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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

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Loss of separation assurance between an Airbus A320, VH-VNQ and Boeing 737, VH-VZB

What happened

Airspace map

Source: Airservices Australia

On 30 August 2013, a loss of separation assurance (LOSA)[1] occurred between an Airbus A320, registered VH-VNQ (VNQ), and a Boeing 737, registered VH-VZB (VZB), 50 km south-south-east of Hay Airport, New South Wales. VNQ was conducting a passenger flight from Melbourne, Victoria to Cairns, Queensland under the instrument flight rules (IFR).[2] VZB was also conducting an IFR passenger flight in the opposite direction, from Cairns to Melbourne.

Both aircraft were operating in Class A airspace,[3] under the control of an Airservices Australia (Airservices) air traffic controller (Controller 1). The required separation standard in the portion of Class A airspace covered by radar surveillance was 5 NM laterally or 1,000 ft vertically. The majority of air routes in the airspace over which Controller 1 had jurisdiction were one-way routes – aircraft could only operate in the direction marked on the aeronautical charts (Figure 1). The Melbourne to Cairns route was a two-way route designated T139 (Figure 2). The airspace also contained a number of east/west routes that crossed T139, as well as a number of north-west/south-east routes. As well as separating aircraft under their jurisdiction, Controller 1 was also responsible for sequencing aircraft arriving through their airspace for arrival into Melbourne.

Flight crews were required to plan flights in accordance with levels based on the magnetic heading of the planned track: flights on magnetic tracks from 000˚ through east to 179˚ must plan odd cruising levels; those on magnetic tracks from 180˚ through west to 359˚ must plan even cruising levels. Within controlled airspace, air traffic control (ATC) may assign and pilots may request a level that does not conform to this requirement when traffic or other operational circumstances require.

The crew of VNQ had planned to operate at flight level (FL) 360,[4] and the crew of VZB had planned to operate at FL360 to a position inland and abeam Emerald, Queensland, and then at FL370 to Melbourne. However, the change of level planned by VZB had not been initiated by the flight crew or the need to continue at FL360 questioned by either Brisbane or Melbourne ATC, resulting in both aircraft converging at the same flight level.

At about 1620 Eastern Standard Time,[5] Controller 1 reported that their focus was on monitoring VNQ's climb through the levels of a number of aircraft on crossing air routes and only became

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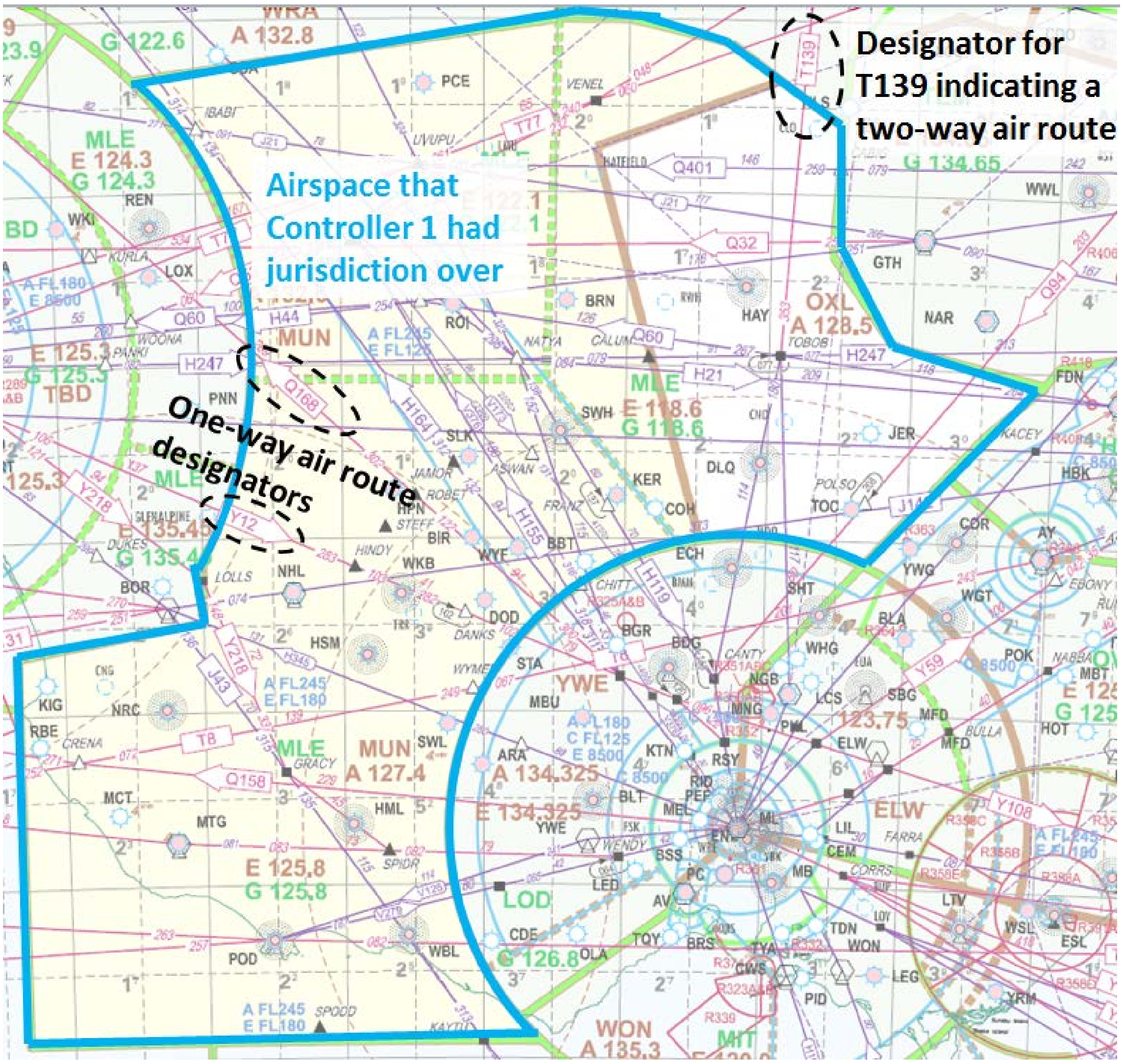
1. A separation standard existed; however, planned separation was not provided or separation was inappropriately or inadequately planned.
2. Instrument flight rules permit an aircraft to operate in instrument meteorological conditions (IMC), which have much lower weather minimums than visual flight rules. Procedures and training are significantly more complex as a pilot must demonstrate competency in IMC conditions, while controlling the aircraft solely by reference to instruments. IFR-capable aircraft have greater equipment and maintenance requirements.
3. Class A: Instrument flight rules (IFR) flights only are permitted. All flights are provided with an air traffic control service and are positively separated from each other.
4. At altitudes above 10,000 ft in Australia, an aircraft's height above mean sea level is referred to as a flight level (FL). FL360 equates to 36,000 ft.
5. Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours.

aware of the aircraft converging at the same level when, at 1624, the Short Term Conflict Alert (STCA) activated and radar separation was about 18 NM (33 km). Controller 1 immediately issued a safety alert,[6] and issued instructions to the crew of VNQ to turn right and provided traffic information[7] on VZB, which was now 14 NM (25 km) away in their 12 o'clock position.[8] Controller 1 then issued a safety alert and issued instructions to the crew of VZB to also turn right. Controller 1 subsequently issued instructions to the crew of VZB to descend to FL350 and provided traffic information on VNQ which was now at 6.3 NM in their 9 o'clock position. Radar separation reduced to 5.9 NM and 900 ft at 1625 as the aircraft passed abeam each other. While there was a loss of separation assurance, radar separation was not infringed.

Figure 1: Airspace that Controller 1 had jurisdiction over



Source: Airservices Australia

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6 Safety alert – the provision of advice to an aircraft when ATC becomes aware that an aircraft is in a position which is considered to place it in unsafe proximity to terrain, obstructions or another aircraft.

7 Traffic information – information issued by ATC to alert a pilot to other known or observed traffic which may be in proximity to the pilot's position or intended route and to help the pilot avoid collision.

