



Australian Government

Australian Transport Safety Bureau

Breakdown of separation B737 / WW24, 22 km S Williamtown, NSW 1 February 2011

Presented by
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Overview

- Definitions
 - Loss of separation assurance (LOSA)
 - Breakdown of Separation (BOS)
- What happened?
- What the ATSB found
- What has been done to fix it?

Based on [ATSB investigation report AO-2011-011](#), available at www.atsb.gov.au



What is a Loss of Separation Assurance (LOSA)?

- ‘Loss of separation assurance’ describes a situation where a separation standard existed but planned separation was not provided or separation was inappropriately or inadequately planned.

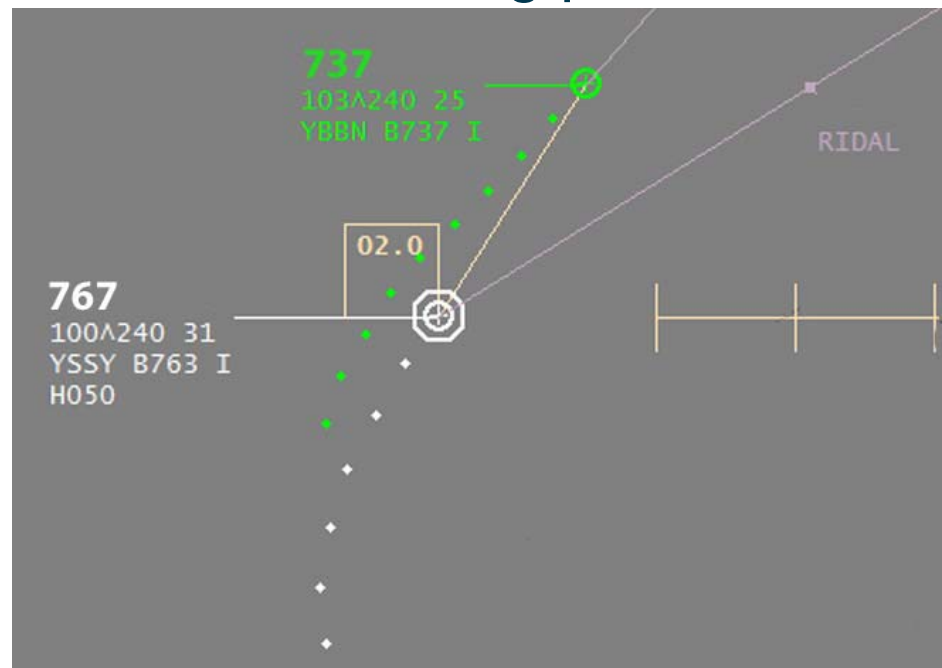


[AO-2009-080 LOSA 222 km NW Tennant Creek, NT, 22 Dec 2009](#)

What is a Breakdown of Separation (BOS)?

- A failure to establish or maintain the specified separation standard between aircraft which are being provided with an air traffic service.

[AO-2010-104](#)
[BOS, near Melbourne Airport,](#)
[5 Dec 2010](#)



What happened?

Williamtown Military ATC

2 sectors – Approach High & Approach Low



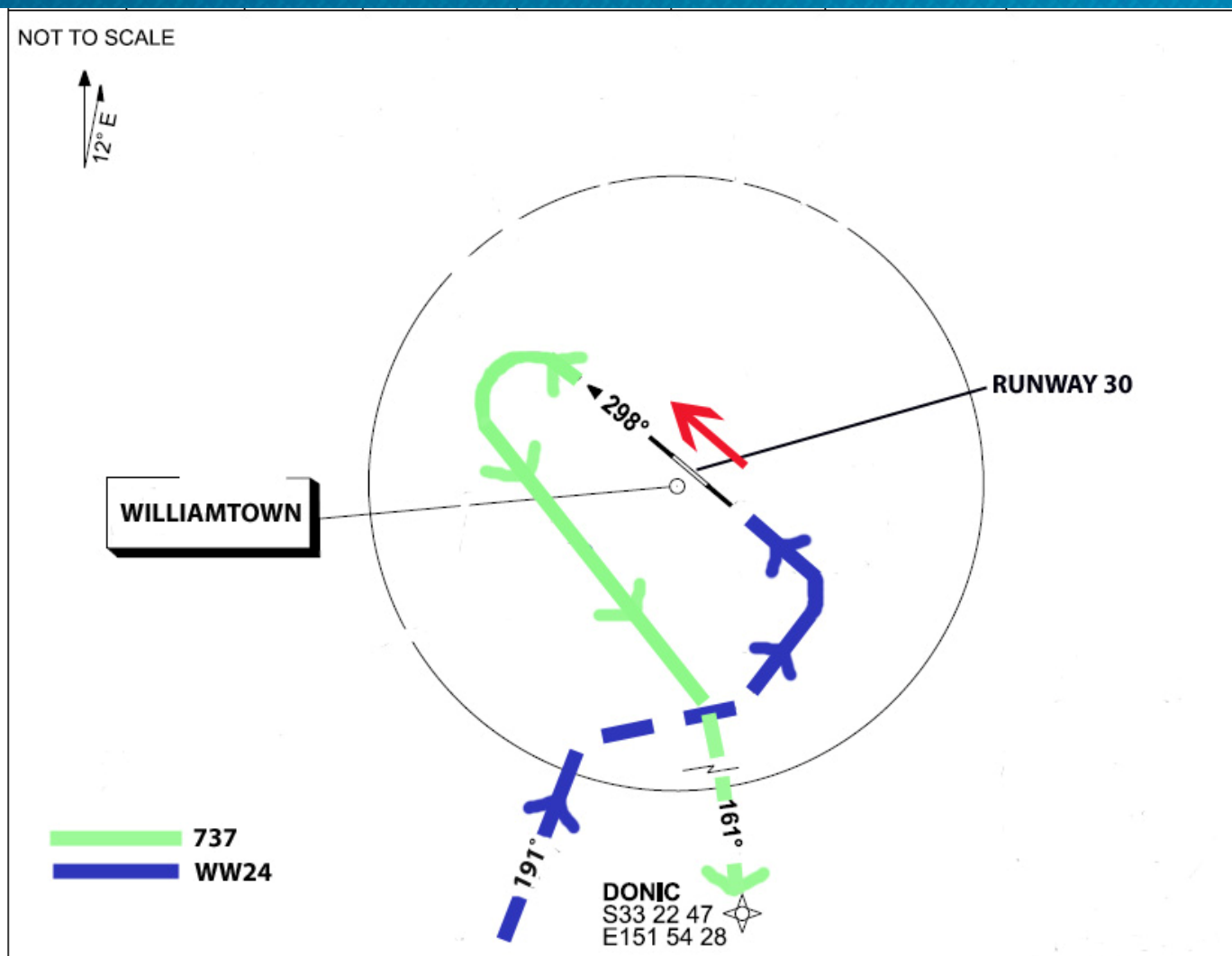
WW24 inbound from Nowra, NSW, assigned non-standard 5,000 ft visual by Approach High



B737 taxis at Williamtown for Melbourne, assigned 5,000 ft by Approach Low



LOSA between B737 and WW24




What happened?


