Australian Government
Australian Transport Safety Bureau

# Separation occurrence involving Boeing 737, VH-VZM, and Boeing 737, VH-VZW

Sydney Airport, New South Wales, on 29 April 2023

**ATSB Transport Safety Report**
Aviation Occurrence Investigation (Short)
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**Addendum**

| Page | Change | Date |
|---|---|---|
| | | |
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# Executive summary

## What happened

In the evening of 29 April 2023, 2 Qantas Boeing 737-838 aircraft were undertaking operations from runway 16L at Sydney Airport, New South Wales. VH-VZW was on final approach to land while VH-VZM was preparing to take off. Shortly after VH-VZM commenced the take-off roll the aerodrome controller identified the spacing between the 2 aircraft had reduced to a distance that could result in compromised runway separation and instructed the crew of VH-VZW to go-around. During the missed approach, the separation between the 2 aircraft reduced to 0.8 NM (1.5 km) horizontally and 330 ft vertically as they climbed away from the runway.

## What the ATSB found

The ATSB identified that the go-around instruction issued by the aerodrome controller was delayed by about 12 seconds due to an inadvertent interjection by the tower shift manager. The ATSB also found that the instruction issued to the crew of VH-VZW by the aerodrome controller subsequent to the go-around was interpreted as a cancelation of the published missed approach procedure. Consequently, the crew did not turn left at 600 ft as required by the procedure and instead continued on the runway track.

## What has been done as a result

Airservices Australia advised that in response to the occurrence it would, among other actions:

- conduct an analysis of landing runway occupancy times at Sydney Airport
- add defensive controlling techniques and minimum assignable altitudes for go-around scenarios
- conduct an assurance review of go-arounds at Sydney involving a second aircraft requiring controller intervention
- add night-time go-around scenarios to compromised separation training.

## Safety message

Aerodrome controllers are required to maintain an orderly flow of air traffic, with minimal delays, while ensuring safe separation between arriving and departing aircraft. This complex operation requires controllers to exercise their professional judgement when applying visual separation standards in a variety of environmental and procedural scenarios. In such a setting, it is inevitable that errors will be made by controllers and pilots alike. Consequently, the sociotechnical system within which these activities take place should be designed to be resilient of these errors and reduce the impact individual actions can have on the overall safety of operations.

# The investigation

Decisions regarding the scope of an investigation are based on many factors, including the level of safety benefit likely to be obtained from an investigation and the associated resources required. For this occurrence, a limited-scope investigation was conducted in order to produce a short investigation report, and allow for greater industry awareness of findings that affect safety and potential learning opportunities.

## The occurrence

In the evening of 29 April 2023, 2 Qantas Boeing 737-838 aircraft were using runway 16L at Sydney Airport, New South Wales:

- VH-VZW on final approach to land
- VH-VZM awaiting clearance to enter the runway to take off.

VH-VZW was conducting a scheduled air transport flight from Auckland Airport, New Zealand to Sydney Airport, with 2 flight crew, 5 cabin crew and 100 passengers on board. VH-VZM was conducting a scheduled air transport flight to Brisbane Airport, Queensland, with 2 flight crew, 4 cabin crew and 52 passengers on board.

Air traffic control was being provided to both aircraft by the aerodrome controller east (ADCE) in the Sydney Airport tower (see *Sydney Airport air traffic control*). The wind at the time was 202°–228° at 11–14 kt, the cloud cover[1] was few at 1,500–2,800 ft and scattered at 2,400–4,900 ft, and it was night.

At 1745:39, as a landing Cessna Citation Mustang passed the runway 16L threshold, the ADCE instructed the crew of VH-VZM to line up and wait on runway 16L with an assigned departure heading of 140°. The crew of VH-VZM acknowledged the instruction and taxied the aircraft onto the runway. The crew then waited for take-off clearance. At 1746:07, the ADCE saw that the Mustang was taking longer than anticipated to vacate the runway and instructed the crew to expedite the exit. In total, the Mustang took 73 seconds from landing to vacating the runway, about 23 seconds longer than the ADCE expected.

At 1747:03, the ADCE issued a take-off clearance to the crew of VH-VZM. At this time VH-VZW was about 2.4 NM (4.4 km) from the threshold of runway 16L on approach to land. The crew of VH-VZM pushed the thrust levers forward and waited for both engines to stabilise. This process took about 4 seconds longer than normal due to a permissible unserviceability[2] affecting the performance of one of the engines. At 1747:18, the flight crew pressed the take-off go around (TOGA)[3] button and commenced the take-off.