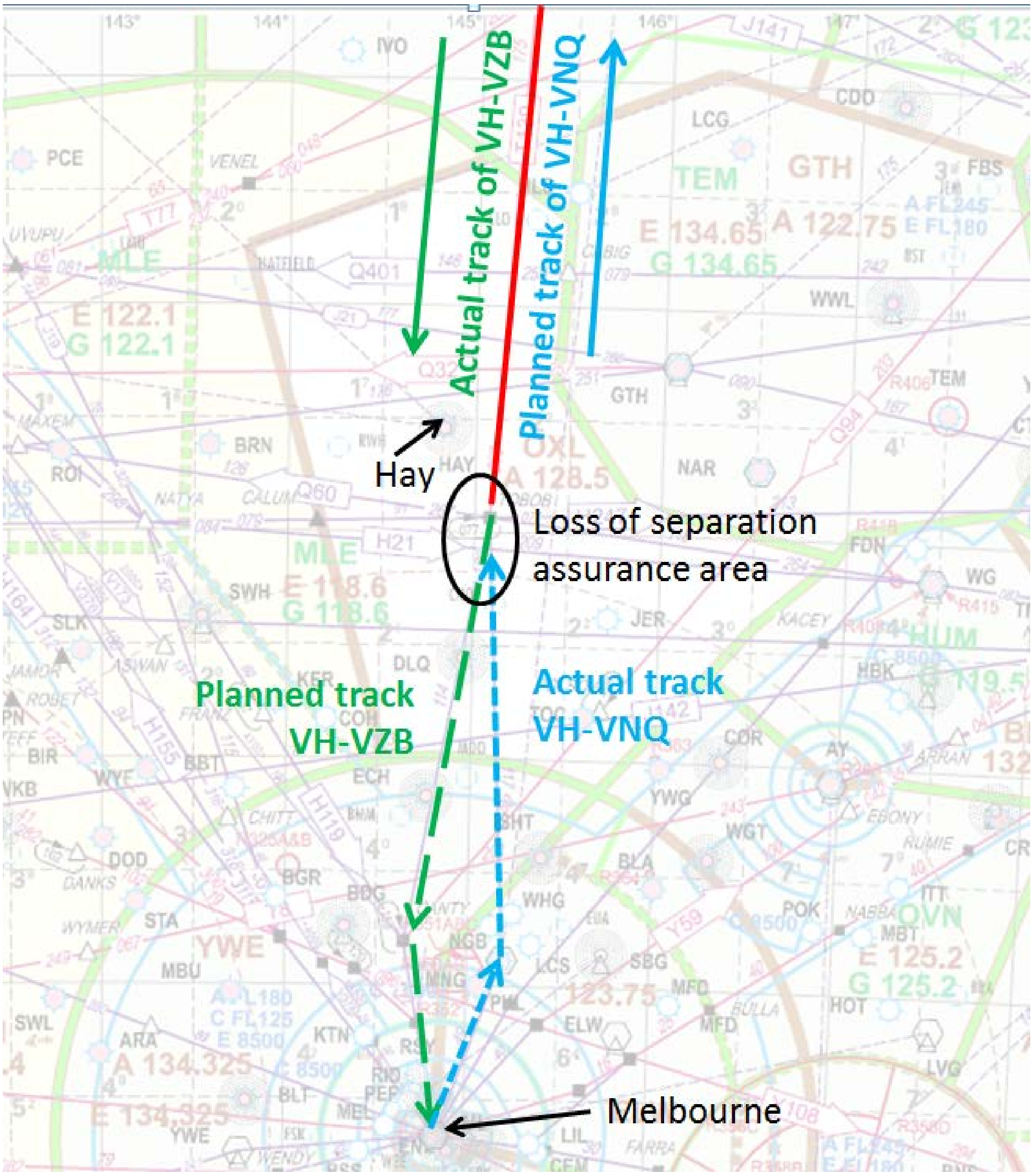
8 The clock code is used to denote the direction of an aircraft or surface feature relative to the current heading of the observer's aircraft, expressed in terms of position on an analogue clock face. Twelve o'clock is ahead while an aircraft observed abeam to the left would be said to be at 9 o'clock.

Airservices Australia investigation report

The Airservices investigation into the LOSA found that Controller 1 correctly utilised compromised separation techniques by issuing safety alerts, turning the aircraft away from each other, descending VZB and passing traffic information. The report also found that an adjustment to the STCA warning distance parameter eight months prior to the incident provided an additional five seconds alert time. The additional time may have assisted Controller 1 to initiate recovery action prior to the separation standard being infringed.

The report noted that the Melbourne to Cairns route structure had not undergone a review following an increase in traffic. Further, the report noted that the Manual of Air Traffic Services (MATS) stated that ATC may assign non-conforming cruising levels only when traffic or other operational circumstances require and to return aircraft to conforming levels when traffic and workload allows.

Figure 2: Airspace map overlaid with aircraft tracks and the LOSA area



Source: Airservices Australia

Safety action

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

Airservices Australia

As a result of this occurrence, Airservices has advised the ATSB that they will review the Melbourne to Cairns air route with regard to creating one-way routes, and more generally review similar routes and risk review mechanisms in place nationally. In addition, Airservices has issued a Standardisation Directive reminding air traffic controllers of their responsibilities regarding the application of non-standard levels and subsequent return to standard levels.

Safety message

The Australian Transport Safety Bureau (ATSB) research report AR-2012-032 titled *Loss of separation between aircraft in Australian airspace January 2008 to June 2012* noted that the basic philosophy driving the design of complex systems, including ATC, is defences in depth. The report identified layers of defence including airspace design, separation standards, the STCA and monitoring and detection by the controllers. A copy of the ATSB research report AR-2012-032 – *Loss of separation between aircraft in Australian airspace January 2008 to June 2012* is available at www.atsb.gov.au/publications/investigation_reports/2012/aair/ar-2012-034.aspx.

In this LOSA incident, the timely activation of the STCA and the controller correctly utilising compromised separation techniques ensured that the separation standards were not infringed.

General details

Occurrence details

Date and time:	30 August 2013 – 1624 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Loss of separation assurance	
Location:	50 km SSE of Hay Airport, New South Wales	
	Latitude: 34° 57.37' S	Longitude: 145° 00.75' E

Aircraft details: VH-VNQ

Manufacturer and model:	Airbus A320-232	
Registration:	VH-VNQ	
Serial number:	5218	
Type of operation:	Air transport - high capacity	
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Aircraft details: VH-VZB

Manufacturer and model:	Boeing Company 737-838	
Registration:	VH-VZB	
Serial number:	34196	
Type of operation:	Air transport - high capacity	
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Incorrect configuration involving Airbus A320, VH-FNP

What happened

Newman Airport

Source: Google earth

On 24 July 2013, an Airbus Industrie A320 aircraft, registered VH-FNP (FNP), was being operated on a scheduled passenger flight from Perth to Newman, Western Australia. The first officer (FO) was designated as the pilot flying.

Prior to reaching the top-of descent point at about 115 NM from Newman Airport, the crew conducted an approach briefing. The briefing included items relevant to Newman, such as runway dimensions, traffic, terrain, weather, the missed approach procedure, and the decision to use 'Flap Full'[1] for the visual approach. The FO then entered the briefed data into the aircraft's flight management guidance system (FMGS). This data allowed the FMGS to compute an approach path for the aircraft to the touchdown point on runway 05.

During the descent, on leaving controlled airspace, air traffic control advised the crew of a Cessna Titan survey aircraft operating in the circuit area at Newman. The crew reported that the descent and the initial part of the approach went according to plan. The captain, as the pilot monitoring, operated and monitored the radio and made all the required radio broadcasts as the aircraft approached Newman. The captain reported that, as the common traffic advisory frequency (CTAF) was quite busy, he spent a considerable amount of time on the radio managing separation from both arriving and departing aircraft.

Approaching Newman from the south, the crew had planned to be at 1,500 ft above ground level (AGL) at 5 NM on final approach. At about 0941 Western Standard Time,[2] as the aircraft turned onto a 5 NM final, the FO commenced flying the flight path vector (FPV),[3] disconnected the autopilot and flight director, and manually flew the aircraft. The weather at the time was a clear day with minimal wind.

When on final approach, the crew reported everything was going to plan and as briefed. The aircraft was on the correct glidepath and on speed. By 500 ft AGL, the landing gear had been extended and 'Flap 3' was selected (Figure 1). As the visual approach had been programmed into the FMGS, the crew expected to receive the automatically generated callout of '500' (500 ft AGL), at which stage they would verify that the approach was stable and the aircraft was configured for landing. On this occasion, neither pilot could recall this callout occurring.

Shortly after, the crew received a ground proximity warning system (GPWS), 'TOO LOW FLAP' warning. The FMGS had been programmed for a 'flap full' landing, but at the time of the warning, Flap 3 was selected. The FO was focussing on the later part of the approach and assessed the aircraft to be at around 500 ft AGL. The FO called 'Flap Full - landing checklist'. At that stage, the captain was maintaining a visual lookout for other traffic and negotiating separation via the radio. With the exception of the final stage of flap, an assessment was made that the aircraft was within all the correct parameters, and it was determined that the safest course of action was to select 'Flap Full' and land. 'Flap Full' was selected, the GPWS warning silenced, and the aircraft landed safely at about 0943.

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1 Flap Full in the A320 refers to 40 degrees of flap.

2 Western Standard Time (WST) was Coordinated Universal Time (UTC) + 8 hours

3 Flight path vector on the Primary Flight Display is used to monitor the descent profile (often referred to as the BIRD).

CTAF recordings

Recordings of the CTAF transmissions obtained by the ATSB identified that there were a number of aircraft operating at Newman at the time. In the 10 minute period prior to FNP landing, there was an inbound helicopter, an arriving aeromedical flight, and a departing scheduled passenger service. The Cessna Titan survey aircraft was also conducting sweeping runs across the north-western part of the circuit area.

Captain experience and comments

The captain held an Air Transport Pilot (Aeroplane) Licence with a total of about 20,190 hours, of which 1,368 hours were on the A320 aircraft.

The captain provided the following comments:

- As the pilot monitoring, the captain was focussed on maintaining separation for FNP with several aircraft within the vicinity, as well as supporting the FO. The captain reported that the workload associated with operating a high performance jet aircraft amongst a mix of other aircraft types, as well as continual efforts to visually acquire traffic, contributed to a temporarily oversight of completing the landing checklist and selecting the final stage of flap.
- The fact that the aircraft was on the correct glidepath and at the approach speed contributed to a sense that the flight was progressing normally.
- There may have been a reliance on, and expectation that the automated 500 ft callout would occur.
- On previous occasions the aircraft failed to provide the 500 ft automatic callout.
- He then assessed that the safest course of action was to select 'Flap Full' and land, rather than go-around and place the aircraft in potential conflict with the survey aircraft and departing aircraft .

First officer (FO) experience and comments

The FO held an Air Transport Pilot (Aeroplane) Licence with a total of about 12,213 hours, of which 1,032 hours were on the A320 aircraft.

The FO provided the following comments:

- There was a reasonable amount of traffic at Newman on the day. The captain and FO continually discussed the traffic and its potential threat to FNP.
- He belived the main concern for FNP was a light aircraft, which departed runway 05 as FNP intercepted final approach. The aircraft was still on upwind during the later stage of their approach. While the crew had lost visual contact with the aircraft, it was still observed on the traffic collision avoidance system (TCAS).[4]
- In the past, the aircraft had occasionally failed to generate the automatic callout at 500 ft AGL.