WW24 transferred to Approach Low frequency



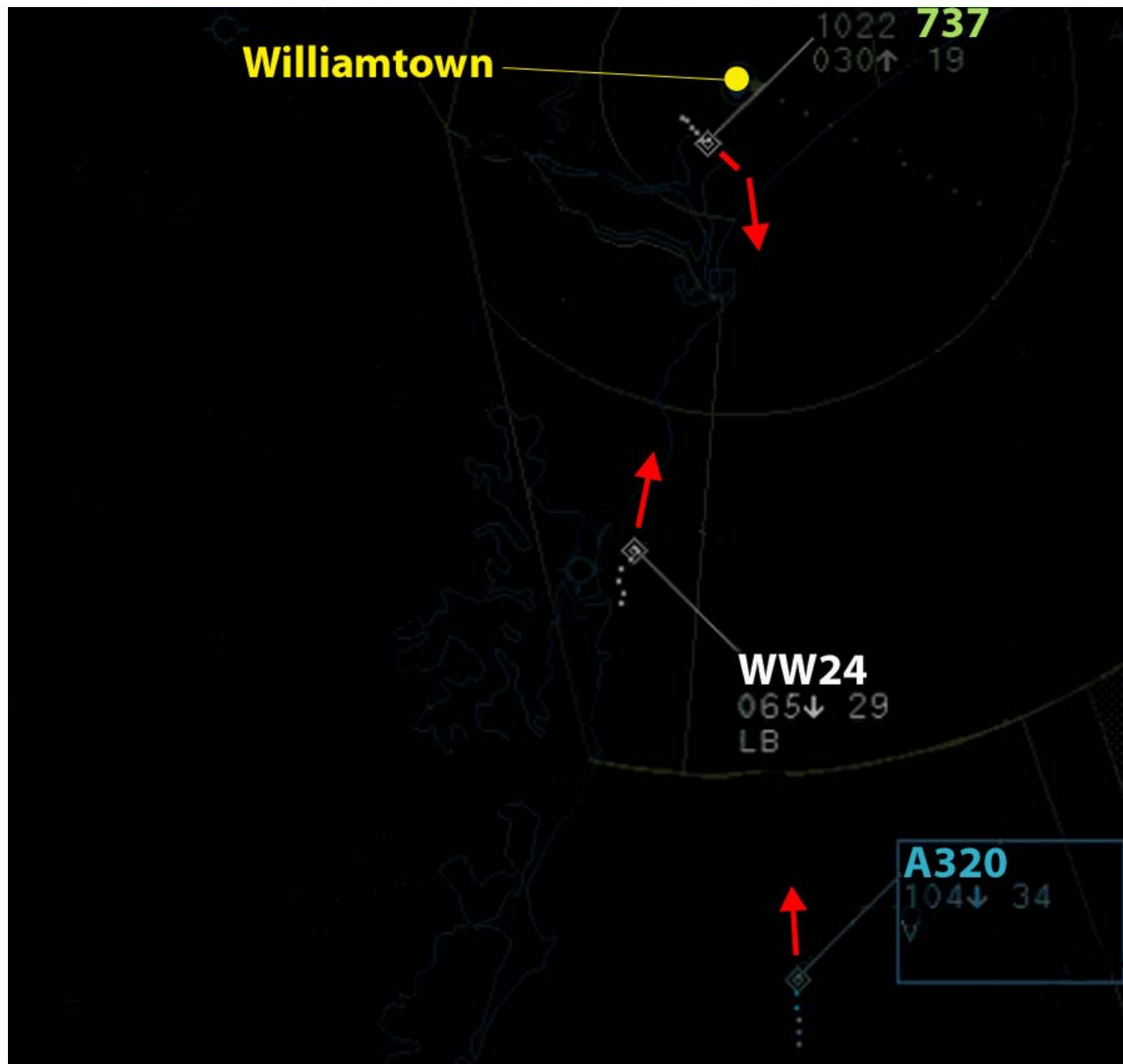
B737 departs – radar return does not couple –
Approach Low controller does not coordinate departure
with Approach High



Approach Low controller annotates WW24 label with
'LB'



A320 tracking to Williamstown calls Approach High – is
assigned 6,000 ft, 250 kt descent




1303:56 local

What happened?

WW24 transferred to Approach Low frequency



B737 departs – radar return does not couple –
Approach Low controller does not coordinate



Approach Low controller annotates WW24 label with 'LB'



A320 tracking to Williamtown calls Approach High – is
assigned 6,000 ft, 250 kt descent



Approach Low controller commences a handover

What happened?

B737 transferred from ADC to Approach High

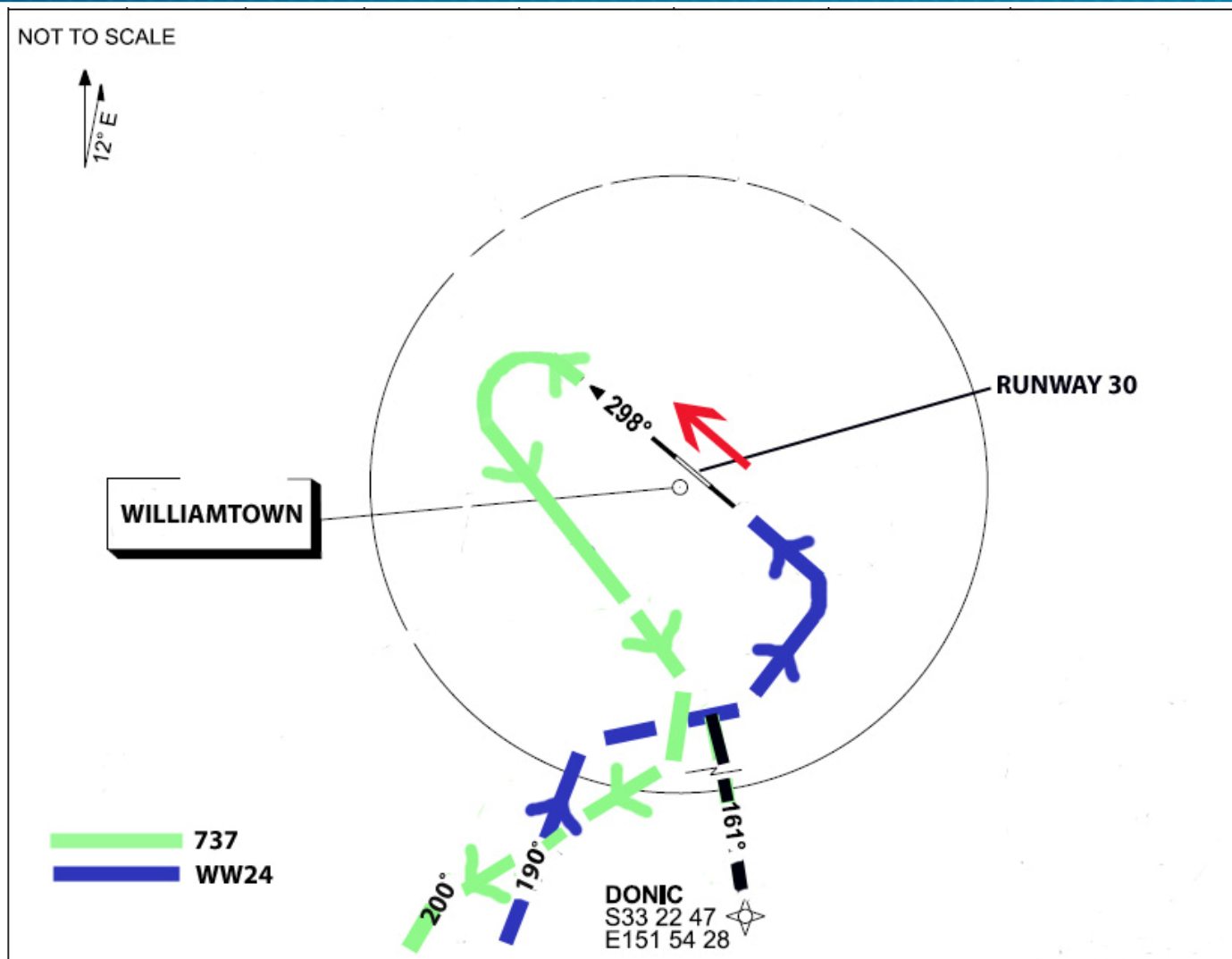


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graph TD; A[B737 transferred from ADC to Approach High] --> B[Approach High controller assigns the B737 a right turn to heading 200°]; B --> C[WW24 is still tracking direct – not for left base runway 30]; C --> D[Approach High controller queries the Approach Low controller's separation plan];
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Approach High controller assigns the B737 a right turn to heading 200°


WW24 is still tracking direct – not for left base runway 30

Approach High controller queries the Approach Low controller's separation plan



What happened?


Approach High controller suggests that Approach Low turn the WW24 east to separate with B737 and A320