Meanwhile, VH-VZW was now about 1.7 NM (3.1 km) from the threshold of runway 16L. The captain of VH-VZW, who was pilot monitoring (PM),[4] assessed that the spacing between VH-VZM and VH-VZW had reduced to a distance that would likely result in a 'go-around'.[5] Consequently,

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1 Cloud cover: in aviation, cloud cover is reported using words that denote the extent of the cover – 'few' indicates that up to a quarter of the sky is covered, 'scattered' indicates that cloud is covering between a quarter and a half of the sky.

2 An item of equipment that may be inoperative for a limited period until repairs can be made.

3 The TOGA button changes various autopilot, autothrottle, and flight director settings to initiate a take-off or missed approach.

4 Pilot flying (PF) and pilot monitoring (PM): procedurally assigned roles with specifically assigned duties at specific stages of a flight. The PF does most of the flying, except in defined circumstances; such as planning for descent, approach and landing. The PM carries out support duties and monitors the PF's actions and the aircraft's flight path.

5 See *Go-around and missed approach*.

the captain instructed the first officer (FO), who was pilot flying (PF), to mentally prepare for a possible go-around.

The ADCE, also aware of the reduced spacing between the 2 aircraft (see *Runway separation standard*) and the potential for compromised runway separation, decided to issue a go-around instruction to the crew of VH-VZW and alerted the tower shift manager (TSM) of the situation (see section titled *Sydney Airport air traffic control*). The TSM moved to look at the runway and began assessing the traffic scenario.

At 1747:22, the ADCE contacted the crew of VH-VZW to issue the go-around instruction. However, before the ADCE issued the instruction itself, the TSM said 'wait'. The ADCE hesitated for a moment and, having initiated contact and needing to complete the communication, instructed the crew of VH-VZW to continue with the approach to land. The TSM later recalled that they had inadvertently spoken, but their intention was for the ADCE to continue with the go-around instruction. The ADCE then waited for further advice from the TSM, but the TSM did not say anything (the TSM recalled gesturing for the ADCE to continue). The ADCE recalled informing the TSM that they would proceed with the go-around instruction.

At 1747:34, the ADCE instructed the crew of VH-VZW to conduct a go-around. The instruction was acknowledged by the crew of VH-VZW which was now about 1.1 NM (2.0 km) from the runway 16L threshold. At 1747:36 the crew of VH-VZW initiated the go-around from an altitude of about 450 ft. (The ATSB determined that, had the go-around instruction been issued at the original intended time, VH-VZW would have been about 0.5 NM (0.9 km) further from the threshold and 160 ft higher than when the actual instruction was issued.)

At 1747:38, the ADCE issued a further instruction to the flight crew of VH-VZW, stating 'passing 2,100 turn left heading 090'. The ADCE stated that they were aware of a requirement not to issue a turn instruction to VH-VZW until it had reached the minimum sector altitude (MSA) of 2,100 ft (see *Turn instructions at night below the minimum sector altitude*).

Although the flight crew heard the instruction, they did not acknowledge it immediately due to the workload associated with the go-around procedure. They interpreted it as an amended missed approach instruction. As a result, the crew continued to fly the runway track as the aircraft climbed, rather than turning left onto a heading of 125° at 600 ft as was required by the published missed approach procedure (see *Missed approach*).

Meanwhile, VH-VZM was accelerating along the runway and had passed 87 kt. The captain of VH-VZM heard the go-around instruction issued to VH-VZW and they expected the aircraft to fly the published missed approach procedure and that this would provide sufficient spacing between the aircraft. The captain then monitored the traffic collision avoidance system (TCAS)[6] which displayed a 'proximate traffic' indication[7] 600 ft above VH-VZM (which was VH-VZW).[8]

At 1748:03, the ADCE asked if the crew of VH-VZW had received the instruction to turn left onto a heading of 090° on passing 2,100 ft, to which they responded that they had. The ADCE and the TSM visually observed the 2 aircraft as they climbed away from the runway. They also had a surveillance display showing the dispositions of aircraft in the vicinity of the airport. During this time the TSM no longer felt 'comfortable' with the separation between the 2 aircraft. As a result, the TSM recalled advising the ADCE that they should issue a safety alert and turn VH-VZW away from VH-VZM (see *Reduced separation and safety alerts*).

