



Australian Government

Australian Transport Safety Bureau

Loss of separation involving Boeing 737 aircraft, VH-YFW and VH-VZD

near Amberley, Queensland, on 11 October 2018

ATSB Transport Safety Report
Aviation Occurrence Investigation
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Addendum

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Safety summary

What happened

On 11 October 2018 a Qantas Airways Boeing 737-800, registered VH-VZD (VZD) was inbound to Brisbane, Queensland from Melbourne, Victoria on a scheduled passenger flight. Another Boeing 737-800 also on a scheduled passenger flight, operated by Virgin Australia Airlines and registered VH-YFW (YFW), departed Brisbane, Queensland for Proserpine, Queensland. The two aircraft were on reciprocal tracks in the Amberley Queensland airspace when a loss of separation occurred. The aircraft inbound to Brisbane, VZD, was being controlled on the Royal Australian Air Force (RAAF) Amberley (military) air traffic control (ATC) frequency and the aircraft outbound from Brisbane, YFW, was being controlled on a Brisbane (civil) ATC frequency.

What the ATSB found

RAAF Amberley and Brisbane ATC operated non-linked air traffic management systems, which did not share a common display. Between ATC jurisdictions without linked systems information was shared using manual coordination between ATC elements.

The departing aircraft from Brisbane (YFW) entered Amberley airspace without a hand-off from Brisbane ATC and without instructions to the crew to change to the Amberley frequency. This resulted in YFW monitoring an incorrect frequency on entry to Amberley airspace and Amberley ATC initially unable to communicate with the flight crew.

The Brisbane departures air traffic controller did not hand-off the departing aircraft YFW until after it had entered Amberley airspace. In addition, just prior to this incident, Brisbane terminal control unit did not advise Amberley ATC of a change in configuration to the terminal control unit consoles. This led to Amberley ATC contacting the incorrect console position at Brisbane ATC once the departing aircraft had entered Amberley airspace, and delayed the opportunity for Amberley ATC to resolve the impending conflict.

Once appropriate communication with Amberley and Brisbane ATC was established, the outbound aircraft was transferred to the Amberley frequency, and the aircraft were initially diverted away from each other, before being re-established on their respective tracks.

What's been done as a result

Following the occurrence both RAAF Amberley and Brisbane ATC have taken corrective actions to improve communication and coordination between the two units. This has included deploying a dedicated communications pathway between Amberley approach and the Brisbane Departures South air traffic control positions, and implementing an airspace release that controls the risk that short notice deviations present across the non-linked systems.

Safety message

This incident highlights the importance of clear communication and coordination between air traffic controllers operating in different, yet immediately adjacent airspace. Air traffic controllers need to maintain a clear understanding of responsibility for separation assurance, especially when operating without a shared traffic picture. This incident also illustrates the effectiveness of the conflict resolution training received by air traffic controllers in loss of separation events.

The occurrence

What happened

On 11 October 2018 at about 1413 Eastern Standard Time (EST),¹ there was a loss of vertical and lateral separation standards in military airspace near the Royal Australian Air Force (RAAF) Amberley aerodrome, Queensland, involving two Boeing 737-800 aircraft. Prior to the loss of separation the two aircraft were operating in the same airspace but on different frequencies, with one aircraft controlled by RAAF Amberley (military) air traffic control (ATC) and the other by Brisbane (civil) ATC.

Sequence leading to the incident

At 1406 a Qantas Boeing 737-800, registered VH-VZD (VZD), operating as QF618 on a scheduled passenger flight from Melbourne, Victoria to Brisbane, Queensland, was on descent to Brisbane Airport and passing through RAAF Amberley airspace, which was controlled by military ATC. Weather warnings were in place for Brisbane and Amberley airports as a frontal weather system, including thunderstorms, was approaching from the west and moving east. About that time, a Virgin Australia Airlines Boeing 737-800 aircraft, registered VH-YFW (YFW) operating as VA1117 on a scheduled passenger flight, departed Brisbane Airport from runway 19 on an initial heading of 195, and turned right onto a heading of 230 and was on climb to flight level (FL)² 180. Due to the convective weather in the area, YFW was unable to use a procedural standard instrument departure, and was flying assigned radar headings provided by ATC. The flight crew advised the Brisbane departures controller that they were unable to make any further turns to the right at that time due to the convective weather.

