Australian Government

Australian Transport Safety Bureau

Aviation Short Investigations Bulletin

Issue 58

Investigation

ATSB Transport Safety Report

Aviation Short Investigations

AB-2017-027

Final – 24 March 2017

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

Publishing information

Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, Australian Capital Territory 2601
Telephone: 1800 020 616, from overseas +61 2 6257 4150 (24 hours)
Accident and incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117, from overseas +61 2 6247 3117
Email: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

Contents

Jet aircraft

Turboprop aircraft

Helicopters

Separation issues

Communication issues

Jet aircraft

Severe turbulence involving Airbus A330, B-5921

What happened

On 28 November 2016, at about 1656 Coordinated Universal Time (UTC),[1] a China Eastern Airlines Airbus A330-243, registered B-5821, operating flight MU-777, departed Kunming, China, for Sydney, New South Wales. On board were 14 crew and 213 passengers.

As the aircraft approached Sydney, the flight crew commenced descent from flight level (FL) 370.[2] The flight crew advised the cabin crew of the descent and illuminated the seatbelt signs. The cabin crew manager announced to the passengers that the aircraft was on descent to Sydney and that as the seatbelt sign had been illuminated they needed to fasten their seatbelts. The cabin crew proceeded to check that passengers had their seatbelts fastened, starting from the front rows and moving towards the back of the cabin.

During descent, the flight crew diverted 5 NM from the flight route due to thunderstorms. Once clear of weather, they received instructions to descend via waypoint[3] BOREE.

At 0248 UTC at FL 230, about ten minutes after the seatbelt sign had been illuminated, the aircraft experienced a severe turbulence event which lasted about 30 seconds. The flight crew commenced the turbulence checklist as per the quick reference handbook (QRH), starting with ‘ignition on’, but as the turbulence had stopped, the rest of checklist was not completed. They checked the flight instruments and engine indications, which were normal, so the flight was continued to Sydney.

Prior to the event, the cabin crew manager was at the back of the cabin checking seatbelts and observed four passengers without a seatbelt, one of whom was standing and reaching for their baggage. During the turbulence event, the cabin crew manager struck their back on a seat armrest. A cabin crewmember in front of the cabin crew manager fell to the ground. Two of the passengers without seatbelts struck their head on the ceiling. After the event, all cabin crewmembers returned to their seats.

After landing, at around 0314 UTC, a cabin crewmember informed the flight crew that there were eleven people who were injured, including three cabin crew. The aircraft sustained minor damage to the interior cabin above row 42, 64, 65, and 68 (Figure 1).

---

[1] Coordinated Universal Time (abbreviated UTC) is the time zone used for civil aviation. Local time zones around the world can be expressed as positive or negative offsets from UTC.

[2] At altitudes above 10,000 ft, an aircraft’s height above mean sea level is referred to as a flight level (FL). FL370 equates to 37,000 ft.

[3] A pre-determined geographic position in airspace.

Figure 1: Damage to cabin (row 42, and 68 passenger service unit)

Source: Operator (annotated by the ATSB)

Captain's comments

The captain provided the following comments:

- On approach to Sydney, the crew did not receive any reports regarding turbulence. They did observe other aircraft divert to avoid the thunderstorms.
- Once they completed the diversion around the thunderstorms, there was no further weather on the radar.
- During the descent, there was some cloud scattered, but no dangerous weather, because they had diverted from the thunderstorms 5–8 minutes earlier.
- The turbulence they experienced was different to any turbulence they experienced before, as it was very short, but very strong.
- As the turbulence event was very short, they did not report it to ATC.
- During the turbulence, there was little change in airspeed or rate of descent.
- The flight crew did not realise that there were any issues within the cabin until after landing. Normally, they would be notified by the cabin crew if there were injuries.
- The flight crew did not make any announcement to passengers, nor cabin crew about the turbulence, as they did not have any warning.

Cabin crew manager comments

The cabin crew manager provided the following comments:

- The seatbelt sign had been switched on about 10 minutes before the turbulence.
- The cabin crew were preparing the aircraft for landing, and ensuring that passengers had their seatbelts on, when the turbulence event occurred.
- The cabin crew did not notify the captain until after landing as the cabin crew manager was injured and they were aware the flight crew were preparing for landing.
- The cabin crew had to keep encouraging passengers to fasten their seatbelts during the flight.

Flight data

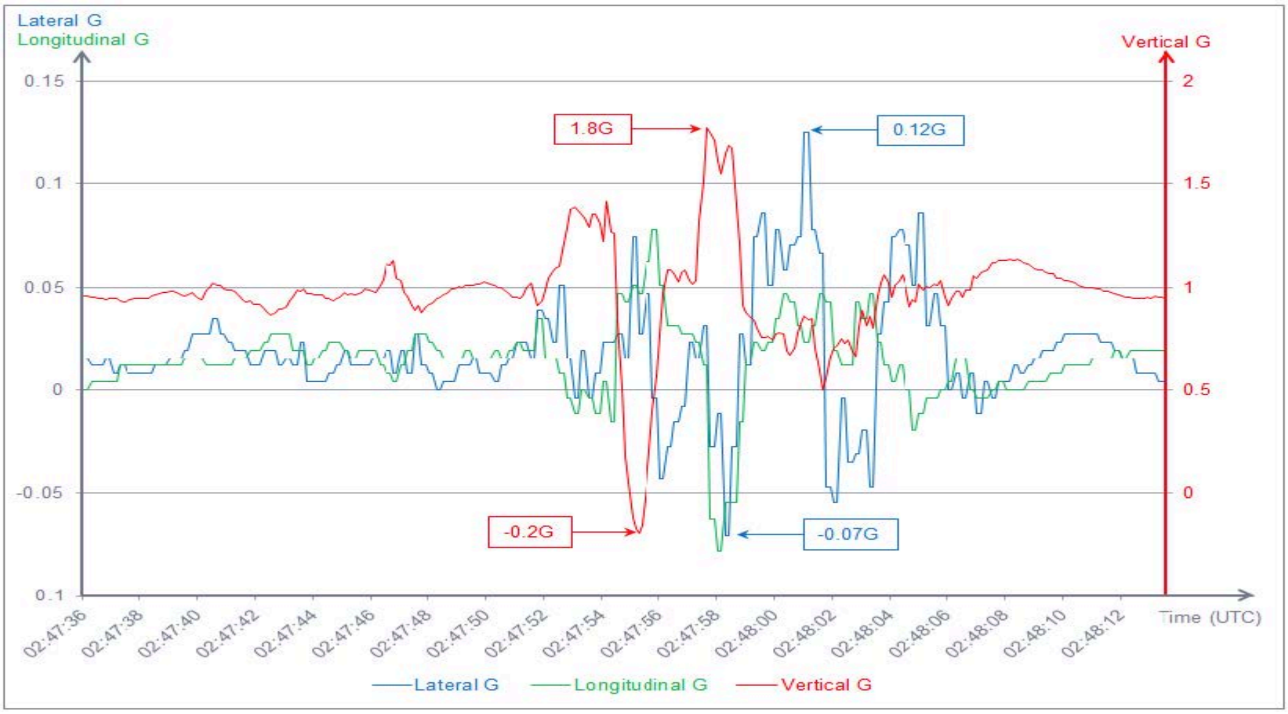
The aircraft manufacturer provided the ATSB with a report of the data extracted from the digital flight data recorder (DFDR). The data shows that when the aircraft encountered the turbulence, the vertical G[4] loadings varied between -0.20 G and 1.8 G and the lateral G loadings varied

[4] G load: the nominal value for acceleration. In flight, g load represent the combined effects of flight manoeuvring loads and turbulence and can have a positive or negative value.

between -0.07 G and 0.12 G (Figure 2). The calculated longitudinal wind varied between around 15 kt tailwind and 5 kt headwind and the lateral wind varied between 20 kt right and 5 kt left. The vertical wind reached a maximum of about 3,100 feet per minute updraft (Figure 3). During the turbulence, the autopilot stayed engaged and the load factors experienced during the turbulence did not exceed the limits of the aircraft.

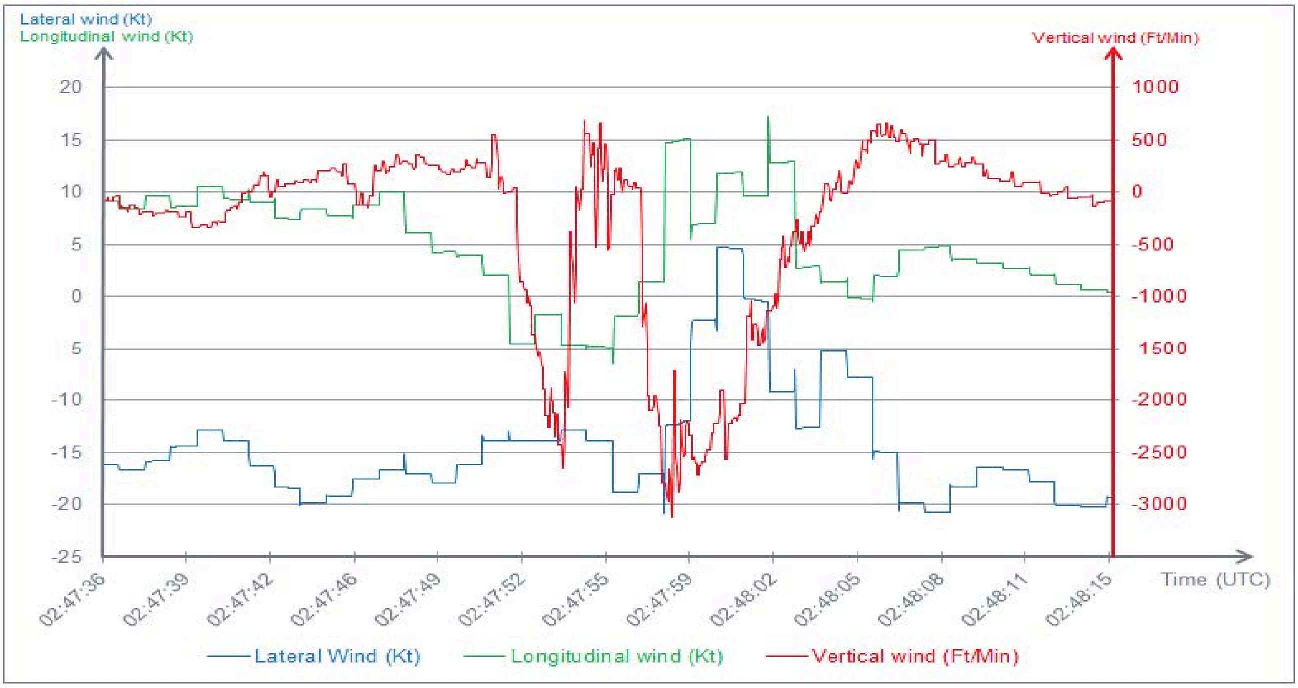
The rapid changes to wind speed and direction confirm the aircraft encountered turbulence conditions.

Figure 2: G Loadings during turbulence



Source: Airbus

Figure 3: Wind variation during turbulence



Source: Airbus

Bureau of Meteorology report

The Bureau of Meteorology (BoM) provided the ATSB with a report detailing the weather at the time of the incident, including conditions, the weather forecast, warnings, and satellite and radar imagery.

The report showed that there were light winds between 20 to 30 kt from FL180 to FL450. There was no significant weather at the time of the turbulence.

It is likely that the turbulence encountered was the result of developing thunderstorms in the area.

Clear air turbulence

Clear air turbulence (CAT) is defined as sudden severe turbulence occurring in cloudless regions that causes violent buffeting of aircraft.

CAT can be serious, because it is not shown on weather radar, meaning it is difficult for pilots, air traffic controllers, and weather forecasters to detect. It can also occur when no clouds are visible. It is common at high altitudes, especially in the vicinity of jetstreams.

Previous occurrences

A search of the ATSB database found the following occurrences where aircraft encountered clear air turbulence resulting in injuries on board:

- On 27 October 2000, a Boeing 747 encountered clear air turbulence en route from Sydney to Osaka, Japan (ATSB investigation 200005031). Although the weather forecast indicated thunderstorms within 110 NM of the flight route there was no turbulence forecast. When the CAT stuck, the seatbelt sign was not illuminated, and people were moving about the cabin. Two passengers sustained broken ankles.
- On 10 May 2013, a Bombardier DHC-8 encountered clear air turbulence about 49 NM north of Townsville, Queensland (ATSB investigation AO-2013-084). The turbulence lasted about 10 seconds. The crew did not observe any cloud and the weather radar did not show any significant weather for the entire flight. Two cabin crew members who were standing at the time sustained head injuries, one of whom was knocked unconscious. Two flight crew sustained minor injuries when objects were thrown around the flight deck.

Safety analysis

The aircraft encountered unforecast CAT about ten minutes after the seatbelt sign had been illuminated for the descent into Sydney. The cabin crew were preparing the cabin for landing. A number of passengers and members of the cabin crew, towards the back of the aircraft, who were not wearing seatbelts, were injured during the CAT event. They sustained head, neck, hand, back, and abdominal injuries.

Finding

This finding should not be read as apportioning blame or liability to any particular organisation or individual.

- The aircraft encountered CAT. The cabin crew and passengers who were injured during the turbulence did not have seatbelts fastened, despite the seatbelt sign being switched on.

Safety message

A clear air turbulence encounter can be a surprising experience for both crew and passengers. A safety bulletin published by the ATSB *Staying safe against in-flight turbulence*, noted that almost all turbulence injuries involved people who are not properly seated and do not have their seatbelt fastened. This incident is a timely reminder of the importance of having the seatbelt fasted when the seatbelt sign is switched on and to pay attention to instructions given by the cabin crew, so that injuries during a turbulence encounter can be minimised.

General details

Occurrence details

Date and time:	29 November 2016 – 1345 ESuT	
Occurrence category:	Incident	
Primary occurrence type:	Turbulence	
Location:	Near Sydney Airport	
	Latitude: 33° 56.77' S	Longitude: 151° 10.63' E

Aircraft details

Manufacturer and model:	Airbus A330	
Registration:	B-5921	
Operator:	China Eastern Yunnan Airlines	
Serial number:	1402	
Type of operation:	Air Transport – High capacity	
Persons on board:	Crew – 14	Passengers – 213
Injuries:	Crew – 3 (minor)	Passengers – 8 (minor)
Aircraft damage:	Minor	

Loading related event involving Airbus A320, VH-VQC

What happened

On 29 October 2016, an Airbus A320 registered VH-VQC, approached Gold Coast Airport, Queensland, prior to operating Jetstar flight JQ407 from Gold Coast to Sydney, New South Wales.