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[6] Traffic alert and collision avoidance system (TCAS): a type of airborne collision avoidance system that interrogates nearby aircraft and uses this information to calculate the relative range and altitude of this traffic. The system provides a visual representation of this information to the flight crew as well as issuing alerts should a traffic issue be identified.

[7] Proximate traffic: an alert issued when an aircraft is within a range of less than 6 NM and 1,200 ft, or a range of 6 NM if the traffic is not transmitting altitude information.

[8] There were no other aircraft in the immediate area.

At 1748:17, the ADCE issued a safety alert to VH-VZW stating ‘safety alert traffic 12 o'clock low heading 140 if you're visual turn left now’. At 1748:24, the crew of VH-VZW initiated a left turn while climbing through 1,533 ft. The TSM recalled further stating to the ADCE that the aircraft needed to be turned further onto a heading of 060°.

At 1748:32, when VH-VZW was at an altitude of 1,710 ft and not climbing as fast as the ADCE expected, the ADCE issued a further instruction to the crew to turn left onto a heading of 060° to put the aircraft onto diverging flightpaths sooner. The ADCE determined that such an instruction carried less risk than permitting the scenario to continue until VH-VZW had reached the MSA. While VH-VZW was below the MSA when issued the instruction to turn, the ADCE was confident that the aircraft was above the highest obstacles in the vicinity. This instruction was acknowledged by the flight crew and the aircraft continued the left turn onto the new heading.

At 1748:38, the closest slant range between the 2 aircraft occurred, with separation reducing to 0.8 NM (1.5 km) horizontally and 330 ft vertically (Figure 1). Neither crew had visual contact with the other aircraft and no TCAS resolution advisory[9] or traffic advisory[10] was triggered. The controllers had both aircraft in sight throughout the occurrence, and the ATSB later assessed that the visual and surveillance information available to the controllers in the tower, accounting for the possibility of visual errors, was sufficient for visual separation[11] to be maintained.

**Figure 1: Overview of aircraft flight paths**


*White lines link the locations of the two aircraft at the same point in time.*
Source: Google Earth, annotated by the ATSB

With VH-VZW continuing to turn towards the east-north-east, the 2 aircraft began to diverge. At 1749:03, the ADCE transferred VH-VZM to the departure controller and the aircraft continued to its destination. At 1749:44, the ADCE transferred VH-VZW to the Sydney Airport director and the aircraft later landed on runway 16R.

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9 Resolution advisory (RA): a manoeuvre, or a manoeuvre restriction, calculated by an airborne collision avoidance system to avoid a collision. Pilots are expected to respond immediately to an RA unless doing so would jeopardise the safe operation of the flight.

10 Traffic advisory (TA): an alert issued by an airborne collision avoidance system when the detected traffic may result in a conflict. Pilots are expected to initiate a visual search for the traffic causing the TA.

11 See *Visual separation*.

# Context

## Personnel information

### VH-VZM flight crew

Both flight crew held an air transport pilot licence (ATPL) aeroplane and Class 1 aviation medical certificate. The captain had a total of 12,413 hours of aeronautical experience, including 2,301 hours on 737 variants. The captain reported feeling 'okay, somewhat fresh' at the time of the occurrence. The first officer had 11,700 hours of aeronautical experience, including 7,800 hours on 737 variants. The FO reported feeling 'very lively, responsive, but not at peak' at the time of the occurrence.

### VH-VZW flight crew

Both flight crew held an ATPL aeroplane and Class 1 aviation medical certificate. The captain had a total of 13,220 hours flight time, with 9,430 hours on 737 variants. They reported feeling 'fully alert' at the time of the occurrence. The FO had a total of 8,100 hours flight time, with 2,650 hours on 737 variants.

### Aerodrome controller east

The ADCE had about 14 years experience as an approach and tower controller with the Royal Australian Air Force and then Airservices Australia. They had been operating in the Sydney Airport tower for about 3 years and held endorsements for the aerodrome controller and coordination roles. The ADCE's last performance assessment (check) prior to the occurrence was completed on 2 March 2023 and they were assessed as competent. They reported feeling 'alert' at the time of the occurrence.