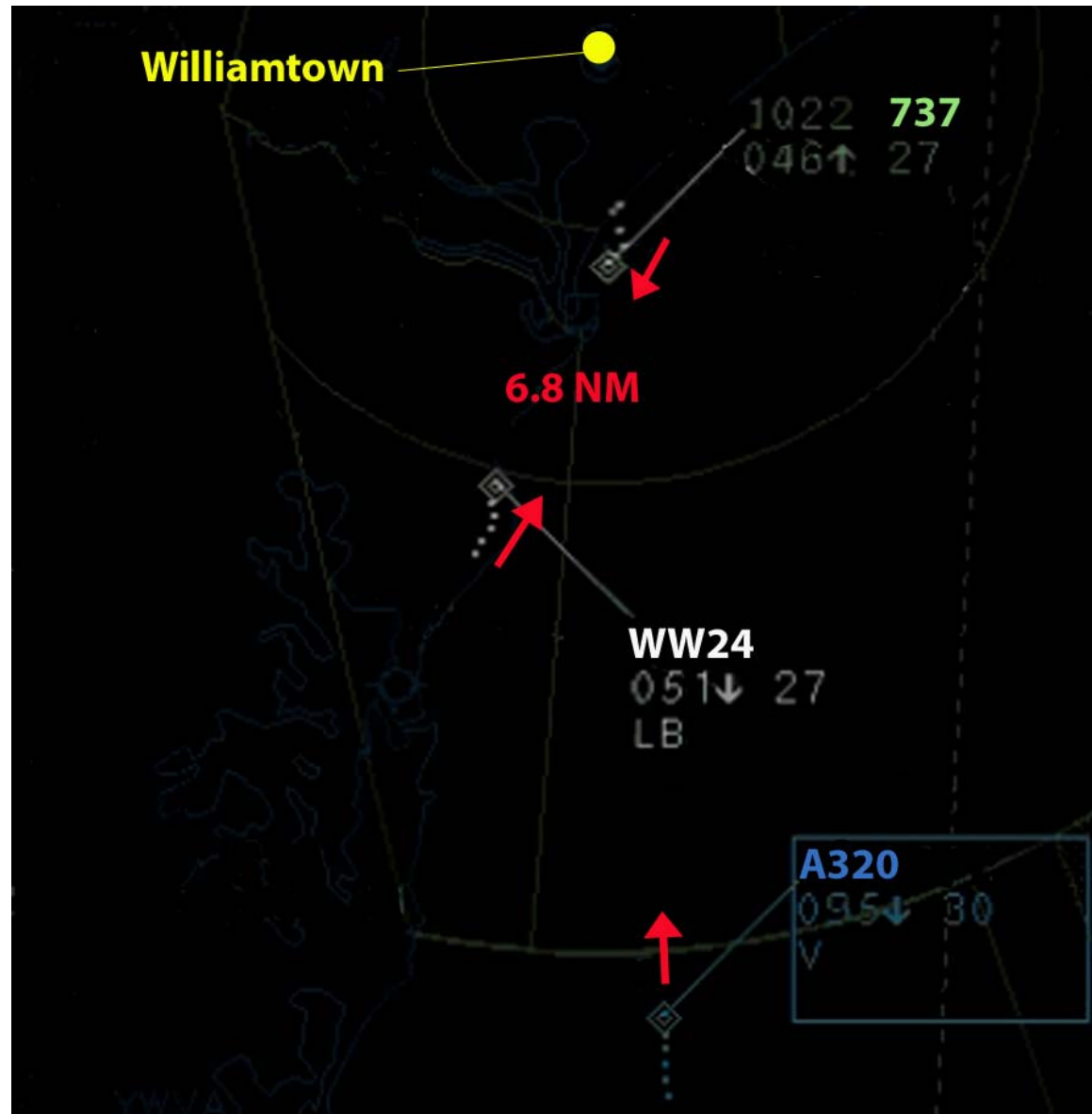
Approach Low controller instructs the WW24 to turn right heading 090°



The training officer taking over Approach Low instructs the Approach High controller to track the A320 to a 15 NM final, which that controller issues.




WW24 and B737 are 6.8 NM apart on reciprocal tracks



1305:01 local

What happened?

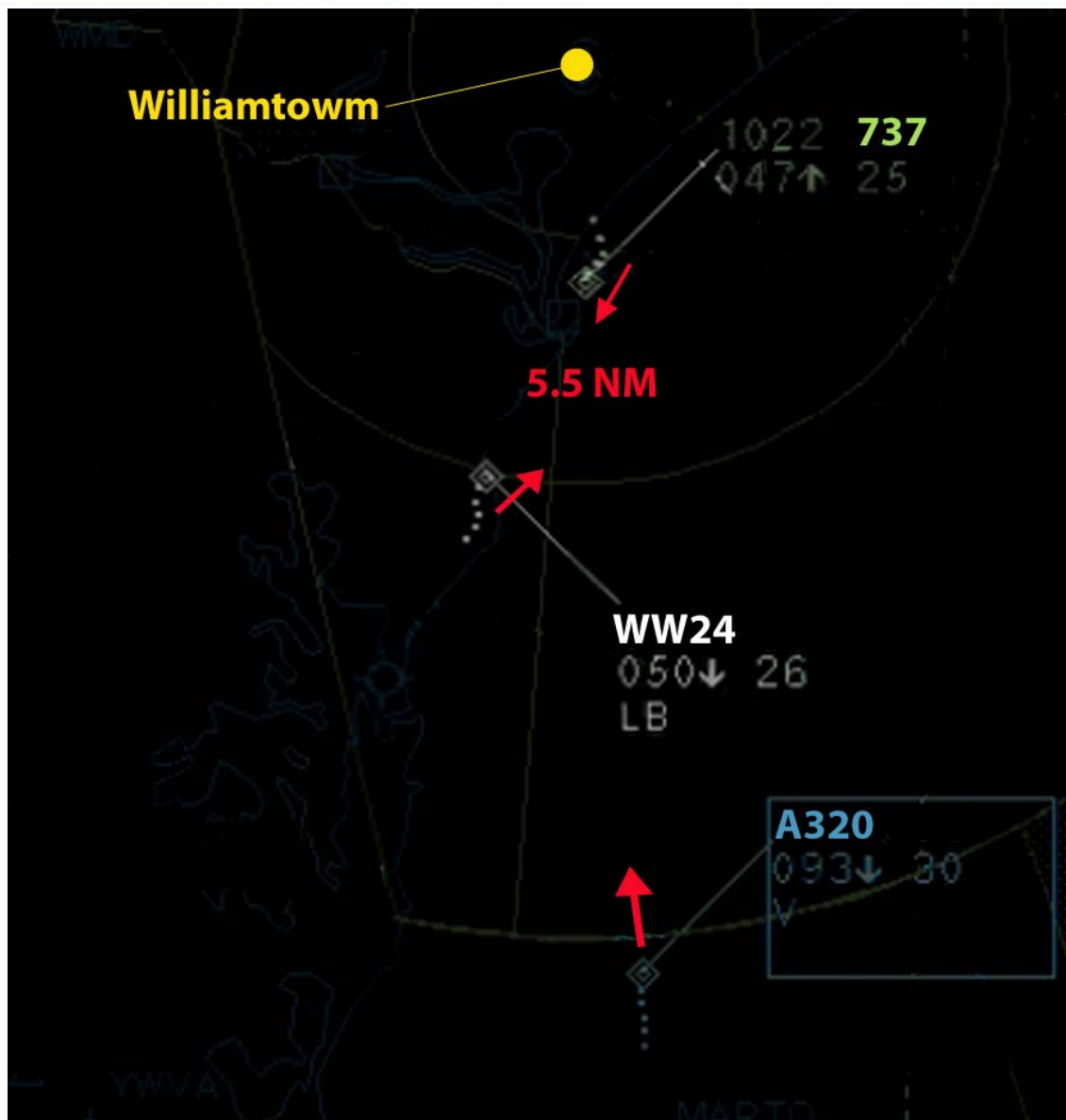
WW24 and B737 are 6.8 NM apart on reciprocal tracks



Approach High controller instructs the B737 to turn further right – crew respond with a traffic query



WW24 and B737 are 5.5 NM and 300 ft apart



1305:10 local

What happened?

WW24 and B737 are 6.8 NM apart on reciprocal tracks



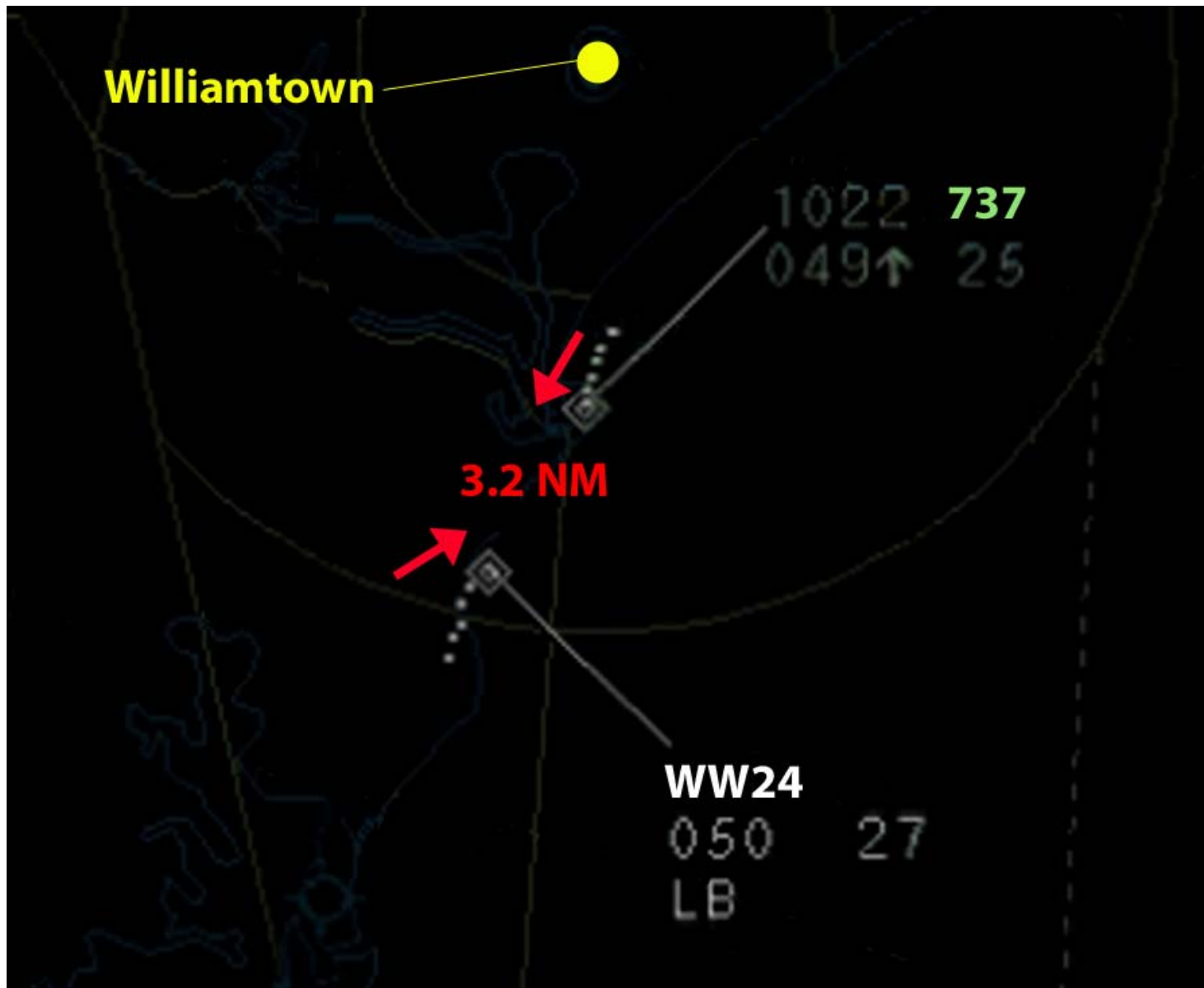
Approach High controller instructs the B737 to turn further right – crew respond with a traffic query