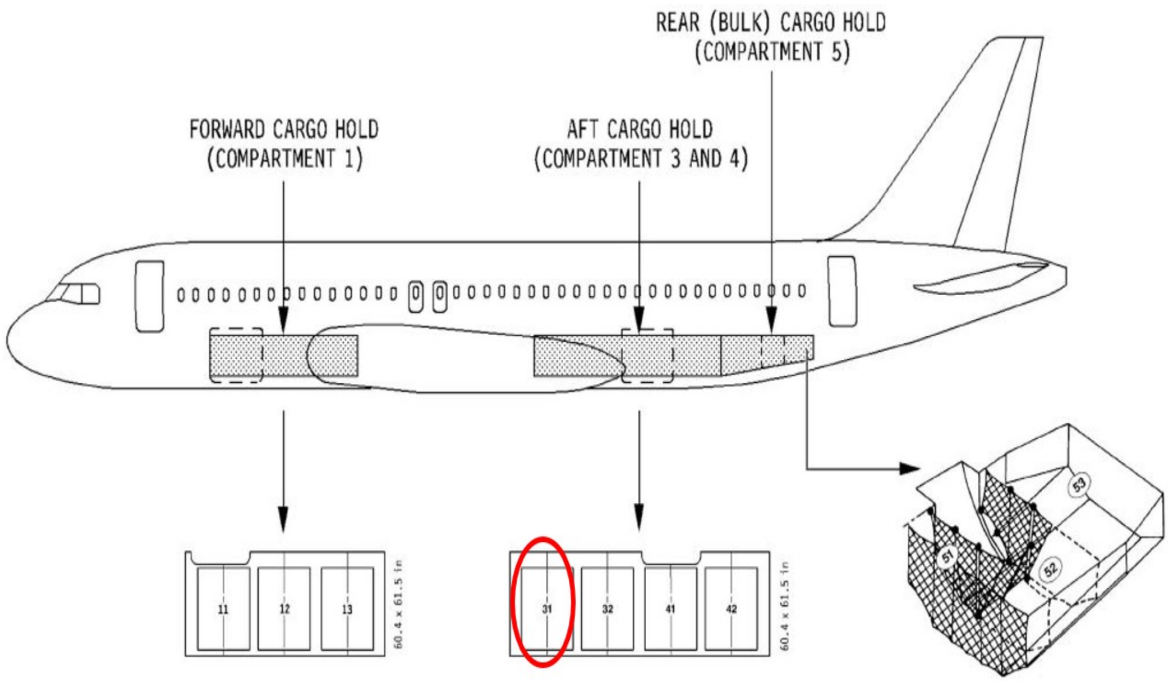
In preparation for the aircraft's arrival, the ground crew leading hand checked whether the pit load sheet[1] from the previous destination had arrived. This would allow the crew to be better prepared to unload the aircraft. As it had not, the leading hand went to assist loader operator 1 in preparing the bay for the aircraft's arrival.

At about 1050 Eastern Standard Time (EST), 20 minutes before the aircraft's arrival, the leading hand received a call detailing the requirements for the aircraft. These requirements included two lifts for passengers who could not board the aircraft using the portable stairs, a non-standard toilet clean and an aircraft water top up. The ground crew were also advised that the aircraft would arrive 3 minutes later than scheduled.

About 7 minutes prior to the aircraft's arrival, the leading hand again checked whether the pit load sheet had arrived, it had not.

Once the aircraft arrived, the leading hand estimated the unloading would require three dollies[2] and retrieved the dollies to unload the aircraft. Loader operator 1 unloaded containers from positions 41, 42, and 32 (Figure 1). Both loader operator 1 and the leading hand assumed only three containers needed to be unloaded.

Figure 1: Aircraft hold positions (with position 31 highlighted)



Source: Operator (modified by the ATSB)

1 A document detailing the actual loads in the aircraft's compartments.

2 A flatbed trolley used to load and unload containers from the aircraft.

After unloading, the loading procedures require a check of the aircraft hold to confirm if there are any containers remaining in the hold. The loader operator 1 reported checking the hold, however as they were walking towards the hold door, watching their footing, they did not detect a container in position 31. The leading hand witnessed loader operator 1 checking the aircraft hold and assumed all containers had been unloaded.

Loader operator 1 then turned the loader around, and unloaded the container in the front of the aircraft (which was staying on the aircraft) and reloaded it at position 11. During that time, they inadvertently put the yellow copy of the underfloor load advice (ULA) [3] sheet in their pocket, rather than on the clipboard as is required. As loader operator 1 repositioned the loader at the rear of the aircraft, they received the request for a passenger lift, and they left the loader, to organise the lift. After organising the lift, loader operator 1 went to complete the clean of the two rear toilets, which took between 5–10 minutes. At the same time, loader operator 2 assisted with the aircraft water top up.

After cleaning the aircraft's toilets, loader operator 1 observed loader operator 2 on the loader continuing the loading process. Loader operator 2 presumed that loader operator 1 had started the loading process and had already loaded a container in position 31. They loaded containers in position 42 and 32, using the information on the container destination cards, as they did not have the yellow ULA copy, and ensured all the locks were engaged. Loader operator 1 then completed the yellow ULA copy using the bingo cards,[4] but they were not aware of the container at position 31.

The leading hand observed loader operator 2 entering the rear hold and assumed that they were checking the locks, which they were doing. As the leading hand had previously worked with the loader operator, they trusted them to have completed the lock check.[5] Loader operator 1 signed the yellow copy of the ULA and handed it to the leading hand for crosschecking. The leading hand checked the yellow copy against their white copy. As both copies matched, they assumed the aircraft was loaded correctly.

The leading hand then proceeded to the flight deck to hand the paperwork to the captain and confirmed that all locks had been engaged.

While pushing the aircraft back, the leading hand received a call advising that the aircraft had been correctly loaded for the previous flight in Cairns and that 20 bags had been reported missing. The duty manager also contacted the leading hand to confirm if all containers had been unloaded, which the leading hand confirmed.

After the aircraft departed the bay, the leading hand and loader operator 1 considered the possibility that a container may have been left on the aircraft. They recalled that all areas had been checked. The leading hand contacted loader operator 2 assisting on the loader who confirmed that there was a container in position 31, however they assumed it had been loaded prior to them taking over the loading of that hold. The duty manager contacted company personnel in Cairns, who provided a pit load sheet for the previous flight. The pit load sheet confirmed there was a container in position 31 with 40 bags that should have been unloaded at Gold Coast Airport.

At about 1230 EST during the cruise, the flight crew received an aircraft communications addressing and reporting system (ACARS) message advising that there was an extra container in position 31. The container weighed about 360kg and had not been included in the aircraft take-off performance calculations.

---

3 A triplicate carbonised form to be completed with details of the number of bags and cargo loaded into each underfloor position. It consists of a provisional (pink) copy, loader (yellow) copy, and final (white) copy. The yellow copy is completed by the loader operator during the loading process.

4 A card for every item of baggage that has a passenger name, flight number, and destination.

5 A check completed by ground staff to ensure containers are secure after loading.

Prior to being advised of the extra container, the flight crew determined the aircraft take-off weight to be 62,844 kg and the take-off trim[6] position to be 0.4 degrees nose down. After being advised of the extra container, the flight crew recalculated the aircraft weight and trim to be 63,204 kg and 0.5 degrees nose down. The recalculated weight and trim showed that the aircraft was within all weight and balance limitations.

The flight proceeded to Sydney without further incident.

Loading procedures

Jetstar's ground operations procedures include the following steps:

- All compartments must be checked and confirmed as empty, including the bulk hold, on all arrivals after unloading.
- If a position in the cargo hold is labelled as 'Nil fit' (empty), then the loader operator is required to inspect the position. The leading hand is then required to visually inspect the nil fit positon and initial the loader copy to show it has been inspected.
- As containers are progressively loaded, the loader operator must notate on the ULA container serial number, destination, contents, and tick loaded and locks up.

Leading hand comments

The leading hand provided the following comments:

- It is unusual for a loader operator to complete a different task.
- The leading hand and two loader operators had worked together previously. This led to a lot of trust within the group.
- At the time, there were also two off-schedule aircraft being handled. This resulted in no extra staff being available to assist with the servicing of the aircraft.
- The other tasks to be completed (lift, water top up, and toilet clean) during the unloading had taken a lot of time and created pressure, which may have led to short cuts being taken.
- They had not come across through-freight before, normally they just take all containers off the aircraft. This particular through-freight needed to have the destination card completed and this created a distraction.
- When they realised that loader operator 2 had not been using the yellow ULA to load the aircraft, they considered unloading the aircraft and restarting the loading process. As they were already running late, they decided against this.
- They were experiencing personal issues on the day, but does not believe they were contributory to the incident.

Loader operator 1 comments

Loader operator 1 provided the following comments:

- Normally when they operate as loader operator, they have always fully loaded or fully unloaded the aircraft.
- During unloading, if you are standing at the controls of the loader you cannot see position 31, only part of 32, and positions 41, and 42. It is only when you walk into the compartment door, or stand on the very edge of the loader at the door are you able to see position 31.
- They were feeling fatigued on the day due to a lack of, and poor quality sleep the previous night. They were also feeling a little dehydrated at the time.

Captain's comments

The captain provided the following comments:

---

6 Part of an aircraft control surface for stabilisation

- The pilot flying commented that during the take-off, they did not notice any unusual aircraft behaviour and did not detect the incorrect trim setting.
- They had used a higher take-off weight than required, to allow for last minute adjustments in the passenger loads. This meant that the extra weight did not have much effect on the flight.

Ground handling operator internal report

The ground handling operator internal report found the following:

- Initially, loader operator 1 was not aware that loader operator 2 had commenced the loading as they were still cleaning. Therefore, they did not offer the yellow copy of the ULA.
- There was a revision to the Standard Underfloor Load Advice Procedures for both leading hand and loader operators to commence from 13 October 2016. One of the changes was that loader operators are to complete the yellow ULA copy progressively as containers are loaded. This was not adhered to during the loading process.

Previous occurrences

A search of the ATSB database of previous loading related occurrences involving incorrect load or weight on the aircraft were detected, particularly when crew were under time pressures and procedures were not followed to resolve discrepancies:

- 8 May 2014: During unloading, unmanifested baggage in the front hold of the aircraft was detected from the previous flight. The dispatcher did not check the front hold due to time pressures from the short turnaround times.
- Loading related event, Bali, Indonesia, 26 May 2014 (ATSB investigation AO-2014-110).[7] A Boeing 737 aircraft was being loaded at Bali Airport for a flight to Melbourne, Victoria. Due to the time restrictions, the ground staff were unable to load all of the bags for the flight before aircraft had to be prepared for departure. The load controller assessed that a total of 93 bags had been loaded and the flight documents produced were using that figure. About 30 minutes after the aircraft departed Bali, the ground handler advised network operations and load control that the final baggage numbers were incorrect. The total number of bags loaded onto the aircraft was 189 instead of 93, which an estimated additional weight of about 1,600 kg. Prior to loading, the ground crew were under time pressure due to the flight already being delayed, breakdown of baggage belt, and scheduled closure of the runway and impending airport curfew.
- Loading event, Sydney Airport, NSW, 8 September 2016 (ATSB investigation AO-2016-119).[8] An Airbus A320 was being loaded at Sydney for a flight to Brisbane, Queensland. The leading hand received the deadload weight statement (DWS) and checked the containers. The third container number (1483) did not match the number listed on the DWS (4183), nor the container card (4183). The leading hand assumed that the freight handler had inadvertently transposed the numbers incorrectly and amended the card and DWS with 1483 and continued loading. When the aircraft was unloaded in Brisbane, it was found that the incorrect container (1483) was delivered and was nearly 650kg heavier than container 4183. The loading procedure if the DWS is incorrect, is that the container must not be loaded onto the aircraft. The leading hand noted that the short turnaround time and the flight was the last one of the day led to procedures being bypassed.
- Loading event, Brisbane Airport, Qld, 19 October 2015 (ATSB investigation AO-2015-189).[9] During boarding, the flight crew were notified of a discrepancy between passenger numbers, but later advised the issued had been resolved. After the passenger count during the flight, it was found that the aircraft departed with 16 more passengers than advised. The investigation is continuing.

---

[7] www.atsb.gov.au/publications/investigation_reports/2014/aair/ao-2014-110/

[8] www.atsb.gov.au/publications/investigation_reports/2016/aair/ao-2016-119/

[9] www.atsb.gov.au/publications/investigation_reports/2015/aair/ao-2015-139/

Safety analysis

The first step in the ground handling operator's aircraft loading procedures involve obtaining a pit load sheet, if available. If the load sheet is not available, then the ground crew can contact the ground operations controller. The ground crew attempted to contact the ground operations controllers, but they were unavailable at the time of this occurrence. These are the only two sources that can provide accurate load information. The investigation was unable to determine why the pit load sheet was not provided.

After unloading, all compartments are to be checked and confirmed as empty. Loader operator 1 did check the hold, but did not see the container in position 31. The leading hand witnessed loader operator 1 checking the hold, but did not check the hold themselves.

Loader operator 1 had commenced the loading and was called away with the yellow ULA copy in their pocket, as opposed to on the clipboard in the loader per normal. Because loader operator 2 continued the loading process, they assumed that any containers on the aircraft had been pre-loaded. This assumption was reinforced as the yellow copy was with loader operator 1. Therefore, load operator 2 completed the loading without the yellow copy and did not complete the sheet as containers were loaded. There was also no communication between the two loader operators on how much of the task had been completed.

When a position is identified as empty on the ULA, the loader operator and leading hand are to check the position is empty and initial it on the yellow copy. The loader operator 1 had commenced the loading process but did not complete the process, nor did they check all the containers once they had been loaded. The leading hand also did not check position 31 though it was marked as empty.

On that day, the ground crew were required to complete additional tasks, including putting in a lift, toilet clean, and water top up. Ordinarily, the leading hand would have asked another team to complete the toilet clean in order to keep the loader operator on that task. It is unusual to have a leading hand complete a different task. The leading hand did call for assistance, but as there were two off-scheduled aircraft also being turned around at the time, no assistance was available Furthermore, the leading hand reported feeling rushed because of the extra tasks to be completed during the 30 minute turnaround, and this contributed to the checks not being completed.

Findings

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

- The lack of loading documentation received at the Gold Coast resulted in the ground crew not knowing the number of containers to be off-loaded from the aircraft. Loader operator 1 did not detect the container in position 31 as they checked to ensure the hold was empty.
- The loader operator and leading hand did not adequately check the containers during the loading process, leading to the container in position 31 not being noticed.
- The individual conducting the loader operator role changed during the loading of the aircraft, which likely led to a misunderstanding of how much of the loading had been completed.
- The ground crew had additional tasks to complete during the unloading and a smaller ground team than normal, which led to the hold not being checked adequately.

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.