At 1410, as YFW was approaching Amberley airspace, the Brisbane departures controller provided the RAAF Amberley approach controller with an identification on the aircraft, as required by the procedures in the *Manual of Air Traffic Services (MATS): Supplementary South East Queensland*.³ At this time, the Amberley approach controller advised the Brisbane departures controller of the inbound aircraft on air route Y195 (Figure 1). The Brisbane departures controller replied that YFW would be turning right soon. The Brisbane departures controller then asked the flight crew of YFW to advise when they could turn right (north). The flight crew advised they would like to stay on heading 230 for an additional 70 to 80 NM due to the weather. It was around this time that YFW entered Amberley airspace (Figure 1), while still communicating with the Brisbane departures controller.

At this time, RAAF Amberley approach was being controlled by a trainee approach controller under supervision of a training supervisor.

At 1411:56, the Amberley approach controller attempted to contact the Brisbane departures south controller regarding the inbound aircraft VZD but was advised that they were speaking to the incorrect controller due to an earlier Brisbane terminal airspace configuration change (see *Brisbane airspace configuration*). The Amberley training officer took over from the trainee controller in the Amberley approach position, and about 17 seconds later established contact with the Brisbane departures controller, advising them of the inbound aircraft (VZD). The Brisbane departures controller questioned the assigned altitude of VZD raising concern over the potential conflict with YFW, which was now within Amberley airspace. At this point, the two aircraft were still

¹ Eastern Standard Time (EST): Coordinated Universal Time (UTC) + 10 hours.

² Flight level: at altitudes above 10,000 ft in Australia, an aircraft's height above mean sea level is referred to as a flight level (FL). FL 180 equates to 18,000 ft.

³ Manual of Air Traffic Service (MATS): Supplementary South East Queensland is the document agreed to by Air Traffic Controllers (civil and military) and identifies coordination requirements for the region.

on different radio frequencies, with VZD on the Amberley approach frequency, and YFW on the Brisbane departures frequency.

Figure 1: Position and direction of the two aircraft when VH-YFW entered Amberley airspace at 1411:44. The red line indicates the boundary between Brisbane airspace (right) and Amberley (left) airspace. Air route Y195 was assigned to VH-VZD.



Source: Airservices Australia – modified by the ATSB

At 1412:20, the Brisbane departures controller advised the Amberley approach controller that YFW would contact them for separation, and at 1412:29 instructed the flight crew of YFW to contact Amberley approach. Around this time, the Brisbane ATC display presented a short term conflict alert (STCA) to the Brisbane departures controller. At about the same time the Amberley approach controller issued a safety alert⁴ to VZD and instructed the crew to turn left (north). Upon contact with YFW at 1413:10, the Amberley approach controller issued a safety alert and instructed them to turn to left (south). After both aircraft had turned and separation recovery actions were complete, VZD resumed its descent into Brisbane and YFW continued its flight to Proserpine.

Both aircraft were fitted with a traffic collision avoidance system⁵ (TCAS) which would have assisted in providing separation instructions to the flight crew in the event ATC were unable to resolve the situation.

Airspace information

The red line in Figure 1 shows the delineation between Brisbane and Amberley airspace. The local coordination procedures between Brisbane and Amberley ATC are described in the *MATS: Supplementary South East Queensland*. This document included the following:

- the hand-off of (aircraft) must be initiated prior to 5 NM (9.26 km) of the boundary

⁴ The provision of advice to an aircraft when air traffic control becomes aware that an aircraft is in a position which is considered to place it in unsafe proximity to terrain, obstructions, active restricted or prohibited areas, or another aircraft.

⁵ An aircraft collision avoidance system monitors the airspace around an aircraft for other aircraft equipped with a corresponding active transponder and gives warning of possible collision risks.

- when runway 19 is in use, the standard assignable level is FL 130 for aircraft on approach to Brisbane on the air route Y195, through Amberley airspace
- Brisbane Terminal Control Unit (TCU) are to advise Amberley of any changes to the position of Brisbane departures south. This includes if it is merged with Brisbane approach south or Brisbane departures north.