WW24 and B737 are 5.5 NM and 300 ft apart



Separation continues to reduce



1305:24 local

What happened?


BOS between the WW24 and B737




1305:34 local

What happened?

Approach Low controller issues a safety alert to the WW24 as the B737 passes behind



Separation reduces to 0.7 NM.
Vertical separation of 400 ft due to B737 crew response to TCAS RA



B737 reported visually sighting the WW2.
WW24 crew do not sight the B737



1305:44 local

What the ATSB found

Contributing Safety Factors

WW24 assigned
non-standard
level-LOSA with
B737

Limited recent
opportunity for
App High ATC to
work sectors
decombined

Aircraft on different
frequencies &
control jurisdictions
in same airspace

No verbal
coordination of
B737 departure or
vertical & tracking
restrictions

App Low ATC did
not communicate
their separation
plan

What the ATSB found

Contributing Safety Factors

App High ATC not aware of separation plan & separation attempt placed aircraft in conflict

Department of Defence air traffic controllers had not received training in compromised separation recovery techniques.
[Significant safety issue]

What the ATSB found

Other Safety Factors

The Williamtown air traffic control procedures did not clearly define the separation responsibilities and coordination requirements between the Approach sectors for departing aircraft.
[Minor safety issue]

The Approach High and Low controllers did not manage the compromised separation recovery effectively.

An important alerting function within the Australian Defence Air Traffic System had been disabled at Williamtown to prevent nuisance alerts.
[Minor safety issue]

What the ATSB Found

Other Key Findings

- The Boeing B737-7Q8 flight crew's compliance with the resolution advisory, provided by their aircraft's traffic alert and collision avoidance system, provided emergency vertical separation with the conflicting aircraft.

What has been done to fix it?



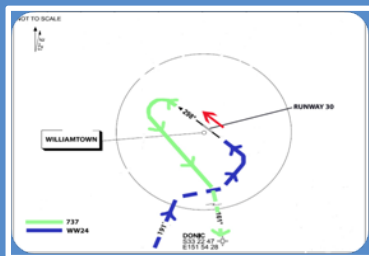
Compromised separation recovery training (COMSERT)

- Controller briefings and lessons with oral testing, with regular scenario based testing, plus COMSERT refresher training
- Additional theory training & mandatory safety/traffic alerts in about 75% of simulator exercises + graduation requirement



Australian Defence Air Traffic System conflict alert function

- 2 month trial - DoD determined erroneous alerts possibly distracting + controller desensitisation
- Conflict alert function enabled at Williamstown when no military flying activity



Williamstown local ATC procedures

- Changes to label data for aircraft tracking, handoffs and mandated voice coordination of crossing track conflicts before the relaxation of vertical separation.

What has been done to fix it?

- The WW24 operator advised that it was fitting TCAS II to all of its aircraft involved in the Defence Support Contract



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Breakdown of separation - Boeing B737-7Q8, VH-VBF and a Boeing B767-338, VH-OGU, near Melbourne Airport, Victoria, 5 December 2010 - final
The ATSB identified a safety issue in that the procedures for takeoffs at Melbourne Airport allowed for aircraft to depart relatively close to each other, with no documented requirements to ensure jet aircraft would maintain a set climb speed.

Fumes event - Boeing 737, VH-VBL, near Melbourne Airport, 17 April 2011 - active
During the climb, the cabin crew detected fumes in the cabin and a number of cabin crew members reported feeling unwell. The investigation is continuing.

Collision with terrain - Cessna C150M, VH-UWR, 55 km NE Bourke, 29 April 2012 - active
During mustering operations, the aircraft collided with terrain. The pilot was fatally injured. The investigation is continuing.

Loss of control - Robinson R44 helicopter, VH-HFH, Cessnock Aerodrome, NSW, 4 February 2011 - final



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Publication Date: March 2012

Released in accordance with section 25 of the Transport Safety Investigation Act 2003

Breakdown of separation 22 km S Williamstown (Newcastle Airport), NSW 1 February 2011

Abstract

At 1305:25 Eastern Daylight-saving Time on 1 February 2011, a breakdown of separation occurred 22 km south of Williamstown (Newcastle Airport), New South Wales between a Boeing B737-7Q8 (737), registered VH-VBK, and an Israel Aircraft Industries Ltd Westwind 1124 (WW24) aircraft, registered VH-AJG. Both aircraft were in communication with and under the jurisdiction of Department of Defence (DoD) air traffic controllers based at Williamstown.

Separation between the aircraft reduced to 0.7 NM (1.3 km) on radar and 400 ft vertically when the required separation standard was 3 NM (5.6 km) or 1,000 ft. The vertical separation achieved was as a result of the 737 flight crew responding in accordance with a resolution advisory provided by their aircraft's traffic alert and collision avoidance system.

The investigation identified a series of errors by the Williamstown Approach controllers involving separation assurance, coordination and communication, and compromised separation recovery.

The investigation also identified three safety issues. The DoD advised that they reviewed and amended Williamstown procedures, introduced compromised separation recovery techniques training and trialled use of the conflict alerting function in the Australian Defence Air Traffic System at Williamstown.

FACTUAL INFORMATION

Sequence of events

At 1305:25 Eastern Daylight-saving Time¹ on 1 February 2011, a breakdown of separation occurred 22 km south of Williamstown (Newcastle Airport), New South Wales (NSW) between:

- a Boeing Company B737-7Q8 (737), registered VH-VBK, and operated on a scheduled passenger service from Williamstown to Melbourne, Victoria
- an Israel Aircraft Industries Ltd Westwind 1124 (WW24) aircraft, registered VH-AJG, and operated on a Department of Defence (DoD) charter arrangement from Nowra, NSW to Williamstown.

Initial events

For air traffic control (ATC) purposes, the airspace within 25 NM (46.3 km) of Williamstown was divided into two jurisdictions: the Approach Low (APP (L)) airspace was up to 5,000 ft, and the Approach High (APP (H)) airspace was 6,000 ft and above.

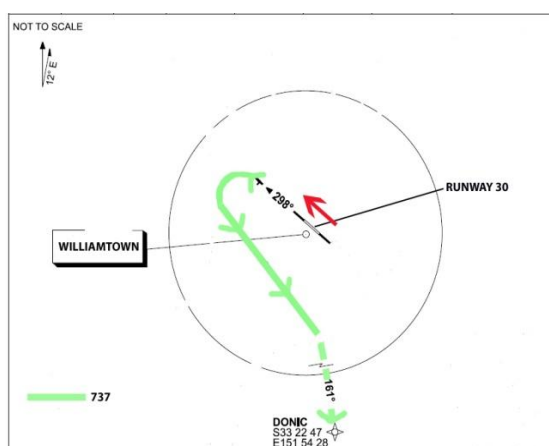
The 737 was flight planned to track from Williamstown to intercept its outbound route via DONIC, an instrument flight rules (IFR) reporting point positioned at 35 NM (64.8 km) on the

1 Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

Williamstown 161 radial (Figure 1). At about 1300, the aircraft taxied for departure from runway 30, which was the duty runway.