### Tower shift manager

The TSM had about 10 years' experience as an enroute and tower controller with Airservices Australia. They had been operating in the Sydney Airport tower for about 5 years and held endorsements for the aerodrome controller, surface movement controller, airways clearance delivery, coordination, and TSM roles. They had been a TSM for about 1 year. The TSM's last performance assessment prior to the occurrence was completed on 17 March 2023 and they were assessed as competent. They reported that they had slept well and 'felt fine' at the time of the occurrence.

### Fatigue analysis

Analysis indicated that the ADCE, TSM, and the flight crews of VH-VZM and VH-VZW were probably not experiencing a level of fatigue known to have an adverse effect on performance.

## Sydney Airport

Syndey Airport has 2 parallel runways oriented 155°/335° magnetic (16L/34R and 34L/16R) and another runway oriented 062°/242° (07/25). At the time of the occurrence, the airport was operating in parallel runway mode with aircraft taking off and landing on runways 16L and 16R. The elevation of terrain to the east of runway 16L within a radius of 10 NM (18 km), is about 150-350 ft.

## *Sydney Airport air traffic control*

### *General information*

The Sydney tower was located to the east of runway 16R/34L and south of runway 07/25. There were 8 Airservices Australia[12] personnel located within the Sydney tower at the time of the occurrence. This included the ADCE, who was responsible for providing traffic management to aircraft taking off and landing on runway 16L, and the TSM, who was responsible for the overall operation of the tower. According to Airservices procedures, the TSM was also responsible for the 'supervision' of controller activities and held 'operational command authority' (OCA) for the Sydney tower.

### *Supervision and operational command authority*

The Airservices Australia *National ATS administration manual* (NAAM) outlined the procedures associated with the TSM's supervision and operational command authority responsibilities.

Within the NAAM, the stated purpose of supervision was to 'provide tactical management of risks while maintaining efficient air traffic operations' and involved the 'observation of air traffic service delivery and, where necessary, supporting, intervening, or directing activities within the area of responsibility'.

However, the procedures contained within the NAAM relating to the TSM's operational command authority (OCA) responsibilities stated:

> OCA does not give the holder the authority to instruct an operational controller to take certain actions such as directing a controller to issue an operational control instruction. The operational controller is always responsible for traffic separation but may accept advice from the OCA holder.

The operational command authority held by the TSM gave the role the 'authority to make decisions on behalf of a unit' (in this instance the Sydney tower). This authority was described by the TSM as involving a 'duty of care' for the overall safety of aircraft traffic managed by Sydney tower.

The NAAM required the TSM to 'initiate and manage necessary short-term mitigation actions' when a situation occurs that 'has or may cause a risk to the continued safe operation' of the airways. These mitigations included workload management, reduction in task complexity, and additional support, observation or supervision. The controllers involved in this occurrence stated that, if the situation necessitated it, it was acceptable for a TSM to issue an instruction to a controller to deconflict an impending or actual unsafe scenario.

## *Air traffic separation*

### *Visual separation*

Throughout the occurrence, the ADCE was providing visual separation to VH-VZW and VH-VZM. This form of separation required the controller to visually observe the aircraft under their control and apply an azimuth (horizontal) spacing between aircraft.

The Airservices Manual of air traffic services (MATS) stated:

> When applying visual separation, consider.
>
> a) aircraft performance characteristics, particularly in relation to faster following
>
> b) aircraft and closure rates;
>
> c) position of the aircraft relative to each other;

[12] Airservices is Australia's principal provider of air traffic services for civil airports and airspace.

d) projected flight paths of the aircraft;

e) possibility of an ACAS [airborne collision avoidance system] RA [resolution advisory] due to closer proximity of operation;

f) known weather conditions; and

g) the possibility of visual errors.

The MATS further stated:

> Only conduct visual separation by judgement of relative distance or height when there are wide margins, and there is no possibility of the aircraft being in close proximity.
>
> Note: Visual determination of the relative distance of aircraft in close proximity can be in error or affected by optical illusion.

### *Turn instructions at night below the minimum sector altitude*

Aerodrome controllers providing visual separation at Sydney Airport at night or during instrument meteorological conditions were restricted from issuing turn instructions (vectors) prior to an aircraft having reached a minimum sector altitude (MSA)[13] of 2,100 ft.