Recorded information

The aircraft was fitted with a flight data recorder (FDR) and following the incident, the data was downloaded and provided to the ATSB. The data showed the following (Figure 1):

- the aircraft was on the correct vertical and lateral path during the approach
- no large changes in pitch or roll were made
- thrust was stabilised
- vertical speed was not excessive
- the GPWS warning activated at 231 ft Radio Height

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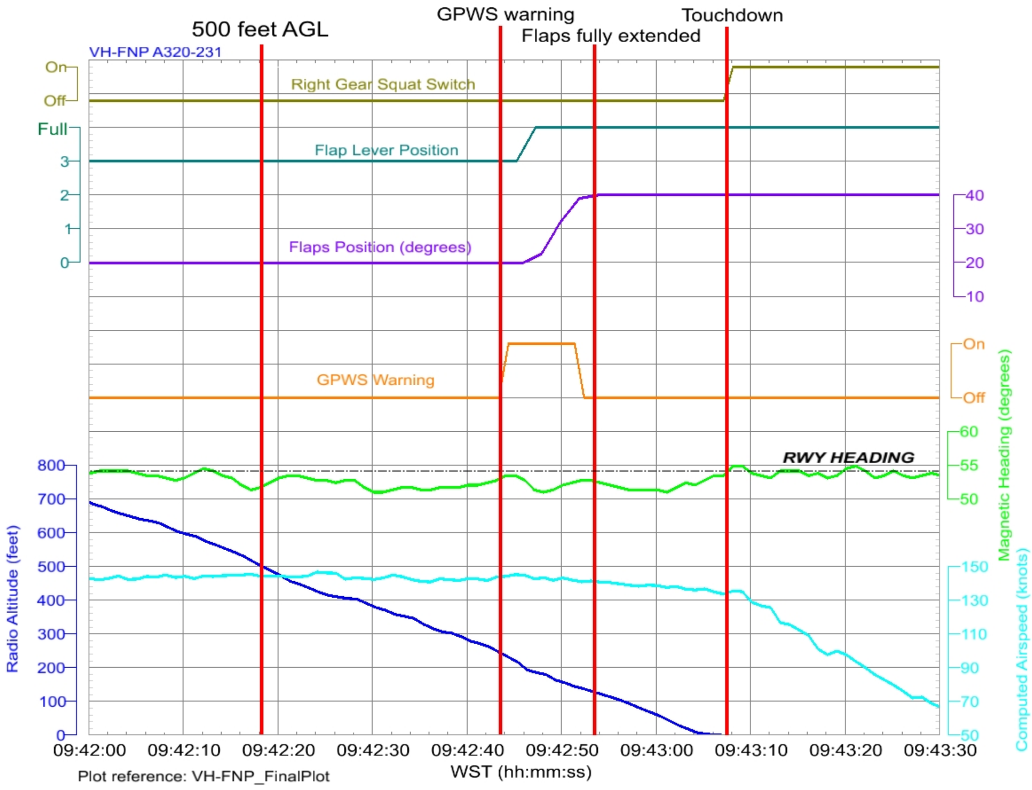
[4] Traffic collision avoidance system (TCAS) is an aircraft collision avoidance system. It monitors the airspace around an aircraft for other aircraft equipped with a corresponding active transponder and gives warning of possible collision risks.

- Full flap was selected at 185 ft
- The flaps were fully extended at approximately 144 ft

Figure 1: Summary of flight data



Source: Australian Transport Safety Bureau

Virgin Australia Regional Airlines investigation

Virgin Australia Regional Airlines conducted an internal investigation and determined the following:

- The approach was considered unstable as the aircraft was not in the desired landing configuration by 500 ft AGL, in visual meteorological conditions, as ‘Flap Full’ had not been selected.
- While the crew did not conduct a go-around as per the company stable approach policy, the captain believed that the safest option was to land.
- The both engines operating missed approach or go-around in daytime visual meteorological conditions should be conducted on runway track, provided obstacle clearance is assured.
- Based on the aircraft’s maximum landing weight, a ‘Flap 3’ landing with autobrake ‘low’ selected would have required a landing distance in excess of the landing distance available.[5] However, if ‘medium’ autobrake was selected or manual braking was used,there would have been sufficient landing distance available with ‘Flap 3’ selected.

5 Runway 05 is 2,072 m in length.

Safety action

Virgin Australia Regional Airlines

As a result of this occurrence, Virgin Australia Regional Airlines has advised the ATSB that they are taking the following safety actions:

- The company's standard go-around procedure is to be reviewed with regard to the requirement to maintain runway track
- A remedial training program was developed for the crew, which included human factors; simulator training; a simulator check; line training; and a line check.

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 of the safety concerns is the handling and management of approaches http://www.atsb.gov.au/safetywatch/handling-approach-to-land.aspx. When compared to other phases of flight, the approach and landing has a substantially increased workload. Pilots and crew must continually monitor the aircraft and approach parameters, and the external environment to ensure they maintain a stable approach profile and make appropriate decisions for a safe landing.

A report published by the United States Navy/National Aeronautics and Space Administration (NASA) Ames Research Center observed concurrent task demands on the flight deck. This research showed that pilots are forced to make decisions interwoven with their well-practiced sequences. This often leads to adding, shedding or rescheduling actions. The report also highlights that distractions pose a continual threat to even the most meticulous and experienced pilot. The report, *Cockpit interruptions and distractions: A line observation study* is available at: human-factors.arc.nasa.gov/awards_pubs/publication_view.php?publication_id=48.

General details

Occurrence details

Date and time:	24 July 2013 – 1000 WST	
Occurrence category:	Incident	
Primary occurrence type:	Incorrect configuration	
Location:	Newman Airport, Western Australia	
	Latitude: 23° 25.07' S	Longitude: 119° 48.17' E

Aircraft details

Manufacturer and model:	Airbus A320-231	
Registration:	VH-FNP	
Operator:	Virgin Australia Regional Airlines Pty Ltd	
Serial number:	429	
Type of operation:	Air transport - high capacity	
Persons on board:	Crew – 4	Passengers – 98
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Flight planning related event involving an Airbus A330, VH-QPD

What happened

On 15 October 2013, at about 0410 Eastern Daylight-savings Time (EDT),[1] the flight plan for a Qantas Airways Airbus A330 aircraft, registered VH-QPD, Qantas Flight 565 (QF 565), was automatically generated and subsequently checked and released by the dispatcher at about 0420. The flight was scheduled to depart Sydney, New South Wales at 0600 on a passenger service to Perth, Western Australia. The first officer (FO) was designated as the pilot flying.

At about 0430, while en-route to the airport, the captain of QF 565 downloaded the weather package and flight plan onto his Qantas issued iPad.

At about 0440, the company meteorologist advised the dispatcher that a new terminal aerodrome forecast (TAF) had been issued for Perth, which required QF 565 to have an alternate destination due forecast fog.[2] The dispatcher then produced a new flight plan for QF 565.

At about 0450, the dispatcher released a new flight plan. He attempted to contact the captain via mobile phone, leaving a voicemail message advising that a new flight plan had been issued due to an amended weather forecast. As it was still prior to the crew's nominal sign-on time of 0500, the dispatcher believed that the crew would see the new plan. The dispatcher appended notes to the flight plan, stating, 'new flight plan due change in weather requirements'.

The captain and FO arrived at the airport before 0500 and both of their mobile phones were switched off prior to this time. The FO initially checked his iPad and the flight plan was not available, but reported that, at about 0504, he was able to download the flight plan and weather (briefing package). The flight plan downloaded by the FO was the original flight plan, despite dispatch having released the new plan prior to this time.

They reviewed the information on their respective iPads and noted that there were no weather requirements for Perth and that they both had the same flight plan. The captain also noted that their initial cruising altitude was flight level (FL)[3] 320. The crew completed the briefing and requested 32.1 tonnes of fuel be uploaded. They then proceeded to the aircraft to commence pre-flight duties (Figure 1).

Each flight plan was issued with a unique retrieval code (RC). The RC identified the flight plan that was downloaded by the crew; the latest plan issued by dispatch; and the plan submitted to air traffic control (ATC). The flight plan downloaded by the crew on that morning had an RC of 4765. The new flight plan released by the dispatcher had an RC of 4794.

When at the aircraft, the FO printed out the deck log (navigation log) from the aircraft communications addressing and reporting system (ACARS) and stowed it. The deck log contained the planned flight route and waypoints, but not the dispatcher notes or other details from the flight plan.

The FO then loaded the flight plan into the flight management computer (FMC). Having completed the walk-around, the captain contacted Qantas Sydney via radio and gave them the fuel order, fuel burn and flight time. He was not advised of any change to the flight plan at that time.

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[1] Easter Daylight-savings Time (EDT) was Coordinated Universal Time (UTC) + 11 hours.

[2] Specified weather conditions or facilities for a particular aerodrome such that, if the weather conditions or facilities are less than the alternate minima, the pilot in command must provide for a suitable alternate aerodrome.

[3] At altitudes above 10,000 ft in Australia, an aircraft's height above mean sea level is referred to as a flight level (FL). FL 320 equates to 32,000 ft.

The crew received an ACARS message from dispatch to check that their RC number was 4794. The FO confirmed that this number matched the RC number on the deck log, and the captain also confirmed the two matched.

Prior to pushback, the crew switched their iPads to 'flight mode'[4]. The captain reported that he had not received an alert on the iPad advising of a new flight plan.

The flight departed at about 0600. When at the top of climb, the captain retrieved the deck log and noticed that the initial flight level on the log was FL 360. He recalled that the initial planned cruise altitude downloaded onto the iPad was FL 320. As they had been cleared by ATC to FL 320, he also assumed that ATC were using the original flight plan. He also noted a departure fuel of 45 tonne on the log and realised that something was wrong.

The captain called dispatch via satellite phone and was advised that Perth now required an alternate due to fog. He then contacted the duty pilot and advised that they did not have the minimum fuel required for the flight to Perth (with an alternate) and amended their destination to Adelaide. The forecast was subsequently updated, removing the requirement for an alternate and the aircraft was able to continue to Perth and landed with fuel reserves intact.

Figure 1: Airbus A330 cockpit

Source: Chris Gimmillard

Dispatch procedures

Communications

- The dispatch procedures stated that, if the crew had 'arrived at briefing', the dispatcher was to create the new flight plan and advise the crew either via telephone, very high frequency (VHF) radio or ACARS, and that 'direct contact must be made'.
- The Flight Dispatch Manual stated that telephone was an approved method for contacting the crew, however, there was no requirement for the crew to have a telephone on, prior to, or during the preparation or conduct of a flight.
- The crew reported that the usual means of communication on the ground was via the company radio frequency.