At 1300:33, the Williamstown Aerodrome Controller (ADC) coordinated the departure instructions for the 737 with the APP (L) controller. The instructions required the aircraft to climb to 5,000 ft in a left turn to intercept its outbound track. In accordance with local ATC procedures, the 737 was to be transferred direct from the ADC frequency to the APP (H) frequency after departure, as it had been assigned a departure instruction level of 5,000 ft or above.

Figure 1: 737 flight-planned track



For illustration purposes only – not to scale.

At 1300:53, the flight crew of the WW24 first contacted the APP (H) controller. The aircraft was about 32 NM (59.3 km) south of Williamstown, tracking inbound via the 191 radial, and passing 10,800 ft on descent. The crew advised that they were on descent to 9,000 ft and visual with the airport, and they requested a visual approach. The APP (H) controller instructed them to descend to 5,000 ft visual² and that the type of approach would be advised later.

Loss of separation assurance

According to the local ATC procedures, the standard assignable level that APP (H) was to issue to descending aircraft was 6,000 ft. Assigning the arriving WW24 with the same level

as the departing 737 (5,000 ft), without any other separation standard, resulted in a loss of separation assurance³ between the two aircraft. At this time, the 737 was on the ADC frequency and the WW24 was on the APP (H) frequency.

At 1301:41, the APP (H) controller transferred the WW24 to the APP (L) frequency. The flight crew reported that they had been cleared to descend to 5,000 ft visual, which the APP (L) controller acknowledged. At that time the aircraft was about 26 NM (48.2 km) south of Williamstown, passing 9,000 ft on descent, with a groundspeed of 330 kts.

The APP (H) controller subsequently coordinated the WW24's assigned non-standard descent altitude of 5,000 ft visual with the APP (L) controller at 1302:26. At about this time, the APP (L) controller annotated the label for the WW24 with the letters 'LB', which indicated that the aircraft was tracking for left base for runway 30.⁴ The annotation was visible on both the APP (L) and APP (H) air situational displays. However, no associated instruction was provided to the WW24 crew, and the WW24 was still tracking direct to the airport.

At 1302:31, the radar label for the departing 737 appeared on the APP (L) and APP (H) displays as Secondary Surveillance Radar (SSR) code '1022' with an altitude readout. The radar return did not 'label up', or couple, to the aircraft's flight data information in the Australian Defence Air Traffic System (ADATS). Consequently, the aircraft's callsign identification was not displayed on the controllers' displays, and a system handoff between control positions was not possible. Local procedures required that the APP (L) controller provide verbal coordination in the event that a system handoff was unachievable. In this case, the APP (L) controller did not coordinate the departing 737 with the APP (H) controller.

Shortly after the appearance of the 737's radar return, the flight crew of an Airbus A321 (A320),

² Used by air traffic control to instruct a pilot to see and avoid obstacles while conducting flight below the Minimum Vector Altitude or Minimum Sector Altitude/ Lowest Safe Altitude.

³ 'Loss of separation assurance' describes a situation where a separation standard existed but planned separation was not provided or separation was inappropriately or inadequately planned.

⁴ The APP (L) controller had entered this annotation in accordance with the local ATC procedures for 'silent' coordination with the ADC.

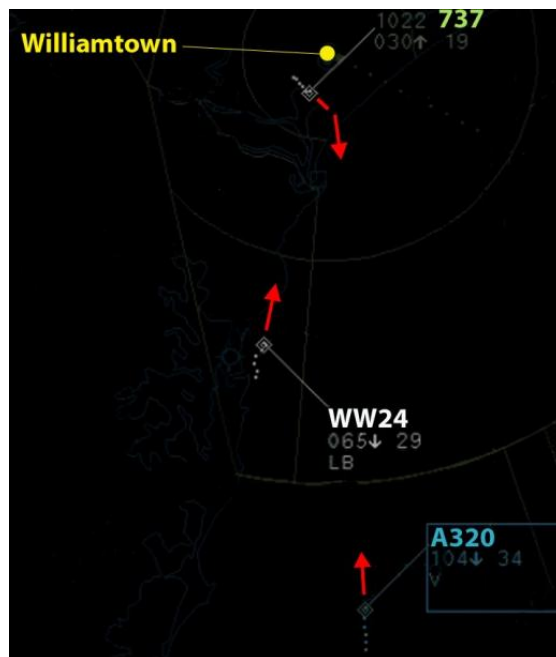
on a scheduled passenger service from Melbourne to Williamtown, called APP (H) on descent. The aircraft's speed had been reduced to 250 kts by a Brisbane Centre controller for sequencing into Williamtown. The APP (H) controller instructed the A320 flight crew to descend to the standard assignable level of 6,000 ft at 25 NM (46.3 km) from Williamtown.

At 1303:16, the APP (L) controller commenced a handover of that position to a trainee and training officer. The handover continued in parallel with the APP (L) controller managing traffic and was not completed until after the breakdown of separation occurred.

Identification of conflict

At 1303:56, after a frequency transfer by the ADC, the 737 flight crew called APP (H) on climb to 5,000 ft. The aircraft was about 1.8 NM (3.3 km) south of Williamtown in a left turn to intercept the 161 radial, and passing 3,100 ft with a groundspeed of 190 kts. After dealing with military jet formation traffic, the APP (H) controller acknowledged the call, radar identified the aircraft, and issued the crew with an instruction to turn right onto a heading of 200° to enable separation with inbound traffic. The controller also advised the crew to expect further climb shortly. At that time, the inbound WW24 was about 10.7 NM (19.8 km) south of Williamtown, passing 6,400 ft on descent, with a groundspeed of 290 kts (Figure 2).

Figure 2: Proximity of aircraft at 1303:56



The APP (H) controller later reported that they had not yet reviewed the details of the pending departures and were not expecting the 737 on frequency. They had based the vector instruction on the expectation that the WW24 was tracking for left base runway 30, which would have it tracking across the departing 737's planned outbound route. However, at that time, the WW24 had not been cleared by APP (L) to track for a left base to runway 30 and it was still tracking direct to the airport. The APP (L) controller later reported that their intention was that, if the WW24 tracked directly to the airport, it would pass behind the 737 with the required lateral separation.

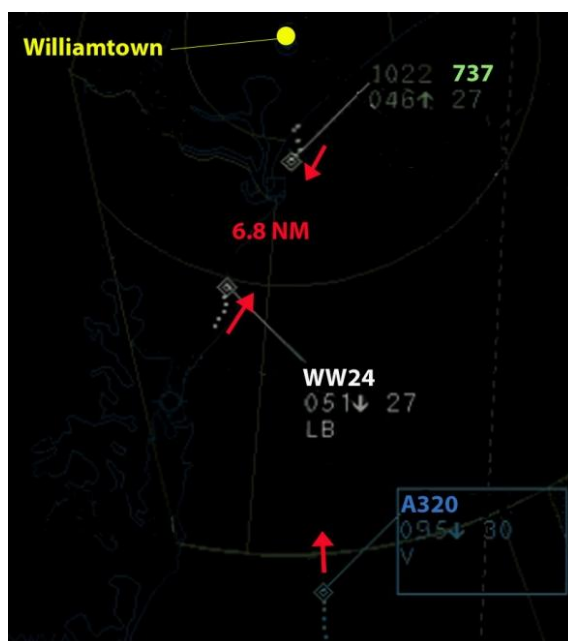
At 1304:31, the APP (H) controller called APP (L) on the hotline to advise that the 737 had been turned on a heading of 200° due to the inbound WW24 and A320. The APP (H) controller then queried the APP (L) controller's separation plan for the WW24. The APP (L) controller replied that the WW24 was still tracking direct to the airport. The APP (H) controller responded with surprise before suggesting that APP (L) turn the WW24 to the east for separation with both the 737 and A320. At 1304:51, the APP (L) controller instructed the WW24 flight crew to turn right onto a heading of 090°, which the flight crew acknowledged.

At 1305:01, the training officer taking over the APP (L) position instructed the APP (H) controller to track the A320 to a 15 NM (27.8 km) final for

runway 30, which the APP (H) controller then actioned. The APP (L) controller continued to conduct the handover of that position to the training officer and trainee.

At the time the training officer made the instruction, the WW24 was descending from 5,100 ft to level off at 5,000 ft, in the 737's 12 o'clock position, at 6.8 NM (12.6 km), with a groundspeed of 270 kts (Figure 3). The 737 was passing through 4,600 ft on climb at the same speed. The A320 was about 27 NM (50 km) to the south of Williamtown, inbound on the 161 radial and passing 9,500 ft on descent. The A320's level assignment of 6,000 ft provided separation assurance with both the 737 and WW24 (both assigned 5,000 ft).