This restriction was further communicated to Sydney Airport controllers in Airservices Australia standardisation directive DIR_22_0036 (issued 10 June 2022, expired 9 September 2022). This directive referenced the MATS which stated controllers were to 'assign levels no lower than the applicable LSALT [lowest safe altitude][14] unless the pilot has accepted responsibility for terrain clearance'. The purpose of the requirement was to ensure the controller maintained responsibility for terrain clearance as pilots may not be able to see terrain and obstacles.

Separately, the MATS stated:

> Do not allow anything in these instructions to preclude you [the controller] from exercising your best judgement and initiative when:
>
> a) the safety of an aircraft may be considered to be in doubt; or
>
> b) a situation is not covered specifically by these instructions.

### *Reduced separation and safety alerts*

Airservices had a compromised separation recovery training package, which defined compromised separation as occurring when 'an aircraft is, or without controller intervention will be, in unsafe proximity or at risk of a collision with another aircraft'. In situations where an unsafe proximity existed, a controller was required to issue a safety alert to draw a flight crew's attention to the traffic scenario. A safety alert was required to be issued as a priority unless the flight crew had advised that action was being taken to resolve the situation or that the other aircraft was in sight.

The ADCE had undergone compromised separation recurrency training in May 2022. The purpose of the recurrency training was to 'refresh the knowledge and skills' of the controller to effectively identify and recover a compromised separation scenario. The training was required to be undertaken every 3 years and comprised a computer-based training module, which was generic to all locations, and 4 simulator sessions that involved scenarios specific to the Sydney Airport environment. The ADCE was assessed as competent during these simulator sessions.

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[13] Minimum sector altitude (MSA): the lowest altitude which will provide a minimum clearance of 1,000 ft above all objects in an area. Separately, the minimum vectoring altitude (MVA) was the lowest altitude a controller may assign to a pilot in accordance with a radar terrain clearance chart (RTCC), which was 1,500 ft in the area of the occurrence. In this context, the tower controllers used MSA as the minimum assignable altitude.

[14] The lowest altitude which will provide safe terrain clearance at a given place. LSALT includes MSA.

***Runway separation standards***

Runway separation standards ensure sufficient separation between aircraft using the same runway. For an aircraft taking off ahead of an aircraft that is on final approach to land, as was the case for VH-VZM, the standard defined in MATS did not permit a take-off clearance to be issued until:

- the arriving aircraft is sighted by the controller and is reasonably assured of landing; or
- separation can be assured if the arriving aircraft conducts a missed approach.

For an aircraft landing behind a preceding aircraft that was taking off, as was the case for VH-VZW, the standard defined in MATS did not permit the landing aircraft to cross the runway threshold until the departing aircraft was airborne and:

- had either commenced a turn; or
- was beyond the point on the runway at which the landing aircraft could be expected to complete its landing roll and there was sufficient distance to enable the landing aircraft to manoeuvre safely in the event of a missed approach.