Brisbane and Amberley ATC used different air traffic management systems to control their airspace. These systems were not linked and did not display the same information, so the Amberley controllers did not get details of aircraft which were not entering their airspace as the details were not entered by their planning function. The Brisbane controllers were required to contact the Amberley controllers to provide them an aircraft's identification and basic details if the aircraft was approaching the boundary between Brisbane and Amberley airspace.

Aircraft hand-off

ATC recordings and interviews identified that the Brisbane departures controller originally intended to turn the departing aircraft, YFW, to the north avoiding Amberley airspace. Amberley controllers stated that YFW came further into their airspace than they were expecting, as they were expecting it to turn north based on communications with the Brisbane departures controller. The Brisbane departures controller reported that several previous aircraft had 'accepted' turns to the north-northwest.

The Amberley approach controller had not received a hand-off of YFW when it entered Amberley airspace. The hand-off of YFW occurred after the impending conflict with the inbound aircraft (VZD) was identified by the Brisbane departures controller. The Brisbane departures controller reported that they had expected Amberley to assure separation between the aircraft by assigning VZD to maintain FL 190, however 5 minutes before YFW entered Amberley airspace VZD had been instructed by the Amberley approach controller to descend to FL 130.

Brisbane airspace configuration

Prior to the occurrence, and due to the World Parachuting Championships at Runaway Bay (about 65 km south-south-east of Brisbane Airport), the airspace sectors for the Brisbane TCU were not in the usual configuration. Due to the proximity of the inbound and outbound tracks of aircraft around the parachute operations, one controller was controlling all departures and approaches in the southern area. Due to the weather front approaching, the parachuting championships were put on hold prior to the incident.

About 5 minutes prior to the incident, at about 1407, the Brisbane airspace was returned to a more standard configuration, being that the departures controller controlled all departures to the south and north. The Brisbane approach south controller was controlling all aircraft approaching from the south. It was reported that this change, back to the more standard configuration was not communicated to Amberley ATC.

Amberley to Brisbane communication

Amberley approach and Brisbane TCU controllers used three tele-communication lines. These included direct lines to the following sectors: Brisbane approach north, Brisbane approach south and Brisbane departures north. There was no direct line to Brisbane departures south. Brisbane TCU used combinations of sectors whereby the sector of Brisbane departures south was always combined with one of the other sectors. In accordance with agreed procedures, Brisbane TCU was required to notify Amberley when the position of Brisbane departures south changed.

The Amberley controllers stated that they were not aware that Brisbane departures positions had been combined until they contacted the incorrect controller. The Airservices internal investigation stated that the Brisbane TCU did not advise Amberley of the change of configuration. There was approximately 4 minutes and 30 seconds from the time Brisbane departures was combined and the Amberley approach controller contacting the incorrect Brisbane controller.

Workload

The presence of the rapidly moving weather front, including thunderstorms, around Brisbane meant that many aircraft were unable to operate on standard instrument departures. This resulted in an increase in coordination requirements for the air traffic controllers. The Brisbane departures controller had continuous communications with multiple aircraft for approximately 6 minutes prior to the loss of separation.

Separation

Once the two aircraft were operating on the same frequency, they were instructed to deviate from their flight path away from each other by the Amberley approach controller. The two aircraft passed each other and had a loss of separation,⁶ where the required separation was 3 NM horizontally or 1,000 ft vertically, and the minimum recorded distances were 2.1 NM and 650 ft.

Safety analysis

The Brisbane departures controller intended to turn the departing aircraft YFW to the north, avoiding Amberley airspace. When YFW did not accept turns to the north, it was unlikely the situation was effectively reassessed by the Brisbane departures controller resulting in YFW entering Amberley airspace without a hand-off. The presence of the rapidly moving weather front likely increased the workload for the Brisbane departures controller due to the increase in aircraft coordination requirements, and this may have influenced the delay in the hand-off of YFW to the Amberley approach controller.

When YFW entered Amberley airspace without a hand-off from the Brisbane departures controller it was operating on a different frequency to Amberley approach and other aircraft in Amberley airspace. This resulted in the Amberley approach controller being unable to effectively manage the multiple aircraft, specifically YFW, in their airspace and therefore reduced their ability to maintain separation standards.

