Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY REPORT
Aviation Short Investigations
AB-2011-128
Final

Aviation Short Investigation Bulletin:

Third Quarter 2011

Issue 7

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INTRODUCTION

About the ATSB

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; and fostering safety awareness, knowledge and action.

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

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

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

About this Bulletin

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

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

To enable this, the Chief Commissioner has established a small team to manage and process these factual investigations, the Short Investigation Team. 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. In addition, the ATSB may include an ***ATSB Comment*** that is a safety message directed to the broader aviation community.

The summary reports detailed herein were compiled from information provided to the ATSB by individuals or organisations involved in an accident or serious incident investigation completed between the period 1 July 2011 and 30 September 2011.

AO-2011-010: VH-VQN and VH-UOP, Breakdown of runway separation

Date and time:	31 January 2011, 0756 CST		
Location:	Darwin Airport, Northern Territory		
Occurrence category:	Serious incident		
Occurrence type:	Breakdown of separation		
Aircraft registration:	VH-VQN and VH-UOP		
Aircraft manufacturer and model:	VH-VQN:	Airbus A320-232	
	VH-UOP:	Cessna Aircraft Company 404	
Type of operation:	VH-VQN:	Air transport – high capacity	
	VH-UOP:	Air transport – low capacity	
Persons on board:	VH-VQN:	Crew – Unknown	Passengers – Unknown
	VH-UOP:	Crew – 1	Passengers – 8
Injuries:	Crew –Nil		Passengers – Nil
Damage to aircraft:	Nil		

FACTUAL INFORMATION

On 31 January 2011, an Airbus A320-232 aircraft, registered VH-VQN (VQN), was being prepared for a scheduled passenger service from Darwin, Northern Territory to Sydney, New South Wales.

During pre-flight preparations, the crew of VQN were assigned runway 29 (Figure 1) by Defence air traffic control (ATC)[1] for their departure.

After this, the wind direction changed, necessitating a change from runway 29 to runway 11. Air traffic control determined that VQN would be the last aircraft to depart runway 29 and the surface movement controller (SMC)[2] commenced coordinating aircraft for runway 11.

At 0747 Central Standard Time[3], the crew of VQN were approved a pushback clearance from the SMC.

At 0750, the pilot of a Cessna Aircraft Company 404 aircraft, registered VH-UOP (UOP), conducting a scheduled passenger service from Darwin to Snake Bay, Northern Territory requested a taxi clearance from the SMC. The pilot received a clearance to taxi to holding point 'Victor Two' (V2) for runway 11.

At 0752, the crew of VQN requested a taxi clearance. The crew were cleared by the SMC to taxi to holding point 'Echo Two' (E2) for runway 29.

At 0754, as UOP approached the holding point, the pilot contacted the aerodrome controller (ADC)[4] and advised that he was ready at V2 for runway 11. The pilot was initially instructed to hold short[5], but soon after, received a take-off clearance and

1 The Department of Defence – Royal Australian Air Force (RAAF) was the airspace administering authority responsible for the provision of ATC services at Darwin.

2 The SMC, who is positioned in the tower, is responsible for the control of all aircraft and vehicle movements on the ground, with the exception of the runway/s.

3 Central Standard Time was Coordinated Universal Time (UTC) + 9.5 hours.

4 The ADC is responsible for all aircraft and vehicle movements on runways and airborne aircraft in the immediate vicinity of the airport.

5 Holding short of the runway involves stopping at a designated point on a taxiway until further instructions are given to enter or cross the runway.

departure instructions. At that time, the pilot of UOP observed VQN positioned at the holding point (E2).

At 0756, as VQN approached the holding point, the SMC passed on instructions to cross the runway and taxi to holding point 'Alpha Six' (A6) for runway 29. About 30 seconds later, UOP commenced the take-off roll.

Prior to crossing the runway, the crew of VQN checked the runway and approach paths for traffic. The pilot in command (PIC) stated that they were clear to the left and the copilot initially replied that they were clear to the right. The copilot then noted that there was an aircraft (UOP) lined up and stopped on runway 11, abeam the 'Bravo Two' (B2) holding point. The PIC looked to the right and confirmed the presence of UOP. Shortly after, the copilot observed UOP commence the take-off roll. He advised the PIC, who immediately stopped the aircraft.

The crew of VQN advised the SMC that there was an aircraft rolling on runway 11. The SMC immediately instructed the crew to hold short. The crew advised the SMC that the aircraft was within the gable markers[6]. As the aircraft had taxied past the holding point, but was short of the runway, a runway incursion[7] resulted.

The ADC assessed the situation and determined that issuing a stop instruction to UOP would have presented a greater risk to the involved aircraft and the takeoff was allowed to continue. Following the runway incursion of VQN, a breakdown of runway separation occurred.

At 0756, after UOP past VQN, the crew were instructed to continue crossing runway 11.

Controller information

The ADC had about 4 years experience as an air traffic controller, of which the preceding year was at Darwin Tower. On the day of the incident, the controller was rostered as the tower supervisor for the day shift. The day shift usually consisted of a tower supervisor, ADC and the SMC. When the shift commenced at 0730, the tower supervisor temporarily assumed the position of ADC to allow the rostered ADC, who had commenced work at about 0600, to have a break. This resulted in only the ADC and SMC positions being staffed at the time of the incident.

The SMC had graduated as an air traffic controller in November 2010 and commenced working at Darwin shortly after.

Coordination

The SMC was responsible for the coordination of aircraft operating on the ground, with the exception of the runway, which was the responsibility of the ADC. Consequently, when an aircraft needed to cross the runway in use, the SMC coordinated this with the ADC.

The ADC noted that the SMC was busy and elected to initiate the cross coordination of VQN. He provided the SMC with the instruction to cross VQN, which the SMC passed on to the crew.

The Manual of Air Traffic Services (MATS) 12-20-420 stated that:

> Where a runway crossing clearance is required, the SMC makes a visual check of approaching and departing aircraft and obtains crossing instruction or restriction...

The SMC reported that a visual check for aircraft would normally be conducted prior to initiating coordination with the ADC. On this occasion, coordination was initiated by the ADC and the check was not conducted by the SMC before passing the instruction on to the crew of VQN.

Conditional clearance

The ADC had provided the instruction for VQN to cross based on the expectation that UOP would have commenced the takeoff soon after receiving the take-off clearance, and would have past taxiway 'Echo' prior to VQN reaching the holding point. However, UOP remained on the runway for about 1 minute before commencing the take-off roll. In hindsight, the ADC stated that he should have provided a conditional clearance for VQN to either hold short of the runway or to cross behind UOP.

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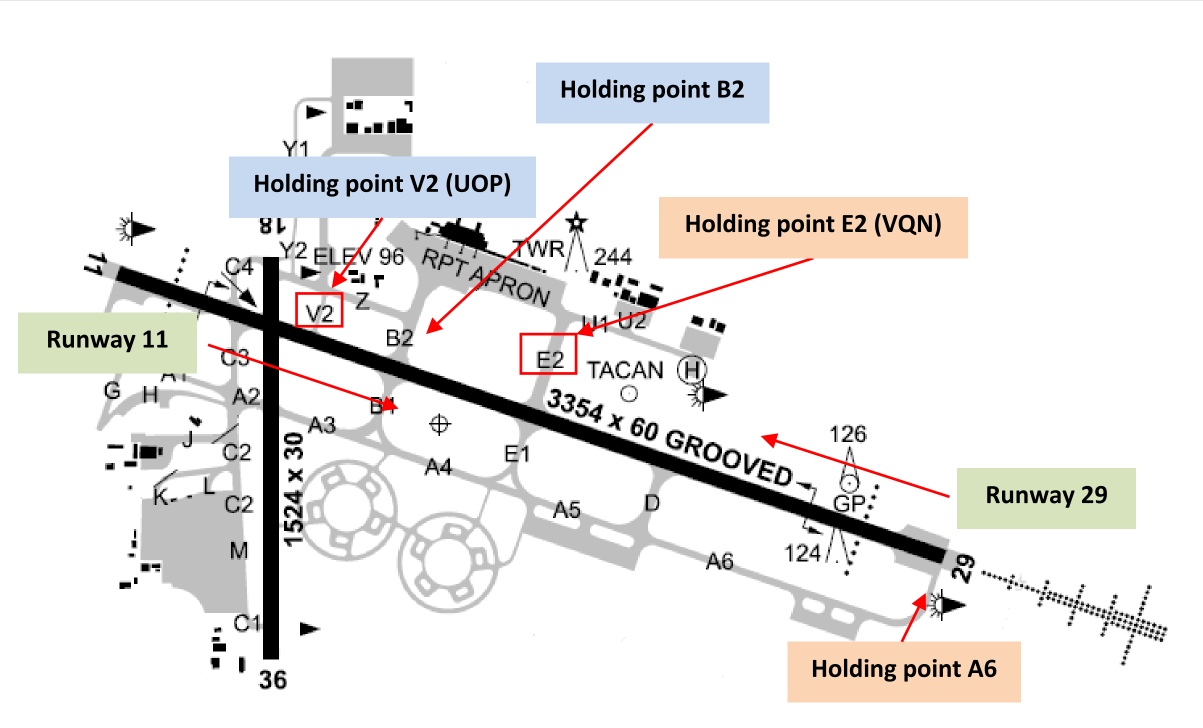
6 Gable markers are used to indicate the graded surface of a runway strip, the edges of an apron and/or taxiway where such are not clearly defined, and the limits of the movement area.

7 The incorrect presence of an aircraft, vehicle or person on the protected area of a surface designed for the landing and take-off of an aircraft.

Figure 1: Darwin Airport



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Monitoring

The ADC continued to monitor and scan the runway for traffic as UOP taxied past holding point V2 for runway 11 and after the instruction to cross had been provided to the crew of VQN. Both the ADC and SMC commenced the coordination of other aircraft, while UOP remained stationary on the runway before commencing the take-off roll.

When the ADC looked back at the runway, he noticed UOP rolling and VQN had commenced crossing.

A visual inspection of the runway prior to UOP commencing the take-off roll had not been conducted, as required by MATS 12-20-580, which states that:

> Visually check the take-off path again, to ensure no obstructions exist, immediately before the take-off commences.

SMC assistance

The SMC's workload leading up to the incident was considered moderate, with five aircraft operating on the frequency and a runway change. Given the SMC's level of experience, the ADC believed he had sufficient time to provide the SMC with guidance on aspects relating to runway change and pilot instructions. While a RAAF investigation determined that the traffic density and complexity of a runway change allowed for this, the ADC stated that he may have become distracted by assisting the SMC.

Tower manning

The RAAF investigation identified that there were 22 movements in the hour preceding the incident and 26 movements in the hour following. That level of traffic was considered normal when the SMC, ADC and tower supervisor positions were staffed. At the time of the incident, the tower supervisor was temporarily relieving the rostered ADC. Given the amount of traffic being coordinated by the SMC and the runway change, the RAAF investigation concluded that a break for the rostered ADC could have been more appropriately timed.

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.

Department of Defence

The RAAF noted that several incidents had occurred when the supervisor was temporarily relieving the rostered ADC. As a result, the RAAF has advised the ATSB that they are taking the following safety action:

Tower manning

The RAAF intends to compile a database that collects information on aircraft and vehicle movements, and controller breaks at Darwin. This information will be used to determine if any correlation between incidents and reduced manning levels in the tower exist.

SAFETY MESSAGE

Runway incursions are recognised as an ongoing safety concern for the aviation industry and have been cited in numerous accidents world-wide. They can be the result of many different factors and involve pilots, controllers and vehicle drivers.

A joint paper published by EUROCONTROL and the United States Federal Aviation Administration in September 2010 recognised that the air traffic management system was critically dependent on the day-to-day performance of air traffic controllers, and that monitoring traffic was a critical and complex activity. This incident highlights the need for controllers to remain vigilant in monitoring and scanning the runway, both prior to, and after issuing takeoff and runway crossing clearances to pilots (http://www.eurocontrol.int/safety/gallery/content/public/library/Safety/HP_White_Paper_2010_low.pdf).

Furthermore, when operating on the ground, it is important that flight crews not only maintain an awareness of their own location in relation to the runway, but also that of other aircraft and vehicles. The actions by the crew of VQN emphasises the significance of conducting a thorough visual inspection of the runway and approach paths prior to entering or crossing any runway, even if a clearance from air traffic control has been provided.

The following websites provide additional information on runway incursions:

- Airservices Australia runway safety https://www.airservicesaustralia.com/flying/runwaysafety/default.asp
- EUROCONTROL runway safety http://www.eurocontrol.int/runwaysafety/public/subsite_homepage/homepage.html
- Federal Aviation Administration - Office of Runway Safety http://www.faa.gov/airports/runway_safety/
- International Civil Aviation Organization: Manual on the prevention of Runway Incursions http://bluskyservices.brinkster.net/rsa/Library/icao.pdf

AO-2011-049: VH-VNG / VH-FMP, Airspace separation event

Date and time:	3 March 2011, 18:41
Location:	Alice Springs Airport, Northern Territory
Occurrence category:	Incident
Occurrence type:	Airspace separation event
Aircraft registration:	VH-VNG / VH-FMP
Aircraft manufacturer and model:	VH–VNG: Airbus Industrie A320-232 VH-FMP: Pilatus Aircraft Ltd PC12/45
Type of operation:	VH-VNG: Air transport –high capacity, VH-FMP: Aerial work
Persons on board:	VH-VNG: Crew – 6 Passengers – 133 VH-FMP: Crew – 1 Passengers –5
Injuries:	Nil
Damage to aircraft:	Nil

FACTUAL INFORMATION

On 3 March 2011 at 1841 Central Standard Time[1], a Tiger Airways operated Airbus Industrie A320-232, registered VH-VNG (VNG) and a Pilatus Aircraft Ltd PC-12/45, registered VH-FMP (FMP), were on approach into Alice Springs Airport, Northern Territory. Both aircraft were operating in Instrument Meteorological Conditions (IMC) under instrument flight rules (IFR).

Alice Springs tower was closed and the aircraft were operating under non-towered aerodrome[2] procedures which required the pilots to coordinate their own separation.

VNG approached the airport from the south (Figure 1) and joined the circuit from overhead the Alice Springs VOR[3]. FMP was inbound from the north and joined the 15 nm DME[4] arc from the 353 radial.

The pilot of FMP made an initial radio call on the Alice Springs Common Traffic Advisory Frequency (CTAF[5]) and announced his position 30 nm to the north of Alice Spring Airport. He broadcast his intentions to join the runway 12 ILS via the 15 nm DME arc and gave an estimated time for being established on the ILS of time 11[6].

The crew of VNG reported their position overhead the Alice Springs VOR 32 seconds later and announced that they were tracking outbound on the runway 12 ILS and gave an estimated landing time of 15.

While turning inbound, the pilots of VNG reported that they were turning left to track inbound on the ILS and gave an updated estimate for established on finals at 11. The conflict between the estimate for FMP established on the ILS at 11, and VNG

1 Central Standard Time was Coordinated Universal Time (UTC) + 9.5 hours.

2 A non-towered aerodrome is an aerodrome at which air traffic control (ATC) is not operating, this includes: an aerodrome that is always in Class G airspace; an aerodrome with a control tower, but no ATC service is currently provided, or an aerodrome that would normally have ATC services, but is presently unavailable.

3 VHF Onmidirectional Radio Range (VOR) emits a signal that can be received by appropriately equipped aircraft and represented as the aircraft's bearing (called a 'radial') to or from the ground based beacon.

4 Distance Measuring Equipment (DME) is a ground-based transponder station. A signal from an aircraft to the ground station is used to calculate its distance from the ground station and where necessary maintain an arc of constant distance from the DME.

5 CTAF is the name given to the radio frequency used for aircraft-to-aircraft communication at aerodromes without a control tower.

6 Time is given in minutes past the hour in UTC time. Time 11 was 1011 UTC (1941 CST).

being established on finals at 11, was not recognised by either crew.

The pilot of FMP recalled that, based on the estimates provided by VNG, he believed that the aircraft was already established inbound on the ILS when he joined the 15 nm arc. The pilots of VNG subsequently requested an updated position from FMP and determined that the PC-12 was in front of them and to their left. The flight crew from VNG announced that they would allow FMP to land first. The pilot of FMP stated that he would turn right to let VNG go in front. The flight crew of VNG acknowledged the broadcast and continued their approach.

The pilot of FMP initiated a right turn with the intention of passing behind VNG, but the turn reduced the separation between the two aircraft. VNG reported receiving a Traffic Advisory[7] (TA) warning on their Traffic Collision Avoidance System (TCAS) followed by a Resolution Advisory[8] (RA). Both aircraft were in cloud at the time of the separation breakdown. Neither aircraft had visual contact with the other aircraft prior to, or during, the TCAS event.

The pilot of FMP continued the right turn and tracked away from the airport for 3 nm then turned inbound on the runway 12 ILS and landed. VNG conducted a missed approach before re-intercepting the runway 12 ILS for a landing.

Radio transmission

The following summary outlines radio transmissions between the two aircraft:

- **18:00:58** Tower closes – airspace becomes a CTAF.
- **18:35:12** FMP reported 30 nm north of Alice Springs leaving flight level 150 on descent. Intends to join the runway 12 ILS via the 15 DME arc from the north. **Estimates established on the ILS at 11.**
- **18:35:44** VNG reported overhead the Alice Springs VOR, tracking outbound for the runway 12 ILS. **Estimates landing at Alice Springs at 15**
- **18:39:16** VNG reported turning left inbound to pick up the runway 12 ILS. **Estimates established on finals at 11.**
- **18:39:27** FMP copied VNG. Reported 10 nm from LISZT passing 8,000 ft.
- **18:40:34** VNG requests FMP provide his distance from Alice Springs.
- **18:40:38** FMP replied 15 nm
- **18:40:42** VNG identified that FMP would be on the left of them and inside their flight path. VNG told FMP that they would wait for FMP.
- **18:40:50** Announced that he would turn right to allow VNG to go first.
- **18:41:00** VNG thanked FMP.
- **TCAS event – no radio transmissions were made regarding the event.**

The pilots of the two aircraft were aware of each other during the descent and arrival into Alice Spring. Both crews provided revisions of their arrival times throughout the approach. Estimated arrival times were given for different positions in the approach, including landing, capturing the ILS and being established on finals.

There was no radio communication on the CTAF regarding the TCAS event between the two flight crews. The pilot of FMP provided incoming traffic with his position and intentions after discontinuing their approach via the 15 DME arc. The flight crew of VNG did not announce their missed approach and did not make any broadcasts on the CTAF frequency for over six minutes following the TCAS event.

TCAS

Both aircraft were equipped with TCAS. The TCAS onboard FMP was designed to provide traffic information, but not resolution instructions. The pilot of FMP recalled that the TCAS was activated, however as he was conducting a turn, he wasn't able to observe the relative distance between his aircraft and the conflicting traffic.

The TCAS on VNG initially activated a TA, followed by an RA. For an RA to be activated on this type of

7 Information (without comment) sent to the pilot about traffic within a specified distance.

8 Verbal or display indication recommending action to increase vertical separation relative to another aircraft.

aircraft at this height, the conflicting traffic must be less than 25 seconds away from a potential collision.

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.

Tiger Airways

Risk management

Tiger Airways conducted a risk assessment of operations into non-towered aerodromes and determined that risk reduction could be achieved by decreasing the frequency of flights. The operator has since ceased flights into Alice Springs. Should commercial operations be planned to recommence into CTAF aerodromes, the operator will conduct further risk assessments and consider this incident as part of that process.

Training

To mitigate risk where an operational diversion to a non-towered airfield is required, a ground school Airspace Procedures course has been developed with all operational pilots having completed that course.

The incident has been incorporated into recurrent Crew Resource Management and Human Factors training. Questions regarding CTAF operations have also been added to the recurrent line training quiz and line check. The descent brief checklist has been amended and now includes an item relating to operations outside controlled airspace.