4 Flight mode disables all wireless activities.

- The captain reported that there was no formal sign on procedure and no one was advised of the crew's arrival at the airport.

Obtainment of flight plan

Prior to the introduction of the company iPads, the crew collected a printed briefing package from the briefing office. The dispatcher would then be aware that the crew had retrieved the flight plan. As no response or acknowledgement was generated when a flight plan was downloaded on an iPad, the dispatcher was unable to determine when, or which flight plan had been downloaded by the crew.

Revised flight information

Prior to introduction of the iPads, if an updated flight plan or weather package was available, a member of ground staff would bring the paper copy to the cockpit. Dispatch could contact the crew via ACARS or satellite phone.

Dispatcher notes

The dispatcher notes printed on the first page of a flight plan did not display on the deck log or appear on the FMC.

iPad flight plans and weather information

The flight plan was obtained by the crew via the 'QPilot' application on the iPad. The application notified the crew when a flight plan was available, however, when in 'flight mode' the notification function was not active. Furthermore, dispatch was not notified when a flight plan or weather package had been downloaded to an iPad.

Pilot comments

The crew reported that there were often issues with downloading weather and flight plans and that, on occasion, one crew member was able to partially download the information, while the other crew member was unable to download any information.

The captain reported that the 'check RC matches your flight plan' ACARS message appeared on an ad-hoc basis. The crew also reported that, if the message had advised of a reason for the check, the weather in Perth had changed and a new flight plan was available, they would have checked the flight plan downloaded to the iPad.

The captain also stated that there is limited internet connection on the flight deck and therefore they are generally unable to download data when in the cockpit.

The crew recommended that the message only be issued when a new flight plan had been created and that an explanation for the check should be appended to the message.

Dispatcher comments

In hindsight, the dispatcher reported that he could have persisted in attempting to contact the crew via other means. The dispatcher reported that he believed that the 'check RC' message was sent to all crews 20 minutes prior to departure, for every domestic flight.

RC check message

The flight plan loaded into the FMC and the deck log were retrieved from the airside computer server once it was released by dispatch. There was no RC number on the FMC. The RC number on the deck log will almost always match the RC number on the ACARS message, as both obtain the RC number from the same server.

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.

Qantas Airways

As a result of this occurrence, Qantas Airways has advised the ATSB that the flight technical personnel are working with the dispatch team to review the process. They have also taken the following interim safety action:

Internal Notice to Airmen (INTAM)

The following INTAM was issued to all crews:

> Whenever the ACARS message – FLIGHT PLAN FILING CHECK – is received, flight crew must ensure the latest flight plan has been uploaded to the iPad and that the fuel order is checked against the new flight plan.

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 of the safety concerns is safety around data input errors www.atsb.gov.au/safetywatch/data-input-errors.aspx.

Effective operating procedures, improved aircraft automation systems and software design, and clear and complete flight documentation will all help prevent or uncover data entry errors.

This incident highlights the importance of ensuring vital information is relayed to crews in a timely manner. When new information is available on the ground, providing that information to crew prior to departure can reduce the impact on crew workload and any consequences to the operation of the flight.

General details

Occurrence details

Date and time:	15 October 2013 – 1600 EDT	
Occurrence category:	Serious incident	
Primary occurrence type:	Pre-flight/planning	
Location:	Sydney Airport, New South Wales	
	Latitude: 33° 56.77' S	Longitude: 151° 10.63' E

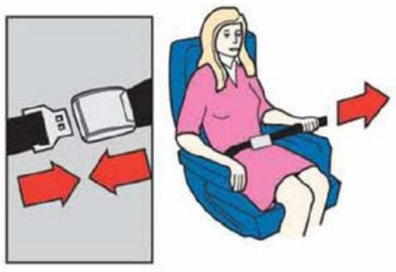
Aircraft details

Manufacturer and model:	Airbus Industrie A330-303	
Registration:	VH-QPD	
Operator:	Qantas Airways	
Serial number:	0574	
Type of operation:	Air transport - high capacity	
Persons on board:	Crew – 10	Passengers – 200
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Turbulence event involving a Boeing 767, VH-OGU

What happened

Keep your seatbelt fastened



Source: ATSB

On 8 November 2013, the captain and first officer operating a Qantas Boeing 767 aircraft, registered VH-OGU, prepared to conduct a scheduled passenger service from Melbourne, Victoria to Sydney, New South Wales. The crew obtained the relevant weather information, with no requirements for holding fuel or an alternate[1] indicated.

Prior to departure, the crew also obtained the Automatic Terminal Information Service (ATIS) for Sydney, which advised of windshear on approach to runway 34 Left, and moderate turbulence below 5,000 ft.

During the descent into Sydney, the crew switched on the seatbelt sign at about 10,000 ft above mean sea level (AMSL). At about the same time, they observed lightning to the right of the aircraft's track, with a corresponding red return on the aircraft's weather radar display.

At about 2026 Eastern Daylight-savings Time,[2] while on approach and descending through 4,200 ft AMSL, the aircraft encountered moderate turbulence for about 2 minutes. At about 3,000 ft AMSL, the crew elected to discontinue the approach, and conducted a missed approach. During the subsequent climb, passing about 4,200 ft AMSL, the aircraft encountered severe turbulence.

The crew reported that full go-around power was required to maintain altitude and speed, and they experienced difficulty controlling the aircraft. In the cabin, one passenger sustained a serious head injury from a laptop computer that fell from an overhead locker. One other passenger sustained a minor rib injury and a third passenger sustained a minor injury from an iPad.

The crew subsequently obtained a clearance from air traffic control (ATC) to climb to 8,000 ft AMSL and conduct orbits. During the climb, the aircraft encountered turbulence lasting several minutes.

After orbiting for about 20 minutes, ATC advised that a number of aircraft had landed successfully and the crew commenced an approach to runway 16 Right. Passing about 5,000 ft AMSL, the aircraft again encountered severe turbulence and was difficult to control, and the crew again conducted a missed approach and commenced a turn to the north.

At about 2127, based on the remaining fuel quantity and the turbulence on the approach to Sydney, the crew declared a 'PAN'[3] and elected to divert to Williamtown, New South Wales. The aircraft landed at Williamtown with fuel reserves intact. On arrival, the aircraft was met by an ambulance and the injured passengers were transferred to hospital for treatment.

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1 Specified weather conditions or facilities for a particular aerodrome such that, if the weather conditions or facilities are less than the alternate minima, the pilot in command must provide for a suitable alternate aerodrome.

2 Eastern Daylight-savings Time (EDT) was Coordinated Universal Time (UTC) + 11 hours.

3 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.

Meteorological information

The Bureau of Meteorology provided the ATSB with a report detailing the weather at the time of the incident including conditions, forecasts, warnings and satellite and radar imagery. A strong and gusty south-westerly change approached Sydney Airport and produced windshear as the change encountered the north easterly sea-breeze.

The wind profiler at Sydney Airport recorded a significant change in wind speed and direction at about 2015, resulting in windshear between 4,000 ft and 5,000 ft. This may have caused a rapid loss of at least 60 kt of headwind for aircraft on descent.

Safety message

> *Turbulence is a weather phenomenon responsible for the abrupt sideways and vertical jolts that passengers often experience during flights, and is the leading cause of in-flight injuries to passengers and cabin crew.*

The Aviation Safety Bulletin *Staying Safe against In-flight Turbulence:* www.atsb.gov.au/publications/2008/ar2008034.aspx published by the Australian Transport Safety Bureau (ATSB) identified that 99 per cent of people on board an aircraft receive no injuries during a typical turbulence event. Between January 1998 and May 2008, 339 turbulence events were reported to the ATSB by the airlines, which resulted in over 150 minor and serious injuries.

This incident serves as a timely reminder to passengers to safely stow any carry-on baggage, laptops, iPads and other items in the overhead locker or under the seat in front of you, particularly when the seatbelt light is turned ON. These items can become projectiles during turbulence if not properly secured.

General details

Occurrence details

Date and time:	8 November 2013 – 2026 EDT	
Occurrence category:	Serious incident	
Primary occurrence type:	Turbulence event	
Location:	near Sydney Airport, New South Wales	
	Latitude: 33° 56.77' S	Longitude: 151° 10.63' E

Aircraft details

Manufacturer and model:	The Boeing Company 767	
Registration:	VH-OGU	
Operator:	Qantas Airways Limited	
Serial number:	29118	
Type of operation:	Air transport high capacity - Passenger	
Persons on board:	Crew – 9	Passengers – 179
Injuries:	Crew – Nil	Passengers – 1 serious, 2 minor
Damage:	Nil	

Turboprop aircraft

Fuel related event involving a Fairchild SA227, VH-UUO

VH-UUO

Source: Victor Pody

What happened

On 28 August 2013, at about 0030 Eastern Standard Time,[1] a Fairchild SA227 aircraft, registered VH-UUO, arrived at Brisbane Airport from Cairns, Queensland. The pilot checked the fuel quantity after landing and advised engineering staff that the fuel tanks were out of balance and the left fuel quantity gauge was unserviceable. The unserviceability was recorded on the aircraft maintenance log (AML).

The pilot and engineers rebalanced the fuel tanks in accordance with company procedures. They also refuelled the aircraft so that a total of 1,200 L of fuel was on board in preparation for the subsequent flight to Bankstown, New South Wales. The pilot then concluded his duty for the day.