Ground handling operator

As a result of this occurrence, the ground handling operator has advised the ATSB that they have taken the following safety actions:

Ground handling operator's safety communications

The loader operator procedures have changed to include the following requirements:

- Physically touch each bulkhead wall after unloading is completed, to ensure no containers are left inside the aircraft.
- If there is no leading hand present, then no movement by the loader machine including unloading/loading will be undertaken.
- If there is no yellow ULA, then no loading is to be completed.
- Yellow ULA must be completed as each container is loaded
- Yellow ULA must be handed to the leading hand for cross checking before the white ULA is taken to the crew.
- Standardised communication between loader operators and leading hand to confirm that all containers have been unloaded.
- The leading hand is to conduct a mandatory visual check to ensure unloading has been completed before any loading commences for the new outbound flight.

Safety message

This incident highlights the effect time pressures and workload can have during loading operations. The ATSB report: *Aircraft loading occurrences - July 2003 to June 2010* found that one reason unlisted cargo was loaded into an aircraft was time pressure where late arriving inbound traffic left little time for loading. This pressure is increased when airlines are under internal and external pressures to meet timeframes.

Overall, this investigation emphasises the importance of adhering to procedures during the completion of tasks and communication between fellow colleagues, particularly if there is a role changeover.

General details

Occurrence details

Date and time:	29 October 2016 – 1535 EST	
Occurrence category:	Incident	
Primary occurrence type:	Loading related	
Location:	Gold Coast Aerodrome	
	Latitude: 28° 09.87' S	Longitude: 153° 30.28' E

Aircraft details

Manufacturer and model:	Airbus A320-232	
Registration:	VH-VQC	
Operator:	Jetstar Airways	
Serial number:	3668	
Type of operation:	Air Transport – High Capacity	
Persons on board:	Crew – 6	Passengers – 155
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

Runway incursion involving Fokker F28 MK 100, and vehicle

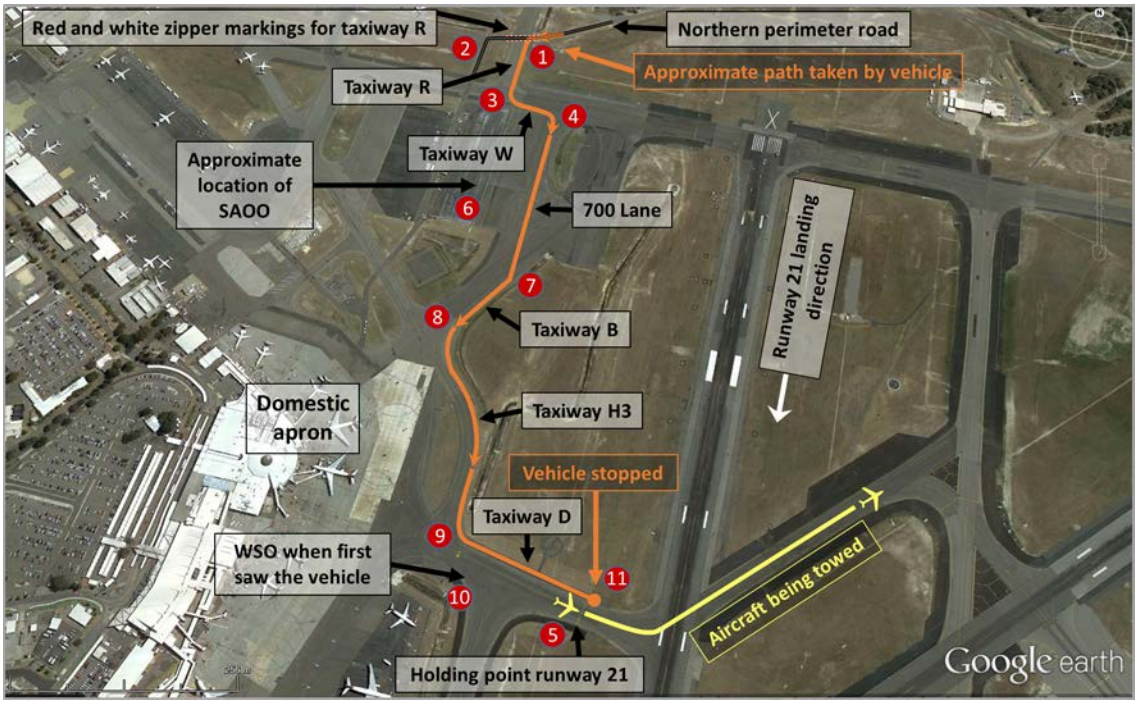
What happened

On 19 October 2016, at about 1037 Western Standard Time (WST), a vehicle was travelling along the northern perimeter road at Perth Airport, Western Australia. The vehicle had a driver and three passengers who were going to conduct a customs inspection on an aircraft, which was scheduled to depart Australia.

The driver had been advised that the aircraft would be parked on the international apron in preparation for the inspection. When the vehicle arrived at the international apron, the aircraft was not there, so the driver decided to show the other passengers some different areas of the airport while they waited for the aircraft to arrive.

As they drove towards the domestic apron, an area unfamiliar to the driver, the driver observed the aircraft that they were to meet, stationary in a position different to what was expected. They thought the aircraft was on the domestic apron, and instead of continuing along the northern perimeter road to the domestic apron, the driver turned left (Figure 1 item 1) and crossed the red and white zipper markings[1] that denote the road is crossing taxiway R (Figure 2). About another 50 m past taxiway R, was a left turn (item 2) for vehicles to access the domestic apron.

Figure 1: Airport map showing the path of the vehicle



Source: Google earth, modified by the ATSB

1 Unless directly involved in the servicing of an aircraft on a bay, vehicles must use the marked roadways for traversing the apron. Where white edge lines of the road turn into red and white chequered markings (referred to as zippers), denotes an active taxiway. The driver must stay clear of this part of the roadway when aircraft are using the taxiway. At taxiway R there were stop signs where vehicles must stop and check for aircraft before proceeding across the taxiway following the road.

Figure 2: Photo showing stop sign and red and white zipper markings that denote a taxiway like that for taxiway R

Source: Airport operator

Rather than being parked as assumed by the driver, the aircraft was actually being towed in company with two safety vehicles and was stationary at taxiway D holding point, waiting for clearance to cross-runway 21. The vehicle then turned left onto taxiway W (item 3) and then right onto the 700 lane (item 4). At about 1038, the surface movement controller (SMC) cleared the aircraft that was being towed (item 5), to cross runway 21. At about the same time, a senior airport operations officer (SAOO), who was in a vehicle and parked near the 700 lane (item 6), noticed the vehicle traveling along the 700 lane but was not able to identify it. The vehicle turned right onto taxiway B (item 7) and then left onto taxiway H3 (item 8).

At about 1040, the tower air traffic controller cleared a Fokker Aircraft F28 MK 100 aircraft (Fokker 100) that was on final approach, to land on runway 21.

At about the same time, the SAOO contacted the SMC to determine the identity of the vehicle that was just turning onto taxiway D (item 9). The SMC advised that they assumed that the vehicle was associated with works being conducted at the intersection of taxiways A and D. The vehicle was not fitted with a transponder. A transponder was not required for operating in the non-manoeuvring area of the airport, but the vehicle was displayed intermittently on the surface movement control system.[2]

A work safety officer (WSO), who was supervising a work site at the intersection of taxiways A and D heard this exchange and observed the vehicle in the rear-view mirror (item 10). They turned their vehicle around, and followed the unidentified vehicle that was traveling along the paved edge of taxiway D, towards the runway 21 holding point. As the vehicle should not have been there and did not appear to be stopping, the WSO used their vehicle's siren, horn and loudspeaker to alert the driver, and informed them that they were about to enter the runway and to stop immediately.

The vehicle passed over the holding point for runway 21 before it stopped. The vehicle stopped about two to three car lengths past the holding point (item 11). The WSO stopped about 5 m before the holding point and over the loudspeaker instructed the driver to go no further and to turn around. The WSO also advised the SMC that they were talking with the driver. The vehicle had

---

[2] The Advance Surface Movement Guidance and Control System (A-SMGCS) uses data sent from aircraft and ground vehicles fitted with a transponder. This data is displayed pictorially on a screen in front of the surface movement controller in the tower, showing the position of aircraft and ground vehicles on a map of the airport. Those vehicles that are not fitted with a transponder are detected with the surface movement radar and their position is shown on the same screen. The A-SMGCS did not generate an alert, as the vehicle did not enter the runway strip.

stopped about 20 m before the white gable markers that denote the runway strip. The vehicle did a hard right turn and crossed back over the holding point at about 10:41:05 (Figure 3). About 3 seconds later, the Fokker 100 aircraft that had just landed on runway 21, passed the vehicle position. At this time, the estimated distance between the vehicle and the Fokker 100 was about 100 m. The crew of the Fokker 100 did not notice the vehicle.

Figure 3: Location of Fokker 100 aircraft landing on runway 21 and vehicle as it crossed back over the taxiway delta holding point for runway 21

Source: Airport operator, modified by ATSB

Vehicle driver comment

The vehicle driver indicated that the three passengers were new to the airside area of Perth Airport and they had used the delay to show the passengers the charter area that was on the same side of the airport as the domestic terminal. As they were traveling back to the international terminal, the driver saw, in the distance, the aircraft that they were to meet. The driver indicated that they were not familiar with the domestic area of the airport where the incident occurred, and they were focused on the aircraft that they needed to meet to complete their job, which also had time constraints.

The driver reported that as they approached the runway, they had stopped to allow the landing aircraft to pass before they saw the flashing lights of the WSO vehicle.

The driver reported that during the training to obtain the authority to drive airside (ADA), they would take every opportunity to gain more experience but would generally go to the same places.

The vehicle was not fitted with a VHF radio to communicate on or hear any of the air traffic control frequencies, nor was it required to be, as it was only authorised to travel on the perimeter road and apron areas.

The driver advised that there was no airport map or airside driving manual located in the vehicle.

Work safety officer comment

The WSO advised that the vehicle did not seem to be slowing down as they crossed the holding point and only seemed to start to slow when the WSO commenced calling on the loudspeaker.

The driver seemed confused and was focused on getting to the aircraft to complete their inspection, rather than where they were on the airport.

Airport operator comment

The airport operator conducted an investigation into the incident and determined that:

- The vehicle was not fitted with a transponder, as the vehicle was not permitted to access the airport manoeuvring area.
- The vehicle driver was issued with a category 2 authority to drive airside (ADA) in April 2016, which included approval to drive on all aprons and roadways but was not permitted on any taxiways or runways.
- The actions of the vehicle driver in leaving the marked perimeter roadway, traversing several taxiways and then crossing a marked runway holding point, were the actions of an individual confused with their location on the airport.
- The lost procedures for Perth Airport are promulgated in the airport driver-training programme and the Airside drivers pocketbook.

Safety analysis

The driver observed the aircraft they were scheduled to inspect and thought they were stationary on the domestic apron. They did not realise that the aircraft was being towed and was stopped at the holding point for runway 21. The driver entered the taxiways without a clearance and without having authorisation to do so. They became confused and crossed the holding point for runway 21. The WSO used their vehicle's siren, horn, and loudspeaker to alert the driver, and informed them that they were about to enter the runway and to stop immediately.

The driver was focused on completing a time critical activity in an area of the airport that they were not familiar with. These probably combined to affect the driver's ability to recognise that the aircraft they were to meet was being towed and stationary on a taxiway and not parked on the apron. The driver also did not identify that they had turned off the perimeter road and traversed several taxiways before crossing a holding point and entering an active runway.

Findings

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

- The driver incorrectly assumed that the aircraft was parked on the domestic apron and in an effort to save time, entered several taxiways without the required approval and authorisation.
- The driver was confused with their location, as they were unfamiliar with that area of the airport, and continued traveling down taxiway D and crossed the holding point for runway 21 before the WSO stopped the vehicle.

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.

Airport operator

As a result of this occurrence, the airport operator has advised the ATSB that they are taking the following safety actions:

- A review of the zipper markings will be conducted in areas where taxiways cross roadways to provide an enhanced level of identification to airside drivers.
- The incident and lessons regarding airfield familiarity, lost procedures and general situational awareness will be communicated in an incident alert.
- Explore the option to implement an authority to drive airside (ADA) 'zoning system', to include a review of all organisations and their requirement to access different areas of the airport.

- Review the system of ADA categories to determine if there is scope to implement a system that controls the access of particular organisations to prevent them from entering areas that they do not have a requirement to regularly access.

Safety message

The International Civil Aviation Organisation (ICAO) has identified runway safety as one of its priorities and has been working with countries and aviation organisations globally to reduce runway safety accidents. ICAO has developed a runway safety website, which offers a range of information and products to assist the aviation community to improve runway safety.

In addition, ICAO has published a *Manual on the Prevention of Runway Incursions Doc 9870 AN/463* and this is available from the ICAO website. The manual includes information on the prevention of runway incursions. The manual discuses that deficiencies in design, training, technology, procedures, regulations and human performance can result in a system break down and safety being compromised. It is important in a complex and dynamic airport environment that all people working in that environment remain vigilant, maintain open communications, and use the systems in place to minimise the risk of a system break down.

Additional information on runway safety is also available from the Airservices Australia webpage Runway safety.

In addition, Airservices Australia has published a guide for airside drivers, *The Airside Drivers Guide to Runway Safety*, which focuses on four aspects of operating safely on an aerodrome:

1. planning your aerodrome operation
2. aerodrome procedures
3. communications
4. aerodrome markings, signs and lights.

General details

Occurrence details

Date and time:	19 October 2016– 1041 WST	
Occurrence category:	Incident	
Primary occurrence type:	Runway incursion	
Location:	Perth Airport, Western Australia	
	Latitude: S 31° 56.42' S	Longitude: 115° 58.02' E

Turboprop aircraft

Fumes event involving Bombardier DHC-8, VH-SBB

What happened

At about 0936 Central Daylight-saving Time (CDT) on 10 November 2016, a QantasLink Bombardier DHC-8-315 aircraft, registered VH-SBB (SBB), was on approach to Adelaide Airport South Australia. Two flight crew, two cabin crew and 43 passengers were on board the regular public transport flight.

At this time, the flight crew contacted air traffic control and informed the approach controller that they were at 9,000 ft. Soon after, the first officer, who was the pilot flying,[1] noticed that the captain's electronic attitude director indicator (EADI) screen had gone blank. The flight crew conducted the display failure checklist. As the captain turned the EADI screen off, they noticed the screen return to normal for about five seconds and then the entire screen pulsed on and off, before returning to a blank state.

The flight crew were then cleared to descend by air traffic control and at about 6,000 ft they noticed a faint electrical smell. They were not able to identify the source of the smell, but suspected that it originated from the failed EADI screen.

The cabin crew had prepared the cabin for landing and all passengers and the two cabin crew were seated. The flight crew contacted the cabin crew through the aircraft's intercom and informed them that there was a smell in the cockpit. The cabin crew reported that they had not identified any unusual smells where they were seated at the rear of the aircraft.