SAFETY MESSAGE

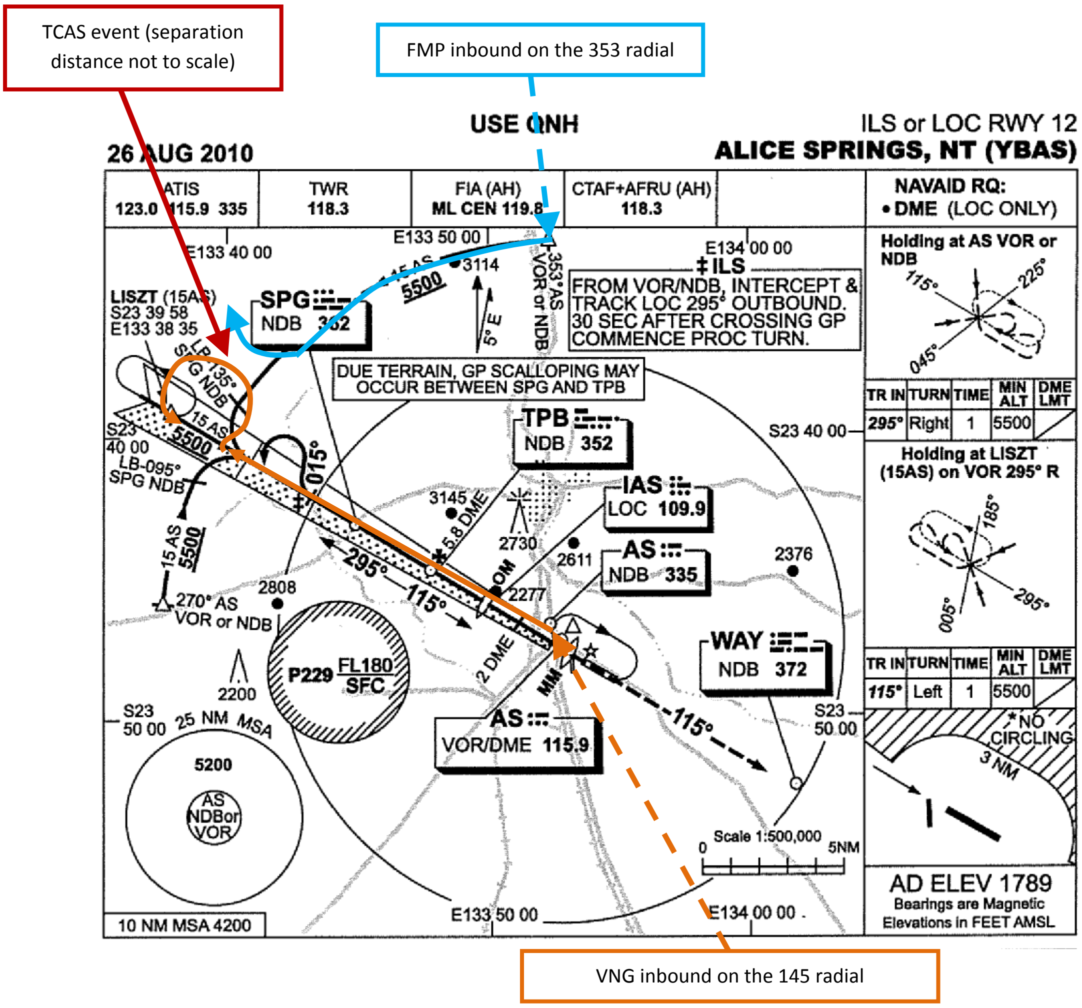
Conducting an instrument approach into a non-towered aerodrome in instrument meteorological conditions (IMC) can create a high workload situation. Clear, accurate and concise radio communication is crucial in order to maintain situational awareness. When operating in cloud, radio communication is the most important tool available for avoiding conflict. This increases the importance of providing precise estimates for the aircraft's position in the approach.

The following ATSB safety report provides advice to pilots on how to operate safely at non-towered aerodromes. The report noted that there have been 73 TCAS RA events between 2003 and 2008 at non-towered aerodromes in Australia.

- AR-2008-044 - A pilot's guide to staying safe in the vicinity of non-towered aerodromes

http://www.atsb.gov.au/media/2097901/ar2008044(1).pdf

Figure 1: Approximate flight path of FMP and VNG into Alice Springs



AO-2011-054: VH-VOB, VH-VGZ, Loss of separation assurance

Date and time:	23 April 2011, 1644 EST	
Location:	Near Armidale Airport, New South Wales	
Occurrence category:	Incident	
Occurrence type:	Loss of separation assurance	
Aircraft registration:	VH-VOB and VH-VGZ	
Aircraft manufacturer and model:	VH-VOB: The Boeing Company B737-8BK VH-VGZ: Airbus Industrie A320-232	
Type of operation:	Air transport – high capacity	
Persons on board:	VH-VOB: Crew - 6 VH-VGZ: Crew – 6	Passengers – Unknown Passengers – 134
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

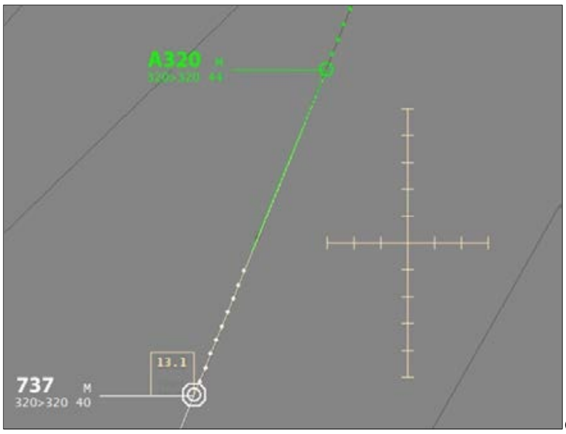
FACTUAL INFORMATION

On 23 April 2011, at 1644:29 Eastern Standard Time[1], a loss of separation assurance occurred between a Boeing Company B737-8BK (737), registered VH-VOB, and an Airbus Industrie A320-232 (A320), registered VH-VGZ, near Armidale Airport, New South Wales (NSW).

Both aircraft were conducting scheduled passenger services, with the 737 operating from Brisbane, Queensland (Qld) to Sydney, NSW at flight level (FL) 320 and the A320 operating from Gold Coast Airport (Qld) to Williamtown (Newcastle), NSW at FL320. They were operating on the same one way air route, H62, until position Mount Sandon, where the leading 737 would continue tracking south for Sydney, while the following A320 was flight planned to track left to Williamtown. The aircraft were under radar surveillance and subject to an air traffic control (ATC), service.

At 1638:35, the flight crew of the 737 contacted ATC and reported that their aircraft was maintaining FL320. The controller issued the flight crew with a Standard Arrival clearance to runway 25 at Sydney. At that time, the following A320 was 13.1 NM (24.28 km) behind, with a closing ground speed of 40 kts (Figure 1).

Figure 1: Position of aircraft at 1638:35



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Note: Each graduation on the scale marker is 1 NM (1.85 km)

About 2 minutes later, the flight crew of the A320 also contacted the controller and reported that their aircraft was maintaining FL320. The controller issued the crew with a clearance to descend to FL250 when ready.

At 1644:29, the controller advised the 737 flight crew that they could expect to hold at BULGA[2] as their ATC sequenced landing time at Sydney was 1733, and that a reduction in their current speed was approved. This was acknowledged by the flight crew. At that time, the A320 was 9.1 NM (16.86 km) behind the 737, with a closing ground speed of 40 kts.

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

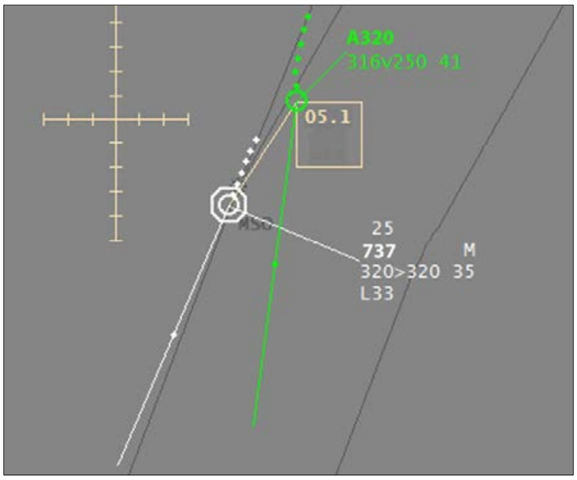
2 BULGA was an Instrument Flight Rules waypoint

At 1647:23, the flight crew of the 737 advised the controller that, for the information of the following traffic, they had reduced their aircraft's speed to Mach 0.64. The A320 was 6.4 NM (11.86 km) behind the 737, with a closing ground speed of 70 kts. The controller advised that there was no problem with the reduced speed as there was no traffic in close proximity.

However, 6 seconds later, the controller apologised to the 737 flight crew and instructed the A320 flight crew to turn their aircraft left onto a heading of 140° magnetic (M), which diverged the A320 48° away from the track of the preceding 737. The controller later reported that they monitored the turn of the A320 on radar and were subsequently concerned that the aircraft had not turned quickly enough to maintain a longitudinal separation standard of 5 NM (9.27 km). The controller issued an instruction to the A320 flight crew to expedite a further left turn onto heading 120° M, 17 seconds after the initial turn instruction. The A320 flight crew acknowledged the amended heading and advised that they had commenced descent to FL250. There was 5.8 NM (10.75 km) between the aircraft at that time.

Separation between the aircraft closed to 5.1 NM (9.45 km) at 1648:27 as the A320 became established in the turn onto the assigned heading, before the distance between the aircraft began to increase (Figure 2).

Figure 2: Position of aircraft at 1648:27



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Note: Each graduation on the scale marker is 1 NM (1.85 km)

Separation standards were not infringed as the required standard of 5 NM (9.27 km) was maintained. A loss of separation assurance[3] had occurred, due to the closing longitudinal proximity between the two aircraft operating at the same flight level, following the controller's approval of the speed reduction for the 737.

Air traffic control

The controller involved in the occurrence had over 30 years of experience in air traffic control and about 10 years of experience on the airspace sector on which the incident occurred. The controller reported having a mental model of the traffic, based on an earlier pair of similar aircraft operating in trail but at different levels. Low traffic levels and accumulative fatigue were also reported as possible contributory factors.

The compromised separation recovery techniques used by the controller were effective and prevented a breakdown of separation, following the loss of separation assurance.

The controller had completed Compromised Separation Recovery (CSR) training some years earlier. The Air Traffic Control Group, of which the controller was a member, was scheduled to complete CSR Refresher Training around the time of the incident, with planned completion by the end of the 2010-11 financial year.

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

Airservices Australia (Airservices) advised that as part of their commitment to continuously improve the safety of air traffic services, their Safety and Assurance group will be undertaking a review of reported occurrences to determine whether speed differential and aircraft performance are significant contributing factors in loss of separation assurance and breakdown of separation incidents, and that

[3] A separation standard existed; however, planned separation was not provided or separation was inappropriately or inadequately planned

the review outcomes will be used to determine if additional refresher training is required for controllers.

SAFETY MESSAGE

A publication by Eurocontrol has identified that periods of low workload may be associated with lower vigilance, and that during these periods, individuals are more vulnerable to performance errors. This occurrence highlights the need for awareness of the effects of low workload on performance, identification of lowered vigilance and subsequent action or implementation of strategies to maintain safe operations.

http://www.eurocontrol.int/documents/hindsight-5-july-2007

This occurrence also emphasises the importance of communication, particularly when an individual or crew identifies that there may be a potential safety problem. Communication from the 737 flight crew regarding their aircraft's reduced speed enhanced the situational awareness of the controller, leading to the identification of the loss of separation assurance and subsequent recovery techniques. In addition, the knowledge and application of effective compromised separation recovery techniques by air traffic controllers is integral in the management of compromised separation situations.

AO-2011-064: VH-OGR, Turbulence event

Date and time:	20 May 2011, 0819 WST	
Location:	Perth Airport, Western Australia	
Occurrence category:	Incident	
Occurrence type:	Turbulence event	
Aircraft registration:	VH-OGR	
Aircraft manufacturer and model:	Boeing Company 767-338	
Type of operation:	Air transport – high capacity	
Persons on board:	Crew – Unknown	Passengers – Unknown
Injuries:	Crew – Nil	Passengers – 2 (minor)
Damage to aircraft:	Minor	

FACTUAL INFORMATION

On 20 May 2011, a Qantas Airways Boeing Company 767-338 aircraft, registered VH-OGR, was being operated on a scheduled passenger service from Melbourne, Victoria to Perth, Western Australia.

Prior to departing Melbourne, the flight and cabin crew discussed the possibility of turbulence and poor weather, and of their conducting cabin preparations earlier than normal for the arrival into Perth.

While in the cruise, the flight crew re-assessed the weather conditions and confirmed that an earlier than normal preparation of the cabin for landing was required. The flight crew notified the cabin crew and then made an announcement over the public address system prior to the descent being commenced. At that time, the cabin crew reported conditions were a 'bit bumpy'.

At flight level (FL)[1] 200, the flight crew turned the seat belt sign on and made an announcement for all passengers and cabin crew to return to their seats and fasten their seatbelts.

During the approach to runway 03 at Perth, prior to reaching 2,500 ft, the flight crew observed a rain band and some turbulence[2] on the aircraft's weather radar system. Shortly after, the flight crew reported experiencing severe turbulence[3] for about 3-4 seconds. The pilot in command (PIC) referred to the turbulence encounter as experiencing 'an almighty whack'; while a cabin crew member believed it 'sounded like hitting corrugated iron'. At the time, unsecured passengers items were observed moving throughout the cabin.

Further turbulence was experienced and the flight crew elected to conduct a go-around. The aircraft was levelled off at 3,000 ft and the PIC made an announcement to reassure the passengers and cabin crew. The cabin crew then contacted the flight crew and advised that two passengers, who were reportedly not wearing their seat belts at the time, had sustained injuries from coming into contact with a window reveal and an overhead locker (Figure 1). The two passengers were seated separately.

1 Flight level (FL) is a standard nominal altitude of an aircraft, used over 10,000 ft in Australia and denominated in up to three digits that represent hundreds of feet (FL 200 equates to 20,000 ft).

2 Turbulence is caused by the irregular movement of air, and often cannot be seen. When air masses with different speeds, direction or temperatures meet each other, turbulence is likely to occur.

3 Severe turbulence is characterised by large, abrupt changes in altitude/attitude, with large variations in indicated airspeed. The aircraft may be temporarily out of control.

Figure 1: Damage to window reveal and overhead locker

A second approach was conducted without further incident. After landing, the injured passengers received medical attention, with one being transported to hospital.

The flight crew did not observe any windshear[4] associated with the turbulence prior to the incident, nor were there any meteorological reports indicating windshear was present in the area.

Passenger injuries

As a result of the turbulence, one passenger sustained a head injury and received medical treatment on arrival at Perth. A second passenger sustained a deep cut to his head; spinal pain; and soft tissue damage to his neck, back, leg and arm, and was subsequently transported to hospital for treatment.

Recorded information

The flight data recorder (FDR) was retrieved from the aircraft and downloaded. An analysis of the data by the Australian Transport Safety Bureau (ATSB) identified that, as the aircraft descended through 2,400 ft (radio altitude), turbulence was experienced over a 9 second period, with severe turbulence recorded for 4 seconds during that time. The turbulence was associated with a change in wind speed and direction from 24 kts at 323° to 48 kts at 280°.

Meteorological information

A report provided by the Bureau of Meteorology on the meteorological situation and weather forecasts associated with the incident noted a cold front approaching Perth from the south-west. The low level area forecasts for the region indicated that showers and thunderstorms[5] were likely in the vicinity of the cold front and severe turbulence associated with cumulonimbus clouds. An aerodrome warning was also issued for Perth several hours prior to the incident advising the possibility of thunderstorms.

The Perth Airport automatic terminal information service (ATIS) information 'Delta', issued at 0726 on 20 May 2011, advised; wind was 350°(magnetic) at 12 kts, moderate rain showers, and scattered cloud[6] at 1,000 ft and 2,500 ft. The ATIS also noted significant weather conditions at 250 ft above ground level of wind at 15 kts from 360° (magnetic).

Passenger survey

A survey was sent to the injured passengers to obtain information about the turbulence event. Only one passenger completed the survey and provided the following details.

The passenger had fastened his seat belt after boarding the aircraft at Melbourne. During the flight, the passenger reported that, after waking from a sleep he visited the toilet and then returned

4 Windshear is present where conflicting wind speeds and/or direction occur over height. The greater the rate of change/shorter the distance, the higher the windshear severity. Windshear is often associated with turbulence.

5 Thunderstorms have the potential to be hazardous to aircraft and may include severe windshear and turbulence, and heavy rain.

6 Cloud cover is normally reported using expressions that denote the extent of the cover. The expression Few indicates that up to a quarter of the sky was covered, Scattered indicates that cloud was covering between a quarter and a half of the sky. Broken indicates that more than half to almost all the sky was covered, while Overcast means all the sky was covered.

to his seat, at which time he heard an announcement regarding the descent. The passenger then recalled waking up from an unconscious state on the floor, and was subsequently assisted to his seat. When the turbulence was experienced, the passenger was seated, but with his seatbelt unfastened.

The passenger also commented that, while passengers are generally aware that turbulence may result in minor disturbances to the flight, the unexpected nature, and potential seriousness of such an event in terms of injury severity, could be better communicated.

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, the aircraft operator has advised the ATSB that they intend to present this incident at the Airservices Australia industry participation working group for discussion to improve the dissemination of information relating to windshear events.

SAFETY MESSAGE

Use of seat belts

Turbulence is one of the leading causes of in-flight injuries. A safety bulletin published by the ATSB identified that, between January 1998 and May 2008, 150 injuries (minor and serious) to passengers and cabin crew were reported from 339 turbulence occurrences.

Generally, 99 per cent of people receive no injuries during a turbulence encounter; however, if passengers and cabin crew are not wearing their seatbelts, they can be thrown around without warning.

Almost all reported in-flight turbulence injuries could be avoided by:

- *Putting your seatbelt on, and keeping it fastened*. When the seat belt sign is on, it is a requirement to have your seat belt fastened for you own safety; it is the best defence against injuries.
- *Paying attention to any safety announcements* made by the flight crew and cabin crew during the flight and making sure you follow their instructions at all times.

The following publications provide additional information on turbulence and in-flight injuries:

- Public Attitudes, Perceptions and Behaviours towards Cabin Safety Communications http://www.atsb.gov.au/media/32927/b20040238.pdf
- Seat Belt Signs http://flightsafety.org/aerosafety-world-magazine/march-2011/seat-belt-signs
- Seat Belt Use and Passenger Injuries in Turbulence http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2011/InFO11001.pdf
- Shake, rattle and roll http://www.casa.gov.au/wcmswr/_assets/main/lib100059/sep-oct11.pdf
- Staying Safe against In-flight Turbulence http://www.atsb.gov.au/media/27791/ar2008034.pdf
- Strategies Target Turbulence-related Injuries To Flight Attendants and Passengers http://flightsafety.org/ccs/ccs_jan_feb01.pdf

AO-2011-073: VH-VWX, Performance calculation event

Date and time:	12 June 2011, 1714 CST
Location:	Darwin Airport, Northern Territory
Occurrence category:	Incident
Occurrence type:	Flight preparation/navigation
Aircraft registration:	VH-VWX
Aircraft manufacturer and model:	Airbus A321-231
Type of operation:	Air transport –high capacity
Persons on board:	Crew – 7 Passengers – 188
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Nil

FACTUAL INFORMATION

On 12 June 2011, a Jetstar Airways Airbus A321-231 aircraft, registered VH-VWX, was being prepared for a scheduled passenger flight from Darwin, Northern Territory, to Bali, Indonesia. The flight was scheduled to depart at 1610 Central Standard Time[1], but the crew were advised that the aircraft's arrival into Darwin was delayed by about 30 minutes.