Amberley ATC were not expecting YFW to enter their airspace due to the Brisbane departures controller stating the aircraft would be turning north soon, which was consistent with their actions for several previous departing aircraft. This, combined with the aircraft operating on a different frequency to Amberley approach, resulted in a delay in the Amberley approach controller being able to resolve the impending conflict. The Brisbane departures controller was expecting the Amberley approach controller to assure separation between the two aircraft, but was unaware that VZD was already on descent and therefore in conflict with YFW.

Due to the World Parachuting Championships, the Brisbane Terminal Control Unit (TCU) were not operating in a standard configuration on the day of the occurrence. When the TCU reverted back to a more standard configuration this was not communicated to Amberley ATC as per the agreed procedure. Consequently, this led to a delay in the Amberley approach controller being able to contact the Brisbane departures south controller due to the incorrect position being contacted. Further, this resulted in a delay in the aircraft being transferred to the Amberley approach controller to effect recovery of the compromised separation scenario. The time from configuration change to the Amberley approach controller contacting the incorrect Brisbane position (4 minutes and 30 seconds) suggests that there was an opportunity for Brisbane TCU to advise Amberley ATC of the new configuration prior to the Amberley approach controller requiring contact with the Brisbane departures south controller.

The Amberley approach controller contacting the incorrect controller resulted in a reduction of potential recovery time of 17 seconds before the correct Brisbane controller was reached. Calculations based on the estimated ground speed of both aircraft obtained from Airservices

⁶ Loss of separation (LOS): an occurrence in which the spacing between two or more aircraft is less than prescribed separation minima in airspace where the aircraft is subject to an air traffic service.

indicate that this 17-second delay led to a reduction in the lateral separation of the two aircraft by approximately 6 km (3.24 NM). This delay in communication between Amberley and Brisbane ATC reduced the amount of time available to recover the impending loss of separation while the aircraft were closing on reciprocal tracks in opposite directions. If this configuration change was immediately relayed to Amberley ATC, it would have allowed the Amberley approach controller more time to resolve the impending conflict between the two aircraft, and separation requirements may have been maintained.

Findings

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- The departing aircraft was not expected to enter Amberley airspace but did so without hand-off of control from the Brisbane departures controller, resulting in the aircraft operating on a different frequency to the Amberley approach controller and the other aircraft operating in Amberley airspace.
- The Brisbane departures controller did not hand-off the departing aircraft until after it had entered Amberley airspace due to the original intention to turn the aircraft north prior to the airspace boundary.
- The Brisbane Terminal Control Unit did not advise Amberley of the changed terminal control unit configuration. This led to Amberley approach contacting the incorrect Brisbane controller once the departing aircraft had entered Amberley airspace, and delayed the opportunity for Amberley approach to resolve the impending conflict.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Airservices Australia

As a result of this occurrence, Airservices Australia (civil air traffic control) advised the ATSB that they are taking the following safety actions:

- Implementing airspace releases that control the risk that short notice deviations present across the non-linked systems.
- Deployed dedicated communication lines between Amberley ATC and Brisbane departures south.

Royal Australian Air Force (RAAF)

As a result of this occurrence, RAAF (military) air traffic control has advised the ATSB that they have taken the following safety actions:

- A communications line to Brisbane departures south has been established and commenced operational use.
- The relevant parties are working together to implement a solution to ensure separation assurance between Brisbane departing aircraft and Amberley traffic during weather diversions.
- Amberley have submitted a documentation change to Airservices Australia to extend the weather colour coding to include the Brisbane TCU/Amberley approach interface.

General details

Occurrence details

Date and time:	11 October 2018 – 14:13 EST	
Occurrence category:	Incident	
Primary occurrence type:	Loss of separation	
Location:	Near Amberley Aerodrome, Qld.	
	Latitude: 27° 38.50' S	Longitude: 152° 41.73' E

Aircraft 1 details

Manufacturer and model:	The Boeing Company 737	
Registration:	VH-YFW	
Operator:	Virgin Australia Airlines	
Serial number:	41037	
Type of operation:	Air Transport High Capacity – Passenger	
Persons on board:	Crew – Unknown	Passengers – Unknown
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

Aircraft 2 details

Manufacturer and model:	The Boeing Company 737	
Registration:	VH-VZD	
Operator:	Qantas Airways	
Serial number:	34198	
Type of operation:	Air Transport High Capacity – Passenger	
Persons on board:	Crew – 6	Passengers – 174
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.