The pilot of the next flight was en-route to Brisbane Airport when he contacted operations staff requesting an additional 200 L of fuel be uploaded due to the forecast weather at Bankstown. The pilot reported that a staff member then went to the aircraft and noted the left fuel quantity gauge unserviceability on the AML and that there had been an imbalance of about 100 L between the fuel tanks, with about 100 L more fuel in the left tank than the right. Unaware that the previous pilot and engineers had corrected the imbalance, the staff member ordered the additional 200 L of fuel as requested by the pilot. He requested that 150 L be put in the left tank and 50 L in the right as he believed this would balance the fuel tanks. However, the 150 L of fuel was incorrectly loaded into the right tank, resulting in a total of 750 L in the right tank, 650 L in the left tank, and an imbalance of 100 L.[2]

When the pilot arrived at Brisbane, he conducted a pre-flight inspection and noted the unserviceable fuel quantity gauge on the AML. He then checked the minimum equipment list (MEL),[3] which stated that one fuel tank quantity gauge may be inoperative provided that a reliable means was used to establish that the fuel quantity on board met the regulatory requirements for the flight.

Prior to commencement of a flight, the pilot was required to establish the fuel quantity by checking the previous flight record for calculated fuel quantity remaining and fuel added since the last flight. The previous pilot had been able to confirm the fuel on-board from three sources: magna sticks;4 the fuel burn during the flight; and the fuel log book. The magna sticks only provided valid fuel quantity readings for each tank between 114 L (30 USG) and 586 L (155 USG), which the previous pilot was able to use on arrival in Brisbane, but could not subsequently be used once the additional fuel had been uploaded. The pilot assessed that the previous pilot and engineers had established the fuel quantity, which complied with the MEL requirements.

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

2 According to the pilot operating handbook, the permissible fuel imbalance between tanks was 114 L (200 lb).

3 Minimum equipment list (MEL), approved by the State of the Operator which will enable the pilot-in-command to determine whether a flight may be commenced or continued from any intermediate stop should any instrument, equipment or systems become inoperative.

4 A Magna-stick was located under each wing, inboard of the engine nacelle. Magna sticks allowed checking of the fuel quantity, in 5 US gallon graduations, of each wing tank, provided the tank contained between approximately 30 and 155 US gallons (114 L to 586 L).

The pilot reported that he expected about 1,400 L of fuel to be on board. The serviceable fuel quantity gauge was indicating 852 L of fuel in the right tank and the left gauge was reading zero. According to the aircraft's fuel log book, there was about 1,400 L on board, with about 700 L in each tank. As the aircraft was on level ground, the pilot opened the cross-flow valve and the serviceable (right) fuel gauge dropped to read 795 L and then stabilised. The pilot believed that he had removed the fuel imbalance and that the aircraft was now in balance. He also made the assumption, in accordance with company procedures, that the gauges were over-reading (and therefore overestimating the fuel on board) and that the fuel log book was under-reading, (and therefore overestimating the fuel burn). The fuel log book reading was determined on the lowest fuel quantity obtained from either: the fuel log, the magna sticks, or the fuel quantity gauge/s.

At about 0130, the aircraft departed Brisbane on the flight to Bankstown. During the initial climb, the pilot reported that the right wing dropped markedly. As the weather was fine and the night was bright, the pilot was able to establish a visual reference and maintain control of the aircraft. The pilot raised the right wing and opened the fuel cross-flow valve to rebalance the aircraft. After about 2 minutes, the pilot reported that the aircraft was in trim[5] and he closed the cross-flow valve.

When in the cruise, the aircraft appeared to be in balance and was in a controllable state. He trimmed the aircraft and then engaged the autopilot. About 1 hour later, the pilot disengaged the autopilot and ensured the aircraft was still in trim.

During the approach to Bankstown, the pilot reported that the aircraft handled normally until at about 400 ft above ground level, when the right wing dropped again when the final stage of flap was selected. The pilot raised the right wing and elected to continue the approach, landing without further incident.

The pilot and an engineer then used the magna sticks to ascertain the fuel quantity remaining in each tank. They determined that there was an imbalance of about 210 L. They opened the cross-flow valve and re-balanced the aircraft.

Pilot comments

The pilot provided the following comments:

- Following the departure from Brisbane, he elected not to return to Brisbane as the aircraft would have been above the maximum landing weight and he would have had to burn off fuel. Once the aircraft was in trim and controllable, he elected to continue to Bankstown.
- The aircraft was not normally operated with full fuel due to payload limitations. The sectors typically flown were 1 hour or less in duration. If the aircraft had been filled prior to departing, the only reliable way to re-check the fuel quantity on board after a short sector would be to fill the tanks to full because of the limited range of validity of the magna sticks.
- He elected not to conduct a go-around at Bankstown as the aircraft may have had similar controllability issues as experienced on climb-out at Brisbane.
- If the aircraft had entered instrument meteorological conditions (IMC)[6] on take-off, he may not have been able to control the aircraft as promptly.
- A pilot with less experience on the SA227 may not have been able to regain control of the aircraft as easily.
- The company pilots perform simulated asymmetric engine failures after take-off regularly as part of their ongoing training and checking, and he believed that practice assisted in his ability to control the aircraft.

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5 Trim is a basic measure of any residual moments about the aircraft centre of gravity in hands-off flight.

6 Instrument meteorological conditions (IMC) describes weather conditions that require pilots to fly primarily by reference to instruments, and therefore under Instrument Flight Rules (IFR), rather than by outside visual references. Typically, this means flying in cloud or limited visibility.

- Adding fuel in attempt to rebalance an aircraft carries a high level of risk. Draining and refilling fuel tanks would be a safer method.

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 taking the following safety actions:

Recommended amendments to the MEL, subsequent to CASA approval

- The pilot in command is to supervise refuelling.
- If the aircraft has been refuelled from a known quantity, either full fuel or within the valid range for the magna sticks, then the next refuel can be from the known fuel burn.
- The subsequent refuel must again be from a known quantity.
- Removing the reliance on using previous flight records for obtaining fuel quantity onboard.

Safety message

This incident highlights the importance of thorough pre-flight preparation in particular with regard to fuel planning and loading. A *Flying* magazine article available at www.flyingmag.com/technique/tip-week/balance-your-fuel reminds pilots that ensuring sufficient fuel is being carried is not the only fuel-related concern to keep in mind. A fuel imbalance can potentially affect the controllability of the aircraft.

Civil Aviation Advisory Publication (CAAP) 234-1(1)[7] provides guidelines for aircraft fuel requirements and 13.1 states that:

> *Unless assured that the aircraft tanks are completely full, or a totally reliable and accurately graduated dipstick, sight gauge, drip gauge or tank tab reading can be done, the pilot should endeavour to use the best available fuel quantity cross-check prior to starting. The cross-check should consist of establishing the fuel on board by at least two different methods…*

The following provide additional information on fuel related events:

- *Flight Safety* magazine, November 2006, has an article regarding a Metro accident resulting from the crew inducing a sideslip to balance fuel, http://flightsafety.org/asw/nov06/asw_nov06_p46-50.pdf?dl=1.
- The ATSB report www.atsb.gov.au/publications/investigation_reports/2007/aair/ao-2007-017.aspx provides valuable information regarding assessment of an aircraft's fuel state.

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7 www.casa.gov.au/download/caaps/ops/234_1.pdf

General details

Occurrence details

Date and time:	28 August 2013 – 0130 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Fuel related event	
Location:	Brisbane Airport, Queensland	
	Latitude: 27° 23.05' S	Longitude: 153° 07.05' E

Aircraft details

Manufacturer and model:	Fairchild Industries Inc. SA227-AC	
Registration:	VH-UUO	
Serial number:	AC 530	
Type of operation:	Charter - freight	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Piston aircraft

Electrical system event involving a Cirrus SR22T, VH-LBQ

What happened

VH-LBQ

Source: Pilot

On 5 August 2013, at about 1240 Eastern Standard Time (EST),[1] a Cirrus SR22T aircraft, registered VH-LBQ, was being operated on a private flight from Archerfield to Kingaroy, Queensland, with the pilot and one passenger on board.

On approach to Kingaroy, at about 500 ft above ground level (AGL), the pilot extended the flaps and, shortly after, disconnected the autopilot (AP). Upon disconnecting the autopilot, the pilot reported that the aircraft pitched-up violently due to trim runaway. The AP pitch trim was trimming the aircraft for a nose-up position, even though the AP was disconnected. This required the pilot to use a large amount of forward physical force to maintain stable flight. He attempted to resolve the problem several times by pressing and holding the autopilot disconnect switch (AP DISC) located on the control yoke, however, this had no effect. The pilot then conducted a go-around.

He then used the manual electric trim (MET) hat switch located on the control yoke, in an attempt to trim the aircraft nose-down. As the pilot was using the MET to trim the aircraft, which was going against the AP pitch trim runaway, the trim adjusted at a slow rate. The pilot was able to regain sufficient control of the aircraft and land safely at Kingaroy.

The pilot reported that, upon parking the aircraft and after releasing the MET, the pitch trim was at full nose-up deflection.

Flight systems

Automatic flight control system

The aircraft was equipped with an automatic flight control system (AFCS), which included a flight director function that provided pitch and roll commands when activated. The AFCS also included an AP function which controlled the aircraft pitch, roll and yaw attitudes following the commands received from the flight director when activated. The autopilot could be disconnected by pressing the AP DISC switch mounted on the control yoke. If the AP DISC switch was depressed, the AP and the MET would not operate until the AP DISC switch was released.

Electronic stability

The aircraft was also equipped with an electronic stability and protection (ESP) system, capable of providing automatic control inputs when the aircraft attitude exceeded predefined limits. The ESP system could be interrupted by pressing and holding the AP DISC switch.

Pitch trim control

The trim of the aircraft could only be manually controlled by the pilot using the hat switch mounted on the control yoke when the AP was disconnected.

[1] Eastern Standard Time (abbreviated EST) was Coordinated Universal Time (UTC) +10 hours.

Subsequent testing

As a result of the event, ground checks were carried out by a maintenance engineer who found no defects with the AP system and was unable to duplicate the event. Two successful test flights were also undertaken with no defects found with the AP system. The elevator trim was subsequently adjusted to correct an observed slight nose-up situation when the AP was disconnected.

On the basis of the evidence available to the ATSB, it was not possible to determine, with any certainty, the reason for the pitch-up event.