The crew were provided with the preliminary load information, which indicated the aircraft's takeoff weight was about 10 tonnes below the maximum takeoff weight. That allowed the crew to plan for a runway 11 intersection departure from taxiway Bravo (Figure 1), with a takeoff distance available (TODA) of 2,316 m[2]. In accordance with standard operating procedures (SOPs), the crew planned to use reduced thrust (flex thrust) for the takeoff.

The pilot in command (PIC), who was designated as the pilot not flying, performed his cockpit duties including the final calculation of the takeoff weight and obtaining the take-off reference speeds (V speeds)[3] from the Darwin Airport charts in the aircraft's performance manual. He then left the cockpit to conduct the external aircraft (walk around) inspection.

In accordance with the operator's SOPs, the copilot then checked the performance data and found an error in the takeoff weight calculations. The copilot corrected the error and consulted the performance charts to extract the revised V speeds relating to the correct takeoff weight. However, when doing this, the copilot inadvertently referenced the performance chart for the full length of runway 11 rather than the chart for the planned taxiway Bravo departure.

The copilot inserted a card into the manual to bookmark the performance chart to assist the PIC with cross-checking the revised data. Such bookmarking was not precluded by the operator and some pilots used the practice to save time.

The PIC returned to the cockpit and was advised of the calculation error and revision to the takeoff weight and V speeds. In checking the validity of the data, he opened the performance manual at the bookmarked page and also referenced the runway 11 full length chart rather than the applicable taxiway B departure chart. The V speeds extracted were decision speed (V_1)[4], rotation speed (V_R)[5] and

1 Central Standard Time was Coordinated Universal time (UTC) + 9.5 hours.

2 TODA refers to the length of take-off run available and any applicable clearway. The operator-specified TODA for the full length of runway 11 was 3444 m.

3 Take-off reference speeds or V speeds assist pilots in determining when a rejected takeoff can be initiated, and when the aircraft can rotate, lift off and climb away safely given the existing flight conditions.

4 V_1: the critical engine failure speed or decision speed. Engine failure below this speed shall result in a rejected takeoff; above this speed the take-off run should be continued.

take-off safety speed (V_2)[6] and were all around 160 kts.

The crew completed the pre-flight preparations and taxied for runway 11 via taxiway Bravo.

The copilot, as the pilot flying, initiated the takeoff and the crew considered that the takeoff run was normal. At about 120 to 130 kts the PIC considered that the runway remaining was insufficient to allow the aircraft to stop safely and, irrespective of the nominated V_1, he decided that they would not reject the takeoff after that point.

The aircraft was rotated at the nominated speed and became airborne with what appeared to the PIC to be about 1,500 ft (450 m) runway remaining. The flex thrust setting was not increased and the takeoff was continued without incident.

Later in the flight, due to the unexpected take-off performance, the crew checked the performance data and realised that they had inadvertently referred to the incorrect chart. The correct V speeds for the runway distance ranged from 138 kts to 144 kts.

Operator performance calculations

Performance calculations conducted by the operator determined that there was sufficient takeoff run and takeoff distance available. However, if the crew had rejected the takeoff at the nominated V_1 of 160 kts, an additional 1,000 m of runway was required to meet accelerate-stop requirements. Alternatively, if an engine had failed at the nominated V_1, an additional 150 m of runway was required to meet accelerate-go requirements and obstacle clearance would have been compromised.

5 V_R: the speed at which the aircraft rotation is initiated by the pilot.

6 V_2: the minimum speed at which a transport category aircraft complies with those handling criteria associated with climb, following an engine failure. It is the take-off safety speed and is normally obtained by factoring the minimum control (airborne) speed to provide a safe margin.

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

Internal investigation

Jetstar Airways advised the ATSB that they have commenced an internal investigation into the incident, which will examine all system and organisational aspects that may have contributed to the event. The outcomes of the investigation will determine any organisational safety actions that they will undertake to prevent a recurrence.

Flight crew notice

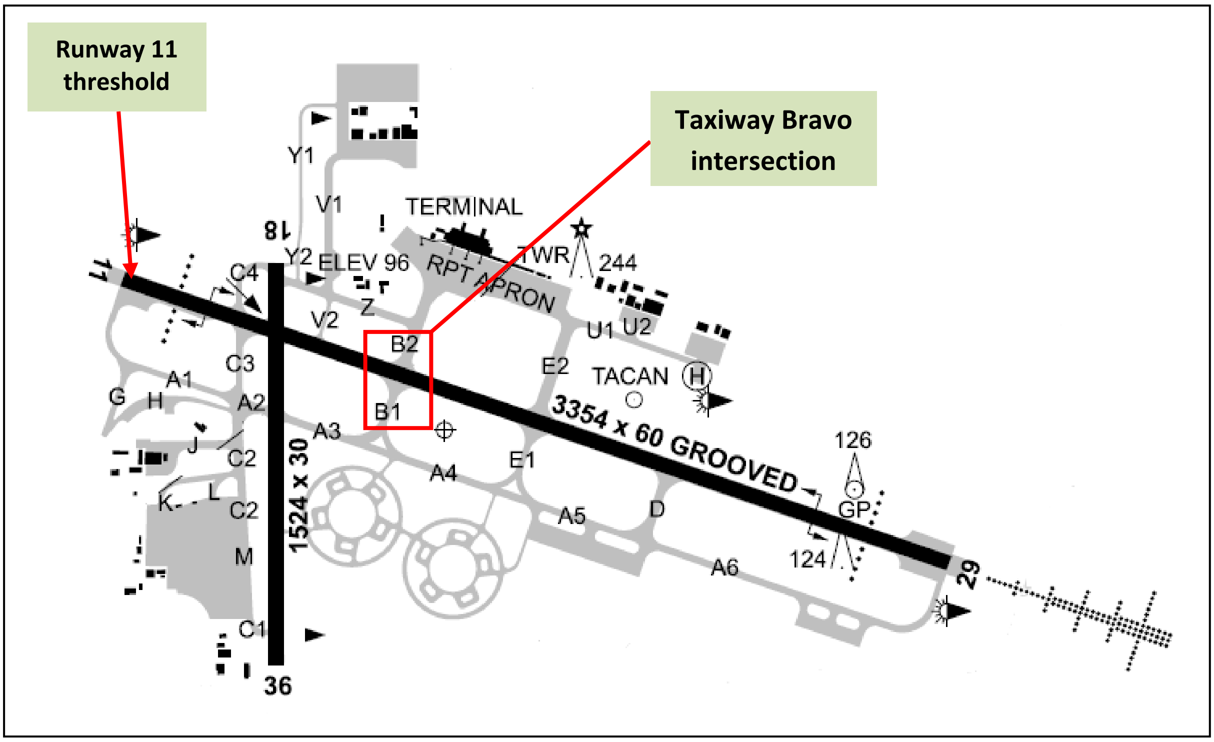
On 17th June 2011, an internal notice was issued to all A320/1 and A330 flight crew reminding pilots of the requirement to independently calculate take-off performance data. The notice also specifically stated that 'Bookmarking the page by the PNF [pilot not flying] is not acceptable. This practice must cease immediately.'

SAFETY MESSAGE

The application of correct operating data is a foundational and critical element of flight safety. However, errors in the calculation, entry and checking of data are not uncommon in the airline operating environment.

In January 2011, the ATSB released a research report titled *Take-off performance calculation and entry errors: A global perspective*. The report identified a number of error types and common contributing safety factors. The report also discussed several error capture systems that airlines and aircraft manufacturers could explore in an attempt to minimise the opportunities of take-off performance parameter errors from occurring or maximise the chance that any errors that do occur are detected and/or do not lead to negative consequences. The report is available at http://www.atsb.gov.au/media/2229778/ar2009052.pdf.

Figure 1: Darwin Airport



AO-2011-079: VH-FNU, Flight crew incapacitation

Date and time:	7 July 2011, 1915 WST	
Location:	90 NM (167 km) N of Perth Airport, Western Australia	
Occurrence category:	Serious incident	
Occurrence type:	Crew incapacitation	
Aircraft registration:	VH-FNU	
Aircraft manufacturer and model:	Fokker B.V. F28 MK 1000	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 4	Passengers – 88
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

FACTUAL INFORMATION

On 7 July 2011, a Skywest Airlines operated Fokker B.V. F28 MK 0100 (F28) aircraft, registered VH-FNU, departed West Angelas mine site on a charter passenger flight to Perth, Western Australia. On board the aircraft were two flight crew, two cabin crew and 88 passengers. The pilot in command (PIC) was designated as the pilot flying.

While in the cruise, the copilot reported feeling a stabbing pain in his lower abdomen, which increased in intensity over a 30 minute period. The copilot left the cockpit momentarily to use the toilet, but the pain continued. On his return, he took paracetamol for pain relief, advised the PIC that he was experiencing abdominal pain, and then notified the aircraft operator.

Shortly after, the copilot's pain increased significantly and he advised the PIC that he was unable to continue his flight duties. He reclined his seat, at which time he began to feel faint. The copilot advised the PIC of this and then became unconscious. The PIC reported that the copilot did not respond to verbal or physical stimulus for about 10 seconds.

In accordance with standard operating procedures, the PIC broadcast a PAN[1] call to air traffic control requesting landing priority and medical assistance for the aircraft's arrival at Perth. The PIC also notified the operator of the situation.

The copilot regained consciousness as the PIC was completing the PAN call, and reported feeling 'groggy and nauseous', with continued pain. The PIC called the senior cabin crew member to the cockpit who assisted by administering oxygen to the copilot, locking his shoulder harness in place, and moving his seat rearwards. The copilot's pain and nausea persisted for the remainder of the flight. Although he remained conscious, he did not resume his flight duties.

The aircraft landed at about 1915 Western Standard Time[2].After landing, the copilot received medical treatment from ambulance personnel and was transported to hospital. He recovered about 2.5 hours later and was released from hospital.

The copilot was subsequently examined and cleared to return to flight duties by a Designated Aviation Medical Examiner (DAME). The DAME determined that the copilot had most likely suffered an acute gastric event aggravated by dehydration and the food consumed.

The copilot had consumed six cups of water and had eaten several meals throughout the day.

Flight crew incapacitation response

Skywest Airlines required that all PICs operating the F28 were assessed in the simulator on responding to a flight crew incapacitation event, twice in a 3-

[1] 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.

[2] Western Standard Time was Coordinated Universal Time (UTC) + 8 hours.

year period. The PIC involved in this incident had completed his last check in April 2011 and was assessed as 'very good'. The PIC reported that the training and checking had greatly assisted with his response to the incident.

SAFETY MESSAGE

Flight crew incapacitation represents a potential threat to flight safety. Research published by the ATSB identified that 21 per cent of in-flight medical and incapacitation events in Australian civil pilots between 1 January 1975 and 31 March 2006 were due to acute gastrointestinal illness. Of this, 43 per cent involved pilots operating commercial passenger aircraft.

Incapacitation may be subtle, or sudden, partial or complete; it may be due to the effects of a pre-existing medical condition, the development of an acute medical condition, or some physiological event. It is important that pilots not only know what incapacitation is and how to avoid it, but how to respond when faced with such an event.

The following publications provide additional information of pilot incapacitation:

- Pilot Incapacitation: Analysis of Medical Conditions Affecting Pilots Involved in Accidents and Incidents – 1 January 1975 to 31 March 2006 http://www.atsb.gov.au/media/29965/b20060170.pdf
- Pilot incapacitation (TP 11629 E) http://www.tc.gc.ca/publications/EN/TP11629/PDF/HR/TP11629E.PDF
- In-Flight Medical Incapacitation and Impairment of U.S. Airline Pilots: 1993 to 1998 http://ntl.bts.gov/lib/39000/39900/39937/0416.pdf

AO-2011-089: VH-VQA, Incorrect aircraft configuration

Date and time:	28 July 2011, 2000 EST	
Location:	Melbourne Airport, Victoria	
Occurrence category:	Incident	
Occurrence type:	Incorrect aircraft configuration	
Aircraft registration:	VH-VQA	
Aircraft manufacturer and model:	Airbus A320-232	
Type of operation:	Air transport –high capacity	
Persons on board:	Crew – Unknown	Passengers – Unknown
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

FACTUAL INFORMATION

The information presented below, including any analysis of that information, was prepared from information supplied to the Bureau by the operator.

On 28 July 2011, at about 1830 Eastern Standard Time[1], a Jetstar Airways Airbus A320-232 (A320) aircraft, registered VH-VQA, departed Newcastle, New South Wales on a scheduled passenger service to Melbourne, Victoria. The First Officer (FO) was designated as the pilot flying for the flight.

During the descent into Melbourne, the crew were assigned the LIZZI FIVE VICTOR standard arrival route (STAR) for a visual approach to runway 34 by air traffic control (ATC), with a requirement to cross waypoint SHEED[2] at or above 2,500 ft.

Prior to commencing the STAR, an approach brief was conducted, during which time the FO advised the Captain that he had not flown the approach previously. The Captain completed the brief, which included the requirement to select Flap 2 and extend the landing gear by SHEED[3], and to expedite the descent from SHEED as the 2,500 ft altitude requirement resulted in the aircraft being positioned higher than normal on approach. The point at which Flap FULL would be selected in preparation for the landing was not discussed.

The Captain elected to conduct the visual approach after crossing SHEED with reference to the precision approach path indicator (PAPI)[4] and distances from the Melbourne distance measuring equipment (DME)[5].

After crossing SHEED as briefed[6], with the indicated airspeed at ‘F speed’[7], the FO disconnected the autopilot, and requested that the flight directors[8] be turned off and the flight path vector[9] turned on.

The Captain amended the aircraft’s flight management guidance computer to provide vertical

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

2 The SHEED waypoint was positioned overhead Essendon Airport. After passing SHEED, the crew were required to conduct a right turn onto final for a visual approach to runway 34.

3 The FO had also previously annotated this requirement on his approach chart.

4 The PAPI is a visual aid that provides guidance information to assist pilots with acquiring and maintaining the correct approach path to the runway touchdown area.

5 The DME is a ground-based transponder station. A signal from an aircraft to the ground station is used to calculate its distance from the ground station.

6 Flap 2 had been selected and the landing gear lowered.

7 ‘F speed’ is the target speed when the aircraft is in the Flap 2 or Flap 3 configuration.

8 The flight director is an instrument that provides a visual indicator of autopilot performance.

9 The flight path vector displays information to the pilot on the primary flight display of the aircraft’s trajectory relative to the ground.

approach guidance from their current position to the runway threshold.

As the aircraft descended through 1,000 ft radio altitude (RA), the Captain noted that the descent rate was about 1,200 feet per minute (fpm). The Captain called 'sink rate' and the FO responded by reducing the descent rate to below 1,000 fpm. At that time, the landing checklist had not been completed[10].

The aircraft was established on final approach at about 800 ft RA.

The FO recalled that his workload was high during the approach. As a result, he had focused on the aircraft's vertical profile and runway alignment, relying on the Captain for decision making and situation awareness. The Captain was not aware of this.

During the approach, the Captain observed the arriving and departing traffic on runway 34, and received a landing clearance from ATC. At about the same time, the 500 ft RA automatic callout alert activated[11], which neither crew member reported hearing[12].

When at 245 ft RA, the Captain realised that the landing checklist had not been completed. At the same time, the crew received a 'TOO LOW FLAP'[13] aural and visual warning from the aircraft's enhanced ground proximity warning system (EGPWS). The Captain identified that the aircraft was in the incorrect configuration[14] and immediately called for a go-around. The FO initiated the go-around[15] and applied take-off/go-around thrust. Prior to establishing a positive rate of climb, the crew received a second 'TOO LOW FLAP' warning.

During the go-around, the FO's workload significantly increased. As a result, he did not call for Flap 1 to be selected, leaving the Captain to select Flap 1 independently. To further compound the FO's workload, a master caution warning for an air conditioning pack fault was received after the go-around had commenced.

In preparation for the second approach, the Captain had considered assuming the pilot flying duties, but elected to ask the FO if he was comfortable with continuing the pilot flying duties, to which the FO replied he was. The FO conducted the second approach without further incident.

Pilot information

The Captain held an Air Transport Pilot (Aeroplane) Licence with a total of 9,775 hours, of which about 4,280 hours were on the A320.

The FO held a Commercial Pilot (Aeroplane) Licence with a total of 1,966 hours, of which about 300 hours were on the A320.

Recorded information

The quick access recorder (QAR) was retrieved from the aircraft and downloaded. An analysis of the data by the Australian Transport Safety Bureau (ATSB) identified that the aircraft's minimum RA prior to the establishment of a positive rate of climb was 166 ft above ground level.

Operator's investigation findings

The operator conducted an internal investigation into the incident and identified the following contributory factors:

- The point at which Flap FULL was to be selected was not included in the approach brief.
- The increased level of assistance from the Captain and a high workload state, had removed the FO from the decision making

10 The operator's stable approach policy stated that the aircraft should be configured for landing and stabilised by 1000 ft.

11 The crew received an automated standard callout alert from the radio altimeter indicating that the aircraft was at 500 ft RA.

12 The operator reported that it was likely the Captain was communicating with ATC at the time the 500 ft RA callout warning activated.

13 The 'TOO LOW FLAP' warning activates when the aircraft is below 245 ft above ground level, the airspeed is below 159 kts, and the flaps are not in the landing configuration.

14 The operator's standard operating procedures state that Flap 3 or Flap FULL can be used for landing, but must be selected by 1,000 ft above ground level.

15 The FO reported that he had only conducted a go-around in the simulator prior to the incident flight.

process and reduced his situation awareness,

- The FO may have experienced cognitive overload during the approach and go-around.
- The Captain reported a high workload from directing and monitoring the FO, while conducting his normal duties, reducing his cognitive capacity and situation awareness of the aircraft's configuration.

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.

Jetstar Airways

As a result of this occurrence, Jetstar Airways has advised the ATSB that they intend to take, or have taken, the following safety actions:

- provide the Captain and FO with a remedial training and coaching program
- conduct a review of their command upgrade training to ensure it specifically focuses on the development of a positive cockpit authority gradient and the command of flight capabilities
- incorporate this incident into the command upgrade training course as a case study
- conduct a review of their recurrent human factors training, in particular, the subjects related to command of flight/leadership, cockpit authority gradient, and flight crew assertion.

SAFETY MESSAGE

For any task to be performed effectively and safely, the cognitive resources required must not exceed the total resources available. Performance on a task is most reliable under moderate levels of workload that do not change unexpectedly and unpredictably. Excessive workload may increase the probability of human error. In addition, managing excessive workload often results in shedding or deferring tasks of perceived lesser importance in favour of tasks that command immediate attention. This is a common concern for pilots, as performance is likely to suffer[16].

This incident highlights the impact excessive workload can have on aircraft operations. It demonstrates the need for pilots to monitor and manage not only their own workload, but to also monitor the workload of other crew members. As a crew, tasks can be redistributed where necessary so that all available resources are utilised in order to minimise the chance of cognitive overload in any one individual.

Incorrect aircraft configuration occurrence

The ATSB recently published the final investigation report (AO-2009-066) into an incorrect aircraft configuration incident on 26 October 2009. While on final approach, a go-around was conducted by the crew at 500 ft RA when it became aware that the aircraft was not properly configured for landing.

The investigation highlighted that:

> Incidents such as the incorrect configuration of an aircraft for landing are rarely the result of a single action or identifiable event. Instead, a number of factors can contribute to create a chain of events that result in an outcome that was never the intention of the pilot(s).

The final report can be accessed at: http://www.atsb.gov.au/media/2500562/ao2009066.pdf

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16 Kantowitz, B.H. & Casper, P.A. (1988). Human workload in aviation. In E.L. Wiener and D.C. Nagel (Eds) *Human factors in aviation*. (pp 157-187). California: Academic Press.