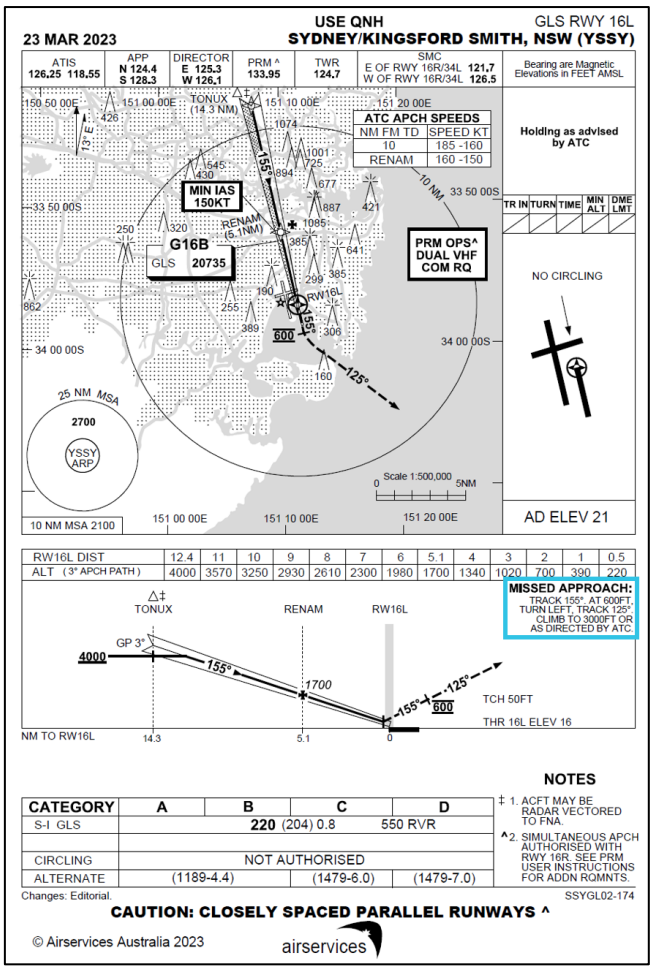
## *Go-around and missed approach*

A go-around refers to the action of aborting a landing from final approach or during the touchdown.

A missed approach procedure provides instrument flight rules[15] aircraft with terrain and obstacle clearance along the missed approach path during a go-around. The flight crew of VH-VZW were flying a GBAS landing system (GLS) approach for runway 16L. In the event of a go-around, the missed approach procedure required a flight crew to initially climb to 600 ft and then execute a left turn onto a heading of 125° (Figure 1). The crew were then required to climb to 3,000 ft or as directed by air traffic control.

[15] Instrument flight rules (IFR): a set of regulations that permit the pilot to operate an aircraft to operate in instrument meteorological conditions.

**Figure 2: Sydney GLS runway 16L approach chart with missed approach requirements (blue box)**




Source: Airservices Australia, annotated by the ATSB

## *Related occurrences*

### *ATSB study on loss of separation occurrences in Australian airspace (AR-2012-034)*

The ATSB's study on loss of separation events involving aircraft in Australian airspace (January 2008 – June 2012) found that 'assessing and planning' or 'monitoring and checking' errors were involved in the majority of individual controller actions that contributed to loss of separation occurrences. This involved the ineffective management of compromised separation before it became a loss of separation event, and controller actions associated with maintaining awareness of traffic disposition.

### *Unsafe proximity and radar vector below minimum vector altitude involving a Boeing 777-31HER, A6-EBU, and two 737-838s, VH-VXS and VH-VYE, Melbourne Airport, Victoria, on 5 July 2015 (AO-2015-084)*

On the evening of 5 July 2015, land and hold short operations (LAHSO) were in effect at Melbourne Airport, Victoria. During these operations, an Emirates Boeing 777 was cleared for an immediate take-off from runway 34 while 2 Qantas Boeing 737s were on approach to runways 34 and 27. This resulted in the crew of the Boeing 737 on approach to runway 27 initiating a missed approach, followed by the crew of the Boeing 737 on approach to runway 34 being instructed by air traffic control (ATC) to go-around. The Boeing 737 on approach to runway 34 was then radar vectored by ATC below the minimum vector altitude.

The ATSB found that:

> The hazard associated with the inability to separate aircraft that are below the appropriate lowest safe altitude at night was identified but not adequately mitigated. This resulted in a situation where, in the event of a simultaneous go-around at night during land and hold short operations at Melbourne Airport, there was no safe option available for air traffic controllers to establish a separation standard when aircraft were below minimum vector altitude.

Airservices subsequently provided training in night operations during land and hold short operations at Melbourne Airport, and introduced a stagger strategy for Melbourne arrivals.

***Close proximity involving Boeing 737, VH-VZO and Airbus A330, VH-EBJ at Sydney Airport, New South Wales, on 5 August 2019 (AO-2019-041)***

In the evening of 5 August 2019, a Boeing 737 was on approach to land on runway 34R at Sydney Airport while an Airbus A330 had commenced a take-off from the same runway. Shortly after the A330 was cleared for take-off, the ADCE identified that the runway separation standard could not be assured and they instructed the crew of the 737 to go-around. During the subsequent missed approach and turn to the right, the 737 came into close proximity with the A330. Among other findings, the ATSB found that controllers had no procedural controls to draw upon to separate aircraft following similar outbound tracks when they were below the minimum vector altitude, and there were no compromised separation training scenarios involving aircraft below this altitude at night.

Following the occurrence, Airservices included compromised separation scenarios in the Sydney tower controller instructor guide, where an aircraft is operating below the minimum vector altitude at night, and in 2023 Airservices advised that the training program also now included a missed approach with a preceding departure in instrument meteorological conditions.