Figure 3: Proximity of aircraft at 1305:01

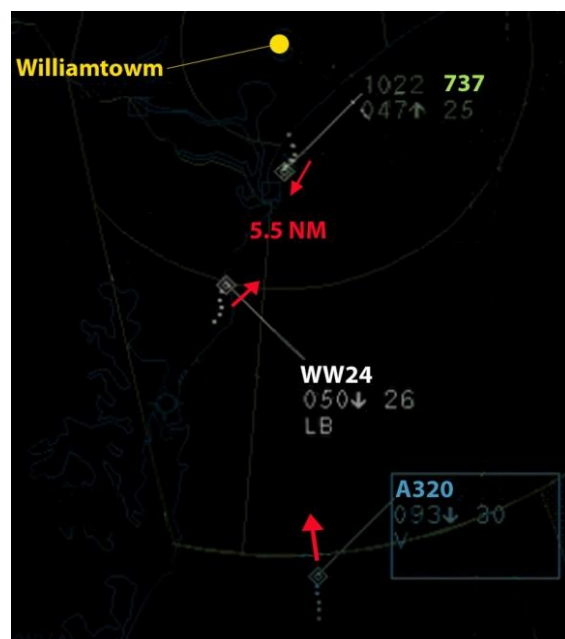


At 1305:10, the APP (H) controller instructed the 737 flight crew to turn further right onto a heading of 250°, although the heading instruction did not include the word 'IMMEDIATELY'. The flight crew responded with a query about traffic 3 NM (5.6 km) from their position, and the controller advised that the traffic was a WW24 making a right turn. The 737 flight crew did not read back the ATC instruction to turn further right and the APP (H) controller did not reissue the instruction or seek a readback from the flight crew.

At this time, the WW24 was about to maintain 5,000 ft at 12 NM (22.2 km) from Williamtown, with a groundspeed of 260 kts, and the 737 was about 6.5 NM (12.0 km) from Williamtown,

passing 4,700 ft on climb with a groundspeed of 250 kts. There was 5.5 NM (10.2 km) between the aircraft (Figure 4).

Figure 4: Proximity of aircraft at 1305:10



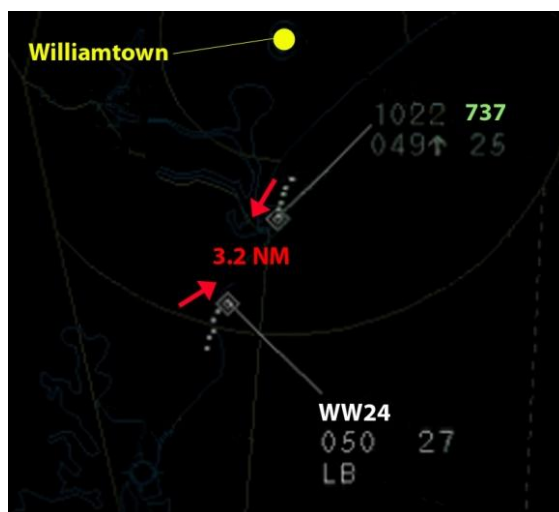
About 14 seconds later, the APP (H) controller received a hotline call from a Brisbane Centre controller querying if they were aware of the pending conflict between the 737 and WW24, and the APP (H) controller responded 'affirm'. At the same time, other controllers in the Williamtown Approach room and Tower were querying the APP (L) controller as to the identity of the aircraft squawking code 1022.

Breakdown of separation

At 1305:24, there was 3.2 NM (5.9 km) between the aircraft, with the 737 at 5,000 ft with a groundspeed of 250 kts, and the WW24 maintaining 5,000 ft, with a groundspeed of 270 kts (Figure 5). The 3 NM (5.6 km) radar separation standard between the 737 and WW24 was infringed 1 second later, resulting in a breakdown of separation.⁵

⁵ A failure to establish or maintain the specified separation standard between aircraft which are being provided with an air traffic service.

Figure 5: Proximity of aircraft at 1305:24



At 1305:34, there was 1 NM (1.9 km) between the aircraft, with the 737 maintaining 4,800 ft (within the 200 ft radar tolerance for an aircraft maintaining 5,000 ft), at a groundspeed of 280 kts, and the WW24 in the 737's 12 o'clock position, tracking right to left at 5,000 ft, with a groundspeed of 300 kts (Figure 6).

Figure 6: Proximity of aircraft at 1305:34



At 1305:44, the APP (L) controller issued the WW24 flight crew with a safety alert, advising that a 737 was passing behind their aircraft. The transmission did not include the level or direction of travel of the 737. At that time, the aircraft reached their closest point of radar separation of 0.7 NM (1.3 km) (Figure 7).

Figure 7: Proximity of aircraft at 1305:44



At the point of closest radar separation, there was 400 ft vertical separation between the two aircraft. The vertical separation was due to the 737 flight crew responding to a resolution advisory (RA)⁶ collision avoidance manoeuvre prescribed by their aircraft's traffic alert and collision avoidance system (TCAS).

At 1305:47, the 737 flight crew advised the APP (H) controller that they had visual contact with the conflicting traffic and were climbing their aircraft back to the assigned altitude of 5,000 ft. The crew later reported that they had sighted the WW24 as it passed in front of them, from right to left. The WW24 flight crew later reported that they did not see the 737.

Personnel information

The APP (L) controller attended the Royal Australian Air Force School of Air Traffic Control in 2006 and had operated as an ATC at Williamtown since 2007, with endorsements in all positions except Approach Supervisor. On the day of the occurrence, the APP (L) controller had been on duty for 3 to 4 hours and worked in four different Williamtown control positions, covering break periods for other rostered controllers.

The APP (H) controller had about 4 years experience in ATC, with about 1.5 years at Williamtown, where the controller held ratings in the Approach cell, including APP (L) and APP (H). On the day of the occurrence, the controller took over the APP (H) control position about 7 minutes before the breakdown of separation occurred.

⁶ A resolution advisory provides pilots with a verbal and/or display indication recommending increased vertical separation relative to a conflicting aircraft.

The APP (H) controller later reported having had limited opportunity to operate the approach high and low sectors individually. The majority of time had been spent with the two sectors combined at the one control position.

Both controllers reported that they had been fit for duty at the time of the incident.

There was no supervisor on duty in the Approach room at the time of the occurrence. The DOD advised that the traffic levels were below that required for a supervisor, as determined by the staffing configuration risk management profile.

Aircraft information - traffic alert and collision avoidance system

TCAS is designed to independently alert flight crews to possible conflicting traffic. It identifies a three-dimensional airspace around appropriately-equipped aircraft based on the closure rate of other transponder-equipped traffic. If the defined vertical and horizontal parameters are satisfied by the evolving potential conflict, it generates a visual and aural alert.

In this occurrence, only the 737 was equipped with TCAS. There was no regulatory requirement for the WW24 to be fitted with TCAS.

The 737's TCAS equipment first generated a traffic advisory (TA)⁷ alert, quickly followed by an RA to descend.

The Aeronautical Information Publication Australia (AIP) documented the phraseology requirements, between flight crew and ATC associated with TCAS. When a flight crew started to '... deviate from any ATC clearance or instruction to comply with an ACAS⁸ resolution advisory (RA) (pilot and controller interchange)', the pilot transmission was 'TCAS RA' to which ATC was to respond with 'ROGER'. During the occurrence, no initial transmission from the 737 flight crew, advising ATC of the start of their response to a TCAS RA, was recorded on the ATC audio data.

Airport information

The primary function of the airport facility at Williamtown was as a military base. The DoD facilitated use of the airport by some civil aviation operators, and the civil terminal was known as Newcastle Airport. The DoD was responsible for the provision of air traffic control services to both military and civil operators.

The single runway at Williamtown, runway 12/30, was aligned south-east to north-west (Figure 1).

Air Traffic Control

Airspace

As previously noted, for ATC purposes, the Williamtown airspace was divided into two jurisdictions: Approach Low (APP (L)) and Approach High (APP (H)). Due to reduced military flying activity over the Christmas stand-down period, Williamtown controllers had been regularly working the two sectors combined as one control position, as traffic levels allowed.

In addition, it was a routine procedure to issue arriving aircraft with a clearance to 5,000 ft visual when the two sectors were combined. The lowest assignable level for arriving aircraft when the two sectors were separated was 6,000 ft.

Coupling of radar track and aircraft data

The radar label for the 737 did not couple to the aircraft's flight data information in ADATS. The DoD advised that 'non-coupling' occurred intermittently. On those occasions, the Planner position was required to manually 'couple' the flight data and aircraft track. No unserviceability with either the radar or ADATS was identified as part of the investigation.

Conflict alert function

ADATS was equipped with a conflict alert function. However, at Williamtown the function had been disabled as the nature of military operations, such as formation flights, had resulted in continual nuisance alerts for Williamtown controllers.

Separation standards

The radar separation standard applicable between the aircraft was 3 NM (5.6 km) or the

⁷ A Traffic Advisory provides pilots with information about other appropriately-equipped traffic within +/- 1,200 ft and 45 seconds in time from their aircraft.