The flight crew were cleared by air traffic control to conduct a visual approach for a landing on runway 12.

The flight crew determined that the smell was getting worse and conducted their phase one-memory checklist items for a fuselage fire or smoke. Both flight crew fitted their oxygen masks and smoke goggles and turned off the air-conditioning recirculation fans for the flight deck and the cabin.

One of the cabin crew went to the forward area of the cabin and could smell an electrical smell that did not go past row one and reported this to the flight crew. At this stage, the flight crew informed them that they were using their supplemental oxygen.

At about 0943, the flight crew made a PAN PAN[2] call to air traffic control and advised that they had an instrument failure and electrical smell. As the aircraft was already, established on approach for runway 12 they were cleared to land by air traffic control. As the electrical smell was increasing in intensity, the flight crew advised the tower controller that they would require emergency services on standby.

The aircraft landed, taxied onto taxiway E and stopped just past the holding point clear of runway 12 (Figure 1). The first officer made an alert announcement through the aircraft's public announcement (PA) system that informed the passengers to remain seated and await further instructions. The PA also signalled to the cabin crew that there was an abnormal situation that may require an emergency or precautionary evacuation. The flight crew contacted one of the cabin crew using the intercom and the cabin crew informed them that the smell in the cabin was

---

1 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.

2 PAN PAN: an internationally recognised radio call announcing an urgency condition which concerns the safety of an aircraft or its occupants but where the flight crew does not require immediate assistance.

getting stronger and that there were no other issues in the cabin. The flight crew contacted the ground controller at about 0950 to inform them that they would be conducting an evacuation at their position on the taxiway. They then conducted the precautionary disembarkation checklist. When the engine propellers had stopped, the captain made the precautionary disembarkation PA. The cabin crew at the front of the aircraft opened the main entry door and directed the passengers towards the airport safety officers that were located on the grassed area near the taxiway. The first officer disembarked the aircraft after the twelfth passenger and also directed the passengers to the grass area where the airport safety officers were located.

Figure 1: SBB parked on taxiway E after the crew and passengers had disembarked

Source: Airport operator

When all passengers had disembarked, the captain and cabin crew disembarked the aircraft with their emergency equipment. The captain briefed the airport fire fighters about the nature of the fumes. The fire fighters informed the captain that no toxic fumes or hot spots were detected although they were able to smell the strong electrical smell.

There were no injuries as a result of the occurrence and the aircraft was not damaged.

Captain's comment

The captain reported practicing emergency procedures about four months prior to the occurrence when conducting simulator training. They commented how valuable that training was to be prepared for this type of occurrence. The captain indicated that the operator provided different tools for different situations. In this emergency, the captain reported using the GRADE model (gather information, review information, analyse alternatives, decide and evaluate the outcome of the action) and that it was helpful to evaluate the situation and decisions to ensure that there was a safe outcome.

The captain indicated that there were no issues with the communication between the flight crew and the cabin crew and that everyone worked together well.

Cabin crew comment

A member of the cabin crew reported that before the disembarkation, the passengers remained seated and calm. Most passengers followed the instructions to leave everything with only 2 or 3 people taking small bags from the aircraft. They advised that everything went smoothly, in accordance with their training and that they worked well as a team.

Aircraft operator comment

The aircraft operator reported that the electronic attitude director indicator (EADI) had failed. The fumes were caused by damage to a circuit card assembly due to a blown resistor on the video driver. There was no damage to any other aircraft parts or components.

Findings

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

- The captain's electronic attitude director indicator (EADI) failed, resulting in fumes in the aircraft.
- As a result of the fumes in the aircraft, the crew reduced the potential risk to the aircraft occupants by conducting a precautionary disembarkation onto a taxiway.

Safety message

Many factors come into play when pilots make decisions in the aviation environment. There are many different models and tools that pilots can use for effective decision making, such as GRADE, as was used by the captain in this event. The models involve a systematic approach to decision making, to consistently determine the best course of action in response to a given situation.

An understanding of the decision-making process provides a pilot with a foundation for developing aeronautical decision-making skills. Some situations require a pilot to respond immediately using established procedures, with little time for detailed analysis. These decisions are based upon training, experience, and recognition. Other situations require a more reflective response, where greater analysis is necessary.

Additional information is provided in the following publication:

US Federal Aviation Administration (FAA), *Pilot's handbook of aeronautical knowledge*, *Chapter 2: Aeronautical decision-making,* available from the FAA website.

General details

Occurrence details

Date and time:	10 November 2016 – 0940 CDT	
Occurrence category:	Incident	
Primary occurrence type:	Fumes	
Location:	near Adelaide Airport, South Australia	
	Latitude: 34° 56.70'S	Longitude: 138° 31.83' E

Aircraft details – VH-SBB

Manufacturer and model:	Bombardier Inc	
Registration:	VH-SBB	
Operator:	Eastern Australia Airlines trading as QantasLink	
Serial number:	539	
Type of operation:	Air transport high capacity - passenger	
Persons on board:	Crew – 4	Passengers – 43
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

Near collision involving Hawker Beechcraft Corporation B300C, VH-NAO, and a work safety officer

What happened

At about 2310 Eastern Standard Time (EST), a Hawker Beechcraft Corporation B300C, registered VH-NAO (NAO), taxied at Sydney Airport, New South Wales (NSW) for a flight to Coffs Harbour, NSW to retrieve a patient. On board were the pilot and three medical staff. The weather was fine and clear.

The pilot made a taxi call and air traffic control (ATC) cleared NAO to taxi from the domestic 5 apron where the aircraft was parked, with a requirement to give way to an inbound company aircraft (taxiing to the domestic 5 apron) and hold short of taxiway delta.

At about the time that NAO taxied, activities commenced in association with planned aerodrome works near the intersection of taxiways golf, charlie and domestic 2 (see Figure 1). Two work safety officers moved to the area in separate vehicles to establish the worksite. Establishment of the worksite included placement of red lights across affected taxiways and covering (taping over) existing green taxiway centre-line and lead-in lighting. Placement of red lights and covering of existing lights was intended to delineate the closed areas of affected taxiways.

Figure 1: Excerpt from aerodrome chart showing the location of the relevant taxiways

Source: Airservices, modified by the ATSB

Other aerodrome works activities required the closure of runway 16R, north of golf. Associated with that work, the controller switched off the runway lights north of the intersection of the runway with golf. Additionally, runway 07/25 was closed.

Once the inbound company aircraft was clear, the pilot of NAO was given further taxi clearance. The cleared route was intended to take the aircraft around the worksite that was being established, and to approach runway 16R at the point from which the aircraft could depart. The pilot was cleared as follows:

> *…taxi golf, bravo 4, and then left at bravo to the golf holding point runway 16R, just to go around the worksite.*

After placing red lights at the eastern and western ends of the worksite on golf, a safety officer moved to the northern end of the worksite on charlie. The safety officer parked the vehicle on the centreline of charlie, facing west across the taxiway, and commenced placing red lights across the taxiway between the position of the vehicle and where charlie meets bravo 4. By then, NAO was on bravo 4, and the safety officer was aware of the location and expected taxi route of the aircraft.

Soon after the safety officer commenced placing red lights across charlie, the pilot contacted ATC to confirm the instruction to turn left into bravo, then back onto golf. The controller advised the pilot that they were 'just crossing charlie now, so bravo is just coming up on your left, about 50 m, and then you'll be right into golf'. At that point, the pilot believed that they had already passed charlie, and were now required to make a sharp left turn into bravo, following the green taxiway lights.

The pilot turned left, believing that they were entering bravo, where in fact, the aircraft was entering charlie, in the area where the safety officer was in the process of placing red lights. As the pilot made the turn, they were not aware of the position of the safety officer, who by then had placed four of seven red lights across charlie. The safety offer saw that NAO had turned onto charlie and waved at the pilot believing that the aircraft would stop. The pilot did not report seeing the safety officer, but saw the vehicle and manoeuvred the aircraft to the western side of the centreline to pass the vehicle. The left wing tip of the aircraft passed about 2 to 3 m from the safety officer who moved further out the way as the aircraft passed. At the time, the vehicle warning beacon was operating and the headlights were on. The safety officer was wearing a high visibility vest.

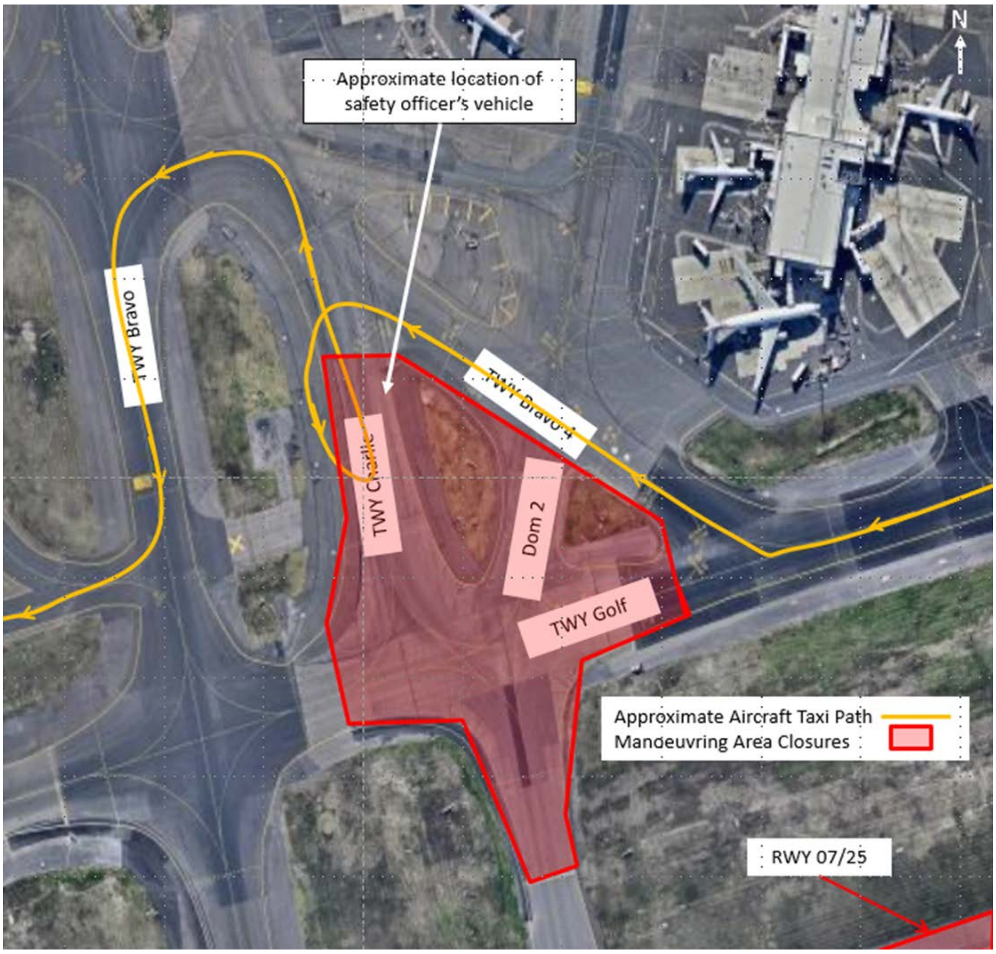
About ten seconds after advising the pilot of NAO that they were crossing charlie, and that bravo was a further 50 m ahead, the controller observed the aircraft turning into charlie. The controller immediately advised the pilot that the aircraft was heading towards the worksite, and restated the requirement to 'continue to the north-west on bravo 4, and then bravo will be on your left'. The pilot advised the controller that the situation was 'confusing' and that they would turn around. The controller informed the pilot that there were safety vehicles in the area that could provide assistance if required. The pilot declined that offer, and advised the controller that they would 'just get round this one', confirming that the safety vehicle on charlie was sighted.

The pilot made a 180 degree turn on charlie and headed north, back towards bravo 4. The safety officer saw that NAO was returning and moved the vehicle off the centre line. The pilot passed the vehicle and taxied onto bravo 4, before making a left turn onto bravo, as initially intended. The approximate taxi path of the aircraft and the position of the safety vehicle at the time the aircraft entered charlie are shown in Figure 2.

The pilot taxied southward on bravo, but turned right towards runway 16R on bravo 6, contrary to the clearance which was to taxi to the runway holding point on golf. ATC advised the pilot that the aircraft appeared to be entering bravo 6, and that golf was the taxiway 'just to the south'.

With the aircraft on bravo 6, ATC checked with the safety officer managing the runway 16R closure to confirm that the aircraft could enter the closed part of the runway at that point without causing any concerns, to which the responsible safety officer replied 'affirm'. The pilot asked ATC if they required the aircraft to reposition, but ATC was able to provide a clearance to enter the runway at the bravo 6 intersection. ATC cleared the aircraft to enter at bravo 6 and taxi south on the runway to the point at which golf intersects the runway (the runway was available for take-off south of that intersection). The aircraft taxied forward then took off from runway 16R without further incident.

Figure 2: Approximate aircraft taxi path and location of safety officer's vehicle



Source: Aircraft operator, modified by the ATSB

Safety analysis

Aerodrome works

Aerodrome works on golf had been underway at Sydney aerodrome since early in 2016, and were undertaken during the aerodrome curfew period. Airservices Australia Aeronautical Information Circular (AIC)[1] H38/15 provided a summary of the works, including a statement that 'operational restrictions will be advised by NOTAM'[2]. On the night of the occurrence, the relevant NOTAM came into effect at 1300 UTC (2300 EST), and included the following operational restrictions:

> *TWY RESTR DUE WIP*
> *TWY G BTN TWY B AND TWY B4 NOT AVBL*
> *TWY C BTN TWY B4 AND RWY 07/25 NOT AVBL*
> *TWY DOM2 BTN TWY B4 AND TWY G NOT AVBL*

Although the pilot was aware of the aerodrome works, they were unaware of this particular NOTAM.

---

1 Aeronautaical Information Circular (AIC) is information for personnel concerned with flight opeations that is of an administrative nature and not directly concerned with the present conduct of flight opeations, but may have implications for the future (Aeronautical Information Publication (AIP) GEN 3.4).

2 A NOTAM is a notice that the timely knowledge of is essential to personnel concerned with flight operations that contains information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard (Aeronautical Information Publication (AIP) GEN 2.2).