## Safety analysis

The aerodrome controller east (ADCE) instructed the crew of VH-VZM to line up and wait on runway 16L. A take-off clearance could not be issued until a landing aircraft had vacated the runway. This aircraft took about 23 seconds longer to exit the runway than the ADCE had originally anticipated. This extra time meant VH-VZW, which was on final approach to land, was about 2.4 NM (4.4 km) from the threshold when the crew of VH-VZM was issued clearance to take off.

On receipt of the take-off clearance, VH-VZM took about 14 seconds to commence the take-off roll due, in part, to a permissible unserviceability affecting one engine's performance. This delay further compressed the spacing between the 2 aircraft. Shortly after VH-VZM commenced the take-off roll, the ADCE identified the spacing between the 2 aircraft had reduced to a distance that meant VH-VZW needed to go around to maintain the runway separation standard. The ADCE also had the option to not issue take-off clearance to the crew of VH-VZM or cancel it during the 14 seconds it took for the aircraft to commence the take-off roll, and this would have prevented the complication of having one aircraft taking off while another was going around.

Having decided to issue a go-around instruction to the crew of VH-VZW, the ADCE's initial communication was inadvertently interrupted by the tower shift manager (TSM) who said 'wait'. The TSM later stated that they did not intend to verbalise anything, and they meant for the ADCE to issue the go-around instruction. This verbal slip likely occurred at a time of high workload as the TSM attempted to assimilate the information associated with the traffic scenario.

The verbalisation of 'wait' by the TSM interrupted the ADCE's management of the traffic scenario. While the TSM did not have the authority to direct the ADCE to issue a control instruction, the TSM was able to provide advice to the ADCE. Consequently, the ADCE deferred the go-around instruction for 12 seconds while they waited for the TSM to provide further guidance, which did not

eventuate. This 12-second delay meant VH-VZW was 160 ft lower and 0.5 NM (0.9 km) closer to the threshold (and to VH-VZM) by the time the go-around instruction was finally issued.

Four seconds after instructing the crew of VH-VZW to go-around, the ADCE issued further instructions to the crew that required them to turn onto a heading of 090° at 2,100 ft. These instructions were provided to the crew at a time of high workload when VH-VZW had not yet reached 600 ft when they were meant to turn left onto a heading of 125° in accordance with the missed approach procedure. Consequently, the crew misinterpreted the instruction as cancellation of the missed approach procedure and they did not turn at this altitude. The timing of the additional instruction likely added workload compared with letting the crew undertake the go-around manoeuvre, and the turn at 600 ft, before issuing any further turn instructions.

The TSM and ADCE monitored the 2 aircraft as they climbed away from the runway. During that time the ADCE issued a safety alert to the crew of VH-VZW to advise of the traffic ahead and then vectored the aircraft while it was below the minimum sector altitude. Although contrary to the Airservices Australia standardisation directive, the issuance of this instruction likely reduced the risk associated with the separation occurrence.

## Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include 'contributing factors' and 'other factors that increased risk' (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition 'other findings' may be included to provide important information about topics other than safety factors.

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

From the evidence available, the following findings are made with respect to the separation occurrence involving Boeing 737, VH-VZM, and Boeing 737, VH-VZW, at Sydney Airport, New South Wales on 29 April 2023.

### *Contributing factors*

- The go-around instruction issued by the aerodrome controller was delayed by about 12 seconds due to an inadvertent interjection by the tower shift manager.
- The instruction issued to the arriving 737 flight crew by the aerodrome controller subsequent to the go-around was interpreted by the flight crew as an instruction to cancel the published missed approach procedure and continue on the runway track before turning at 2,100 ft. Consequently, the 737 flight crew did not turn left at 600 ft as required by the procedure.

## Safety actions

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. All of the directly involved parties are invited to provide submissions to this draft report. As part of that process, each organisation is asked to communicate what safety actions, if any, they have carried out to reduce the risk associated with this type of occurrences in the future. The ATSB has so far been advised of the following proactive safety action in response to this occurrence.