⁸ Airborne Collision Avoidance System – a term which encompasses TCAS.

vertical separation standard was 1,000 ft. In this occurrence, both separation standards were compromised.

Controller separation planning and coordination

The local ATC procedures stated that the ADC would 'normally' transfer aircraft that had been assigned a departure instruction level of 5,000 ft or above straight to the APP (H) frequency. However, the APP (L) controller was still able to request the ADC to transfer an aircraft direct to their frequency, if required.

The Manual of Air Traffic Services (MATS) stated that a 'Clean Hand-off' was:

A surveillance system hand-off where there are no vertical restrictions or tracking restrictions within 45 degrees of the nominal forward track upon transfer to the receiving unit.

During the occurrence, the nominal forward track of the 737 was within 45° of the WW24 and vertical and tracking restrictions existed.

The local ATC procedures required that the APP (L) controller coordinate restrictions with APP (H) for aircraft requiring climb above 5,000 ft, or for aircraft that APP (L) required on frequency that were climbing higher than 5,000 ft. In addition, if an aircraft's radar label did not couple, and a system handoff could not be conducted, then APP (L) was required to verbally coordinate with APP (H).

The local ATC procedures did not require that the APP (H) controller voice coordinate any changes in tracking for departing aircraft, beyond the requirements of MATS.

For arriving aircraft, the procedures stated that voice coordination was to be used between the approach sectors in various situations. These included when separation responsibility was not clear, and when relaying tracking/altitude restrictions.

Separation assurance

MATS described separation assurance as the preference for controllers to proactively plan to de-conflict aircraft, rather than to wait for or allow a conflict to develop before its resolution.

In order to assure separation, MATS required controllers to:

1. Apply standards to ensure and apply separation, to avoid conflicts;
2. Plan traffic to guarantee separation, rather than having to resolve conflicts after they occur;
3. Execute the plan to ensure that separation is maintained; and then
4. Monitor the plan to ensure it succeeds.

The existence of a separation standard between arriving and departing aircraft, particularly when the departing traffic is not yet radar identified, ensures that separation is maintained in the event of an unforeseen occurrence such as a radio failure or an aircraft transponder or ATC radar/equipment malfunction.

Compromised separation

Separation is considered to be compromised when separation standards have been infringed, or where separation assurance is lacking to the extent that a breakdown of separation is imminent.

In accordance with MATS, controllers were required to issue safety alerts to pilots of aircraft as a priority when they became aware that aircraft were in a situation considered to be in unsafe proximity to other aircraft. The following phraseology is an example of the words to be used:

(Callsign) TRAFFIC ALERT (position of traffic if time permits) TURN LEFT/RIGHT (specific heading, if appropriate), and/or CLIMB/DESCEND (specific altitude if appropriate) IMMEDIATELY.

During the occurrence, the APP (L) controller issued the WW24 flight crew with a safety alert after the two aircraft had just passed. The alert did not include a control instruction or the level of the conflicting traffic, but did provide a relative position and type of aircraft.

The APP (H) controller did not issue the 737 flight crew with a safety alert. When the crew requested verification from the controller of traffic 3 NM (5.6 km) from their position, the APP (H) controller advised the aircraft type.

At the time of the occurrence, the DoD did not provide compromised separation recovery training

as part of its air traffic controller initial or ongoing training.

Other occurrences

Williamtown ATC occurrences

In addition to the incident on 1 February 2011, between 1 January 2010 and 30 June 2011 there were nine breakdowns of separation involving Williamtown ATC reported to the Australian Transport Safety Bureau (ATSB). The DoD conducted internal investigations into the occurrences and implemented safety actions, at the local level, in response to their investigation findings. None of these occurrences appeared to involve an arriving aircraft being assigned a non-standard level. Some of the occurrences involved problems with compromised separation recovery.

Other compromised separation occurrences

The ATSB investigation AO-2009-080 examined a loss of separation assurance that occurred 222 km north-west of Tennant Creek, Northern Territory on 22 December 2009 and involved an Airbus A330-300 (A330) aircraft, registered B-HLV, and a Boeing Company B737-800 aircraft, registered VH-VUJ. The findings from that investigation included⁹:

The controller had not received training in compromised separation recovery techniques. [Significant safety issue]

In response, Airservices Australia, the civilian air traffic control provider involved in that incident, implemented a compromised separation recovery training module for its air traffic control groups, including Approach controllers. In addition, a dedicated compromised separation recovery training module was introduced at the Airservices Australia Learning Academy, as part of initial ATC training.

ANALYSIS

The breakdown of separation between the Boeing B737-708 (737) and the Israel Aircraft Industries Ltd Westwind 1124 (WW24) involved a series of

errors by the Approach High (APP (H) and Approach Low (APP (L) controllers, as well as limitations in the risk controls used by the Department of Defence (DoD) air traffic control provider. The two aircraft came within 1 NM (1.8 km) at the same level, but by that stage the flight crew of the 737 had started to descend in response to a traffic alert and collision avoidance system (TCAS) resolution advisory (RA), and soon after the aircrafts' controller-initiated headings resulted in the aircrafts' tracks diverging.

Separation assurance techniques

The initial error occurred when the APP (H) controller assigned the WW24 descent to 5,000 ft. This resulted in a loss of separation assurance between the WW24 and the 737, as the departure instruction for the 737 had already been coordinated between the aerodrome controller (ADC) and the APP (L) controller, resulting in both aircraft being assigned the same level and with conflicting tracks.

The APP (H) controller's action was probably a skill-based error, using the routine procedure of assigning 5,000 ft for an arriving aircraft when the APP (H) and APP (L) sectors were combined. The APP (H) controller had limited recent opportunity to operate the Williamtown approach control sectors without them being combined.

This error highlights the importance of the constant application of separation assurance techniques in the prevention of conflicts. The standard assignable level of 6,000 ft for aircraft descending into Williamtown provided a vertical separation standard of 1,000 ft with departing aircraft flight planned above 5,000 ft. If the same standard assignable level was used when the two approach sectors were combined, this would reduce the risk of controllers assigning the wrong level when the sectors were de-combined. However, when the sectors are combined, the controller is aware of all the potentially conflicting traffic, and has the flexibility to apply separation assurance principles.

As the APP (L) controller issued the departure instruction for the 737 before the flight crew of the WW24 had called on the APP (L) frequency, that controller was initially unaware of the non-standard level of 5,000 ft visual that was issued to the arriving aircraft. However, after becoming aware that the WW24 was assigned

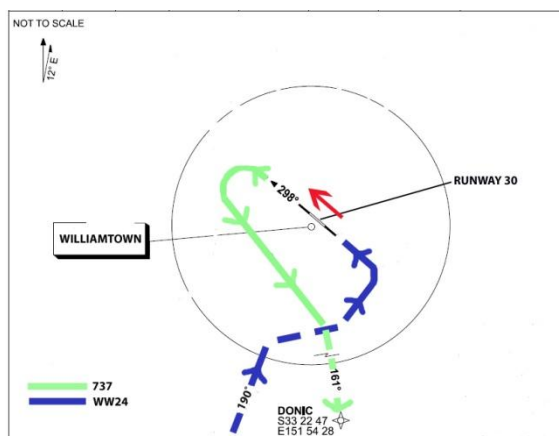
⁹ www.atsb.gov.au/publications/investigation_reports/2009/aair/ao-2009-080.aspx

5,000 ft, the APP (L) controller had an opportunity to request that the ADC transfer the 737 to the APP (L) frequency. Both the 737 and WW24 would have then been on the same frequency and under the same control jurisdiction, while assigned the same altitude and operating in the APP (L) airspace. There was also an opportunity at that time for the 737 to be assigned 4,000 ft or the WW24 to be restricted to 6,000 ft to re-establish separation (assurance) between the aircraft.

Coordination and communication

The APP (L) controller had determined a plan to maintain radar separation between the 737 and WW24, with the aircraft remaining under different control jurisdictions. The APP (L) controller had delayed tracking the WW24 for left base so the aircraft was tracking direct to the airport, with the intention that that would have provided segregation between the aircrafts' tracks (Figure 8). However, that plan was not communicated to the APP (H) controller, who believed that the two aircraft would have been in conflict. The initial response by the APP (H) to resolve the perceived problem by vectoring the 737 exacerbated the situation.

Figure 8: Approach Low separation plan



For illustration purposes only – not to scale.

In addition to the APP (L) controller not communicating their separation plan, there were other coordination and communication errors. The APP (L) controller did not coordinate the departure of the 737 with APP (H) when the radar label did not couple with the aircraft's track. The APP (L) controller also did not coordinate the tracking restrictions for the 737. The reasons for the communication errors could not be determined.