Taxi route

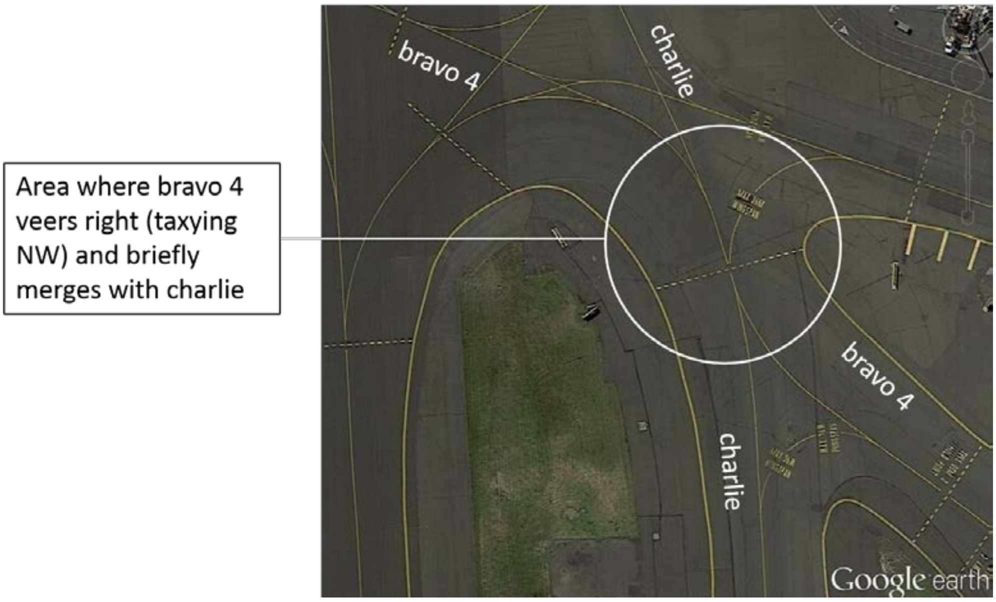
The taxi route by which the pilot was cleared was uncommon. The pilot had considerable experience operating at Sydney, but could not recall having followed the taxi path previously, either during the day or at night. Under normal circumstances, the pilot would have expected to taxi to runway 16R via golf. At the time of the occurrence, taxi via golf was not available because of the works. Similarly, runway 07/25 was also unavailable for taxi.

Aerodrome lighting conditions and taxiway markings

The taxi paths through the open space at the junction of bravo 4, charlie and charlie 2, are complex. Numerous guidance markings and lights complicate the area, and bravo 4 merges with charlie for a short distance as the two taxiways cross (Figure 3). A curve in bravo 4 as it meets charlie may have given the pilot the impression that the aircraft had arrived at the intersection of bravo 4 and bravo, being the point at which a sharp left turn was required. This expectation by the pilot may have been reinforced by the fact that the aircraft had just passed domestic 2, which the pilot may have misinterpreted as charlie.

The potentially confusing characteristics of the taxiway junction would have been exacerbated at night. At the time of the occurrence, additional vehicle lights were moving about the area, some steady (head/tail lights) and some flashing, and the partially established worksite lighting would have further complicated the environment. The pilot expected that some lights may have already been covered or turned off, which added to the potential for confusion over taxiway identification.

Figure 3: Taxiway intersection showing the area where bravo 4 veers right (taxying NW) and bravo 4 and charlie merge for a short distance



Source: Google earth, modified by the ATSB

At the time of the occurrence, the lead-in lighting to charlie and the charlie taxiway lighting had not yet been covered. This may have given the impression that the taxiway was still available, perhaps further reinforcing in the pilot's mind that they had already passed charlie, and reached bravo. The taxiway signage was not affected by the works and was illuminated at the time of the occurrence. The pilot commented that their mental picture of the area was different to what they encountered at the time of the occurrence.

For similar reasons, as the pilot turned into bravo 6 (from bravo) to approach runway 16R, they were initially under the impression that they had reached golf.

Electronic charts

The operator had recently installed electronic charts (e-charts) in the aircraft. Using GPS information, e-charts can provide near real-time on-aerodrome positional information. At the time of the occurrence, the pilot was using paper charts, because they were more comfortable with paper charts and had not been trained in the use of e-charts. The use of e-charts was not mandated by the operator.

ATSB Comment

Continuing aircraft operations in the vicinity of a worksite while that worksite is only partially established, can be problematic. Operational considerations should be carefully balanced with the safety implications of allowing aircraft to continue to operate near a partially established worksite.

Under some circumstances, particularly where other complicating factors exist (such as poor ambient lighting conditions), it may be prudent to identify a transition period, and temporarily restrict aircraft movements until the worksite is fully established. The transition period would essentially be the time from which ATC release control of an area to a safety officer, until the safety officer then advises that establishment of the worksite is complete.

Airservices provided comment in relation to establishing a transition period, advising that the potential for a transition period to cause additional confusion around the availability of the work surface, or create additional disruption during times of high traffic levels would need to be taken into consideration. They consider the current process of instructing pilots with detailed taxi routes, as was the case in this occurrence, is effective. ATC will treat work areas as unavailable once an area is released to the work safety officer.

Findings

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

- The pilot was unaware of relevant taxiway closures until advised by ATC as part of their taxi clearance.
- The pilot became confused about the position of the aircraft as they taxied past the worksite on bravo 4, probably due to a combination of factors, including:
  - The pilot was not familiar with the taxi route, and the taxi route took the aircraft through a complex junction of taxiways at night.
  - The worksite was only partially established (not all red lights were in place, and some existing taxiway lighting had yet to be covered).
- The pilot was not familiar with the use of e-charts, which may have assisted with their orientation under the circumstances.

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.

Aircraft operator

As a result of this occurrence, the aircraft operator has advised the ATSB that they are considering the following safety actions:

- Implementation of a training program to cover some contributing factors identified in the internal company report dealing with the occurrence, including the use of e-charts and other similar technologies.

- Development or acquisition of safety promotional material for staff, dealing with aircraft operations near worksites.

Safety message

This occurrence highlights the potential hazards involved when mixing aircraft operations with aerodrome works. The potential for misunderstanding or confusion is significant, particularly at night and in complex movement areas. The potential for confusion is further elevated when a worksite is in the process of being established. Relevant authorities are encouraged to carefully consider the risks involved and implement appropriate risk management strategies to minimise the likelihood of a misunderstanding or confusion.

Additionally, pilots are encouraged to stop and seek clarification from ATC if there is any doubt about the cleared taxi route. Similarly, ATC officers are encouraged to direct an aircraft to stop if they have any doubt about the intentions of the pilot, or there is any evidence that taxi instructions have been misunderstood. Timely and effective communication is essential to a shared understanding in a dynamic operational environment, particularly when the environment is complicated by unusual circumstances.

General details

Occurrence details

Date and time:	16 August 2016 – 2316 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Near collision	
Location:	Sydney Airport, New South Wales	
	Latitude: 33° 56.77' S	Longitude: 151° 10.63' E

Aircraft details

Manufacturer and model:	Hawker Beechcraft Corporation B300C	
Registration:	VH-NAO	
Serial number:	FM-49	
Type of operation:	Aerial work - EMS	
Persons on board:	Crew – 4*	Passengers – 0
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

*Crew includes the pilot and three medical staff.

Runway undershoot involving Fairchild SA226, VH-SSV

What happened

On 23 November 2016, a Fairchild SA226TC, registered VH-SSV (SSV), departed from Brisbane Airport, Queensland, for a passenger charter flight to the Theodore aircraft landing area (ALA), Queensland. On board the aircraft were the pilot and five passengers.

When SSV arrived at Theodore, the aircraft joined the circuit on the downwind leg for runway 17 at 2,100 ft[1] using the area QNH.[2] The pilot turned the aircraft through the base leg of the circuit, using a constant radius turn, and rolled the aircraft to wings level for the final approach at about 1,400 ft.

In the early stages of the final approach, the pilot noticed the aircraft sink,[3] so they[4] increased power slightly to compensate and by mid final they were satisfied the aircraft was stable on the desired approach path profile. On short final, the pilot checked the airspeed and noted the aircraft was at their calculated airspeed of V_{REF}[5] +2 (111 kt). Shortly after they checked the airspeed, the pilot noticed the aircraft sink, so they pulled back on the elevator control and started to increase power, but the main wheels touched down just prior to the runway threshold. A loud bang was heard within the aircraft and the pilot immediately suspected the aircraft had struck one of the runway 17 threshold solar powered lights.

The landing was completed and after parking the aircraft on the apron, a passenger reported to the pilot that the right wing was leaking fuel. On inspection, the pilot found a puncture to the underside of the right wing, just outboard from the right engine nacelle, which had breached the fuel tank (Figure 1). They concluded it was probably the result of debris from the damaged runway light flicked up by the right main wheel tyre. There were no injuries and the aircraft received minor damage.

Figure 1: Damage to the underside of wing

Source: Pilot

1 The elevation of Theodore ALA is 560 ft.

2 QNH: the altimeter barometric pressure subscale setting used to indicate the height above mean sea level. Forecast Area QNH are considered accurate to within 5 hPa, which equates to a height of about 150 ft.

3 Sink: an increase in rate of descent with little change in the horizontal attitude of the aircraft.

4 Gender-free plural pronouns: may be used throughout the report to refer to an individual (i.e. they, them and their).

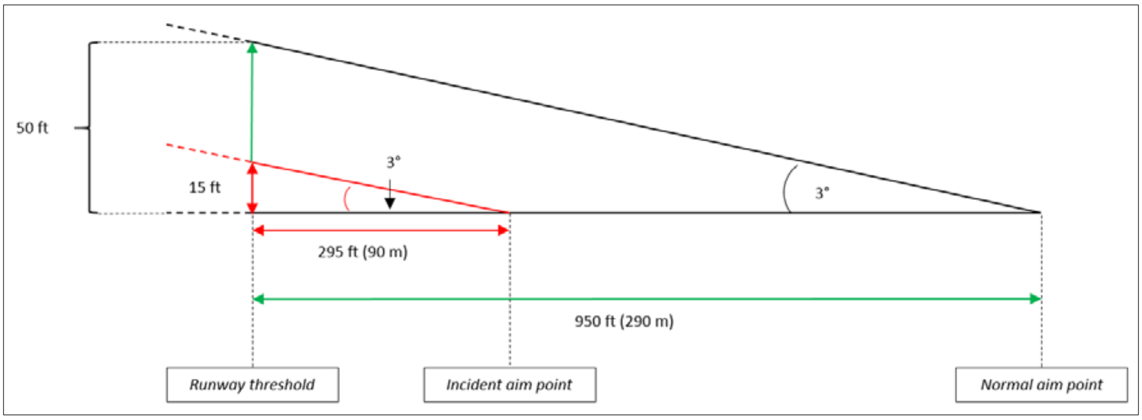
5 V_{REF} is the reference landing speed of an aeroplane which it attains in a specified landing configuration at a height of 50 ft above the runway threshold, and is used to determine the landing distance required.

Landing threshold height

Theodore ALA is situated about 560 km north-west of Brisbane. The ALA has a sealed runway strip surface at an elevation of 560 ft and direction 170-350. The runway length is 1,342 m with a slight down slope to the south (runway 17) and is fitted with low intensity runway lights at the thresholds and at 90 m intervals alongside the runway strip. The pilot used the first row of runway lights from the threshold as their landing aim point.

The landing distance required (LDR) begins at a height of 50 ft from over the runway threshold. The pilot reported flying a standard 3° approach path angle. However, a 3° approach path, with a threshold height of 50 ft is based on a landing aim point about 290 m from the runway threshold. Using the same approach path angle with an aim point 90 m from the runway threshold will reduce the threshold height to about 15 ft (Figure 2).

Figure 2: Runway threshold heights



Source: ATSB (not drawn to scale)

Landing distance performance calculations

Aeroplane flight manual

The pilot used the aeroplane flight manual (AFM) for their performance calculations. The AFM has six sections. The first four sections of the AFM were approved by the United States Federal Aviation Administration (state of manufacture). Section six was manufacturer's data for calculating performance. The manufacturer's data section provided two approach options for calculating LDR. One option was the short field landing approach at V_{REF} 1.1 V_{s0}[6] with full reverse thrust on landing. The other option was the normal approach at V_{REF} 1.3 V_{s0} with no reverse thrust on landing.

The AFM charts are only applicable to level runways. Runway slope is not included as a factor in any of the landing distance charts.

Civil Aviation Order 20.7.4

Civil Aviation Order (CAO) 20.7.4 – *Aeroplane weight and performance limitations – aeroplanes not above 5,700 kg – private, aerial work and charter operations* – paragraph 10 was the CAO for defining how to calculate LDR. Paragraph 10.1 required the calculated LDR to be multiplied by a safety factor, which was 1.43 for SSV. However paragraph 10.1 was subject to paragraph 10.3. Paragraph 10.3 stated:

> Where there is an approved foreign flight manual or a manufacturer's data manual for an aeroplane that sets out the landing distance required for that aeroplane, then that aeroplane must be operated so as to comply with the requirements set out in paragraphs

6 V_{s0} is the stalling speed with wing flaps in the landing setting and undercarriage extended.

> 10.1 and 10.2 or the requirements relating to landing distance set out in either of those manuals.[7]

Therefore, CAO 20.7.4 did not require a multiplication factor to be applied if LDR was calculated from either the approved foreign flight manual[8] or manufacturer's data manual.

Company operations manual

The company operations manual for the Fairchild SA226TC provided the following directions to their pilots for performance calculations:

- The pilot-in-command is responsible for ensuring the aircraft is capable of the performance required for the operation. This assessment should include take-off and landing distances, climb performance, and single engine performance.
- Charts supplied in the manufacturer's approved flight manual for this aircraft are American charts and are not factored as required by CAO 20.7.4. Take-off and landing information derived from these charts must be factored to comply with the CAOs, specifically:
  - Take-off distances must be multiplied by a factor of 1.25
  - Landing distances must be multiplied by a factor of 1.43

While the operations manual referenced factoring as a regulatory requirement, it was also company policy to factor landing distances in accordance with CAO 20.7.4 paragraph 10.1, in order to include a safety margin to the flight manual charts, which were un-factored charts.

Pilot calculations

The pilot calculated a short field approach and normal approach LDR with the following results:

- Short field approach V_{REF} 93 kt. Un-factored LDR 590 m; factored LDR 840 m.
- Normal approach V_{REF} 109 kt. Un-factored LDR 1,080 m; factored LDR 1,543 m.

Therefore, for a runway length of 1,342 m, both approaches were suitable un-factored, but only the short field approach was suitable when factored. The calculations did not include a factor for runway slope, but the pilot was aware of a downslope on runway 17 from their previous experience.

Pilot's minimum control speed experience in SA226TC

The pilot noted that the AFM-published V_{MC}[9] for the aeroplane was 94 kt, which was greater than their calculated short field approach V_{REF}, but less than their calculated normal approach V_{REF}.