Vidulich, M.A. (2003). Mental workload and situation awareness: Essential concepts for aviation psychology practice. In P.S. Tsang and M.A. Vidulich (Eds) *Principles and Practice of Aviation Psychology*. (pp. 115-146). New Jersey: LEA.

AO-2011-018: VH-NRF, Engine failure

Date and time:	9 February 2011, 1232 EST	
Location:	4 NM (8 km) NE of Bankstown Airport, New South Wales	
Occurrence category:	Accident	
Occurrence type:	Total power loss	
Aircraft registration:	VH-NRF	
Aircraft manufacturer and model:	Piper Aircraft Corporation PA-28-181 Archer	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – 1 (Minor)	Passengers – 1 (Minor)
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 9 February 2011, a Piper Aircraft Corporation PA-28-181 (Archer) aircraft, registered VH-NRF (NRF), was being prepared for a private flight from Ballina to Bankstown, New South Wales[1] The aircraft was refuelled to full tanks[2] and shortly after the flight departed towards Coffs Harbour, maintaining 2,000 ft to stay below the cloud.

As the aircraft approached Coffs Harbour, the pilot noted showers in the area. He contacted air traffic control (ATC) and received a clearance to track along the coast. Visibility reduced and the pilot received an amended clearance to a lower altitude and the aircraft was descended to 800 ft. Shortly after, the weather improved and the aircraft tracked towards Port Macquarie at about 3,000 ft and continued along the coast. When approaching Williamtown airspace, the pilot received an ATC clearance to track southbound at 2,000 ft.

Soon after, the pilot noticed that the tachometer was fluctuating between 1000-1100 revolutions per minute (RPM)[3]. The pilot initially assumed there was an engine problem and applied carburettor heat, turned the fuel pump on, and placed the fuel mixture and throttle controls full forward. These actions did not affect the tachometer and it now fluctuated between 1000-2500 RPM. The engine sound appeared normal and did not correlate with the indications. The pilot contacted the operator and assessed that it was an indication problem and the flight was continued.

The pilot was re-cleared by ATC to track to Bankstown at 4,500 ft. The pilot conducted a climbing orbit to avoid cloud and the engine performed as expected. The tachometer continued to fluctuate for the remainder of the flight.

When overhead Prospect Reservoir, an approach point to Bankstown, the pilot broadcast his inbound call to Bankstown ATC and was cleared for a straight-in approach to runway 11 Left. The pilot conducted an orbit overhead the Reservoir to maintain separation with another aircraft in the area, before a descent was commenced and the aircraft was tracked towards Bankstown.

Shortly after, at about 1,200 ft, the engine lost power. The pilot immediately applied carburettor heat and the engine momentarily responded, but stopped again. The fuel pump was selected on,

1 The pilot and passenger had flown to Ballina on 4 February. They attempted to fly back to Bankstown on 8 February, but returned to Ballina due to weather.

2 Maximum fuel capacity of the aircraft was 189 L of which 181 L was useable fuel.

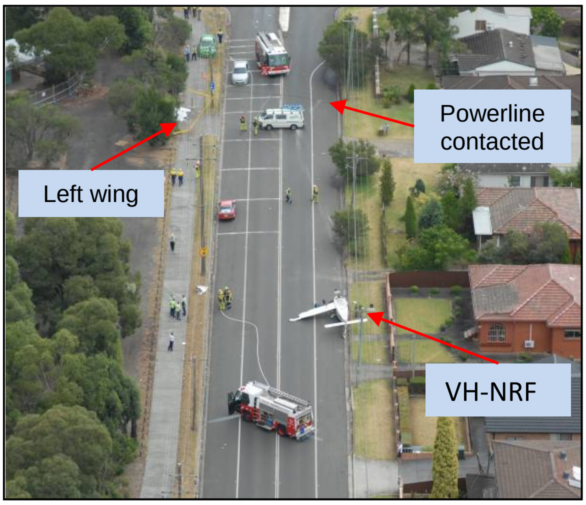
3 The typical cruise RPM setting for the aircraft was about 2400-2500 RPM.

the mixture set full rich and full throttle applied. The pilot attempted to broadcast a MAYDAY[4] call, but it was over-transmitted; a second broadcast was made before the pilot elected to land on a street.

The pilot then moved the fuel selection to the right tank[5], confirmed the fuel pump was on, cycled through the mixture and throttle range, and checked the master switch and circuit breakers, but without effect.

About 1 minute later, in preparation for the landing, the pilot attempted to turn the fuel selector off and positioned the aircraft to fly between powerlines that ran across the street, but due to vehicles in the area he had to slow the aircraft. He determined he had insufficient height to fly over the powerlines so attempted to fly between two powerlines that were about 2.5 m apart. During the manoeuvre, the left wing contacted the lower powerline and became separated from the aircraft. The aircraft then rolled to the left and became inverted. It continued airborne along the street before the right wing collided with a power pole. The aircraft spun around and impacted the ground at about 1232 Eastern Standard Time[6] (Figure 1).

Figure 1: Accident site



Photograph courtesy of the NSW Police Force

The pilot and passenger released their seatbelts. The door could not be opened, so the pilot kicked the door window out and both egressed. The pilot and passenger sustained minor injuries, the aircraft sustained serious damage (Figure 2).

Figure 2: Aircraft wreckage

Photograph courtesy of the aircraft insurance assessor

A dog, which was in a cage secured to the back seat, escaped from the wreckage and was retrieved soon after.

Following the accident, about 0.5 L of fuel was drained from the left tank and 20 L from the right tank. As a result, it was considered that the engine failure was due to fuel starvation[7]. The reason for the tachometer fluctuation was not identified.

Pilot information

The pilot held a Private Pilot (Aeroplane) Licence, with a total of 68.9 hours experience, of which 33.1 hours was on the Archer aircraft.

Aircraft inspection

An inspection of the aircraft by the Civil Aviation Safety Authority (CASA) did not find any obvious fuel leaks from the engine, the carburettor, or the right wing. The colour of the exhaust pipe outlet was reported as normal, with no indications that the fuel mixture was too rich or too lean.

Fuel consumption

The operator's investigation into the accident determined that, as there was no evidence of fuel leakage, the aircraft may have experienced excessive fuel burn.

4 A MAYDAY transmission is made in the case of a distress condition and where the pilot requires immediate assistance.

5 The aircraft had two fuel tanks, one in each wing.

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

7 Fuel supply to the engine was interrupted although there was adequate fuel onboard the aircraft.

The pilot had applied an estimate of 40 L per hour (L/h) when making the pre-flight fuel planning for the trip. He had also taken into account forecast winds, taxi time, and a 45 minute fixed fuel reserve. That calculation provided an additional 34 minute margin above the reserve. Headwinds experienced en route increased the flight time by 16 minutes.

Based on the fuel uplift at Ballina and that retrieved from the wreckage the estimated fuel burn for the flight was between 47-50 L/h.

There was insufficient data available to determine the average fuel burn for the aircraft over-time.

Fuel management

The pilot used a cruise setting of 2500 RPM and leaned the mixture. As the flight was operated below 5,000 ft, he had placed the mixture control more towards the full rich position than normal. After the tachometer began to fluctuate, the mixture setting was increased slightly.

While the pilot recognised that flying at a lower altitude with a richer mixture setting would have resulted in an increased fuel flow, he believed that it should not have accounted for the extent of the apparent excessive fuel burn.

The pilot further stated that he changed fuel tank selection every 30 minutes using a flight timer. He did not rely on the fuel gauges for fuel quantity as they were generally unreliable, but had used them to confirm that fuel was being consumed from the selected tank. The pilot also reported that he did not recall observing a fuel calibration card[8] in the aircraft and was not aware of its purpose.

The operator believed that the pilot had adequately planned the flight as per the pilot's operating handbook (POH) and that the fuel management procedures employed were correct.

Aircraft history

The operator advised that the aircraft had a history of rough running and had been placed into maintenance, with no issues or faults found. A company pilot also reported that on a previous occasion, when leaning the aircraft, the mixture control required moving to the near idle cut-off position before the engine began to run rough. The pilot reported this to maintenance personnel who advised that it was normal for the aircraft.

Engine failure response actions

The POH for the Archer aircraft stated, that if power loss occurs at a low altitude, the first step is to prepare for an emergency landing. However, if sufficient altitude exists, the pilot should change the fuel tank selection to the tank containing fuel, turn the fuel pump on[9], move the mixture control to the full rich position, and apply carburettor heat.

Where time permits, it is crucial that pilots complete all of the checklist items in sequence when responding to an emergency situation in-flight, such as an engine failure, in order to maximize the chances of the engine re-starting.

When the pilot performed the initial response actions, the fuel tank selection was not changed. This was conducted a short time after.

The pilot later attempted to turn the fuel selector off in preparation for the landing, but was only able to place it at the left tank position.

The pilot had conducted his initial flying training in a Cessna 152 aircraft, which did not have selectable fuel tanks. Consequently, changing fuel tank selection was not part of the immediate engine failure response actions for that aircraft. Research has shown that under stressful situations such as responding to an engine failure, pilot's can revert to previously learnt actions and procedures.

Pilot comments

The pilot reported that, as a result of this accident, he elected to undertake a flight check to review engine failure response procedures and was assessed as competent by the Chief Flying Instructor. He also identified a number of points that all pilots should consider:

8 Fuel calibration cards detail the accuracy of the aircraft's fuel gauges. Without the card, a pilot cannot determine the accuracy of the fuel gauge reading.

9 The tank selection must be made before selecting the fuel pump on to prevent the fuel lines from becoming aerated.

- be aware that your aircraft may not always perform as expected
- when conducting a longer flight, consider stopping en route and refuelling
- when operating near populated areas, be prepared and identify possible landing locations; don't wait until an emergency occurs.

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 accident, the aircraft operator has advised the ATSB that they have taken the following safety actions:

- An internal circular was issued to all instructors to emphasise to students the importance of changing fuel tank selection when conducting the initial engine failure response actions.
- The operations manual was amended to include the following:
  - pilots operating company aircraft below 2,000 kg are to lean the aircraft in accordance with the POH when operating below 3,000 ft above mean sea level
  - fuel gauges and calibration cards are to be used as a guide and monitored throughout a flight; if a discrepancy between the written fuel log, which is used on flights conducted outside the circuit and training area, differs from the fuel gauges, pilots are to exercise sound judgement and common sense.
- The amount of fuel uplifted at the end of a flight will be recorded on the aircraft's flight record so that an accurate fuel flow calculation for each flight can be conducted.
- A meeting with all student pilots was held to highlight the accident involving NRF and the amendments to the operations manual.

SAFETY MESSAGE

Research published by the ATSB identified that 56 per cent of fuel-related accidents between 1991 and 2000 were the result of fuel starvation. This accident highlights the risks associated with operating an aircraft that has different procedures from that previously familiar with and the importance of having accurate knowledge of the aircraft's fuel usage

A United States Federal Aviation Administration (FAA) publication titled 'Meet Your Aircraft' highlighted the risks associated with operating a new aircraft that has different procedures from that previously familiar with. It was emphasised that pilots should be aware that during stressful or emergency situations, they may use the wrong procedures. Under these circumstances, pilot must ensure that they use the correct procedures for the aircraft they are flying and be particularly careful when making any changes that involve the fuel system or landing gear.

Aircraft fuel consumption

A CASA advisory circular on fuel planning (AC 91-180(0)) states, that where range or endurance is critical for a flight, pilots should determine fuel flow rates based on the aircraft manufacturer's figures and not by approximate rates that may be used for training or short flights. However, it is important to note that these figures are based on usage by optimally tuned engine(s) in an optimum airframe in optimum circumstances by a test pilot, and that these figures are unlikely to be replicated under normal operations.

If operating a particular aircraft on a regular basis, pilots should become familiar with its fuel usage by repeatedly recording the amount of fuel used against the flight time. If the resultant fuel flow figures vary from that published by the manufacturer, further exploration may be required.

The following publications provide additional information on fuel awareness and planning:

- Australian Aviation Accidents Involving Fuel Exhaustion and Starvation http://www.atsb.gov.au/media/43380/Fuel_exhaustion_and_starvation.pdf

- CASA AC 91-180(0) Fuel Planning
  http://www.casa.gov.au/newrules/parts/091/download/ac091-180.pdf
- Meet Your Aircraft (P-8740-29)
  http://www.faasafety.gov/gslac/ALC/libview_normal.aspx?id=6853
- Fuel Awareness
  http://flighttraining.aopa.org/pdfs/SA16_Fuel_Awareness.pdf

AO-2011-037: VH-WZI, Partial right engine failure

Date and time:	3 March 2011, 1745 EST
Location:	B56 NM (104 km) N of Cairns, Queensland
Occurrence category:	Incident
Occurrence type:	Partial right engine failure
Aircraft registration:	VH-WZI
Aircraft manufacturer and model:	Aero Commander 500-S
Type of operation:	Charter - freight
Persons on board:	Crew – 1 Passengers – Nil
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Nil

FACTUAL INFORMATION

On 3 March 2011, an Aero Commander 500-S aircraft, registered VH-WZI, departed Horn Island for Cairns, Queensland on a charter flight with one pilot on board. The purpose of the flight was to transport live crayfish.

At about 1745 Eastern Standard Time[1], air traffic control (ATC) requested the pilot of WZI to reduce the aircraft's airspeed to arrive at a specified waypoint[2] four minutes later than planned. The pilot reduced the engine power in order to slow the aircraft down. After reducing the power, the right engine fuel flow reduced from 100 lbs/hr to 30 lbs/hr and the airspeed reduced from 160 kts Indicated Airspeed (IAS) to 130 kts IAS. The right engine reduced from 2400 RPM to 1800 RPM and the aircraft yawed to the right.

The aircraft was flying at 7,000 ft above mean sea level (AMSL) flying over terrain of about 4,500 ft when the pilot noticed the reduced performance in the right engine. He believed it was due to a fuel blockage and initially attempted to clear it by selecting the fuel pump on and enriching the fuel mixture, but these actions did not clear the blockage.

The pilot requested a clearance from ATC to descend to 5,000 ft as the aircraft was unable to maintain 7,000ft. The pilot recalled that a descent at about 130 kts was conducted, with the intention of quickly manoeuvring the aircraft clear of high terrain rather than minimising the rate of descent as he believed that was a safer course of action. He determined that, as the engine was producing some power, the aircraft's performance would be further degraded by shutting down the right engine and feathering[3] the propeller.

About 56 NM (104 km) to the north of Cairns Airport, the pilot declared a Mayday[4] and indicated that he was unsure if he was able to reach Cairns Airport. The aircraft continued to descend to 3,700 ft, flying over terrain of between 1,000 ft and 2,500ft high. The pilot was asked by ATC if he was familiar with Bloomfield River aeroplane landing area (ALA) (Figure 1), located 11 NM (20 km) to the north of his current position. The pilot requested directions to Bloomfield River and turned towards the coast.

Once clear of high terrain and at about 3,000 ft, the pilot decided to shut down the right engine and feather the propeller and the aircraft was able to maintain altitude. On reaching the coast, the pilot

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

2 Predetermined and accurately known geographical position forming the start or end point of a route segment.

3 The term used to describe rotating the propeller blades to an angle edge on to the air flow that minimised aircraft drag following an engine failure or shut-down in flight.

4 International call for urgent assistance.

tracked north following the coastline at 2,000 ft and made a safe landing at Bloomfield River ALA.

Both propellers were found in the feathered position on the ground. It could not be determined if the left propeller was feathered during flight or on the ground due to conflicting statements between the pilot and witnesses.

Figure 1: Bloomfield River Airstrip

Image courtesy of Google Earth©

Engineering action

A Licensed Aircraft Maintenance Engineer (LAME) flew to Bloomfield River the day after the incident. He noted that both propellers were feathered. He conducted a fuel drain and confirmed that there was no water present in the fuel and the fuel was a normal colour. The LAME was able to start the left engine and move the propeller out of the feathered position; however, he was unable to start the right engine. He shut down the left engine and back flushed the fuel vapour return system[5] in the right engine. The right engine fuel flow returned to normal and he was able to start both engines.

The LAME reported that blockages to the fuel vapour system were a known problem on this aircraft type, and that he had seen this problem on four other occasions in Aero Commander aircraft. These previous events had also occurred when the engine power had been reduced.

Pilot training

The pilot reported that he had completed his initial multi-engine endorsement in 2004 and had since completed six multi-engine command instrument rating (CIR) renewals. He had conducted his initial endorsement training on the Aero Commander upon commencement of his employment with the operator about 12 months prior to the incident. The pilot recalled that he had conducted simulated engine failures during each of his CIR renewal flights and during his endorsement training.

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

Change to planned route

The operator has amended their planned flight route from Horn Island to Cairns, with aircraft now required to track via Cooktown to remain clear of high terrain.

Safety information dissemination

The operator informed all of their safety critical personnel about the incident, and has ensured they are aware of fuel blockage issues with the Aero Commander.

SAFETY MESSAGE

There is limited guidance available to pilots on how to best deal with a partially inoperative engine in a twin-engine aircraft. If the aircraft is unable to maintain altitude with the power available, consideration should be given to treating the event as an engine failure, flying at the best single engine climb speed and feathering the propeller to minimise drag.

Some guidance can be found in the Civil Aviation Authority (CAA) Handling Sense Leaflet 1 – Twin Piston Aeroplanes

http://www.caa.co.uk/docs/33/20110217HSL01.pdf

The leaflet discusses factors to consider during an engine failure. It highlights that an engine failure may be progressive and therefore difficult to assess

5 A purging line used to remove excess vapour from the fuel pump for return to the fuel tank.

due to limited yaw and minimal reduction in performance. The leaflet also points out that, instrument indications can be misleading during an engine failure with manifold air pressure on the failed engine showing ambient pressure, which may give similar indications to the live engine. If the propeller is windmilling, the RPM reading can also be high.

The Civil Aviation Safety Authority Civil Aviation Advisory Publication (5.23-1(1)) *Multi-Engine Aeroplane Operations and Training* provides some guidance for flying instructors on how to demonstrate insidious and partial engine failure. It states:

> Part of managing an engine failure is to recognise the type of problem and then decide the appropriate action. It is very unlikely that an engine failure will be instantaneous, and instructors should give trainees advice about what action to take to manage partial engine failures and attempt to restore power when possible.

http://www.casa.gov.au/wcmswr/_assets/main/download/caaps/ops/5_23_1.pdf

AO-2011-042: VH-SMY, Collision with terrain

Date and time:	25 March 2011, 0830 WST	
Location:	90 km WNW of Geraldton Airport (East Wallabi Island), Western Australia	
Occurrence category:	Accident	
Occurrence type:	Collision with terrain	
Aircraft registration:	VH-SMY	
Aircraft manufacturer and model:	Cessna Aircraft Company 172	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – Minor	Passengers – Nil
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 25 March 2011, at about 0800 Western Standard Time[1], a Cessna Aircraft Company 172 aircraft, registered VH-SMY (SMY), was to be operated on a charter passenger flight from Geraldton to East Wallabi Island (in the Abrolhos Islands group), Western Australia. On board were the pilot and one passenger

During the before take-off magneto check[2], the pilot reported the engine ran roughly. The pilot suspected that the spark plugs had become fouled and completed the appropriate actions for attempting to clear the plugs. The pilot performed a second magneto check and the engine continued to run rough. The pilot again attempted to clear the spark plugs. A third magneto check was conducted and was considered acceptable for the flight.

The pilot obtained the weather for the flight, which indicated a light wind from an easterly direction. The pilot conducted a passenger brief and the aircraft departed.

During the flight, the pilot compared the ground speed[3] on the global positioning system (GPS) with the aircraft's indicated airspeed[4] to gain an appreciation of the wind conditions[5]. The pilot recalled observing a very strong tailwind. The pilot also stated that the engine performed as expected and that the fuel mixture was leaned for the cruise.

When approaching the Island, the pilot made the appropriate radio broadcast and noted that there were no other aircraft operating in the area.