Electric trim/autopilot failure checklist

The pilot operating handbook for the aircraft stated, that in the event of an electric trim (MET) or AP failure, the pilot should maintain manual control of the aircraft, disengage the AP (if engaged) and, if the problem is not corrected, pull the circuit breakers for the pitch trim, roll trim and AP. If runaway trim occurred, de-energise the circuit by pulling the circuit (pitch trim, roll trim or AP) and land as soon as conditions permit.

Pilot comment

At the time, the pilot was unable to action the manufacturer’s trim runaway abnormal checklist. The pilot believed that, if he had actioned the checklist, this would have made the situation more difficult. The circuit breakers were located on the left side of the centre console. The pilot elected not to pull the circuit breaker as he would have had to spend time searching for the correct circuit breaker, which would have been unsafe as the aircraft was close to the ground, close to the airport and he was still applying significant force against the trim runaway.

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

Red circuit breaker collars

VH-LBQ will be fitted with red circuit breaker collars around the relevant circuit breakers to make them easily identifiable.

Company procedure

The operator will now require all pilots operating the Cirrus SR22T aircraft to memorise the procedures for an electric trim or AP failure.

Safety message

The pilot’s decision to go-around when the aircraft became difficult to handle is to be commended. The ATSB has investigated incidents and accidents which have resulted from pilots persisting with an unstable approach. This occurrence highlights the safety benefit to be gained from going around, which allowed the pilot time to troubleshoot and prepare for landing with the pitch trim difficulties. This decision helped ensure the aircraft landed safely.

General details

Occurrence details

Date and time:	5 August 2013 – 1240 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Electrical system event	
Location:	near Kingaroy aerodrome, Queensland	
	Latitude: 25° 34.85’ S	Longitude: 151° 50.47’ E

Aircraft details

Manufacturer and model:	Cirrus Design Corporation SR22T	
Registration:	VH-LBQ	
Serial number:	0228	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Aircraft proximity event between a Piper PA-44, VH-CZH and a Mooney M20, VH-DJU

What happened

On 5 October 2013, a Piper PA-44 aircraft, registered VH-CZH (CZH), was enroute to Rottnest Island, from Perth, Western Australia, to conduct instrument flight rules (IFR)[1] navigation aid (navaid) training. On board were a flight instructor and student pilot.

As CZH departed Perth controlled airspace during the short transit to Rottnest Island, the pilot contacted and monitored the Perth Centre air traffic control (ATC) frequency, as well as broadcasting on, and monitoring, the Rottnest Island common traffic advisory frequency (CTAF).

When CZH arrived over the Rottnest Island non-directional (radio) beacon (NDB)[2] at 3,000 ft above mean sea level (AMSL), there was one other IFR training aircraft conducting navaid training, and a visual flight rules (VFR) aircraft departing the aerodrome. The student of CZH, monitored by the instructor, practiced some holding patterns prior to commencing the runway 27 NDB approach (Figure 1). Both the instructor and student constantly updated their position reports on the CTAF. CZH was in instrument meteorological conditions (IMC),[3] with the weather rapidly deteriorating as a large cold front moved in from the south-west. With the significant increase in turbulence, the instructor began to manage the operation of the radio, to allow the student to focus on flying the aircraft.

At about 1509 Western Standard Time (WST),[4] as CZH was inbound in the holding pattern at 2,000 ft, Perth Centre ATC advised the crew that an IFR Mooney M20 aircraft, registered VH-DJU (DJU), was inbound to Rottnest Island, and would be on descent from 3,000 ft, for instrument navaid training. The estimated time of arrival overhead the NDB would be 1518. The instructor in CZH acknowledged this traffic information.

Shortly after, as DJU left Perth controlled airspace, the instructor and student in DJU gave their initial report to Perth Centre ATC advising they were at 3,000 ft and in cloud. Perth Centre ATC passed traffic information and a position report on CZH to the pilots of DJU, advising that CZH was conducting navaid training. The pilot in DJU acknowledged this transmission.

The air traffic controller then queried the pilot of DJU if he would be monitoring both the Perth Centre frequency and the Rottnest Island CTAF. Before the pilot could reply, the aircraft encountered moderate to severe turbulence and the pilot requested a descent to 2,000 ft. The controller approved the descent, advising the pilot that this would take DJU from controlled airspace into uncontrolled, Class G, airspace.[5] The pilot acknowledged this information.

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1 Instrument flight rules permit an aircraft to operate in instrument meteorological conditions (IMC), which have much lower weather minimums than visual flight rules. Procedures and training are significantly more complex as a pilot must demonstrate competency in IMC conditions, while controlling the aircraft solely by reference to instruments. IFR-capable aircraft have greater equipment and maintenance requirements.

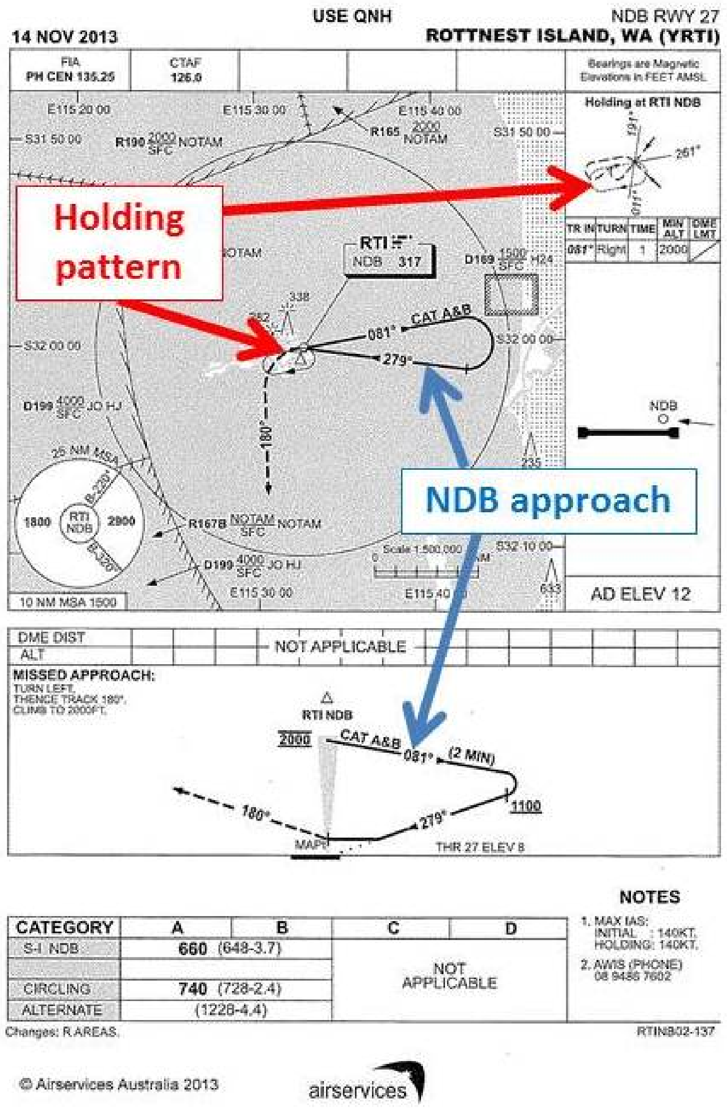
2 A radio transmitter at a known location, used as a navigational aid. This signal transmitted does not include inherent directional information.

3 Describes weather conditions that require pilots to fly primarily by reference to instruments, and therefore under IFR, rather than by outside visual reference. Typically, these means flying in cloud or limited visibility.

4 Western Standard Time (WST) was Coordinated Universal Time (UTC) + 8 hours.

5 Class G: IFR and VFR flights are permitted and do not require an airways clearance. IFR flights must communicate with air traffic control and receive traffic information on other IFR flights and a flight information service. VFR flights receive a flight information service if requested.

Figure 1: Rottnest Island runway 27 NDB approach chart



Source: Airservices Australia

At about 1515, the instructor of CZH, having expected DJU to have made a CTAF call by now, tried to contact DJU on the CTAF. After three attempts with no response, he asked Perth Centre ATC for DJU's current position.

At about 1516, Perth Centre ATC alerted CZH that DJU was in their 10 o'clock[6] position on converging tracks and descending through 1,900 ft (Figure 2). As CZH was about to turn inbound to the NDB, and would soon be conducting the published missed approach climbing southward to 2,000 ft (Figure 3), the instructor in CZH broadcast on the Perth Centre frequency and suggested to the crew of DJU that they climb to 3,000 ft. The crew in DJU responded, advising they were currently at 2,000 ft. The pilot of CZH advised that they were at 1,200 ft. DJU then commenced a climb to 3,000 ft.

After completing the approach, CZH departed Rottnest Island for Jandakot, and DJU continued with instrument navaid training.