During the pilot's SA226TC endorsement training in the simulator, the first time they were given an engine failure at V1 they were unable to arrest the yaw and roll in a timely manner and crashed the aircraft (simulator). The SA226TC does not have an auto-feathering[10] propeller mechanism fitted. It is fitted with a negative torque sensing system (NTS system). In the event of an engine failure during flight, the NTS system provides automatic drag reduction by moving the propeller blades towards the feather setting. Once the drag reduces and the negative torque decreases, the feather valve returns to its normal position under the influence of its spring, and the propeller

---

7 Paragraph 10.3 includes the following note: The data contained in some manufacturers' data manuals is un-factored and makes no allowance for degraded aircraft performance. Where there is a considerable difference between the data in a manufacturer's data manual and the data in the flight manual for the aeroplane then the manufacturer's data should be treated with caution.

8 An approved foreign flight manual means the flight manual approved by the relevant regulatory aviation authority of the country where the aeroplane is, or was, manufactured.

9 V_{MC} is the lowest airspeed, at which, in the event of the critical power unit suddenly becoming inoperative, it is possible to maintain control of the aeroplane with that engine inoperative, and to maintain straight flight using no more than 5° of bank without a change of heading greater than 20°.

10 Feathering: the rotation of propeller blades to an edge-on angle to the airflow to minimise aircraft drag following an in-flight engine failure or shutdown.

blades move toward the fine (unfeathered) setting. This condition is repetitive until the pilot manually feathers the propeller and is called ‘NTSing.’

The pilot then successfully completed the simulator exercise three more times, completing all drills and feathering the propeller in an appropriate time frame. However, the minimum angle of bank they achieved while regaining control of the aircraft (simulator) was 30°.

From their simulator experiences of the asymmetric handling qualities of the aircraft near V_{MC}, the pilot was uncomfortable conducting approaches at a calculated V_{REF} below or close to V_{MC}.

Approach profile and aim point selection

The pilot reported that they had flown to Theodore numerous times previously, which included 28 times during 2016 in SSV. They did not want to conduct an approach using a V_{REF} less than $V_{MC.}$ Therefore, they employed the normal approach profile with a V_{REF} 1.3 V_{s0}, with the LDR factored in accordance with their operations manual. This produced an LDR greater than landing distance available. In addition, the AFM charts assume a level surface. There is no factor for runway slope and downslope will increase LDR. To minimise the landing distance, the pilot applied full reverse thrust in addition to wheel braking after touchdown for the ground roll when landing at Theodore.

Runway aim point markers, located about 300 m from the threshold on sealed runways, were the standard aim point employed by the pilot. However, unsealed runways, such as Theodore, do not require aim point markers. Consequently the pilot utilised the runway side lights for their aim point. The pilot understood that the landing distance available was between their calculated un-factored and factored LDR for a normal approach using V_{REF} 1.3 V_{s0}, but the downslope on runway 17 would increase their landing distance. This led them to select the first row of runway lights as their aim point in order to maximise the runway distance available for braking. They estimated, from their previous experience, that the normal approach with the use of full reverse thrust on landing would result in a landing distance about 100 m longer than that calculated using a short field approach.

Stabilised approach criteria

The company had a ‘no-fault’ go-around policy and published stabilised approach criteria. For a visual approach the criteria apply from 300 ft above ground level. There were several criteria listed for a stabilised approach, which included:

- The aircraft is on the desired flight path, e.g. established on final/base leg;
- Only small pitch and heading changes are required to maintain the desired flight path;
- For circling approaches, the wings must be level on final not below 300 ft above ground level; indicated airspeed at threshold (50 ft) within tolerance (V_{REF} +5, -0).

During the approach, the aircraft was flown on the pilot’s desired flight path. On short final the pilot checked their airspeed, which was within the threshold stabilised approach criteria and continued the approach. When the aircraft began to sink on short final, the pilot pulled back on the elevator to pitch the aircraft nose upward and applied power in an attempt to avoid an early touchdown, but there was insufficient height to recover.

Convective weather

The pilot reported the incident occurred at about 1657 Eastern Standard Time (EST) and the temperature was about 36 °C. The runway surface is bitumen and the ALA is surrounded by paddocks. On the approach to runway 17, some of the paddocks had been ploughed in preparation for planting and some had light coloured crops. Following discussions between the pilot and their chief pilot, they concluded that because the wind speed in the area at the time was light, the sink may have been the result of local convective currents (known as *thermals*).

Convective currents are the result of uneven surface heating, which sets up areas of local circulation as the air flows from areas of higher pressure towards areas of lower pressure. Ploughed ground and bitumen surfaces, such as sealed runways, absorb and radiate a large amount of heat. If there are neighbouring surfaces, which absorb and radiate less heat, then local updrafts and downdrafts will form, which may strengthen throughout the day.

Further information is available from the United States Federal Aviation Administration's *Pilot's Handbook of Aeronautical Knowledge: chapter 12: weather theory*.

Safety analysis

The pilot considered that a go-around from short final, with an engine failure to be the worst-case scenario when flying the Fairchild SA226TC. The short field approach required a V_{REF} below the published V_{MC} and therefore, when they planned their flight to Theodore, they utilised the normal approach profile speed of V_{REF} 1.3 V_{s0} to provide a safety margin.

The pilot calculated a LDR, from the AFM, for a short field and normal approach, which were both less than the landing distance available. When the pilot applied the factor of 1.43, the normal approach LDR was greater than the landing distance available. The pilot also knew from their previous experience, that there was a downslope on runway 17 at Theodore, which increased their LDR relative to a level runway. Therefore, the pilot always applied full reverse thrust whenever they landed the aircraft on runway 17 at Theodore. Their previous experience of using full reverse thrust on landing from a normal approach, led them to expect an actual landing distance about 100 m longer than required for a short field approach and within the Theodore landing distance available.

The pilot's knowledge of the landing distance required and downslope of runway 17, led them to select the first row of runway lights as their aim point marker, while maintaining a 3° approach path profile. The use of this aim point resulted in the aircraft descending below 50 ft prior to reaching the runway threshold and therefore a low approach path on short final.

The time of the incident was near the end of a hot day with light winds. The pilot did not report that any airspeed fluctuations occurred during the approach, but they experienced sink early on the final approach and again when the incident occurred. Therefore, the runway undershoot was probably the result of a low approach path, which combined with a downdraft from local convective activity to lead to an early touchdown. The early touchdown resulted in the collision with a runway light and subsequent damage to the aircraft wing.

Findings

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

- The pilot flew an approach path with a low runway threshold height, which combined with a downdraft from local convective activity on short final, resulting in a runway undershoot, collision with the runway light and damage to the aircraft wing.

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.

Operator

As a result of this occurrence, the aircraft operator has advised the ATSB that they have taken the following safety actions:

Internal investigation

The operator conducted an investigation into the incident, where a detailed safety report was produced. The report concluded that 'this incident was a mishandled landing, with the pilots' aiming point and probable thermal activity as contributing factors.'

Training

Prior to further operations in this aircraft type, the incident pilot was retrained on the aircraft type, which involved the following:

- The pilot received a detailed briefing covering aircraft type performance.
- The pilot flew with the type specialist for re-training. These flights involved operations into different airports and runway environments.
- The pilot was returned to duty on charter operations under supervision, and then re-assessed prior to further line flying operations.

Operations manual

The company operations manual for the Fairchild SA226TC shall be amended to reference the factoring of landing distances as a company procedure.

Safety message

This incident highlights the risk of unintended consequences associated with variations from standards. Each change on its own may not lead to an incident or accident, but may increase the likelihood of an incident or accident if combined with an unexpected event(s).

Further general information on calculating landing distances is available from the Flight Safety Foundation *approach and landing accident reduction briefing note 8.3 – landing distances.*

General details

Occurrence details

Date and time:	23 November 2016 – 1657 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Runway undershoot	
Location:	Theodore ALA, Queensland	
	Latitude: 24° 59.60’ S	Longitude: 150° 05.58’ E

Aircraft details

Manufacturer and model:	Fairchild Industries Incorporated SA226TC	
Registration:	VH-SSV	
Serial number:	TC-383	
Type of operation:	Charter - passenger	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Minor	

Helicopters

Tail rotor driveshaft failure involving Bell 206, VH-CHO

What happened

On 21 November 2016, at about 0730 Eastern Daylight-saving Time (EDT), a Bell 206B helicopter, registered VH-CHO, took off from a property about 30 km south of Bathurst, New South Wales. The pilot was conducting an aerial inspection of the property, with the farm manager on board as a passenger.

After overflying a flat area on high ground, the pilot raised the collective[1] and turned the helicopter to follow down-sloping terrain. At about 75 ft above ground level and an airspeed of about 40 kt, the pilot and passenger heard and felt a bang. The pilot looked outside to see if there was any obvious damage to the spray booms on the helicopter and in the back seat to see whether anything had fallen onto the floor, and assessed that the helicopter was too high to have collided with anything outside.

The pilot initially decided to land as soon as possible in order to check the helicopter to determine the cause of the bang, and started to slow it down. As the airspeed decreased, the helicopter started to yaw rapidly to the right and the pilot, unable to arrest the rotation with left anti-torque pedal, realised they had lost tail rotor authority. The pilot immediately rolled the throttle to the ground idle detent and as the helicopter stopped yawing, lowered the collective. The pilot saw that the rotor rpm had dropped to about 80 per cent and prepared for a hard landing. The pilot cushioned the landing by pulling back on the cyclic,[2] but the helicopter landed heavily. The belly tank (for spraying) absorbed some of the impact of the landing. The spray booms (fitted to the aircraft for spraying operations) probably helped prevent the helicopter rolling over.

The electronic locator beacon activated on impact. The pilot and passenger sustained minor injuries and the helicopter was substantially damaged (Figure 1).

Figure 1: Accident site showing damage to VH-CHO

Source: Aircraft operator

---

[1] Collective: a primary helicopter flight control that simultaneously affects the pitch of all blades of a lifting rotor. Collective input is the main control for vertical velocity.

[2] Cyclic: a primary helicopter flight control that is similar to an aircraft control column. Cyclic input tilts the main rotor disc, varying the attitude of the helicopter and hence the lateral direction.

Post-accident inspection

The tail rotor driveshaft had fractured at the No. 2 bearing (Figure 2).

The tail rotor blades were undamaged in the impact, which indicated that they were probably not rotating when the helicopter collided with the ground. There were scrapes inside the tail rotor driveshaft cowling, which indicates that the shaft was probably rotating when it fractured.

There was no evidence of oil leakage, overheating, corrosion or vibration of the tail rotor driveshaft system.

Figure 2: Fractured tail rotor driveshaft

Source: Aircraft engineer

Maintenance history

The helicopter had serial number 714, and was fitted with a long tail rotor driveshaft. The manufacturer required the single long driveshaft to be replaced with a segmented shaft in serial numbers 1252 and above.

The helicopter was fitted with a data augmentation monitoring system, which did not show any abnormalities.

The tail rotor bearings were 'on condition' items, that is, were required to be replaced if worn on inspection. The driveshaft was inspected every 1,200 hours and was in good condition apart from the fracture after the accident.

On 18 August 2016, the No. 1 and No. 3 tail rotor driveshaft bearings and tail rotor gearbox were replaced. On 29 September 2016, the No. 1 tail rotor bearing and bearing hanger were replaced. Post-accident inspection did not reveal any abnormalities.

Manufacturer comments

The helicopter manufacturer (Bell Helicopter) reported that the single long tail rotor driveshaft (P/N 206-040-330-001) was replaced with the segmented shafts in Bell 206B helicopters about 45 years ago. At serial number 1252, all Bell 206B helicopters and follow-on Bell 206B3 helicopters were equipped with segmented shafts. The change was made for ease of maintenance in replacing hanger bearings. In addition, if a segmented shaft was damaged, only it would have to be replaced and not the entire long shaft. The long shaft is still procurable through Bell Helicopter. The manufacturer reported that the long tail rotor driveshaft has not been a safety concern with no recent failures recalled.

Pilot comments

The pilot provided the following comments:

- When the pilot heard the bang, the helicopter was at a very high power setting with the blades highly pitched. Although the pilot rolled the throttle off, it took a couple of seconds before the yawing stopped, then they put the collective down and by that time the rotor rpm had dropped.
- There were about 30 gallons (114 litres) of fuel on board and the helicopter was loaded well within weight and balance limitations.
- The temperature was 18.5 °C, the wind light and variable, and the elevation about 3,200 ft above mean sea level. The conditions were well within the performance limitations of the helicopter.
- If the pilot had been able to get into a position where they could do a run-on landing, there may not have been any damage.
- The pilot did not know the tail rotor authority was lost until it was too late to do anything other than land immediately.

Safety analysis

The pilot and passenger heard a bang, which was probably the tail rotor driveshaft failing in flight, as indicated by the scraping inside the tail rotor driveshaft cowling. This resulted in a loss of authority of the tail rotor, and the lack of tail rotor blade damage suggests the blades were (near) stationary at the time of ground impact. It was not determined why the tail rotor driveshaft fractured.

The pilot slowed the helicopter to make an approach to land and check out the cause of the bang, which caused the helicopter to start yawing to the right. The pilot then realised they had lost tail rotor authority, rolled off the throttle to stop the yaw, and as the rotor rpm had dropped they were then committed to an immediate landing.

Findings

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

- The tail rotor drive shaft failed, which resulted in a loss of tail rotor authority.
- The helicopter was low and slow when tail rotor authority was lost, limiting the time available for the pilot to assess the circumstances and manage the forced landing.

Safety message

This incident highlights the importance of robust and current training in emergency procedures. Being able to identify a problem and react quickly can reduce the severity of damage and injuries.

General details

Occurrence details

Date and time:	21 November 2016 – 0740 EDT	
Occurrence category:	Accident	
Primary occurrence type:	Propeller/rotor malfunction	
Location:	30 km S of Bathurst Airport, New South Wales	
	Latitude: 33° 40.25' S	Longitude: 149° 34.18' E

Helicopter details

Manufacturer and model:	Bell Helicopter Company 206	
Registration:	VH-CHO	
Serial number:	714	
Type of operation:	Aerial work	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – 1 Minor	Passengers – 1 Minor
Aircraft damage:	Substantial	

Separation issues

Separation issue involving Bombardier DHC-8, VH-QOV, and Eurocopter MBB-BK 117, VH-EHQ

What happened

On 26 November 2016, at about 0908 Eastern Standard Time (EST), a Bombardier DHC-8-402 aircraft, registered VH-QOV (QOV), operating scheduled passenger flight QF2320 from Brisbane, commenced descent to Bundaberg Airport, Queensland (Qld). At about the same time, a Eurocopter MBB-BK 117 helicopter, registered VH-EHQ (EHQ) was being prepared to depart Bundaberg. The crew of EHQ had been tasked to conduct a visual flight rules (VFR) flight to search for potential wreckage from a trawler missing off the Qld coast.