First approach

The aircraft joined the circuit on base for runway 18 (Figure 1). When on final approach, the wind conditions were gusty, resulting in the nose of the aircraft being positioned at a 45° angle to the runway to remain aligned with the runway centreline. The pilot elected to overfly the runway at about 500 ft and assess the wind conditions, which appeared to be gusting from an east to south-easterly direction.

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

2 The aircraft engine was fitted with a dual ignition system comprising of two sets of spark plugs, each supplied with electrical power from a magneto. The pre-takeoff magneto check involved the pilot turning one magneto off in order to see if the engine would continue to run on the other magneto, and vice versa. A rough running engine may have indicated that one or more spark plugs had become fouled from carbon or lead deposits.

3 Speed of the aircraft relative to the ground.

4 Airspeed directly obtained from the airspeed indicator instrument.

5 If the ground speed on the GPS was greater than the aircraft's indicated airspeed, a tailwind was present.

Figure 1: East Wallabi Island airstrip

© Google Earth

The pilot stated that he continually monitored the wind conditions at the Island by referencing the ground speed on the GPS, observing the windsock, and noting the position of the boats moored[6] in close proximity to the island.

The pilot conducted a circuit and prepared the aircraft for landing.

Second approach

When on final approach, the aircraft was again positioned at a 45° angle to the runway. The pilot believed that the wind was too strong for a landing and at about 100-150 ft, he commenced a go-around. The pilot applied full power, but the engine did not perform as expected. He reported that the aircraft appeared 'sluggish' and that he heard a noise indicating that the engine was 'choking'.

As the aircraft approached the end of the Island, engine performance improved and normal operations were resumed. Another circuit was commenced.

The pilot suspected spark plug fouling, as the engine had been operated at a low power setting on the approach for some time.

Third approach

When on the downwind leg of the circuit, the pilot noted that the windsock was moving considerably, from the north-east to the south-east, but predominantly from the east, to south-east direction.

On final approach, the aircraft was again at a 45° angle and experiencing wind buffet.

The pilot selected an aim point beyond the threshold[7] due to a known 'bump'[8] at the beginning of the runway. During the landing flare, the aircraft floated and the stall warning horn activated. The pilot applied rudder to align the aircraft with the runway centreline and the aircraft touched down about half way along the runway.

The pilot commenced braking[9] and retracted one stage of flap. The pilot determined that the aircraft could not be stopped by the runway end and elected to go-around. He moved the throttle full forward, but the engine did not deliver full power. The pilot reported that the engine 'gurgled'.

The pilot believed the aircraft momentarily became airborne before contacting a sand dune[10] before coming to rest upright in the water (Figure 2).

The passenger egressed while the pilot broadcast a MAYDAY[11] call, shut down the aircraft, and then exited. The pilot sustained minor injuries, while the passenger was not injured. The aircraft sustained serious damage.

The pilot reported that the approach was rough as a result of the wind conditions and that he did not feel comfortable. However, due to the recent commencement of his employment, he wanted to complete the flight. The operator had also stated to the pilot during his induction training, that if the crosswind component was too great for a landing at any airstrip, the pilot should return to Geraldton. While there were no external pressures, the pilot

6 Boats moored off-shore will point into wind.

7 The beginning of the usable portion of the runway.

8 The airstrip was about 600 m in length, with a gravel surface. There was a 50 m section near the beginning of runway 18, which had exposed capstone rock present. Pilots operating into the airstrip would generally land beyond the capstone ('bump').

9 The pilot believed that he may have locked the brakes during the landing.

10 The pilot reported that the sand dune was about 1-2 m in height.

11 A MAYDAY transmission is made in the case of a distress condition and where the pilot requires immediate assistance.

elected to conduct the landing in order to please the operator.

Figure 2: VH-SMY

Photograph courtesy of the aircraft operator

The reason for the degraded engine performance was not determined.

Meteorological information

The Bureau of Meteorology's weather observations at North Island[12] indicated that the wind at 0400 was 7 kts gusting to 8 kts from 100°. At 0800 the wind was 14 kts gusting to 17 kts from 040°, while at 0900 the wind was 14 kts gusting to 19 kts from the same direction.

Pilot information

The pilot held a Commercial Pilot (Aeroplane) Licence with a total of 520.3 hours, of which 118.8 hours were on the Cessna Aircraft Company 172 aircraft type.

The pilot had commenced employment with the operator 4 days prior to the accident flight. Within that time, he had flown to the Abrolhos Islands on four occasions and conducted at least four landings at East Wallabi Island[13]. These included several induction flights with the operator.

During induction, the operator had stated to the pilot on several occasions that the winds at the Islands could be variable; this was also observed on one of the induction flights. The importance of monitoring the ground speed on the GPS to determine wind strength and direction was also emphasised.

The pilot stated that the wind conditions at the Island were similar to that experienced at Rottnest Island, Western Australia, where he had flown to on a regular basis. He believed that he was proficient at conducting crosswind landings.

SAFETY MESSAGE

This accident highlights the need for pilots to be aware that self-imposed undue pressure, can come about for a variety of reasons (time or task-oriented), it is important to understand one's personal limitations, especially when flying in or around adverse weather conditions.

This issue was previously identified by the ATSB in investigation BO/200100348, into a fatal accident on 26 January 2001 where there was evidence to suggest that the pilot was probably experiencing self-imposed pressure to conduct the flight, including:

> The pilot had only recently moved to Karratha. At such an early stage of his appointment, he may have been trying to create a positive impression and accordingly, could have been reluctant to not complete the flight back to Newman, particularly as that would have entailed a degree of inconvenience for the passengers.

The following publications provide additional information on self-imposed pressure:

- BO/200100348: Cessna Aircraft Company 310R, VH-HCP, 3 km east of Newman aerodrome, Western Australia, 26 January 2001 http://www.atsb.gov.au/media/24547/aair200100348_001.pdf
- NTSB/AAR-11/04: Agusta S.p.A. A-109E, N606SP, Near Sante Fe, New Mexico, 9 June 2009 http://www.ntsb.gov/Publictn/2011/AAR1104.pdf
- It's deadly to ignore procedures – Bruce Byron http://www.schofields-flying-club.com.au/newsletter/oct06.htm

12 North Island is located about 11 NM (20 km) north-west of East Wallabi Island and is part of the Abrolhos Islands group.

13 Two of the four flights to the Islands were conducted in VH-SMY, while the remaining two flights were conducted in a Gippsland Aeronautics Pty Ltd GA-8 aircraft.

AO-2011-048: VH-FTB, Collision with terrain

Date and time:	18 April 2011, 1300EST	
Location:	28 km S Ingham (ALA)	
Occurrence category:	Accident	
Occurrence type:	Collision with terrain	
Aircraft registration:	VH-FTB	
Aircraft manufacturer and model:	Eagle Aircraft Company DW-1	
Type of operation:	Agricultural	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Serious	Passengers – Nil
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 18 April 2011 at about 1320 Eastern Standard Time[1], the pilot of Eagle Aircraft Company DW-1 bi-plane aircraft, registered VH-FTB (FTB), departed the Ingham authorised landing area (ALA) to conduct aerial agricultural work about 28 km to the south, in a field adjacent to the Bambaroo School.

On arriving at the spray field the pilot completed his WISHSTANDE[2] assessment of the area. The pilot had established his A-B, C-D, lines[3] (Figure 1) and had commenced the application spray runs.

After completing the second run (heading south), the pilot pulled up to clear the tree line at the southern end of the field. He looked to the left and right for obstacles and saw bare branches of a large tree close to the lower right wing. Before the pilot was able to take evasive action, the leading edge of the lower right wing contacted a large branch protruding into the flight path.

After the tree contact, the pilot was able to clear all other obstacles and level the aircraft. Stability was deteriorating as the outboard sections of the upper and lower right wings began to deform which resulted in FTB commencing to roll to the right in an uncontrollable manner. The pilot applied left rudder and aileron to counter the roll. As the right wings became aerodynamically loaded, they continued to deform and collapse.

At that point, the pilot became concerned that control authority was diminishing. FTB continued to roll right, so the pilot commenced lowering the aircraft's nose to get to the ground as quickly as possible before becoming inverted.

The pilot was able to keep FTB upright and flew it to the ground in the adjacent ploughed field. On contact with the ground the wheels dug into furrows and the aircraft cart-wheeled several times before coming to rest. As a result of the impact, the aircraft was seriously damaged.

The pilot sustained serious injuries including multiple fractures to his right leg, vertebra, sternum and right eye socket. The pilot also sustained a large laceration to the right side of his mouth and jaw.

Pilot information

The pilot held a commercial pilot license (Aeroplane) with agricultural class 2 rating. The pilot had more than 2,000 hours total flying experience with 63 hours in aerial agricultural work and about 37 hours on the aircraft type. He held a valid class 1 medical with no restrictions.

Weather

At the time of the accident the weather was reported as being 'good' with east to south-easterly winds of about 4 kts. The sun was not considered a

1 Eastern Standard Time was Coordinated Universal Time +10 hours.

2 Aerial application checklist covering the assessment of wind, sun and various hazards associated with aerial agricultural operations

3 The boundaries for the spraying operation

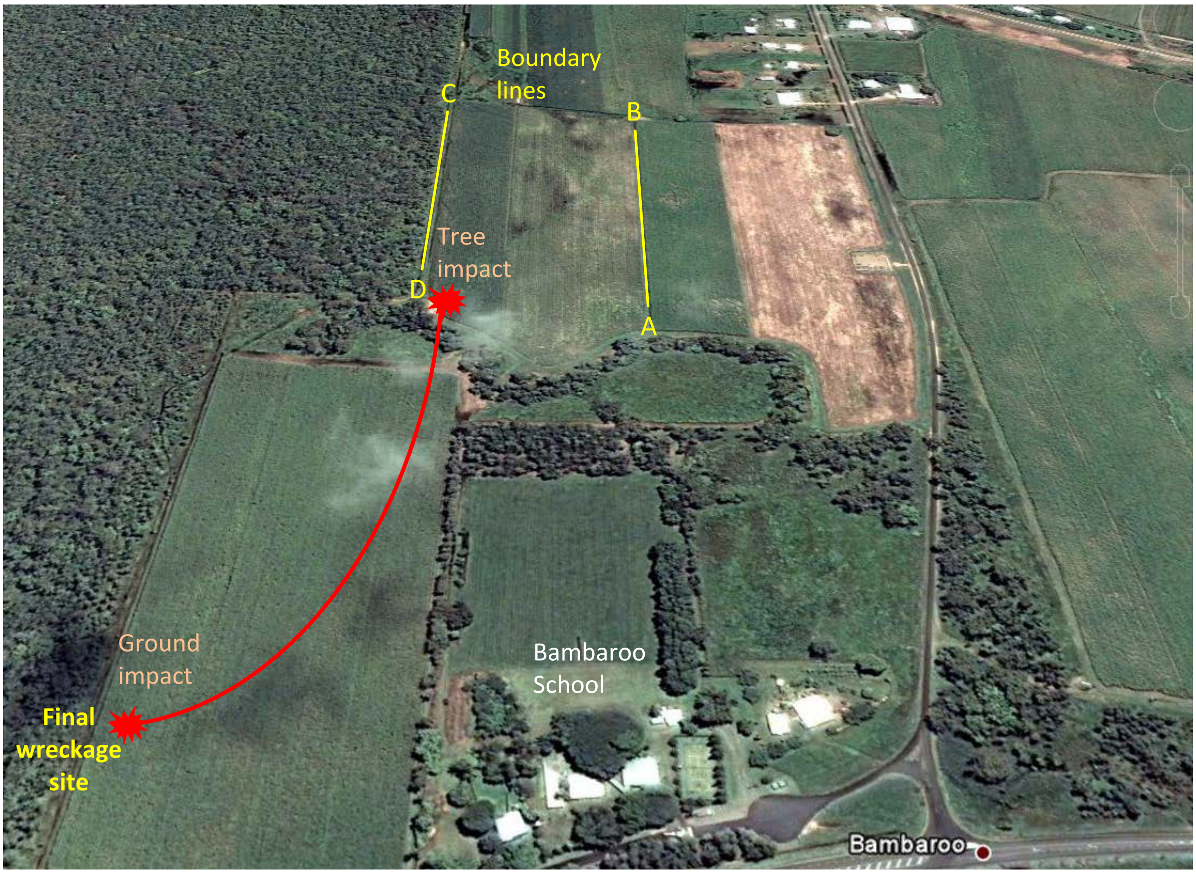
distraction at the time as the spray run was travelling to the south and the sun was almost directly overhead.

Survival aspects

The aircraft sustained extensive damage during the accident sequence. The cockpit frame structure, however, remained intact (Figure 2). The hopper had split and was deformed to the right. The pilot believed that it was the hopper that caused the injuries to his right leg

Although the pilot's injuries were serious, his being securely restrained and wearing a helmet significantly reduced the potential level of injury.

Figure 1: Spray field and ground impact site



© Google Earth

Figure 2: Wreckage

Courtesy of Queensland Police Service

Pilot comment

The pilot reported having been on duty for about 3-4 hours at the time of the accident, being well rested and that he did not believe that fatigue was a factor in the accident. The pilot was not suffering from any illness or injury at the time

The pilot also commented that a cyclone had passed through the area recently which may have contributed to the condition of the impacted tree (Figure 3).

Figure 3: Bare tree

Courtesy of Queensland Police Service

The tree's position and lack of foliage against the backdrop of green trees and mountain ranges, made it difficult to see from crop level. The pilot commented that while FTB still had a near full payload on board, a decision not to dump the load was made for fear that its release may have resulted in an uncontrolled inversion of the aircraft due to the sudden change of centre of gravity. The pilot believed that had the aircraft been inverted at ground impact the injuries sustained would have been fatal.

ATSB Comment

Decision making

The pilot made a conscious decision not to dump the payload. The Aerial Agricultural Association of Australia (AAAA) acknowledges that the dumping of a load is an emergency procedure which will almost certainly require the pilot to make a quick decision under pressure. As a 'safe rule' the AAAA advise, "if in doubt, dump". However, while the injury sustained to the right leg of the pilot may be attributed to a loaded hopper at impact, other factors such as the handling and controllability of the aircraft once the payload was released cannot be known.

Survivability

Despite the high level of damage to FTB, the structural integrity of the cockpit area, the effectiveness of the pilot's restraints and the use of a helmet directly contributed to the pilot's survival and reduced the level of injuries sustained.

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 the accident, the aircraft operator has advised the ATSB that they are taking the following safety action:

Training

The operator will review training requirements and conduct a feasibility study into providing a two seat training aircraft to ensure pilot proficiency and safety.

SAFETY MESSAGE

This accident highlights the inherent risks associated with operating at low-level. While not a wire-strike event, factors presented in this accident are directly related to those found in many wire-strike occurrences.

The ATSB research report *Wire-strike Accidents in General Aviation: Data Analysis 1994 to 2004* attributes the high hazard levels associated with low-level flying, being due to; the greater number of obstacles to avoid, significantly less time to control emergency situations and an increased workload due to navigating the dangerous environment in addition to their normal workload. It also highlights that risk mitigation strategies associated with low-level flying rely heavily on the level of situation awareness (SA) maintained by the pilot. Strategies to establish and maintain adequate SA include; pre-flight reconnaissance and observations, memory and awareness and maintenance of good scanning technique.

http://www.atsb.gov.au/publications/2006/wirestrikes_20050055.aspx

The AAAA represents Australia's aerial application pilots and operators, providing training and guidance on all aspects of the industry.

Guidance material provided by AAAA identifies that the most common obstruction hazard is the power line. The literature also advises that while other obstructions can be seen fairly easily, the one notable exception is dead (or bare) trees. Of particular note, dead (bare) trees can be a particularly difficult hazard to manage during late afternoon or twilight. Dead (bare) limbs on the shaded side of trees in poor light are almost impossible to see.

http://www.aerialag.com.au/site/default.asp

The following ATSB publications provide statistics on accidents and incidents involving agricultural operations between the periods 1985-1992 and 1986-1995:

http://www.atsb.gov.au/publications/1995/survey-of-ag-accidents-1985-1992.aspx

http://www.atsb.gov.au/publications/1997/survey-of-ag-accidents-1986-1995.aspx

AO-2011-052: VH-CKX, Runway undershoot

Date and time:	26 April 2011, 1145 WST	
Location:	90 km WNW of Geraldton Airport (East Wallabi Island), Western Australia	
Occurrence category:	Accident	
Occurrence type:	Runway undershoot	
Aircraft registration:	VH-CKX	
Aircraft manufacturer and model:	Beech Aircraft Corporation A36 (Bonanza)	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 26 April 2011, at about 1110 Western Standard Time[1], a Beech Aircraft Corporation A36 (Bonanza) aircraft, registered VH-CKX, departed Geraldton on a charter passenger flight to East Wallabi Island (in the Abrolhos Islands group), Western Australia.

On arrival at the Island, the pilot overflew the airstrip to observe the windsock and then joined the circuit on crosswind for runway 36, with a tighter than normal circuit pattern conducted.

Due to the tight circuit, the turn onto base was commenced at 800 ft and continued onto final at 500 ft. When on final approach, maintaining 75 kts, the pilot reported that the aircraft was to the left of the extended runway centreline and about 50 ft lower than normal, but he was not concerned. He then positioned the aircraft to intercept the runway centreline.

When on late final approach, the pilot glanced to the left at a maritime channel marker for about 2-3 seconds to ensure separation with the aircraft was adequate. He estimated that the aircraft was about 30 m horizontally from the marker.

The pilot then looked back at the runway and realised that the aircraft was too low. He immediately applied rearward pressure on the control column in an attempt to ‘stretch’ the approach and clear sand dunes. The aircraft collided with the sand dunes and bounced, before landing 50-60 m along the runway. At the time, the aircraft’s power setting was close to idle and the pilot could not recall applying any additional power during the recovery manoeuvre.

The aircraft was shutdown and the pilot and passengers egressed. The pilot spoke to witnesses who advised that the aircraft had contacted the ground. He then inspected the aircraft and observed damage to the left wing. The aircraft was later inspected by an engineer, who determined that the rear main spar on the left wing was cracked at the flap actuator point (Figure 1).

Pilot information

The pilot held a Commercial Pilot (Aeroplane) Licence, with a total of 2,151 hours experience, of which 21 hours was on the Bonanza.

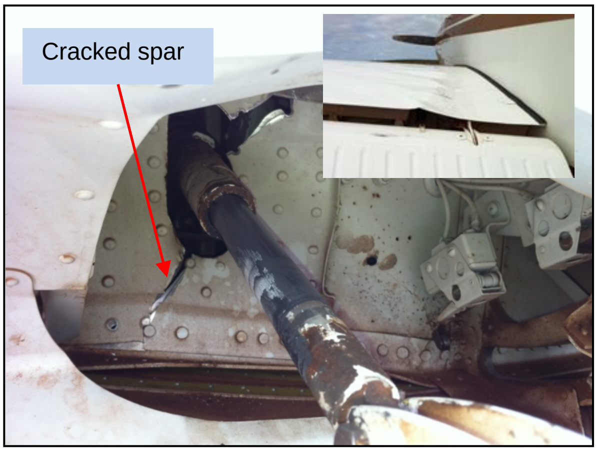
Airstrip information

The East Wallabi Island airstrip had one runway aligned 180/360°, about 600 m in length. The approach to runway 36 was over water, with sand dunes of 1-1.5 m in height located about 10 m before the runway threshold[2].