Local procedures

The local ATC procedures did not clearly define the separation responsibilities and coordination requirements between the Approach High and Low positions for departing aircraft. There was no stated requirement in the local ATC procedures for the APP (H) controller to coordinate any tracking changes for departing aircraft while they were operating in APP (L) airspace. In this case; however, the APP (H) controller did coordinate the change in the 737's track.

Compromised separation recovery

When the APP (H) controller was informed that the WW24 was not tracking for left base, they realised that the perceived conflict had not been effectively resolved. At that stage, the controller should have issued a safety alert to the 737 flight crew, and the APP (L) controller should have issued a safety alert when instructing the WW24 crew to turn right heading 090°.

Though the APP (H) controller issued the 737 flight crew with a second heading that would have turned that aircraft further to the right, that instruction directly preceded the 737 flight crew's query regarding the conflicting traffic. At that time, the 737 flight crew would have been focused on understanding the traffic situation.

In addition to issuing safety alerts, the controllers should have been prioritising the conflict resolution. The training officer, who was taking over the APP (L) position with a trainee, instructed the APP (H) controller to amend the tracking of the A320, and the APP (H) controller actioned this request. The APP (L) controller also continued the position handover.

Overall, the controllers did not resolve the situation effectively, and this was due at least in part to the DoD not providing its air traffic controllers with compromised separation recovery training.

Australian Defence Air Traffic System

The Australian Defence Air Traffic System was equipped with a conflict alert function, but the function had been disabled at Williamtown. While the function is a system defence to assist controllers, in this situation, the controllers were already aware that the WW24 and 737 were in potential conflict. It is unlikely that an operating

and functioning alert would have enhanced the response and resolution of the breakdown of separation. In other situations, it may alert controllers to an impending conflict.

The fact that the 737 flight data did not couple with the aircraft's track on departure was a minor distraction. The lack of an identifying label on the radar display did not prevent either of the approach controllers from using the radar for separation or traffic management purposes.

FINDINGS

From the evidence available, the following findings are made with respect to the breakdown of separation between a Boeing B737-7Q8 aircraft, registered VH-VBK, and an Israel Aircraft Industries Ltd Westwind 1124 aircraft, registered VH-AJG that occurred 22 km south of Williamtown (Newcastle Airport), New South Wales on 1 February 2011. They should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing safety factors

- The Approach High controller assigned the Westwind 1124 descent below the standard assignable level, which resulted in a loss of separation assurance with the departing Boeing 737-7Q8.
- The Approach High controller had limited recent opportunity to operate the Williamtown Approach control sectors without them combined as one control position.
- The aircraft involved were subject to different control jurisdictions and on separate frequencies, while operating in the Approach Low designated airspace and when assigned the same altitude.
- The Approach Low controller did not verbally coordinate the departure of the Boeing 737-7Q8 when the radar track remained uncoupled, or coordinate the vertical and tracking restrictions for the departing aircraft.
- The Approach Low controller did not communicate their separation plan for the two aircraft to the Approach High controller.
- As the Approach High controller was not aware of the Approach Low controller's

separation plan, their attempt to establish separation between the two aircraft placed the aircraft in direct conflict.

- Department of Defence air traffic controllers had not received training in compromised separation recovery techniques. *[Significant safety issue]*

Other safety factors

- The Williamtown air traffic control procedures did not clearly define the separation responsibilities and coordination requirements between the Approach sectors for departing aircraft. *[Minor safety issue]*
- The Approach High and Low controllers did not manage the compromised separation recovery effectively.
- An important alerting function within the Australian Defence Air Traffic System had been disabled at Williamtown to prevent nuisance alerts. *[Minor safety issue]*

Other key findings

- The Boeing B737-7Q8 flight crew's compliance with the resolution advisory, provided by their aircraft's traffic alert and collision avoidance system, provided emergency vertical separation with the conflicting aircraft.

SAFETY ACTION

The safety issues identified during this investigation were communicated to the relevant organisations during the investigation. In addition, these organisations were given a draft report and asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue.

For a critical or significant safety issue, the Australian Transport Safety Bureau (ATSB) expects the relevant organisation(s) to take safety action to address the issue. If appropriate safety action is not taken, the ATSB may issue a formal safety recommendation or a safety advisory notice.

For a minor safety issue, the ATSB notes that the associated risk is considered broadly acceptable. The ATSB still encourages the relevant organisation(s) to take safety action, but it does

not issue a formal recommendation or a safety advisory notice.

When the ATSB has been advised of safety action in response to a safety issue, it is published in the final report.

Department of Defence

Compromised separation recovery training

Significant safety issue

Department of Defence's air traffic controllers had not received training in compromised separation recovery techniques.

Action taken by the Department of Defence

Following the incident, all Department of Defence (DoD) air traffic control flights initiated directed controller briefings and lessons with oral testing in addition to written theory regarding the provisions of MATS relating to safety alerts. Subsequently, they also introduced regular (fortnightly on average) scenario-based questioning of controllers on safety alerting.

The DoD reported that:

All four safety alert criteria (Restricted Airspace, Terrain, Obstructions and other aircraft) have been cyclically addressed including interactive discussion of the issues likely to be faced by aircrew and priorities for controllers. An increased focus on safety alerting has been included in ground school and On the Job Training material. The result has been a marked increase in use of safety alerting when required and a higher fidelity of standard and complete execution.

Safety alert phraseology has been given significantly greater emphasis in all core knowledge theory exam banks. Additionally the School of Air Traffic Control (SATC) advises that Compromised Separation Recovery Training (COMSERT) including the use of safety alerts has been given significant emphasis in initial and post graduate courseware.

The SATC has incorporated additional theory time on safety alerts in training course documentation and mandatory safety/traffic alerts in approximately 75% of simulator exercises for the Tower and Approach control elements. The correct use of safety alerts was a requirement for course graduation.

The DoD also advised that the development of COMSERT training for all ATC flights was in progress, with the objective to provide refresher training at each ATC operational location. When finalised, the training will be available to all Australian Defence Force air traffic controllers.

ATSB assessment

The ATSB is satisfied that the action taken by the DoD will satisfactorily address this safety issue.

Australian Defence Air Traffic System conflict alert function

Minor safety issue

An important alerting function within the Australian Defence Air Traffic System had been disabled at Williamtown to prevent nuisance alerts.

Action taken by the Department of Defence

Following the incident, the DoD conducted a trial of the Australian Defence Air Traffic System (ADATS) conflict alert function at Williamtown to validate the safety case that had previously determined that the functionality be disabled, due to numerous unavoidable, spurious alarms. After hazard identification and risk assessment, simulator testing of developed procedures, and Approach controller training, Williamtown commenced a 2-month trial of continual activation of the conflict alert function, across various traffic conditions.

Subsequent DoD investigations into the numerous conflict alert activations during that period indicated that the alert function did not assist controllers in the identification or resolution of traffic conflicts, and false alerts may have resulted in controller desensitisation. In addition, controllers were found to be distracted by the supplementary procedures required to avoid erroneous alerts.

Consequently, the DoD reported that the result of the conflict alert trial was the discontinuation of the enablement of the ADATS conflict alert function at Williamtown during military operations. The conflict alert function was enabled when military flying activity was not ongoing.

Williamtown local procedures

Minor safety issue

The Williamtown air traffic control procedures did not clearly define the separation responsibilities and coordination requirements between the Approach sectors for departing aircraft.

Action taken by the Department of Defence

The DoD reported that, following the occurrence, Williamtown air traffic control procedures were reviewed with integral changes to:

- The entry of silent coordination in label data to be differentiated between intended tracking and actual tracking;
- Handoffs to be defined as 'clean handoffs' unless otherwise coordinated; and
- Mandated voice coordination of crossing-track conflicts prior to the relaxation of vertical separation.

In addition, the DoD reported that it was continuing to review Williamtown air traffic control procedures on a regular basis.

Operator of the Israel Aircraft Industries Ltd Westwind 1124

Although not identified as a safety issue in this occurrence, the operator of the Israel Aircraft Industries Ltd Westwind 1124 aircraft advised that it was fitting Traffic Alert and Collision Avoidance System II to all of its aircraft involved in the Defence Support Contract, with two aircraft already fitted with the equipment and the remaining six aircraft to be equipped over the next year. The operator noted:

...that this safety action is beyond the current regulatory requirements and with the fitting of this equipment, the likelihood of a similar occurrence resulting in a mid-air collision would be significantly reduced.

SOURCES AND SUBMISSIONS

Sources of Information

The main sources of information during the investigation were the Williamtown controllers and the Department of Defence (DoD).

References

- Manual of Air Traffic Services.
- Australian Aeronautical Information Publication.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act 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 DoD, the Civil Aviation Safety Authority, the Approach High and Approach Low air traffic controllers and the operators of the two aircraft involved in the breakdown of separation.

Submissions were received from the DoD and one of the aircraft operators and were reviewed and where considered appropriate, the text of the report was amended accordingly.