Dash 8 were considered 1 (unreadable) from the runway 09 threshold to the runway 36 threshold on VHF COM 2, while these were 5 (perfectly readable) to 4 (readable with practically no difficulty) on VHF COM 1.

General trends identified from schedule 3 testing were that:

- Dash 8 VHF radio readability was most adversely affected by stations transmitting from directly behind the Dash 8 on both VHF COM 1 and 2 with slightly reduced readability and increasing signal weakness with increasing distance.
- VHF radio readability was adversely affected by increased distance between the ground-based stations, this was more evident on VHF COM 2, leading to unreadable radio signal readability and weaker signal strength.
- VHF readability was somewhat adversely affected from the runway 27 threshold to the runway 09 threshold using VHF COM 2, however Dash 8 reception from the runway 09 threshold reduced further to become only 2 (readable now and then).

Schedule 4 Testing- What we found

- The signal strength was strongest towards the front of the aircraft and weakest to the rear using VHF COM 1
- The signal strength of VHF COM 2 was consistently less (greater than half strength) at all locations with the VHF COM 2 maximum loss (−10 dBm) at the front and right rear quarter most notable.
- The lowest VHF COM 1 strength (−32.7 dBm) was recorded at the direct rear of the aircraft and was consistent with similar levels to VHF COM 2
- transmissions on VHF COM 2 on the ground had significantly reduced strength compared to VHF COM 1 and that radio reception and transmission strength to the rear of the aircraft was reduced on both VHF COM1 and VHF COM 2.



Contact with De Havilland Aircraft of Canada Limited

Provided the testing results and asked for their interpretation

- Agreed that the testing showed reduced strength and clarity of VHF COM 2 ground based transmissions and reception
- Produced 2 flight operations service letters (FOSL) recommending that Dash 8 operators of 100-400 models, consider using VHF COM 1 for ground-based communications.

ATSB report AO-2023-050 found:

- The Dash 8 crew were actively engaged in multiple communications with airborne traffic to ensure separation for departure, and were not aware of the Lancair taxiing for runway 36.
- The Lancair pilot's entering and backtracking radio call for runway 36 was partially over transmitted. This did not afford an opportunity to alert other aircraft as to their location or intentions.
- Neither the Dash 8 nor the Lancair crews heard each other's previous radio calls prior to the Dash 8 taking off on runway 09, and the Lancair gave a rolling call on runway 36.
- Both the Dash 8 and Lancair crews had no awareness of each other at any stage until after the Dash 8 was taking off, and the Lancair pilot gave a rolling call.
- The reduced Dash 8 radio reception and transmission strength to the rear of the aircraft affected radio call readability to and from other airfield users. This reduced the situational awareness for the Dash 8 crew and other traffic.
- Dash 8 ground-based transmissions on VHF COM 2 had reduced strength and clarity. This likely led to situations where other aircraft had difficulty in receiving and understanding radio transmissions, and Dash 8 aircraft not receiving other traffic radio transmissions.

Other factor that increased risk

- Third party intervention by the Mooney pilot prevented the Lancair from rolling on runway 36. The Lancair pilot held on the runway until the Dash 8 departed.

Safety issues identified:

- Due to topography and buildings at Mildura Airport, aircraft are not directly visible to each other on the threshold of runways 09, 27 and 36. The lack of a requirement for mandatory rolling calls increased the risk of aircraft not being aware of each other immediately prior to take-off. **(Safety issue)**
- The QantasLink radio procedure required Dash 8 flight crews to use the VHF COM 2 radio to broadcast and receive on local frequencies during operations at non-controlled aerodromes. This reduced the ground-based radio transmission and reception strength, and therefore reduced the likelihood of other aircraft receiving calls in some circumstances. **(Safety issue)**
- Release of Safety Action Notice **AO-2023-050-SAN-01** to all Dash 8 operators in Australia.
- De Havilland Aircraft of Canada Limited did not publish any guidance to operators of Dash 8 aircraft on the transmission and reception performance limitations of VHF COM 2 radios for ground-based communications. **(Safety issue)**

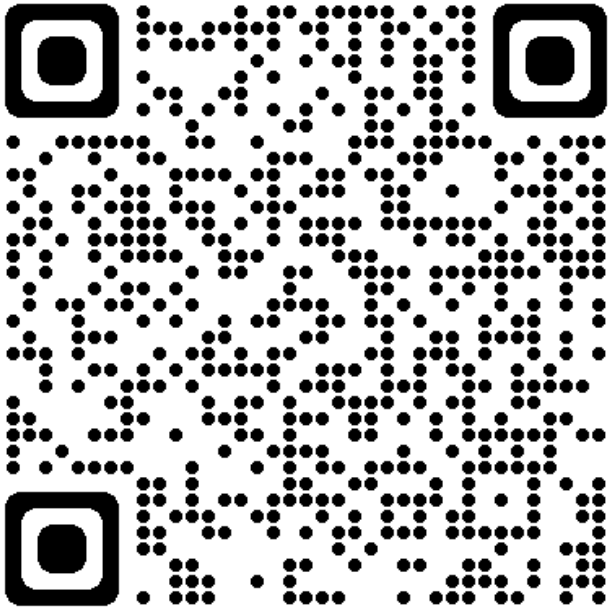
In summary

- Communication and self-separation in non-controlled airspace is one of the ATSB's SafetyWatch priorities.
- Good co-operations between QantasLink, Aerodrome operator and ACMA
- Conduct of ATSB's first radio signal strength testing as part of an investigation.
- Successful acknowledgment of particular issues relating to an aircraft type that has been operating for over 30 years.
- Positive safety action by all stakeholders.

The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry. This investigation report highlights the safety concerns around Reducing the collision risk around non-towered airports.

SafetyWatch

Follow us



[Subscribe to our mailing list and get all our reports over email]