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

2 The beginning of the usable portion of the runway.

Figure 1: Aircraft damage

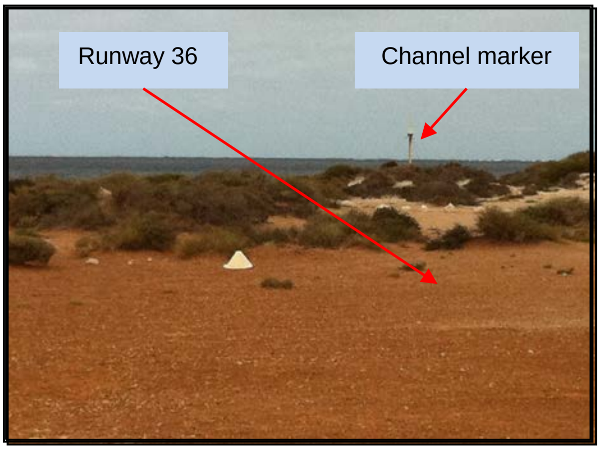


Photographs courtesy of aircraft operator

Maritime channel marker

The channel marker provided navigational guidance for vessels operating into the anchorage and jetty area located on the eastern side of the Island. The marker, which was about 2.8 m in height, was located to the south-west of the runway[3] (Figure 2). The pilot stated that, while the marker was positioned to the left of the runway centreline, it was reasonably visible when on final approach.

Figure 2: Channel marker



Photograph courtesy of aircraft operator

Previous approaches

The pilot estimated that he had previously flown to the Island about 10 times and conducted three landings on runway 36. One landing was conducted in the Bonanza, while the other two landings were in a Cessna Aircraft Company 172 aircraft.

The pilot stated that he had sighted the channel marker on his previous flight in the Bonanza, but not in the 172. He suggested that he may have been more aware of the marker when flying the Bonanza due to the aircraft's slightly longer wing span and low-wing configuration when compared with the high-wing 172.

The pilot also reported that the aircraft was lower and about 5 kts slower on final approach when compared with his previous flight in the Bonanza. He was also attempting to touchdown close to the threshold, where previously, the aircraft was landed further along the runway.

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 have reviewed their check and training procedures for the Abrolhos Islands and incorporated a checklist that details the items for assessment when determining a pilot's competency for operating at the Island's airstrips. The operator is also in the process of developing a presentation on the assessment items to be used in conjunction with their training syllabus.

SAFETY MESSAGE

This accident demonstrates the importance of establishing, and maintaining the desired approach path by simultaneously adjusting the aircraft's power setting and attitude. It also highlights the unexpected nature of distractions and the impact they can have on aircraft operations.

Final approach

The objective of a good final approach is to descend at an angle and airspeed that will allow the aircraft to reach the desired landing point, which the United States Federal Aviation Administration (FAA) recommends should be

3 Height and location information provided by the Department of Fisheries.

beyond the runway threshold, but within the first one-third of the runway. To achieve this, it is essential that both the descent angle and airspeed are controlled throughout the approach by simultaneously adjusting the aircraft's pitch attitude and power setting.

When the aircraft is too low on the approach and it is determined that the runway will not be reached unless appropriate action is taken, the pilot must immediately increase power to maintain airspeed and at the same time, raise the nose of the aircraft to stop the descent. It is crucial that pilots do not attempt to stretch the approach by adjusting the attitude only, as the airspeed may reduce and the aircraft may touchdown short of the desired landing point.

The following FAA publication provides additional information on approaches and landings http://www.faa.gov/library/manuals/aircraft/airplane_handbook/media/faa-h-8083-3a-4of7.pdf.

Distractions

Distractions can affect any pilot and are not unique to any one type of operation. A research report published by the ATSB identified that 13 per cent of accident and incidents associated with pilot distraction between January 1997 and September 2004 occurred during the approach phase of flight.

The Flight Safety Foundation suggests that after a distraction source has been recognised and identified, the next priority is to re-establish situational awareness by conducting the following:

- *Identify*: What was I doing?
- *Ask*: Where was I distracted?
- *Decide/act*: What decision or action shall I take to get 'back on track'?

The following publications provide additional information on pilot distractions:

- Dangerous Distraction: An examination of accidents and incidents involving pilot distraction in Australia between 1997 and 2004 http://www.atsb.gov.au/media/36244/distraction_report.pdf

- Flight Safety Foundation Approach-and-landing Briefing Note 2.4 – Interruptions/Distractions http://flightsafety.org/files/alar_bn2-4-distractions.pdf

AO-2011-072: VH-FAL, Total loss of power

Date and time:	15 June 2011, 0822 WST	
Location:	Meekatharra Aerodrome, WA	
Occurrence category:	Accident	
Occurrence type:	Total Power loss	
Aircraft registration:	VH-FAL	
Aircraft manufacturer and model:	Piper Aircraft Corporation, PA-46-310P Malibu	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – 1 (minor)	Passengers – 1 (minor)
Damage to aircraft:	Serious	

FACTUAL INFORMATION

At about 0720, Western Standard Time[1], on 15 June 2011, a Piper Aircraft Corporation PA-46-310P Malibu aircraft, registered VH-FAL (FAL), departed from Doolgunna Station, on a private flight to Meekatharra WA, with the pilot and one passenger on board.

After departing, the pilot overflew the Sandfire Mine site at about 0725 conducting a number of passes before proceeding to Meekatharra. The pilot reported that about 128 litres of fuel was on board which would have resulted in about 60 litres remaining upon arrival at Meekatharra.

The aircraft joined downwind at Meekatharra for a landing on runway 09 and was to follow an Embraer Brasilia aircraft registered VH-XUA (XUA), which the pilot saw land and assumed would turn off at the taxiway. As FAL continued the base leg and approach, the pilot realised that the crew of XUA had rolled out to the end of the runway and then commenced to backtrack to the taxiway.

At that point, the pilot decided to discontinue his approach and overshoot, applying power for a go-around[2]. He did not retract the landing gear or flaps for the manoeuvre.

The pilot made a broadcast advising all traffic he was conducting a go-around and commenced a low level circuit at about 500 ft above ground level (AGL). While on the downwind leg, the engine lost power. The pilot switched fuel tanks (which he believed was from right to left), ensured the mixture and propeller levers were fully forward and slowly introduced the throttle trying to restart the engine, but it did not respond. He then realised he would not make the aerodrome and landed heavily about 500 m short of the runway 09 threshold (Figure 1).

The pilot stated that in hindsight he should possibly have used the fuel boost pump, but the event happened very quickly. After coming to rest, the pilot and passenger vacated the aircraft through the normal exit. Both occupants sustained back injuries.

Meekatharra airport manager

The Meekatharra airport manager reported that while he was waiting for the arrival of XUA, he observed FAL on a low level go-around and stated that "the engine on VH-FAL stalled and backfired several times, then revved loudly". As the aircraft passed overhead and commenced the downwind leg for 09, "there was no engine noise heard coming from the aircraft."

After observing the aircraft impact the ground at about 0822, the airport manager contacted

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[1] Western Standard Time (WST) was Coordinated Universal Time (UTC) + 8 hours.

[2] A 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 in place for a safe landing have been met.

emergency services and responded to the accident site. He then ferried the occupants to the Royal Flying Doctor Service (RFDS) for treatment.

The airport manager advised that upon his arrival at the aircraft, there was no fire, but quite a lot of fuel was observed leaking from the left wing tank. Only a small amount of fuel was found in the severed and inverted right wing.

The fuel from both wings was found to be clean, bright and free of visible contaminants. The aircraft fuel filter, contained within the engine bay, was found intact but empty of any fuel (Figure 2).

Figure 2: Empty fuel filter in engine bay.

Photograph courtesy of the Meekatharra airport manager

Embraer Brasilia VH-XUA

At 10 miles from Meekatharra airport, the crew of XUA made a CTAF call stating their intention to land on runway 09.

They heard the pilot of FAL transmit that he was 15 miles from Meekatharra and joining for Runway 27. The crew of XUA queried the position of FAL and were told that FAL was on the 025⁰ track to Meekatharra.

After turning onto final approach, XUA attempted to acquire FAL visually, but were unable to do so. After landing, as the aircraft was heavy, the pilot of XUA allowed the aircraft to roll to the end of the runway and then commenced to back track to the taxiway.

While backtracking on the runway, the crew of XUA observed FAL at low level making a left turn overhead the terminal building. At the same time, the pilot of FAL transmitted that he was "going around and conducting a low level circuit".

About a minute later as XUA was exiting the runway, the pilot of FAL broadcast he was making an emergency landing onto Runway 09. The crew of XUA then observed FAL losing height and impacting the ground about 500 m short of the runway. XUA then transmitted a MAYDAY[3] to Melbourne air traffic control on behalf of FAL.

Fuel management

The pilot stated that his usual actions were to set the aircraft fuel selector to the fullest fuel tank for takeoff, then manage the fuel balance with appropriate tank selection during the flight.

He stated that as this process was routine to him, he could not actually recall making a tank selection change during the flight. As such, the pilot was not sure if he had inadvertently allowed FAL to become starved of fuel.

SAFETY MESSAGE

Fuel starvation and exhaustion has been an ongoing contributing factor in aviation accidents. The ATSB published research paper; *Australian Aviation Accidents Involving Fuel Exhaustion and Starvation, 2002*, identified that fuel starvation and exhaustion accounted for 6% of all accidents over the period 1991 – 2000 and accounted for the loss of 49 lives. The paper also identified that 'pre-flight preparation' and 'events during flight' were common factors that contributed to these events. Sound procedures and training were considered important factors in increasing awareness of the problem.

http://www.atsb.gov.au/media/43380/Fuel_exhaustion_and_starvation.pdf

In their aviation safety seminars (AvSafety Seminars), the Civil Aviation Safety Authority has indicated that a fuel related incident occurs once every ten days in Australia. Many fuel starvation and fuel exhaustion accidents are easily preventable, yet can turn tragically wrong just as easily. The importance of correct situational awareness and decision making was canvassed as critical to a safe flight and good outcome at these events.

[3] Mayday is an internationally recognised radio call for urgent assistance.

http://casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_91344

The following publications also provide useful information on fuel starvation and exhaustion:

- http://www.casa.gov.au/wcmswr/_assets/main/fsa/2003/jan/18-19.pdf
- http://www.atsb.gov.au/media/57006/fsa_0701.pdf#page=3
- http://www.atsb.gov.au/publications/investigation_reports/2005/AAIR/aair200504768.aspx

To ensure the safe conduct of a flight, it is crucial that pilots establish a disciplined cockpit routine that covers all critical aspects of in-flight handling and aircraft performance management.

Figure 1: VH-FAL

Photograph courtesy of the Meekatharra airport manager

AO-2011-095: VH-WYG/N171UA, Breakdown of separation

Date and time:	7 August 2011, 1347 EST	
Location:	10 NM (19 km) NW of Sydney Airport, New South Wales	
Occurrence category:	Incident	
Occurrence type:	Breakdown of separation	
Aircraft registration:	VH-WYG and N171UA	
Aircraft manufacturer and model:	VH-WYG: Cessna Aircraft Company 172 N171UA: Boeing Company 747	
Type of operation:	VH-WYG: Private N171UA: Air transport – high capacity	
Persons on board:	VH-WYG: Crew - 1	Passengers – Nil
	N171UA: Crew - Unknown	Passengers – Unknown
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

FACTUAL INFORMATION

On 7 August 2011, a Cessna Aircraft Company 172 aircraft, registered VH-WYG (WYG), departed Bankstown, New South Wales, for a student solo-navigation exercise, under the visual flight rules (VFR). At 1347 Eastern Standard Time[1], after WYG entered Sydney controlled airspace without a clearance (Figure 1), a breakdown of separation between WYG and a departing Boeing Aircraft Company 747 aircraft, registered N171UA, occurred (Figure 2). At 1347:05 the separation closed to approximately 2.5 NM (4.63 km) with 800 ft vertical separation. 2 seconds later, the required vertical separation standard of 1,000 ft was established. Air Traffic Services (ATS) alerted the crew of N171UA to the traffic, and issued instructions for N171UA to conduct an avoidance turn away from WYG. The crew of N171UA subsequently advised ATS that they had not received a traffic advisory (TA) on their traffic alert and collision avoidance system (TCAS).

When the pilot of WYG contacted ATS at Long Reef for an airways clearance to conduct the Sydney Harbour scenic route, he was informed that he had been radar-identified as having entered controlled airspace without a clearance. The pilot then elected to terminate the navigation exercise and return to Bankstown via the Lane of Entry.

The navigation exercise

The student pilot's navigation exercise required him to depart Bankstown in a northerly direction, via the Lane of Entry, climb to 1,500 ft, and to pass overhead the VFR navigation points at Parramatta and Pennant Hills, before turning in an easterly direction to Long Reef. He was then to conduct the Sydney Harbour scenic route, return to Long Reef, then proceed in a northerly direction to other navigation points, before eventually returning to Bankstown. The navigation points of Parramatta, Pennant Hills and Long Reef were depicted on the Airservices Australia Visual Terminal Chart (VTC).

The pilot had flown the same navigation exercise route with a flying instructor the week before. He stated that the leg from Pennant Hills to Long Reef was very close to the control area step. He said that during the flight the previous week, the instructor had told him to fly a more northerly track towards the Bahai Temple, which is easily identifiable and depicted on the VTC.

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

Meteorological information

The weather on day of the flight was fine during the morning, but in the afternoon there were patches of showers moving through the Sydney basin area. The pilot reported that the weather forecast indicated rain showers, a cloud base of 2,000 ft with higher patches between 2,000 and 5,000 ft, and moderate winds from the north-west. He stated that rain showers had passed through the Bankstown area an hour before the flight.

The pilot stated that one flight had returned from the Newcastle area due to inclement weather. The supervising instructor had discussed the weather situation with the pilot, using the Bureau of Meteorology website weather radar and weather reports. He told the pilot to turn back to Bankstown if he saw any inclement weather stopping him from continuing the flight.

In-flight weather

The pilot reported that it was not raining at Bankstown on departure, but that he could see a large rain shower cell over Parramatta. He stated that en route to Parramatta he had noticed rain showers to both the left and the right of his intended track. He had seen a gap that he thought would enable him to maintain visual reference, but as he got closer, the gap closed. The rain shower cell appeared to be quite heavy preventing him from proceeding to the left (westerly direction), instead, he went to the right (easterly direction) aware that he was close to the 700 ft Sydney control area step.

The pilot considered returning to Bankstown, but could not as there was now low cloud behind him. He then considered tracking west towards Prospect in order to return to Bankstown, however, Prospect also had cloud. He stated that the only remaining option was to 'veer to the right' of Parramatta.

The pilot had never encountered weather conditions like that before, either with an instructor or solo, and had never flown in heavy rain.

Visual navigation cues

The pilot reported that he used a number of golf courses in the area as visual navigation cues. The VTC depicts a number of golf courses, both inside and outside controlled airspace. During the dual training flight the previous week, the instructor had told the pilot to be careful of using the golf courses as sole cues, as there were a number of courses inside the control area steps.

Pilot information

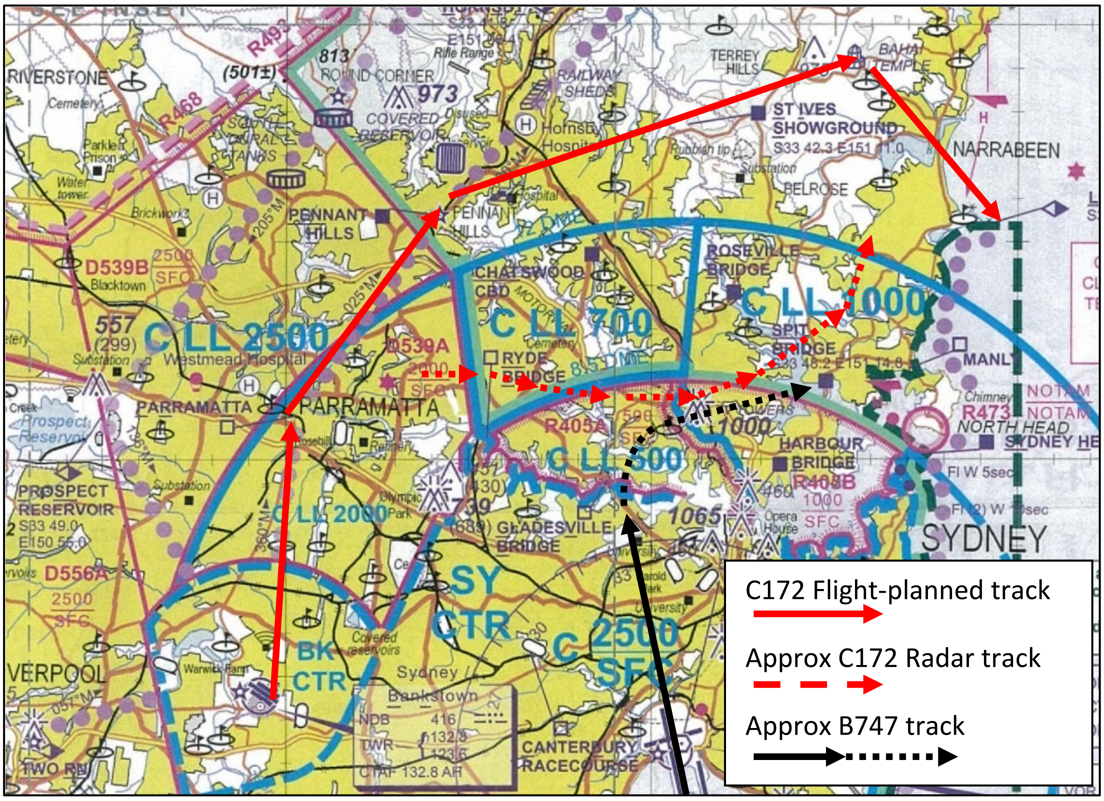
The pilot was a Private Pilot (Aeroplane) Licence student who was conducting a solo navigation exercise. He held a Student Pilot Licence and a Class 2 Aviation Medical Certificate. He had a total of about 93 hours, including about 76 hours on the 172, and about 6 hours in the preceding 90 days.

SAFETY MESSAGE

This incident highlights the importance of both weather avoidance, and awareness of proximity to controlled airspace. The pilot reported that he intended to seek more training involving flight in inclement weather.

- Information to assist pilots to navigate into and out of Bankstown aerodrome, and to remain clear of controlled airspace, is published in the *Sydney VTC* and *En-Route Supplement Australia (ERSA)*. In addition, the Civil Aviation Safety Authority and Airservices Australia have produced the *Sydney General Flying Guide,* which provides aircraft navigation information using detailed mapping and imagery. The guide also states that it is to be used in conjunction with the current Sydney VTC and ERSA.

Figure 1: Flight-planned and actual routes



AO-2011-096: VH-FRI, Icing Event

Date and time:	9 August 2011, 1348 EST	
Location:	Port Macquarie, New South Wales	
Occurrence category:	Incident	
Occurrence type:	Icing event	
Aircraft registration:	VH-FRI	
Aircraft manufacturer and model:	Piper Aircraft Corp PA-44-180	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

FACTUAL INFORMATION

On 9 August 2011, a Piper Aircraft Corp PA-44-180, registered VH-FRI (FRI), departed Bankstown for Coffs Harbour, New South Wales. The purpose of the flight was for the pilot to gain multi-engine and instrument flight rules (IFR) experience.

The pilot reviewed the weather forecast an hour prior to departure and observed that there was forecast storms off the coast, scattered to broken cloud between 3,000 ft and 5,000 ft and other scattered cloud with tops up to 10,000 ft along his intended flight path. He recalled that the forecast icing level was 5,000 ft.

The pilot planned to fly to Coffs Harbour via the designated IFR route which would keep the aircraft's track west of the coast. He planned to fly at 9,000 ft so he would be on top of the forecast cloud and be able to divert around the scattered clouds with tops up to 10,000ft.

Prior to departure, the pilot conducted routine pre-flight inspections which included testing the pitot heat[1], which was found serviceable. The aircraft taxied for departure at Bankstown Airport at about 1130 EST[2]. Before takeoff, the pilot conducted further pre-flight checks, including testing the autopilot disconnection horn, which was found to be serviceable.

The aircraft departed Bankstown Airport and commenced a climb to 9,000 ft. Air Traffic Control (ATC) advised the pilot that he was unable to receive a clearance to fly at 9,000 ft due to military activity at Williamtown, so he was issued a clearance to fly at 10,000 ft.