Bundaberg is a non-controlled airport with a common traffic advisory frequency (CTAF). A CTAF is a designated frequency on which pilots make positional broadcasts when operating in the vicinity of a non-controlled aerodrome. Bundaberg is also equipped with an aerodrome frequency response unit (AFRU) with a pilot activated light (PAL) option. When a pilot transmits on the correct frequency, the AFRU will provide an automatic response, either 'Bundaberg CTAF' (if the frequency has not been used in the previous five minutes) or a beep-back. At night, or at other times of low natural light levels, transmitting three one second pulses, one second apart, on the frequency will activate the runway lighting and the transmission will change to the aerodrome name and CTAF with either 'runway lights on' or 'no runway lights'. At other times, this action will activate the precision approach path indicator (PAPI).

At 0912, three one second pulses were broadcast on the Bundaberg CTAF. This resulted in the AFRU correctly responding automatically, 'Bundaberg Aerodrome no runway lighting'*.* Two seconds later a single one second pulse was also broadcast on the CTAF. The next recorded CTAF broadcasts were those made by the flight crew of QOV while on approach to Bundaberg. Broadcasts were made at 27 NM, 10 NM and 5 NM and on each occasion the flight crew received the AFRU beep-back. No responses from other aircraft were heard.

While QOV was on final approach to Bundaberg, EHQ taxied for departure from a position to the east of runway 32. The helicopter taxied a short distance, took off and once airborne commenced a left turn tracking initially towards Hervey Bay.

During EHQ's departure, the flight crew of QOV received a traffic advisory (TA)[1] from their aircraft's traffic alert and collision avoidance system (TCAS).[2] On receipt of the TA, the flight crew of QOV attempted to sight the traffic causing the alert. After a few seconds, they identified a helicopter, later determined to be EHQ, in their 2 o'clock[3] position around 1.5 NM, and around 1,000 ft below their aircraft. The helicopter was clear of their projected flight path and accordingly the flight crew continued the approach, landing without further incident.

After landing, the flight crew of QOV made two broadcasts on the CTAF to identify the helicopter. These were unsuccessful and they requested, on area frequency, if air traffic control knew the identity of the helicopter. The pilot of EHQ heard this exchange and subsequently identified

---

1. When a TA is issued, pilots are instructed to initiate a visual search for the traffic causing the TA.
2. TCAS is an aircraft collision avoidance system. It monitors the airspace around an aircraft for other aircraft equipped with a corresponding active transponder and gives warning of possible collision risks.
3. O'clock: the clock code is used to denote the direction of an aircraft or surface feature relative to the current heading of the observer's aircraft, expressed in terms of position on an analogue clock face. Twelve o'clock is ahead while an aircraft observed abeam to the left would be said to be at 9 o'clock.

themselves also advising they had not heard the earlier broadcasts made by the flight crew of QOV.

Pilot comment VH-EHQ

The pilot of EHQ provided the following comments:

- The flight was routine, preparations for the flight were not rushed with normal pre-departure checks conducted. They recalled completing normal communication checks including ensuring all frequencies were set correctly and at appropriate volumes. They also recalled hearing an aircraft broadcast on the air traffic control area frequency, and a response from the AFRU when the PAPI was activated. They did not hear any other broadcasts made by the flight crew of QOV.
- Normally, when departing from a location similar to the one they did on the day of the incident, the pilot advised they would make a taxi call and a call departing on the CTAF. They recalled making these calls but could not recall if an AFRU response was received.
- During the left turn after departure, the crew of EHQ sighted QOV on final approach, clear of their projected flight path.
- After departure, they heard the flight crew of QOV on area frequency attempting to determine the identity of the helicopter. They identified themselves and subsequently checked their communications set up, with nothing abnormal found.

Captain's comment VH-QOV

The Captain of QOV provided the following comments:

- They had made all of the necessary CTAF broadcasts, receiving the AFRU response, and did not receive any broadcasts made by EHQ.
- They were surprised upon receipt of the TA, but had quickly visually identified the traffic and confirmed it was not on a conflicting flight path.

Safety Analysis

The ATSB reviewed all available recordings from air traffic control and the Bundaberg CTAF. All broadcasts made by the flight crew of QOV and the AFRU responses were recorded. There were no identifiable recordings of broadcasts made by the pilot of EHQ. The ATSB was not able to determine why the broadcasts reportedly made by the pilot of EHQ were not transmitted on the CTAF or why the crew were not able to hear the broadcasts made by the flight crew of QOV. It is probable that the pilot did not correctly configure and operate the helicopter's communications system.

Findings

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

- It is probable the pilot of EHQ did not correctly configure and operate the helicopter's communications system for CTAF operations while departing Bundaberg airport and they did not detect the error.

Safety action

As a result of this occurrence, the pilot of EHQ has advised they now transmit on the CTAF and activate the lighting to confirm they have the correct radio frequency and volumes selected.

Safety message

The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry.

One such concern is Safety around non-controlled aerodromes, which highlights that it is difficult for pilots to detect another aircraft through visual observation alone. The ATSB has identified that insufficient communication between pilots operating in the same area is the most common cause of safety incidents near non-controlled aerodromes.

This incident highlights the fundamental importance of effective communication, particularly during operations at a non-controlled aerodrome. The Civil Aviation Safety Authority (CASA) has produced several publications and resources that provide important safety advice related to operations in the vicinity of non-controlled aerodromes. Relevant guidance and explanatory material provided by CASA includes the following:

- CASA Civil Aviation Advisory Publication (CAAP) CAAP 166-1(3) Operations in the vicinity of non-controlled aerodromes
- CAAP 166-2(1) Pilots' responsibility for collision avoidance in the vicinity of non-controlled aerodromes using 'see-and-avoid'
- Operations at non-controlled aerodromes booklet.

General details

Occurrence details

Date and time:	26 November 2016 – 0922 EST	
Occurrence category:	Incident	
Primary occurrence type:	Airspace - Aircraft separation - Issues	
Location:	Bundaberg Aerodrome	
	Latitude: 24° 54.23' S	Longitude: 152° 19.12' E

Aircraft details – VH-QOV

Manufacturer and model:	Bombardier Incorporated DHC-8-402	
Registration:	VH-QOV	
Operator:	SUNSTATE AIRLINES (QLD) PTY. LIMITED operating as QantasLink	
Serial number:	4277	
Type of operation:	Air Transport High Capacity	
Persons on board:	Crew – 4	Passengers – 38
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

Aircraft details – VH-EHQ

Manufacturer and model:	Eurocopter MBB-BK 117 C-1	
Registration:	VH-EHQ	
Serial number:	7502	
Type of operation:	Aerial Work	
Persons on board:	Crew – 3	Passengers – 0
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

Loss of separation involving Bombardier DHC-8, VH-LQG, and Boeing 777, ZK-OKF

What happened

On 9 December 2016, a QantasLink Bombardier DHC-8-402, registered VH-LQG (LQG), departed runway 16 left at Sydney Airport. The aircraft was operating a scheduled passenger flight from Sydney to Tamworth, New South Wales. The captain was the pilot monitoring (PM) and the first officer the pilot flying (PF).[1] At the time of departure, windshear conditions existed in the vicinity of Sydney Airport and because of this, the flight crew used normal take-off power.[2]

When LQG departed, an Air New Zealand Boeing 777-219ER, registered ZK-OKF (OKF), operating a scheduled passenger flight from Auckland, New Zealand, was on descent to Sydney from the east, assigned 6,000 ft by the Sydney Approach controller. The projected routes of the aircraft crossed approximately 11 km east of Sydney (Figure 1) and the Approach controller had assigned OKF an altitude of 6,000 ft to provide separation with LQG, who would be assigned 5,000 ft.

At 1407 Eastern Daylight-saving Time (EDT), LQG became airborne and after passing 500 ft, the PF turned the aircraft to an assigned heading of 090. When this turn was made, the flight crew had the go-around (GA) vertical mode selected on the aircraft flight guidance control panel with the altitude select (ALT SEL)[3] mode. After passing the acceleration altitude[4] of 1,100 ft, the PF requested the PM to select the indicated airspeed mode and a speed of 185 kts. The PM did this and then, at 1407:45, they contacted Sydney Departures while the PF engaged the autopilot.

When the PM contacted Sydney Departures, they reported passing 1,900 ft, heading 090 and climbing to an assigned altitude of 3,000 ft. Sydney Departures identified LQG on radar and instructed them to climb to an altitude of 5,000 ft. The PM read back this instruction and the flight crew correctly updated the autopilot with the new altitude and engaged the ALT SEL mode.

At 1408:12, as the aircraft climbed through 2,600 ft, Sydney Departures instructed LQG to track direct to waypoint KAMBA.[5] The position was entered into the flight management system and the autopilot was set to the lateral navigation mode. The aircraft then commenced turning left towards KAMBA.

At 1408:38, as the aircraft climbed through 3,800 ft (Figure 1), Sydney Departures advised LQG there would be a short delay at 5,000 ft due to traffic above them. This was acknowledged by the PM.

---

1 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.

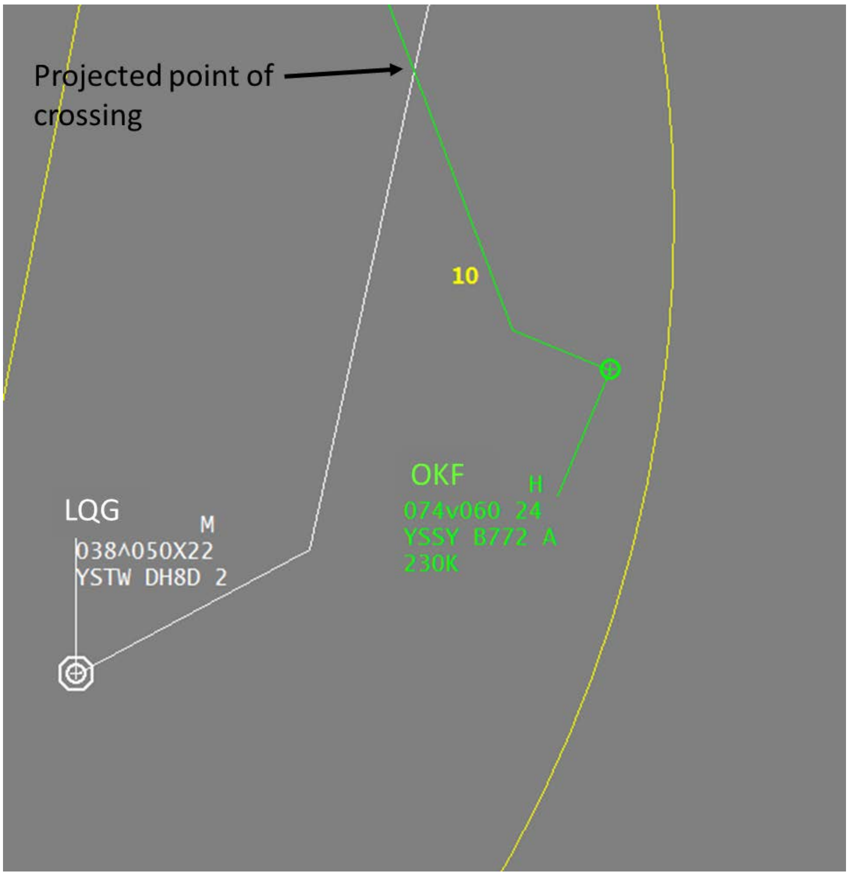
2 Except for the first flight of the day, usual practice is to depart at a reduced power setting.

3 In the ALT SEL mode, the aircraft will climb to and then maintain the pre-selected altitude.

4 The altitude the aircraft transitions from take-off speed to climb out speed.

5 Waypoint: A geographical location on the route of an aircraft. KAMBA is located at S 33 29.7 E 151 26.0.

Figure 1: Disposition of aircraft when LQG was passing 3,800 ft direct KAMBA and showing the projected point of crossing.



Source: Airservices Australia, modified by the ATSB

Also around this time, with the aircraft now tracking to KAMBA, the PF increased the airspeed setting from 185 knots to 210 knots. Almost simultaneously, the autopilot altitude mode changed to capture the assigned altitude.

The adjustment of the airspeed setting, while the autopilot was in altitude capture mode, resulted in the autopilot reverting from altitude capture mode to pitch mode, which meant the autopilot would now not stop the aircraft climb at 5,000ft.

Consequently, the PF decided to disconnect the autopilot and commenced hand flying the aircraft. They pitched[6] the aircraft nose down, to reduce the rate of climb, and simultaneously the PM selected the autopilot indicated airspeed and ALT SEL modes. Once these modes were selected, the PF attempted to reconnect the autopilot so the aircraft would maintain 5,000 ft. Before ensuring the autopilot had reconnected, they became aware of the conflicting traffic (OKF) and obtained its position by referencing the traffic alert and collision avoidance system (TCAS)[7] display. During this time, as the autopilot had not been correctly reconnected, the aircraft continued to climb.

After sighting OKF, the PF looked back at the aircraft instrumentation and observed the aircraft had climbed through 5,000 ft. This coincided with an altitude alert from the autopilot, which indicated that the selected altitude was exceeded. The PF responded by again pitching the aircraft

6 Pitching: the motion of an aircraft about its lateral (wingtip-to-wingtip) axis.
7 Traffic alert and collision avoidance system (TCAS): a type of airborne collision avoidance system (ACAS).

nose down to stop the climb and return the aircraft to 5,000 ft. The maximum altitude LQG reached was 5,600 ft[8] before the aircraft began to descend.

Prior to the altitude excursion, the air traffic control system presented a short term conflict alert (STCA), to both the Sydney Approach and Departures controllers. In response to the STCA, both controllers monitored the altitude of LQG to ensure the aircraft would maintain 5,000 ft. When the Sydney Departures controller observed LQG continue to climb, they issued the flight crew a safety alert,[9] requested confirmation that the aircraft was maintaining their assigned altitude and issued them a heading instruction to turn away from OKF. The Sydney Approach controller issued the flight crew of OKF a safety alert and instructed them to stop their rate of descent. In response, the flight crew of OKF advised they would level out and reported they were over the top of LQG and would be able to sight them again shortly. During the conflict, the lowest altitude OKF reached was 6,800 ft.

Separation Standards

The Sydney Approach and Departures controllers had anticipated that LQG and OKF would pass with less than the required 3 NM (5.6 km) surveillance separation between the aircraft. LQG subsequently passed approximately 0.5 NM (1 km) behind OKF. As surveillance separation did not exist, 1,000 ft vertical separation was required. In applying vertical separation, using pressure derived altitude information, tolerances need to be applied. When these tolerances are considered, the 1,200 ft displacement between the aircraft was not adequate to apply vertical separation. Consequently, the level excursion by LQG resulted in a loss of prescribed separation.

Operation of Autopilot

In multi-crew operations, standard operating procedures are established to support the principles of crew resource management (CRM). This includes defining the roles of the PF and PM in relation to autopilot selections. The captain of LQG reported that if the autopilot is engaged, the PF will make the autopilot selections. If the PF is hand flying the aircraft, the PM will make the selections, under the direction of the PF. In both sets of circumstances, visual and verbal cross-checks are made to help identify any potential errors.