### *Safety action*

Airservices advised that it had or would undertake the following safety actions in response to this occurrence:

- conduct a detailed analysis of landing runway occupancy times at Sydney, and possibly other major aerodromes, to determine expected runway occupancy times for different types of aircraft (including operator) and conditions (runway direction/wind/time of day/surface condition). This data to be disseminated to ATC [air traffic control] to assist when managing runway separation standards
- Sydney tower to add defensive controlling techniques and minimum assignable altitudes applicable to go around scenarios, in particular at night or in IMC [instrument meteorological conditions]
- conduct an assurance review examining go arounds at Sydney involving a second aircraft and requiring controller intervention. Specifically, analysing how separation and terrain clearance is being managed and possible reasons behind any unfavourable trending
- standardisation directive disseminated to Sydney tower referring to MATS [manual of air traffic standards] 9.4.1.2.1 and outlining the importance of using the MSA [minimum sector altitude] of 2100 ft as the standard at night or in IMC as applicable to go around scenarios
- standards to add night-time go around scenarios to compromised separation training
- standardisation directive ATS_DIR_23_0037 disseminated to Sydney Tower referring to the NAAM [national air traffic services administrative manual] initial occurrence response requirements to be followed, and the importance of taking steps to assess the risk associated with the potential safety occurrence.

# General details

## Occurrence details

| | | |
|---|---|---|
| Date and time: | 29 April 2023 1747 EST | |
| Occurrence class: | Incident | |
| Occurrence categories: | Loss of separation assurance, Missed approach / Go-around, Flight below minimum altitude | |
| Location: | Sydney Airport, New South Wales | |
| | Latitude: 33.9461° S | Longitude: 151.1772° E |

## Aircraft 1 details

| | | |
|---|---|---|
| Manufacturer and model: | Boeing Company 737-838 | |
| Registration: | VH-VZW | |
| Operator: | Qantas Airways | |
| Serial number: | 39359 | |
| Type of operation: | Part 121 Australian air transport operations - Larger aeroplanes-Standard Part 121 | |
| Activity: | Commercial air transport-Scheduled-international | |
| Departure: | Auckland Airport | |
| Destination: | Sydney Airport | |
| Persons on board: | Crew – 7 | Passengers – 100 |
| Injuries: | Crew – 0 | Passengers – 0 |
| Aircraft damage: | None | |

## Aircraft 2 details

| | | |
|---|---|---|
| Manufacturer and model: | Boeing Company 737-838 | |
| Registration: | VH-VZM | |
| Operator: | Qantas Airways | |
| Serial number: | 34192 | |
| Type of operation: | Part 121 Australian air transport operations - Larger aeroplanes-Standard Part 121 | |
| Activity: | Commercial air transport-Scheduled-domestic | |
| Departure: | Sydney Airport | |
| Destination: | Brisbane Airport | |
| Persons on board: | Crew – 6 | Passengers – 52 |
| Injuries: | Crew – 0 | Passengers – 0 |
| Aircraft damage: | None | |

# Sources and submissions

## Sources of information

The sources of information during the investigation included:

- captain and first officer of VH-VZW
- captain and first officer of VH-VZM
- aerodrome controller east
- tower shift manager
- flight data from VH-VZM and VH-VZW
- air traffic control audio recordings and radar data
- Airservices Australia
- Qantas Airways
- Civil Aviation Safety Authority.

## Submissions

Under section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. That section allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the following directly involved parties:

- captain and first officer of VH-VZW
- captain and first officer of VH-VZM
- aerodrome controller east
- tower shift manager
- Qantas Airways
- Civil Aviation Safety Authority
- Airservices Australia.

Submissions were received from Airservices Australia. The submissions were reviewed and, where considered appropriate, the text of the report was amended accordingly.

# Australian Transport Safety Bureau

## About the ATSB

The ATSB is an independent Commonwealth Government statutory agency. It is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers.

The ATSB's purpose is to improve the safety of, and public confidence in, aviation, rail and marine transport through:

- independent investigation of transport accidents and other safety occurrences
- safety data recording, analysis and research
- 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, as well as participating in overseas investigations involving Australian-registered aircraft and ships. It prioritises investigations that have the potential to deliver the greatest public benefit through improvements to transport safety.

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

## Purpose of safety investigations

The objective of a safety investigation is to enhance transport safety. This is done through:

- identifying safety issues and facilitating safety action to address those issues
- providing information about occurrences and their associated safety factors to facilitate learning within the transport industry.

It is not a function of the ATSB to apportion blame or provide a means for determining 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. The ATSB does not investigate for the purpose of taking administrative, regulatory or criminal action.

## Terminology

An explanation of terminology used in ATSB investigation reports is available on the ATSB website. This includes terms such as occurrence, contributing factor, other factor that increased risk, and safety issue.