Approaching Kempsey, the pilot noticed an increased build up of cloud along his intended flight path. He assessed that it was likely the aircraft would pass through cloud, above the forecast freezing level, if he continued along his track. As the aircraft was not equipped to fly in icing conditions, the pilot made the decision not to continue on to his original destination. He recalled that he had seen Port Macquarie prior to observing the increased cloud levels and elected to divert there.

The pilot informed ATC of his intentions and began to plan his approach and descent. In order to access and examine the appropriate approach plates[3], the pilot programmed the aircraft's GPS to track to Port Macquarie and engaged the autopilot to commence a descent and follow the GPS track.

The pilot estimated that he had been examining the charts for about a minute when he looked up and noticed that the aircraft had inadvertently entered

[1] The heating element of the pitot tube, a pressure instrument used to measure air speed.

[2] Eastern Standard Time was Coordinated Universal Time (UTC) + 10 hours.

[3] A flight-planning document for a specific airfield, giving details of minimum heights, safe headings and weather minimums. They can also include a horizontal map and vertical profile for an instrument approach.

cloud. He then noticed that the electronic flight instrument system (EFIS) screen was blank and displayed two alerts; "check pitot heat" and "attitude fail".

The pilot then observed the analogue instruments and saw that the altimeter was fixed at 9,600 ft, the airspeed indicator showed an airspeed of zero and the vertical speed indicator was fixed at 600 ft/min rate of descent (Figure 1). The autopilot had disconnected, although no aural alert was heard. The pilot followed the standby attitude indicator and set an attitude and power setting to estimate an appropriate rate of descent. The compass and turn and bank co-ordinator were also functioning normally.

The pilot then received a radio call from another aircraft taxiing at Port Macquarie requesting his position. At that stage the pilot was unable to determine his exact position and, given the limited instrument information available, he decided to broadcast a PAN call[4], which ATC acknowledged.

About a minute after the PAN call, the pilot became visual with the ground and was able to navigate the aircraft to Port Macquarie. He noticed that there was light icing on the leading edge of the wings.

The pilot then switched on the instrument alternate static source and the flight instruments became operational. The flight landed at Port Macquarie without further incident.

After shutting the aircraft engines down, the pilot observed that the pitot tube was warm, but not as hot as he would have expected. The pilot recalled that the pitot heat had been selected on for the entire flight.

Engineering action

An engineering inspection was conducted once the aircraft had returned to Bankstown Airport. The following system faults were found:

Pitot tube

The inspection revealed that the pitot tube was not producing even heating across its surface. Further investigation found that only one of two heating elements had been fitted. A second element was subsequently fitted.

The engineer was aware that the element hadn't been fitted and believed that it was not required. Civil Aviation Order 20.18 required that at least one airspeed indicating system was fitted with a system which will prevent malfunction due to either condensation or icing.

Autopilot

The pilot reported that the aural alert had not sounded when the autopilot had disconnected. An engineering inspection found that the autopilot alert unit was inoperative. Further inspection found that associated wiring has been damaged. The investigation was not able to determine when the alert unit and wiring became inoperable.

The alert unit and wiring were repaired and the autopilot disconnect aural alert was made serviceable.

EFIS

During the engineering inspection the EFIS displayed a residual airspeed of 29 to 31 knots. The unit was replaced.

Air traffic control information

Radar

The ATC radar data showed the aircraft diverted to Port Macquarie about 30 NM to the north-west of Port Macquarie aerodrome. Shortly after turning towards the aerodrome, the aircraft began to descend. About 30 seconds later, the radar data showed the aircraft turn right through about 270° onto a north-easterly heading, tracking away from Port Macquarie. At 7,300 ft, and about five minutes after initiating the descent, the aircraft turned towards Port Macquarie Aerodrome for an approach and landing.

Pilot-controller communication

ATC audio recordings from the controlling Centre were reviewed by the ATSB. The recordings showed that the pilot declared a PAN, informed ATC he had a pitot heat failure and had lost his primary attitude and altitude indicators. The pilot then requested assistance.

4 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.

The controller acknowledged the PAN call, confirmed the aircraft's position and requested the pilot repeat the nature of the problem. The pilot repeated that he had pitot heat icing and no attitude indicator, although both radio transmissions were muffled. One minute later, the controller queried if the pilot needed further assistance and to confirm if he was in a right turn for Port Macquarie. The pilot confirmed he was turning right to Port Macquarie although radar images showed the aircraft was turning away from the aerodrome.

A further 30 seconds later, the controller again asked if the pilot was "OK for a landing at Port Macquarie". The pilot replied that he was trying to exit cloud and again requested assistance, although he did not specify what assistance he required. The controller sought cloud base information from other aircraft in the area and relayed this to the pilot.

The pilot then requested assistance regarding traffic at Port Macquarie and the controller suggested the pilot turn from his current heading of 030°M to 150°M to track direct to the aerodrome. Shortly after commencing the turn, the pilot became visual with the ground.

Meteorological information

Area forecast (ARFOR)

In order to facilitate the provision of aviation weather forecasts by the Bureau of Meteorology (BoM), Australia is divided into a number of forecast areas. Port Macquarie and Coffs Harbour Aerodromes are located within Area 20. The Area 20 ARFOR issued by the BoM, valid from 1500 on the 8 June 2011 to 0500 on 9 June 2011 was consistent with the pilot's reported weather forecast.

Terminal Area forecast (TAF)

The TAF for Port Macquarie Aerodrome, issued at 2232 on 8 August 2011, forecast showers and rain with cloud scattered at 5,000 ft.

Meteorological observations (METAR)

The METAR for Port Macquarie, issued by the BoM at 0330 on 9 August 2011, forecast cloud scattered at 8,500 ft. Half an hour later, at 0400, the Port Macquarie METAR reported cloud scattered at 3,800 ft, scattered at 4,600 ft and broken at 7,500 ft.

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

The operator has directed their contract maintenance organisations to ensure that both heating elements are fitted and serviceable prior to certifying the aeroplane airworthy. An undertaking was also made to educate flight crew on the correct technique for checking that both heating elements are operating when conducting a pitot heat check.

SAFETY MESSAGE

The pilot acknowledged that if he had made an earlier decision to divert to Port Macquarie, he would have had more time to set the aircraft up for the approach and landing and would have been less likely to have a high workload during the descent. However, importantly, the pilot did make the decision to divert, rather than attempt to continue to the destination through cloud, above the freezing level.

The weather forecast indicated potentially challenging conditions for an aircraft not equipped to operate in icing conditions. Under these circumstances, it is important for pilots to set personal limits that may be more restrictive than the regulatory requirements.

The incident also highlights the importance of clear communication between pilots and controllers. It is essential in an abnormal or emergency situation that the details and severity of the problem be clearly communicated so that the appropriate level of support and assistance can be offered. In turn it is also important that the support offered is timely and constructive.

The Flight Safety Foundation Approach and Landing Accident Reduction Briefing Note 2.3, *Pilot-Controller Communication*, states that the most important requirements for flight crew in an emergency situation are time, airspace and silence. The briefing note suggests controller's use a memory aid such as ASSIST (Acknowledge, Separate, Silence, Inform, Support, Time) to help determine their response.

The briefing note can be found at: http://flightsafety.org/files/alar_bn2-3-communication.pdf

Figure 2 Cockpit display

Image courtesy of the Operator.

AO-2011-097: VH-BZE/ VH-PVL, Runway incursion

Date and time:	12 August 2011, 1402 EST
Location:	Moorabbin Airport, Victoria
Occurrence category:	Serious incident
Occurrence type:	Runway incursion
Aircraft registration:	VH- BZE and VH-PVL
Aircraft manufacturer and model:	VH-BZE Piper PA28-161/ VH-PVL Piper PA28R-200
Type of operation:	VH-BZE: Private VH-PVL: Charter
Persons on board:	VH-BZE: Crew – 1 Passengers – Nil VH-PVL: Crew – 2 Passengers – Nil
Injuries:	Crew – Nil Passengers - Nil
Damage to aircraft:	Nil

FACTUAL INFORMATION

On 12 August 2010, at about 1402 Eastern Standard Time[1], the pilot of a Piper PA-28-161 (Warrior II) aircraft, registered VH-BZE (BZE) was cleared by the Surface Movement Controller (SMC) to taxi to holding point Alpha 2 (A2) for a departure from runway 13R, on a private navigational flight from Moorabbin Airport to Ararat, Victoria. Following line up checks, the pilot changed to the Tower frequency and was issued a takeoff clearance from runway 13R by the Aerodrome controller (ADC).

A Piper PA-28R-200 (Arrow II) aircraft, registered VH-PVL (PVL) was on a training flight with an instructor and student pilot onboard. It had recently landed on runway 13R and exited the runway via taxiway Bravo 2, before contacting the SMC. The SMC then cleared PVL to taxi via taxiway Bravo crossing runways 22, 17L and 17R.

The pilot of BZE inadvertently commenced a take-off roll on runway 17R instead of runway 13R, which resulted in a runway incursion on runway 17R.

The SMC observed BZE on the wrong runway, instructed PVL to stop immediately and alerted the Aerodrome Controller (ADC) who instructed BZE to cancel the takeoff and exit the runway via the first taxiway. BZE was taxied back to the apron and parked. PVL also continued taxiing to the apron and parked (Figure 1). The instructor of PVL reported the aircraft came within 100 m of each other before stopping.

Figure 1: Moorabbin Airport

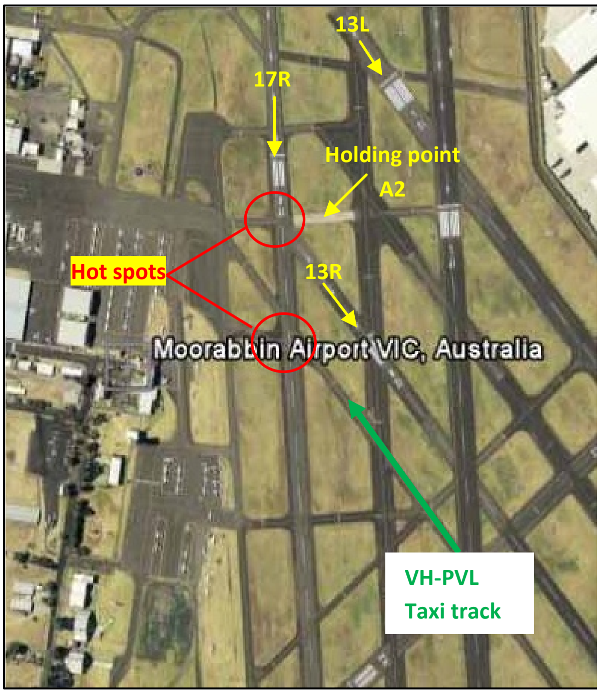


Image courtesy of Google Earth ©.

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

Pilot information

The pilot of BZE held a Private Pilot Licence, with a total of 75.7 hours experience of which 6.2 was on the Warrior II. The pilot had his last flight review on 10 June 2011. He had recently returned to Australia from overseas and had flown 6.3 hours in the past 90 days. The incident flight was his second flight since his return to Australia.

The pilot reported that he arrived at the airport at 1100 with an initial planned departure time of 1300. He reported that flight planning with an instructor and having to replenish the aircraft's engine oil resulted in delays to the actual departure time. In addition, he was anxious to depart as soon as possible to permit a return before last light.

He reported that he had only previously used runway 13R once or twice during flight training and that he had a copy of the airport diagram. His confusion about which runway to use for the takeoff was predicated on the fact that both runways use the same entry point from taxiway A2. Runway 13R required a left turn of about 120º magnetic (M) for alignment, while runway 17R required a left turn of about 90º M for alignment.

Metrological conditions

The conditions at the time of the incident were wind from the east-south-east at 10 kts with a maximum of 17 kts, cloud scattered at 2,800 ft and a temperature of 17º C. Because of these conditions, runway 13L was being utilized for arrivals and departures to the east and runway 13R was for arrivals and departures to the west.

Communications

The review of communications between air traffic control (ATC) and the pilot confirmed that at:

- 1403:59, the pilot of BZE requested taxi clearance for runway 13R and a departure for Ararat. He was given that clearance.
- 1405:43, the pilot of BZE reported holding at A2 for runway 13R.
- 1405:56, ATC cleared BZE for takeoff on 13R.
- 1406:25, ATC instructed BZE to hold position and shortly thereafter instructed PVL to do the same.

Further communications included the ADC instructing the pilot of BZE to take the next taxiway and exit the runway. The pilot of PVL communicated to ADC that he had not seen BZE, as the other aircraft was in his 'blind spot'.

Runway safety and hot spots

The International Civil Aviation Organisation defined a runway hot spot as:

> A location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots and [airside] drivers was necessary.

By identifying hot spots, it was easier for users to plan the safest possible path of movement in and around an airport. Planning is a crucial safety activity for airport users — both pilots and air traffic controllers alike. By making sure that aircraft surface movements are planned and properly coordinated with ATC, pilots add another layer of safety to their flight preparations. Appropriate planning helps avoid confusion by building familiarity with known problem areas and eliminating last-minute confusion.

The training organisation that operated BZE advised that several Moorabbin Airport maps, including those with hot spots noted, were posted in their operations room. The training organisation that operated PVL was not aware of any information on hot spots at the Moorabbin Airport.

The Airservices Australia (ASA) En Route Supplement Australia (ERSA) information for Moorabbin Airport did not annotate identified hot spots. However, information regarding hotspots at a number of airports including Moorabbin was available from the ASA website.

ATSB comment

During this incident, the pilot was provided clear instructions regarding the runway to use for the takeoff.

Factors that may have affected the pilot's ability to interpret and act on these instructions were:

- delays in the departure of the aircraft
- time constraints to return before last light
- pilot lack of experience
- pilot lack of recency
- pilot lack of familiarity with the runway in use.

The SMC and ADC were vigilant in identifying the potential conflict between the two aircraft and acted to prevent a possible collision.

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 the pilot of BZE conducted remedial training in the use of runway 13R.

SAFETY MESSAGE

Pilot familiarization with the airport or aerodrome layout, including taxiways and runways, is a vital mitigator to runway incursions and runway/taxiway usage errors.

The US Federal Aviation Administration (FAA) published a suggested best practices article for pilots to ensure runway safety. These included:

- review and understand airfield signage and markings
- review the appropriate airfield diagrams and hot spots
- print out the diagram and have a copy for reference in the cockpit
- maintain a sterile cockpit environment.

The article also noted to stop the aircraft on the taxiway and request ATC clarification if there is confusion regarding aircraft position or taxi clearance.

Refer to the FAA website link below for further best practices to ensure airfield safety for pilots http://www.faa.gov/airports/runway_safety/pilots/best_practices/.

Where an airport or aerodrome is used for pilot initial training, the local training organisations utilizing those facilities should highlight hot spot areas during pre-flight briefings to their student pilots. Airservices has identified hot spots at the following five Class D aerodromes – Moorabbin, Bankstown, Parafield, Jandakot and Archerfield. This information is available at http://www.airservicesaustralia.com/flying/runway safety/ri_hotspots.asp

AO-2011-098: VH-DSA, Total Power Loss

Date and time:	15 August 2011, 1130 EST.	
Location:	South Grafton aerodrome	
Occurrence category:	Accident	
Occurrence type:	Total power loss	
Aircraft registration:	VH-DSA	
Aircraft manufacturer and model:	Cessna Aircraft Company, 177	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 0
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 15 August 2011, at about 1045 Eastern Standard Time[1], a Cessna Aircraft Company 177 aircraft, registered VH-DSA (DSA) departed Ballina, New South Wales, for a private flight to South Grafton, New South Wales. The pilot was the sole occupant and the expected flight time was 42 minutes. Prior to departure, the pilot stated that he had carried out a pre-flight fuel quantity check and used a dipstick to check the fuel level of both wing fuel tanks. Each tank contained 30 L of usable fuel, which he calculated as sufficient for a one hour flight with 45 minutes reserve fuel. He had not obtained an area forecast (ARFOR)[2] for the flight, or an aerodrome forecast (TAF) for Grafton, but he had earlier accessed the Bureau of Metrology (BOM) website for general weather information. He had also observed the weather as fine and clear from his car while travelling from South Grafton to Ballina earlier that morning.

The pilot completed a normal takeoff with both fuel tanks selected and climbed to a cruise altitude of 2,500 ft above mean sea level (AMSL). He then selected the left fuel tank and selected the fuel mixture setting to partially lean. When the aircraft was about 12 minutes from Grafton, the pilot selected the fuel supply from both fuel tanks. The pilot had observed other traffic below him at 1,500 ft so elected to remain at 2,500 ft until closer to the aerodrome. At about 5 NM from South Grafton aerodrome, he turned DSA right onto downwind while approaching the aerodrome runway from the west. He reduced engine power and observed that the tachometer rpm was in the normal operating range green arc of 2200-2500 rpm, then quickly descended the aircraft to 1,000 ft.

At 1,000 ft AMSL, the pilot advanced the engine throttle, but there was no response from the engine. He then completed the normal recovery procedures for an engine failure. He selected carburettor heat as he thought the rpm may have dropped below the green arc during the descent. He advanced the throttle again but there was no response from the engine. With the propeller windmilling and the aircraft descending at 500 ft/minute with flaps partially extended, he attempted to reduce speed from 80 kts to 70 kts. At 300 ft, with full flap extension and the stall warning sounding, he selected the master switch to off and prepared to land into wind.

At 1130, the aircraft landed about 70 m short of the South Grafton runway threshold and continued along the ground for a short distance before impacting a shallow earth drain (Figure 1), seriously damaging the aircraft. The pilot observed that the emergency locator transmitter had activated before he exited the aircraft. Shortly after the accident, the pilot used the aircraft dipstick to check the right tank and found that it contained a quantity of fuel.

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

2 An area forecast issued for the purposes of providing aviation weather forecasts to pilots. Australia is subdivided into a number of forecast areas.

Meteorological information

The BOM's relevant forecast for the area (ARFOR 20) was valid from 1105 EST until 2100 EST. It forecast broken low cloud along the ranges and slopes east of Tenterfield, Mudgee and Bathurst, typical with a moist, south-easterly airflow. The forecast base of the broken stratus was 2,000 ft.

The meteorological aerodrome report (METAR) for Grafton at 1130 EST gave a ground-level Dry Bulb temperature of 18°C and, a Wet Bulb temperature of 10°C, giving a Dewpoint[3] Depression of 8°C.

ATSB COMMENT

Carburettor icing

The forecast base of the broken stratus was 2,000 ft. An aircraft flying beneath the cloud in those conditions would be prone to carburettor icing[4].

The Carburettor Icing Probability chart (Figure 2), recently issued by the Civil Aviation Safety Authority, was used by the Australian Transport Safety Bureau to plot the probability of carburettor icing, using the available meteorological information. When plotted on the chart it gave a relative humidity of 57% and the probability of serious carburettor icing at descent power.