Pilot monitoring comments:

- After they had selected the correct modes, they believed the PF had reconnected the autopilot. At this time, their attention was divided between managing other radio transmissions and monitoring the PF’s actions.
- The requirement to maintain 5,000 ft on departure was received regularly and something they monitored closely. In normal circumstances, the autopilot would remain engaged.
- The PM advised that they should have been monitoring the PF’s actions more closely.

Pilot flying comments:

- They were aware that when the autopilot mode changed to altitude capture, as they used the speed control, the autopilot mode could change to pitch. So, when this occurred they disconnected the autopilot rather than concentrating on changing the modes with a high rate of climb close to the required altitude.
- They thought they had reconnected the autopilot after the PM had reset the modes, but were distracted by looking outside the aircraft for the conflicting traffic and did not confirm the autopilot had reconnected.

---

8 Displayed pressure altitude-derived level information

9 The provision of advice to an aircraft when an ATS Officer 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.

Safety analysis

When the PF initiated the speed increase to 210 knots, the autopilot had not commenced capturing the assigned altitude. The speed increase at this stage of flight was reported as consistent with company practice of increasing speed when tracking towards the intended destination.

As the PF increased speed, the autopilot started to capture the assigned altitude. These near simultaneous events resulted in the autopilot reverting to pitch mode. The potential for the autopilot to behave in this manner was known to the flight crew. It is probable that the altitude capture occurred earlier than expected, due to the aircraft's rate of climb being unusually high. The selection of normal take-off power on departure contributed to this high rate of climb.

The PF became concerned that the autopilot was not correctly configured to maintain the assigned altitude and disconnected the autopilot to hand fly the aircraft. After the PM had selected the correct autopilot modes, the PF, believing the autopilot would successfully maintain the aircraft at 5,000 ft, decided to reconnect the autopilot. They attempted to do this but the action was not successful. The PF did not realise this and the PM did not correctly confirm the status of the autopilot.

It was probable that the PF was distracted with looking for the conflicting traffic, rather than ensuring they had successfully reconnected the autopilot.

The loss of separation subsequently occurred after LQG did not maintain 5,000ft on a track that conflicted with OKF.

Findings

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

- The PF increased the aircraft speed at approximately the same time as the autopilot commenced capturing the selected altitude. This resulted in the autopilot mode changing and influenced the PF's decision to disconnect the autopilot.
- The PF did not engage the autopilot correctly and became distracted before ensuring it was connected, resulting in the aircraft climbing through the assigned level. The PM was also not aware that the autopilot had not been correctly reconnected.

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.

Operator

As a result of this occurrence, the aircraft operator has advised the ATSB that they have taken the following safety action:

Further training was provided to both the PM and PF in the areas of situational awareness, human factors and operational decision-making during high workload scenarios, including a review of aircraft automation technology and procedures. The crew members were also required to demonstrate competency prior to return to flying duties.

Safety message

Maintaining separation in high traffic terminal areas, such as Sydney, requires that flight crews strictly adhere to air traffic control instructions. As highlighted in this occurrence, any deviation has the potential to reduce safety margins.

During this occurrence, the interactions between the crewmembers were not effective in responding and managing the encountered threats and highlights the importance of effective CRM.

CRM is described as the practical application of all aspects of human factors including situational awareness, decision-making, threat and error management, team cooperation and communication.

One important aspect of effective CRM, is related to successful monitoring of aircraft systems and ensuring crewmembers actively cross check each other's actions. These skills can be improved through standard operating procedures and increased emphasis and practice.

Key flight crew monitoring principles include:

- be technically proficient
- keep all team members informed
- ensure the task is understood, supervised and accomplished
- train as a team
- make sound and timely decisions.

Further information can be obtained from the Operator's Guide to Human Factors in Aviation (OGHFA).

General details

Occurrence details

Date and time:	9 December 2016 – 2245 EST
Occurrence category:	Incident
Primary occurrence type:	Loss of Separation
Location:	11 km east of Sydney Airport

Aircraft details

Manufacturer and model:	Bombardier DHC-8-402	
Registration:	VH-LQG	
Operator:	Sunstate Airlines operating as QantasLink	
Serial number:	4376	
Type of operation:	Air Transport High Capacity - Passenger	
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

Manufacturer and model:	Boeing 777-219ER	
Registration:	ZK-OKF	
Operator:	Air New Zealand	
Serial number:	34378 LN:575	
Type of operation:	Air Transport High Capacity - Passenger	
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

Communication issues

Unlawful communications

What happened

During the period from 30 September 2016 to 3 November 2016, a series of unlawful communications occurred on multiple air traffic control (ATC) frequencies and the aircraft emergency frequency around the Melbourne area, Victoria.

On 30 September, the flight crew of an aircraft approaching Melbourne Airport, reported hearing two instructions on the Melbourne tower (Figure 1) ATC frequency. The Melbourne tower controller did not make or hear the instructions, and there was no impact on operations.

On 25 October, on three occasions, flight crew of aircraft landing on runway 34 at Melbourne Airport received instructions, via unlawful broadcasts from an individual impersonating a Melbourne tower controller, on the Melbourne tower frequency. The Melbourne tower controller heard the broadcasts and immediately provided clarifying instructions to the flight crew. There was no impact on aircraft operations.

Figure 1: Melbourne airport ATC tower

Source: Airservices Australia

On 27 October, at about 1429 eastern daylight time, ATC received reports from flight crew of emergency broadcasts on the aircraft emergency frequency, apparently being transmitted by multiple aircraft. The broadcasts indicated an inflight emergency to the north of Melbourne. In response to these reports, ATC declared a distress phase[1] and, in accordance with emergency procedures, contacted the Australian Maritime Safety Authority (AMSA). At 1502, AMSA confirmed that the broadcasts were false and cancelled the distress phase.

At 1539, ATC received two further reports of emergency broadcasts on the aircraft emergency frequency. The broadcasts used the registration of an aircraft which was operating to the north of Melbourne at that time. The broadcasts indicated an inflight emergency overhead the Melbourne metropolitan area. ATC immediately declared a distress phase. Air traffic control then contacted

[1] Distress phase is an emergency phase declared by the air traffic services when there is reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger or require immediate assistance.

the aircraft, the flight crew confirmed that they had not made the broadcasts and that operations were normal. At 1542, having confirmed that the emergency broadcasts on the aircraft emergency frequency were false, ATC cancelled the distress phase.

At 1721, a Boeing 737-800 aircraft approached runway 16 at Melbourne airport. As the aircraft descended through about 200 ft above ground level, the flight crew received the instruction 'go around'.[2] The flight crew could not determine a reason for the instruction, however, recognising that questioning the instruction at that time could create further confusion, elected to conduct the go around. As the flight crew commenced the go around, the controller confirmed that the instruction had not been broadcast by the controller and that the aircraft remained cleared to land. As the flight crew had already commenced the go around, they elected to continue the procedure. The aircraft returned to land without further incident.

At 1724, ATC personnel updated the Melbourne Airport automatic traffic information service (ATIS)[3] used by arriving and departing aircraft crew for airport information to include notification of the unlawful broadcasts.

At 1739, the ATIS was further updated to include the information that ATC would use light signals to confirm aircraft clearances in the event of further unlawful broadcasts.

At 1929, the Avalon approach controller received an emergency broadcast using the registration of an aircraft which was operating to the north-west of Melbourne at that time. Air traffic control contacted the aircraft, the flight crew confirmed that they had not made the broadcasts and that operations were normal. No distress phase was raised and there was no impact on operations.

On 31 October, ATC received a report from the flight crew of an aircraft departing Melbourne Airport of unlawful broadcasts on the aircraft emergency frequency. The broadcasts simulated aircraft ground proximity and warning system aural alarms. There was no impact on operations.

On 3 November, ATC received multiple reports from flight crew of unlawful broadcasts occurring on the aircraft emergency frequency. The broadcasts indicated an inflight emergency, the flight crew receiving the broadcast responded, however no reply was received. There was no impact on operations.

Air Traffic Control procedures

The provider of civil ATC services in Australia, Airservices Australia, had the following procedures in place to manage unlawful broadcasts on ATC frequencies:

Manual of air traffic services (MATS)

The Airservices Australia MATS contained the following procedure for managing malicious radio transmissions:

- Report unauthorised (malicious) transmissions to aircraft as detailed in local instructions.

MATS also contained the following instructions to assist controllers in managing unforeseen situations which have not been documented:

> *Best judgement*
> *Do not allow anything in these instructions to preclude you 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.*

---

2 Go around, the procedure for discontinuing an approach to land, is a standard manoeuvre performed when a pilot is not completely satisfied that the requirements for a safe landing have been met. This involves the pilot discontinuing the approach to land and may involve gaining altitude before conducting another approach to land.

3 ATIS is a continuous broadcast of recorded information relevant to airport operations. Flight crew operating at a controlled aerodrome will listen to the information provided by the ATIS prior to arrival, or departure.

Local Instructions

Melbourne tower local instructions did not provide procedures or guidance to controllers on the handling of unlawful communications.

ATC personnel response

In the absence of detailed procedures, ATC personnel used the following to manage the impact of the unlawful communications:

- Shift managers briefed controllers about the activity.
- Shift managers also provided controllers with recordings of previous events to familiarise the controllers with the individual's voice.
- Controllers contacted individual aircraft directly to advise that unlawful broadcasts were occurring. When controllers heard unlawful broadcasts, they immediately clarified clearance details with the affected aircraft.
- The no-radio procedure of using light signals to provide aircraft clearance details was determined to be a suitable method to confirm clearances.
- Included a warning on the Melbourne Airport ATIS.
- Recorded all available information.

Airservices Australia Comment

The provider of civil air traffic services within Australia, Airservices Australia, provided the following comments:

- Airservices considers that the established organisational resilience/crisis management practices proved effective to handle each unlawful communication event. Given it is not possible to document all elements of scenarios that a controller may face, Airservices training and risk management practices are designed to enable controllers to manage a range of unusual situations which are not documented.
- Controllers will always assume that an ATC broadcast is real, as was prevalent in these occurrences. The In-Flight Emergency Response checklist was utilised and followed until it was determined that the broadcasts were hoax calls and the aircraft were not in distress. Having an established procedure to manage hoax calls may lead to ambiguity with regards to the validity of a broadcast.
- The development of detailed procedures may not achieve a safety outcome as it would be impracticable to cater for all situations. Furthermore, it may restrict initiative required by ATC to safely manage each scenario on a case by case basis.

Safety analysis

Despite an absence of local instructions, ATC personnel were able to use best judgement to implement effective methods to manage the unlawful communications.

The false emergencies scenarios were handled quickly and effectively within existing emergency procedures. Air traffic control and AMSA personnel were able to quickly confirm the non-existence of the emergency situations and cancel the distress phases.

The unlawful communications resulted in minimal impact on aircraft, ATC and AMSA operations.

Findings

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

- There were minimal documented local instructions in place for managing unlawful communications.
- Despite an absence of documented local instructions, training and crisis management practices enabled ATC personnel to effectively manage the unlawful communications to minimise the impact on aircraft and AMSA operations.

ATSB comment

The unlawful communications were broadcast by one individual. The Australian Federal Police arrested and charged this individual with five offences relating to the communications.

Safety message

Unlawful communications transmitted with malicious intent, while rare, have the potential to impact the safe operation of aircraft and, as demonstrated by this series of events, divert AMSA away from their core tasks.

Despite an absence of local instructions, ATC personnel were able to use best judgement to implement effective methods to quickly and effectively manage the unlawful communications to minimise the risk to flight safety.

General details

Occurrence details

Date and time:	30 September to 3 November 2016
Occurrence category:	Incident
Primary occurrence type:	Interference with aircraft from ground – Radio interference
Location:	Melbourne area, Victoria

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau 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; 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 fare-paying passenger operations.

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.

Purpose of safety investigations

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. The terms the ATSB uses to refer to key safety and risk concepts are set out in the next section: Terminology Used in this Report.

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 Bulletin

The ATSB receives around 15,000 notifications of Aviation occurrences each year, 8,000 of which are accidents, serious incidents and incidents. It also receives a lesser number of similar occurrences in the Rail and Marine transport sectors. It is from the information provided in these notifications that the ATSB makes a decision on whether or not to investigate. While some further information is sought in some cases to assist in making those decisions, resource constraints dictate that a significant amount of professional judgement is needed to be exercised.

There are times when more detailed information about the circumstances of the occurrence allows the ATSB to make a more informed decision both about whether to investigate at all and, if so, what necessary resources are required (investigation level). In addition, further publically available information on accidents and serious incidents increases safety awareness in the industry and enables improved research activities and analysis of safety trends, leading to more targeted safety education.

The Short Investigation Team gathers additional factual information on aviation accidents and serious incidents (with the exception of 'high risk operations), and similar Rail and Marine occurrences, where the initial decision has been not to commence a 'full' (level 1 to 4) investigation.

The primary objective of the team is to undertake limited-scope, fact gathering investigations, which result in a short summary report. The summary report is a compilation of the information the ATSB has gathered, sourced from individuals or organisations involved in the occurrences, on the circumstances surrounding the occurrence and what safety action may have been taken or identified as a result of the occurrence.

These reports are released publically. In the aviation transport context, the reports are released periodically in a Bulletin format.

Conducting these Short investigations has a number of benefits:

- Publication of the circumstances surrounding a larger number of occurrences enables greater industry awareness of potential safety issues and possible safety action.
- The additional information gathered results in a richer source of information for research and statistical analysis purposes that can be used both by ATSB research staff as well as other stakeholders, including the portfolio agencies and research institutions.
- Reviewing the additional information serves as a screening process to allow decisions to be made about whether a full investigation is warranted. This addresses the issue of 'not knowing what we don't know' and ensures that the ATSB does not miss opportunities to identify safety issues and facilitate safety action.
- In cases where the initial decision was to conduct a full investigation, but which, after the preliminary evidence collection and review phase, later suggested that further resources are not warranted, the investigation may be finalised with a short factual report.
- It assists Australia to more fully comply with its obligations under ICAO Annex 13 to investigate all aviation accidents and serious incidents.
- Publicises ***Safety Messages*** aimed at improving awareness of issues and good safety practices to both the transport industries and the travelling public.

Australian Transport Safety Bureau

Enquiries 1800 020 616
Notifications 1800 011 034
REPCON 1800 011 034
Web www.atsb.gov.au
Twitter @ATSBinfo
Email atsbinfo@atsb.gov.au
Facebook atsbgovau

Investigation

ATSB Transport Safety Report
Aviation Short Investigations

Aviation Short Investigations Bulletin Issue 58
AB-2017-027
Final – 24 March 2017