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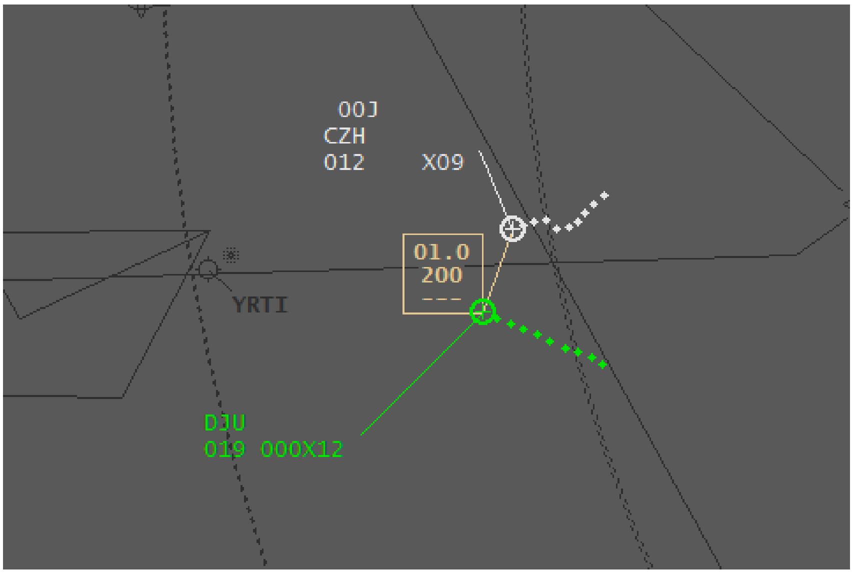
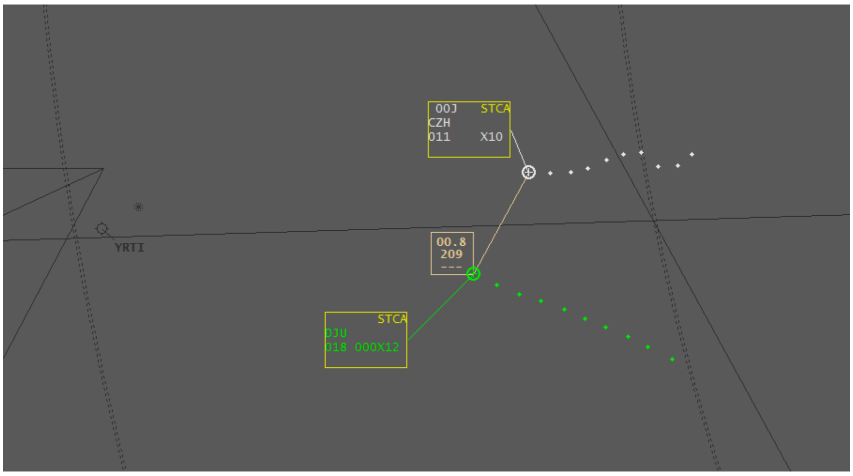
6 The clock code is used to denote the direction of an aircraft or surface feature relative to the current heading of the observer's aircraft, expressed in terms of position on an analogue clock face. Twelve o'clock is ahead while an aircraft observed abeam to the left would be said to be at 9 o'clock.

Figure 2: Radar data at 1516:16 showing both aircraft on converging tracks and 700 ft vertically and 1.0 NM laterally apart



Source: Airservices Australia

Figure 3: Radar data at 1516:31 showing both aircraft on converging tracks and 700 ft vertically and 0.8 NM laterally apart



Source: Airservices Australia
Note: STCA is a short term conflict alert

Pilot comments (VH-CZH)

The instructor of CZH provided the following comments regarding the incident:

- He became concerned when his attempts to contact DJU on the CTAF were not successful. He had calculated that the pilots in DJU should have called inbound giving the aircraft's position and intentions, given the estimated time of arrival that had been passed by Perth Centre ATC.
- As CZH continued outbound on the runway 27 NDB approach, he recalled requesting DJU's position from Perth Centre ATC. Centre then advised him of DJU's converging track and descent.
- If the pilots of CZH were not visual approaching the minima, the instructor was concerned about potential conflict with DJU during the published missed approach. He then suggested over the Perth Centre frequency to the crew in DJU that they climb. To reduce the proximity between the two aircraft, CZH continued to descend to the minima.

- He reported that Perth Centre ATC were very pro-active in issuing traffic advice. The first CTAF call he heard from DJU was when the aircraft passed over the NDB.
- He commented how important it is for all pilots to broadcast on and monitor the CTAF.

Pilot comments (VH-DJU)

The instructor of DJU provided the following comments regarding the incident:

- He reported that they had entered IMC when crossing the coast westbound and when still in controlled airspace on the Perth Departures frequency. He noted that when the aircraft entered the eastward moving cold front that the rapid increase in turbulence meant he focussed his attention on monitoring the student as he worked to keep DJU within safe parameters.
- His attention remained on the student's efforts to keep DJU under control, when he recalled getting a request from Perth Centre ATC, but was unable to communicate other than 'STANDBY' as they continued to deal with the conditions.
- He recalled being advised to climb back to 3,000 ft, which they commenced when suggested to them.

Safety message

Operations at non-controlled aerodromes such as Rottnest Island continue to feature in ATSB reports.

This occurrence had extra layers of complexity for the following reasons:

- both aircraft operating in IMC
- extremely rough and turbulent conditions
- the timing of DJU entering the worst of the weather, when they were still on frequency with Perth Departures and also Perth Centre ATC once descending
- the high workload for instructors and students in the airspace between Jandakot, Perth and the transition to class G airspace close to Rottnest Island .

The ATSB SafetyWatch campaign highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry. One of the safety concerns is safety around non-controlled aerodromes. The following link highlights that insufficient communication between pilots, and breakdowns in situational awareness were the most common contributors to occurrences in the vicinity of non-controlled aerodromes. Between 2003 and 2008, 709 occurrences in the vicinity of non-controlled aerodromes were reported to the ATSB. Of these, 388 related to a break-down of communication, both air-to-air, and air-to ground. The ATSB has produced a sticker (Figure 4) available to be displayed throughout relevant sectors of the industry.

Figure 4: ATSB SafetyWatch sticker in relation to Non-Towered (non-controlled) aerodromes

Source: ATSB

This report is available at: www.atsb.gov.au/safetywatch/safety-around-aeros.aspx.

The following publications from the Civil Aviation Safety Authority (CASA) also provide further information on operations at non-controlled aerodromes:

- The Civil Aviation Regulations 1988 (CAR) 166C (2) detail the requirements to broadcast in the vicinity of a non-controlled aerodrome.
- Civil Aviation Advisory Publication (CAAP) 166-1 (0) – *Operations in the vicinity of non-towered (non-controlled) aerodromes* offers guidance material on CAR 166. It is available at www.casa.gov.au/wcmswr/_assets/main/download/caaps/ops/166-1.pdf

General details

Occurrence details

Date and time:	5 October 2013 – 1517 WST	
Occurrence category:	Serious incident	
Primary occurrence type:	Aircraft proximity event	
Location:	7 km east of Rottnest Island, Western Australia	
	Latitude: 32° 00.27' S	Longitude: 115° 37.08'E

Aircraft details: VH-CZH

Manufacturer and model:	Piper Aircraft Corporation PA-44-180	
Registration:	VH-CZH	
Serial number:	4496216	
Type of operation:	Flying training	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Aircraft details: VH-DJU

Manufacturer and model:	Mooney Aircraft Corporation M20J	
Registration:	VH-DJU	
Serial number:	24-1075	
Type of operation:	Flying training	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Helicopters

Loss of control involving a Eurocopter EC-120B, VH-VMT

What happened

On 8 December 2013, at about 1430 Eastern Daylight-savings Time,[1] a Eurocopter EC-120B helicopter, registered VH-VMT, departed from a property 16 km north of the Ballina/Byron Gateway Airport, New South Wales for a local flight. On board the helicopter were the pilot and two passengers.

At about 1555, the helicopter returned to the property from the north, overflew and approached to land on a heading of about 340º. The pilot reported that the wind was from the north, at about 20 kt.

When about 3 ft above ground level, the pilot reported that he entered the hover[2] with an airspeed of less than 10 kt and with full engine power selected. Immediately after, the helicopter began to yaw to the left. The pilot applied right anti-torque pedal to counteract the yaw and reduced the engine power to idle. The helicopter continued to yaw left and the pilot applied full right anti-torque pedal, but was unable to arrest the rotation. The helicopter rotated left about 90° before the left skid lowered and contacted the ground. It continued to rotate and rolled onto its right side. The helicopter was substantially damaged (Figure 1) and the pilot and passengers were able to evacuate uninjured.

The pilot believed that a combination of main rotor downwash and a wind gust contributed to a loss of tail rotor effectiveness (LTE).

Figure 1: VH-VMT

Source: NSW Police Force

Tail rotor (anti-torque) system

On European designed single rotor helicopters, such as the Eurocopter EC-120B, the main rotor blade rotates in a clockwise direction when viewed from above. The torque required to drive the main rotor causes the fuselage of the helicopter to rotate in the opposite direction, nose left. The tail rotor (anti-torque) system provides thrust, which counteracts this torque and provides directional control during hover.

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

2 Most take-offs and landings are carried out in a helicopter via the hover as the aircraft is in equilibrium, with the heading, position and height over the surface constant.

Loss of tail rotor effectiveness

Loss of tail rotor effectiveness (LTE) is a critical, low-speed aerodynamic flight characteristic that can result in uncommanded rapid yaw rate, which does not subside of its own accord and, if uncorrected, may result in loss of control. In helicopters with a clockwise-rotating main rotor blade, the resulting yaw is to the left.

LTE may occur in all single main rotor helicopters at airspeeds less than 30 kt. Any manoeuvre that requires the pilot of a clockwise rotating main rotor blade to operate in a high-power, low-airspeed environment with a left crosswind or tailwind creates an environment where unanticipated left yaw may occur. Furthermore, the European Helicopter Safety Team (EHEST) leaflet, *Safety considerations: Methods to improve helicopter pilots' capabilities*,[3] states that LTE is more likely to occur when the critical yaw pedal (the right pedal for the EC-120) is close to the full travel position.

The Eurocopter EC-120 is also fitted with a shrouded tail rotor or Fenestron, which can be similarly affected by LTE as a conventional tail rotor. However, according to Eurocopter Service Letter 1673-67-04[4]:

> *With a Fenestron, when transitioning from cruise flight to hover flight, be prepared for a significant movement of the foot to the right. Insufficient application of the rudder pedal will result in a leftward rotation of the helicopter during the transition.*
>
> *For the same thrust value needed for hover flight, the Fenestron requires a little more action to be applied to the right rudder pedal.*

Pilot comment

The pilot reported that he had recently been operating a Eurocopter EC-350 (Squirrel), which required less anti-torque input than the EC-120.

Safety message

In helicopters, wind will cause anti-torque system thrust variations to occur. Certain relative wind directions are more likely to cause tail rotor thrust variations than others. Knowing which direction the wind is coming from is critical. By maintaining an awareness of the wind and its effect on the helicopter, pilots can significantly reduce the exposure to LTE. The EHEST leaflet highlights the importance of pilots recognising the onset of a potential LTE situation and commencing positive recovery actions without delay. The leaflet also details the varying conditions where LTE may occur, how LTE can be avoided, and the how to recover from a LTE.

The following ATSB reports provide additional information regarding LTE accidents:

- www.atsb.gov.au/publications/investigation_reports/2013/aair/ao-2013-016.aspx
- www.atsb.gov.au/publications/investigation_reports/2013/aair/ao-2013-021.aspx
- www.atsb.gov.au/publications/investigation_reports/2008/aair/ao-2008-043.aspx

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3 www.eurocopter.com/site/docs_wsw/RUB_36/EHEST1_Training_Leaflet_Safety_Considerations.pdf
4 www.eurocopter.com/site/docs_wsw/RUB_36/1673-67-04en.pdf

General details

Occurrence details

Date and time:	8 December 2013 – 1618 EDT	
Occurrence category:	Accident	
Primary occurrence type:	Loss of control	
Location:	16km N Ballina/Byron Gateway Airport, New South Wales	
	Latitude: 28° 41.68' S	Longitude: 153° 36.40' E

Helicopter details

Manufacturer and model:	Eurocopter EC-120B	
Registration:	VH-VMT	
Serial number:	1619	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Aircraft proximity event between a Bell 206, VH-WCS and a PZL Bielsko 51, VH-XOP

What happened

VH-XOP

Source: Operator

On 4 December 2013, at about 1440 Eastern Standard Time (EST),[1] a PZL Bielsko 51 glider, registered VH-XOP (XOP), was winched at the Gympie aeroplane landing area (ALA), Queensland. About 20 minutes later, the glider entered the circuit on downwind at about 900 ft above ground level (AGL), and the pilot broadcast a downwind call on the common traffic advisory frequency (CTAF).

At about the same time, a Bell 206 helicopter, registered VH-WCS (WCS), was conducting circuits from runway 32. On board the helicopter were a flight instructor and two student pilots. The helicopter had been conducting circuits for about 1 hour and the pilot reported that he was in constant communication with the glider operators.

The instructor of WCS broadcast on the CTAF when turning base and subsequently heard the downwind call of XOP. At that time he sighted the glider on mid-downwind. Soon after, the pilot of XOP broadcast turning base.[2] The glider pilot then commenced a diagonal base leg, on about a 45° angle from the downwind leg (Figure 1).

WCS turned onto final approach and the instructor reported that he then broadcast a final call when at 500 ft AGL; 0.78 NM from the threshold of runway 32, and at a speed of 60kt. The instructor reported that, at that time, he believed the glider was on the late downwind or base leg of the circuit.

The pilot of XOP then reported broadcasting a final call. The pilots of XOP and WCS reported not hearing each other's finals broadcast. The pilot of XOP then broadcast a call to the pilot of WCS, asking whether he had the glider in sight, but no response was received.[3] The crew of WCS did not hear this call, despite hearing other transmissions from aircraft on the CTAF.

About 90 seconds later, the instructor of WCS sighted the glider to his right, at about the same height and about 10 m away. The pilot of XOP also observed the helicopter to his left and slightly above. In response, he lowered the nose of the glider to increase the airspeed to 60 kt to stay below the helicopter. The glider then landed on the grass to the left of the runway.

The instructor of WCS took control of the helicopter from the student, conducted a clearing turn and subsequently landed on the sealed runway. He then attempted to communicate with the pilot of XOP on the CTAF and received a response from the glider base operator. The operator advised that XOP had experienced 'an emergency', and later reported to the ATSB that this involved performing a diagonal base leg.

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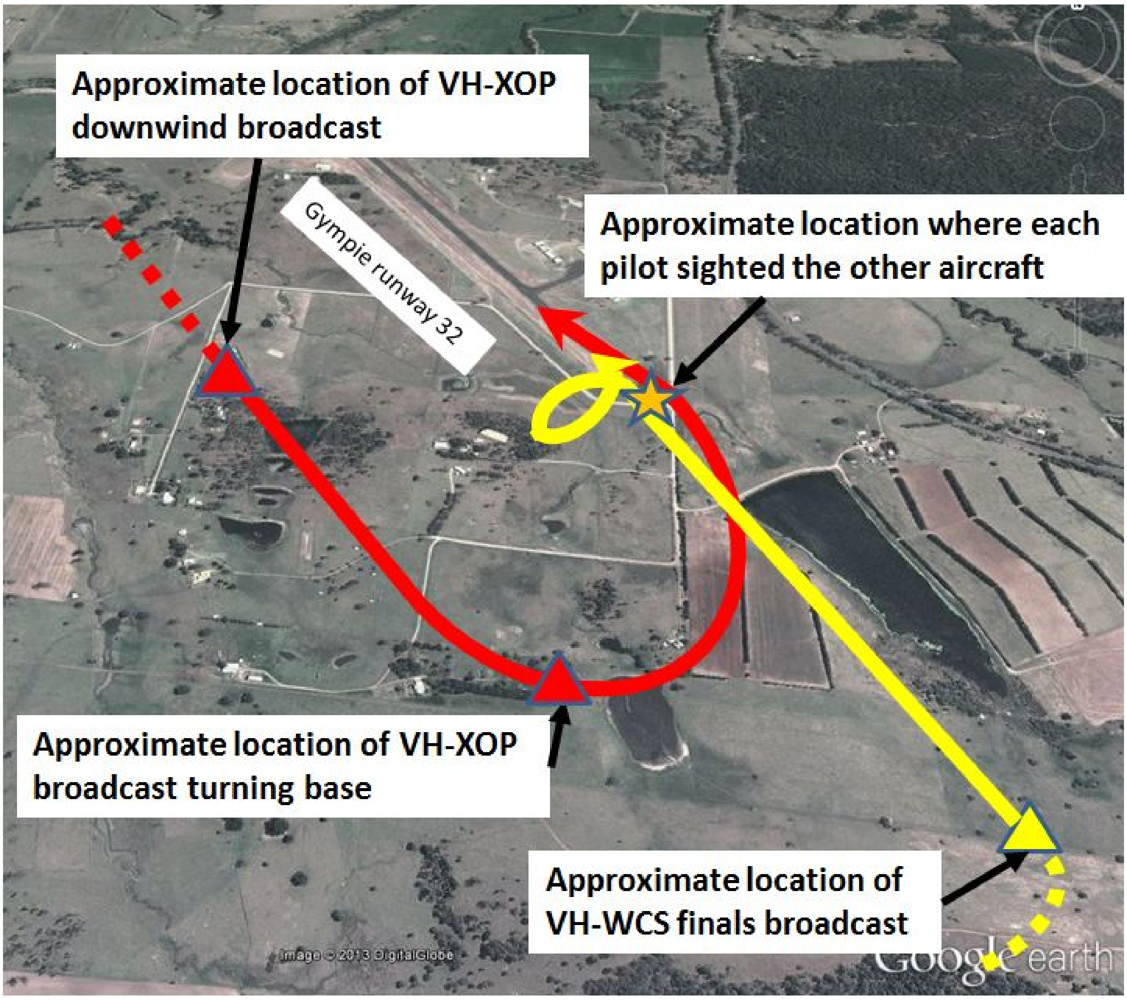
1 Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours.
2 A pilot in the circuit reported hearing the glider pilot's base and finals broadcasts, and call to the pilot of WCS.
3 The ATSB was unable to verify the pilots' broadcasts as CTAF transmissions were not recorded at Gympie.

Gliding Federation of Australia comments

The Gliding Federation of Australia reported that the helicopter may have been in the glider pilot's blind spot during the diagonal base leg and turn onto final. If the glider turned onto final above, and in front of the helicopter, the pilots of each aircraft would not have been able to sight the other. The glider pilot had then applied the airbrakes, steepening the approach path.

Figure 1: Approximate aircraft flight paths and broadcast locations



Source: Google earth and pilot recollection

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 of the safety concerns is safety around non-controlled aerodromes www.atsb.gov.au/safetywatch/safety-around-aeros.aspx.

The ATSB has issued a publication called *A pilot's guide to staying safe in the vicinity of non-towered aerodromes*, which outlines many of the common problems that occur at non-controlled aerodromes, and offers useful strategies to keep yourself and other pilots safe. The report found that insufficient communication between pilots and breakdowns in situational awareness were the most common contributors to safety incidents in the vicinity of non-controlled aerodromes.

SafetyWatch

In addition, issues associated with unalerted see-and-avoid have been detailed in the ATSB's research report *Limitations of the See-and-Avoid Principle*. The report highlights that unalerted see-and-avoid relies entirely on the pilot's ability to sight other aircraft. Broadcasting on the CTAF is known as radio-alerted see-and-avoid, and assists by supporting a pilot's visual lookout for traffic. An alerted traffic search is more likely to be successful as knowing where to look greatly increases the chances of sighting traffic. The report is available at www.atsb.gov.au/publications/2009/see-and-avoid.aspx.

The ATSB report into a recent similar incident is also available at www.atsb.gov.au/publications/investigation_reports/2013/aair/ao-2013-108.aspx.

This incident highlights the importance of broadcasting radio calls to alert pilots and assist in see-and-avoid practices. It serves as a reminder to keep a good lookout for other aircraft, particularly around non-controlled aerodromes. Both incidents also demonstrate the importance of understanding the differences in performance and circuit patterns flown by gliders and helicopters or other powered aircraft.

General details

Occurrence details

Date and time:	4 December 2013 – 1500 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Aircraft proximity event	
Location:	Gympie (ALA), Queensland	
	Latitude: 26° 16.97' S	Longitude: 152° 42.12' E

Aircraft details: VH-WCS

Manufacturer and model:	Bell Helicopter Company 206B	
Registration:	VH-WCS	
Serial number:	2931	
Type of operation:	Flying training - dual	
Persons on board:	Crew – 2	Passengers – 1
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Glider details: VH-XOP

Manufacturer and model:	PZL – Bielsko 51-1 Junior	
Registration:	VH-XOP	
Serial number:	B-1822	
Type of operation:	Gliding	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

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

24 Hours 1800 020 616
Web www.atsb.gov.au
Twitter @ATSBinfo
Email atsbinfo@atsb.gov.au

Investigation

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