SAFETY MESSAGE

This accident demonstrates that carburettor icing poses an insidious hazard to pilots during reduced power descent. Icing can occur at temperatures below 30°C and is more likely at reduced power settings. The best defence against carburettor icing is awareness and vigilance. The following publications provide additional information on carburettor icing:

- *Flight Safety Australia – A chill in the air* http://casa.realviewtechnologies.com/?iid=47830&pnum=2 May-June 2011, page 27.
- *Melting Moments: Understanding Carburettor Icing* http://www.atsb.gov.au/publications/2009/carburettor-icing.aspx

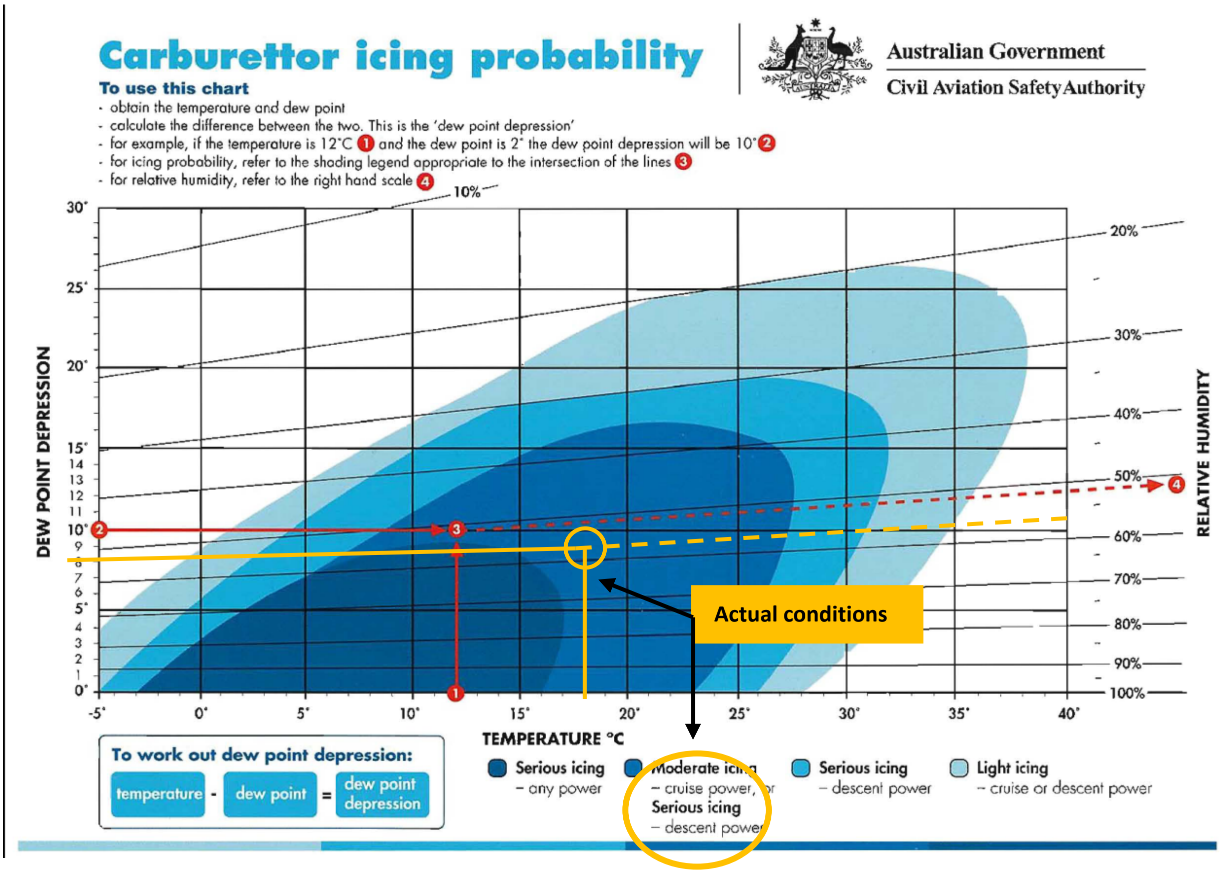
3 Dewpoint is the temperature at which water vapour in the air starts to condense as the air cools. It is used among other things to monitor the risk of aircraft carburettor icing or likelihood of fog at an aerodrome.

4 Carburettor ice is formed when the normal process of vaporising fuel in a carburettor cools the carburettor throat so much that ice forms from the moisture in the airflow can restrict the inlet airflow and interfere with the operation of the engine.

Figure 3: VH-DSA in the shallow earth drain.

Image courtesy of the aircraft owner.

Figure 2: Carburettor icing probability chart



AO-2011-122: VH-SHZ, Fuel starvation event

Date and time:	22 September 2011 1351 WST	
Location:	93 km south-east of Kalumburu Aerodrome, Western Australia	
Occurrence category:	Serious incident	
Occurrence type:	Fuel starvation event	
Aircraft registration:	VH-SHZ	
Aircraft manufacturer and model:	Cessna Aircraft Company U206G	
Type of operation:	Charter – passenger/freight	
Persons on board:	Crew – 1	Passengers – 6
Injuries:	Crew – Nil	Passengers –Nil
Damage to aircraft:	Nil	

FACTUAL INFORMATION

On 22 September 2011, at about 1317 hours Western Standard Time (WST)[1], a Cessna Aircraft Company model U206G (C206) aircraft, registered VH-SHZ, departed Kalumburu Aerodrome, Western Australia (WA) with the pilot and six passengers on the return leg of a charter flight returning to Wyndham, WA. Following climb-out, and in level flight at 5,500 ft above mean sea level (AMSL), the engine shut down without warning. At the time of the engine shutdown, the right wing fuel tank was selected and the right fuel quantity gauge indicated less than ¼ tank. The pilot then actioned the C206 emergency procedures including:

- switching fuel tank selection
- adjusting to full rich mixture
- activating the engine fuel boost pump and
- confirming all switch positions.

With the engine still not responding, and at about 2,000 ft AMSL, the pilot began selecting an appropriate forced landing area. At that point, the engine restarted and the pilot selected climb power and returned to level flight at 5,500 ft.

The pilot chose not to go to a higher altitude because of cloud. He then changed course and diverted to Forest River Mission, WA. With the engine running normally and sufficient fuel in the left fuel tank, upon reaching Forest River Mission, the pilot chose to continue on to Wyndham (Figure 1). An uneventful landing was completed at Wyndham.

Figure 1: Map of flight

Image/photograph courtesy of Google Earth

Fuel information

A post-flight inspection revealed that the pilot had not secured the right wing fuel tank filler cap in the fully locked position following refuelling that morning. As a result, fuel was able to vent from the right tank. The right tank rubber bladder was found elevated with no fuel evident in the tank. The left fuel tank had about 40 L of fuel remaining.

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

The pilot reported that he arrived at Wyndham Aerodrome at about 0830 that morning and had sufficient time to fuel and conduct a pre-flight inspection of the aircraft for the return flight to Kalumburu.

During the pre-flight inspection, the pilot added fuel to both the left and right fuel tanks for a fuel total quantity of 215 L. He estimated that 190 L of fuel was required for the flight. He also stated that, during flight, he normally switched fuel tank selection every 30 minutes. When the aircraft departed Wyndham at 1145, the left fuel tank was selected. At 1222, the pilot selected the right fuel tank. At 1252, the aircraft landed at Kalumburu Aerodrome. Upon departure, the right fuel tank was still selected.

The aircraft had two fuel tanks with a maximum capacity of about 123 L each. The fuel tank selector had three positions, RIGHT, LEFT and OFF. Average fuel burn for the aircraft was about 52 L per flight hour. According to the pilot, the aircraft had flown a total of about 30 minutes on the right tank before landing at Kalumburu, with a calculated total fuel burn of about 26 L. Upon departure, the right tank should have contained about 81 L or enough fuel for in excess of 1 flight hour.

Pilot information

The pilot received his commercial pilot licence in April 2010. He had about 550 hours with about 300 hours in the C206. He had previously flown 0.8 hours on both the 20 and 21 September 2011.

ATSB comment

Fuel gauge

The Australian Transport Safety Bureau determined that the most likely reason for the ¼ reading on the right fuel quantity gauge was a vacuum created within the tank from fuel venting out of the unsecure right fuel filler cap, resulting in the lower portion of the fuel bladder being drawn upward and the fuel quantity indicator float also forced upward.

SAFETY MESSAGE

This incident highlights the risk of in-flight fuel venting and the importance of conducting a thorough pre-flight exterior inspection which includes specifically checking the security of the fuel tank filler caps. The incident also demonstrates the effectiveness of following emergency procedures.

Fuel venting

Fuel venting in-flight in high wing aircraft such as the Cessna can be particularly serious as it is not readily evident to the pilot in-flight due to the high wing and fuel caps being obscured. The Civil Aviation Safety Authority Airworthiness Circular *AC91-365 (0), Fuel and Oil Safety, section 8,* outlines pertinent advisory information regarding fuel venting concerns and can be found at http://www.casa.gov.au/newrules/parts/091/download/ac091-365.pdf.

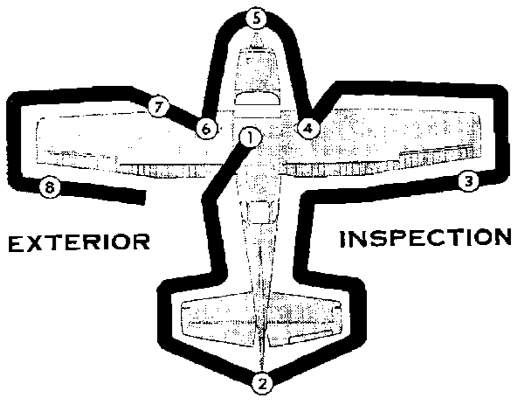
Pre-flight inspections

The pre-flight exterior inspection should be completed with consistent beginning and completion points. If interruptions take place during the inspection, the inspection should be restarted from the beginning point.

The C206 pilot operation handbook notes the procedures to complete a through pre-flight 'exterior' inspection. Positions 4 and 6 of figure 2 show where the fuel tank filler caps are located.

Further information on the completion of a thorough pre-flight on a C206 can be found at http://www.firstflight.com/lessons/flt00.htm

Figure 2: Typical Cessna exterior inspection diagram



Emergency procedures

The pilot took appropriate action in flying the aircraft, identifying a suitable landing site and following the C206 emergency procedures, which included switching fuel tank selection. As a result, the engine problem was successfully resolved in time to avoid a forced landing.

AO-2011-059: VH-BNG, Wirestrike

Date and time:	4 May 2011, 0730 EST	
Location:	6 km E of Ingham (ALA)	
Occurrence category:	Serious incident	
Occurrence type:	Wirestrike	
Aircraft registration:	VH-BNG	
Aircraft manufacturer and model:	Bell Helicopter Company, B206	
Type of operation:	Aerial work	
Persons on board:	Crew – 1	Passengers –Nil
Injuries:	Crew – Nil	Passengers –Nil
Damage to aircraft:	Minor	

FACTUAL INFORMATION

On 4 May 2011, at about 0730 Eastern Standard Time[1], a Bell Helicopter Company B206 helicopter, registered VH-BNG (BNG), struck a single power line and conducted a precautionary landing in a nearby field. The pilot was conducting agricultural spraying operations 6 km E of Ingham, Queensland

The pilot had been contracted to commence end-of-season agricultural spraying operations of sugar cane fields earlier that day and was on his third chemical spray load. While approaching a paddock of four hectares with a house at each end, he calculated that with the required buffer zone[2] of 100 m from each house, the effective spray coverage would only be one hectare. Considering the loss of effective spray coverage and that some local residents were opposed to aerial spraying, the pilot was on the verge of ceasing the spray operation.

After flying over the field and one of the houses, the pilot reported that his attention was diverted from looking for powerlines, to a resident walking from the house to his car. He was uncertain about the resident's reaction to the presence of the helicopter. While assessing the resident, the pilot's thoughts moved toward the conduct of the spray operation, considering where to start, the buffer zone and that he needed to quickly descend over the cane field to start spraying. On receiving a positive reaction from the resident, the pilot completed another loop over the crop. Still conscious of what the resident was doing, the pilots focus moved directly to completing the spray operation and not to looking for visual cues of powerlines. As he quickly descended the helicopter to the field to begin the spray run, the nose of the helicopter struck a power line. The power line spanned the cane field from a pole on a side road, adjacent to the house.

The pilot reported that the helicopter experienced increased vibration levels. As it descended into the top of the sugar cane, the pilot increased power and it came to a hover. As there was no violent shuddering or vibration, he completed a right turn to check whether the wire was attached to the helicopter and then slowly hover-taxied to an open field about 200 m away. After a precautionary landing, the pilot inspected the helicopter for damage and found that the chin view windows were broken and there was significant damage to a main rotor blade (Figure 1).

Pilot comment

The pilot commented that end-of-season spray operations were less than desirable, being small lots surrounded by numerous obstacles, including houses. The fields that day had not been sprayed previously and presented a higher level of commercial pressure and frustration than normal. The planning for that day's operation had been done independently by the contracting organisation, not by the pilot. The pilot also

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

2 A buffer zone is applied to minimise the effect of chemical overspray on nearby properties.

commented that human factors such as insufficient communication, pressure and distraction, played a part in the accident and had he recognised these factors earlier, he would have ceased the operation.

Pilot information

The pilot held a Commercial Pilot (Helicopter) licence with a total of 7500 hours experience and 2500 hours on the B206 helicopter at the time of the accident. He held a Class 1 instructor rating with a Class 2 agricultural rating and a valid Class 2 medical.

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 Pilot / Owner - operator

As a result of this accident, the pilot advised that planning for future operations would be carried out by the pilot flying, not by persons indirectly involved in the operation.

SAFETY MESSAGE

Pilot distraction

This accident highlights how distraction can impact aircraft operations and is a reminder that distractions are not unique to any one type of operation and that no pilot is immune. Research published by the ATSB in 2005 identified 325 accidents and incidents (occurrences) between the period January 1997 and September 2004 associated with pilot distractions.

The Flight Safety Foundation also recognises that distractions occur frequently, while some cannot be avoided, some can be minimised or removed. The Foundation recommends that after a distraction source has been identified, pilots should re-establish situational awareness by applying the following:

- *Identify*: What was I doing?
- *Ask*: Where was I distracted?
- *Decide/act*: What decision or action shall I take to get 'back on track'?

The following publications provide information on pilot distractions:

- Dangerous Distraction: An examination of accidents and incidents involving pilot distraction in Australia between 1997 and 2004 (www.atsb.gov.au/publications/2005/distraction_report.aspx)
- Flight Safety Foundation Approach-and-landing Accident Reduction Briefing Note 2.4 – Interruptions/Distractions (http://flightsafety.org/files/alar_bn2-4-distractions.pdf

Wirestrikes

Wirestrikes pose an ongoing problem to aerial agricultural operations. There are 180 wirestrikes in the ATSB database for the period between 2001 and 2010. Of these, 100 involved agricultural flying. Research by the ATSB has shown that 63 percent of pilots were aware of the position of the wire before they struck it.

Research published by the ATSB found the capacity for the human eye to detect items like power poles is limited to about 70° horizontally. The ability to focus on the pole and recognise the potential wire hazard is decreased when the wire span is long and the poles spaced several hundred metres apart.

The following ATSB publications provide information on wirestrike accidents and research:

Wire-strike accidents in General Aviation: Data Analysis 1994 to 2004 (2006)

http://www.atsb.gov.au/media/32640/wirestrikes_20050055.pdf

Avoidable accidents No. 2 – Wirestrikes involving known wires: a manageable aerial agriculture hazard.

http://www.atsb.gov.au/media/2487114/ar2011028.pdf

Figure 4: VH-BNG after wirestrike.

Photograph courtesy of the Queensland Police.

AO-2011-063: VH-XXW, Loss of control

Date and time:	13 May 2011, 1606 EST	
Location:	Bankstown Airport, New South Wales	
Occurrence category:	Accident	
Occurrence type:	Loss of control	
Aircraft registration:	VH-XXW	
Aircraft manufacturer and model:	Aérospatiale Eurocopter Group AS 350B3	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – 1 (minor)	Passengers – Nil
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 13 May 2011, at 1606 Eastern Standard Time[1], an Aérospatiale Eurocopter Group AS 350B3 helicopter, registered VH-XXW (XXW), impacted terrain at Bankstown Airport, New South Wales. As a result of a post-impact fire, the helicopter sustained serious damage (Figure 1).

The owner-pilot (pilot) had obtained a clearance from air traffic control (ATC) 3 minutes earlier, to complete a high 'air transit'[2] (to avoid ground obstacles) and was instructed to hold short of the main helipad. The pilot completed the air transit from outside a hangar to a level grassed area south-west of the main helipad, at about 15-20 ft above ground level (AGL). At that time, the broadcast wind was from 270 ° at 15 kts. The wind direction at the time of the accident was recorded as moving to 220° at 15 kts.

While stationary in hover, at about 8-10 ft AGL, and with the automatic throttle at the flight setting, the pilot decided to land on the grass to make a phone call. He assessed that the wind was coming onto the front right of XXW at the 2 o'clock position, with the helicopter perpendicular to the runway. When about 2 ft AGL, and with no unusual sounds or warnings, the pilot stated that XXW suddenly commenced rotating to the left in an anticlockwise direction. The pilot applied progressive input to the right pedal, but was unable to correct the uncommanded yaw. The pilot, due to the close proximity to terrain, raised the collective lever and climbed to about 10 ft AGL while XXW completed three to four oscillating 360° anticlockwise rotations. At the same time, the pilot noticed the helicopter drifting towards a chain-wire fence, bordering a large freight building. During the uncontrolled yaw, the pilot reported that other than the main rotor rpm horn sounding momentarily, there were no visual or aural warnings,

While still rotating anticlockwise, the pilot decided to conduct a forced landing and slowly lowered the collective lever. The helicopter contacted the ground, rolled onto its right side and was seriously damaged from the post impact fuel-fed fire. The pilot exited the helicopter through the front left door. He sustained minor burns and other minor injuries.

Air traffic control placed all traffic on hold, activated the crash alarm, notified the New South Wales Police Force, initiated the airport emergency procedures drill, and closed the airport.

Tail rotor anti-torque system

The purpose of the tail rotor is to counter the torque reaction of the main rotor (the AS 350B3 main rotor rotates clockwise when viewed from above) and gives directional control about the yaw axis. The

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

2 Air transit means airborne movement of a helicopter that is: for the purpose of going from one place within a helicopter landing site (HLS) to another place within the HLS; at or below 100 ft above the surface of the HLS; and at speeds greater than those used in air taxiing.

following phenomena have a direct effect on a helicopter's directional control:

- Loss of tail rotor authority (LTA) - attributed to a mechanical failure, or a mechanical malfunction, resulting in the loss of tail rotor control.
- Loss of tail rotor effectiveness (LTE) - attributed solely to aerodynamic phenomena that may occur in varying degrees in all single main rotor helicopters at airspeeds less than 30 kts. It affects the tail rotor's ability to provide directional control about the vertical axis.

Correct and timely pilot response to an uncommanded yaw is critical. The yaw is usually correctible if additional opposite-direction pedal input is applied immediately. If the response is incorrect or slow, the yaw rate may rapidly increase to a point where recovery is not possible.

Pilot information

The pilot held a Private Pilot (Helicopter) Licence with a total of 250 hours experience and 47 hours on the AS 350B3 helicopter at the time of the accident. He held a valid Class 1 medical certificate without restrictions.

The pilot had undergone practical training for loss of tail rotor authority (LTA) in XXW and received theory training for loss of tail rotor effectiveness (LTE) and recovery.

Recent maintenance

The helicopter was new to the Australian register, having completed only 46.7 hours in service. All pre-certification maintenance and inspections had been undertaken during that period.

An approved modification to lengthen both front seat rails had been completed prior to collection by the pilot that day. The modification was conducted to compensate for the height of the pilot.

Pilot comment

The pilot believed that he had experienced LTA due to a mechanical malfunction. He reported that, initially, the uncommanded yaw was slow, but accelerated when he raised the collective lever to gain height. He subsequently thought that action may have made the situation worse, as raising the collective lever also increased main rotor torque. He also thought the initial yaw may have continued because he had not placed the automatic throttle to the idle position.

The pilot commented that with more experience he may have facilitated early recovery of the situation. He however, believed the early progressive right pedal inputs he made had no affect on correcting the anti-clockwise yaw. The pilot did not believe the change in range of the seat, due to the extended rails, affected his application of the pedals or his actions during the event.

Witness accounts

Witnesses who attended the accident site[3] reported that the tail rotor had been rotating on contacting the ground. One witness also reported that the extensive fire damage prevented assessment of control and switch settings.

Helicopter manufacturer

The Eurocopter Group, service letter (SL) *1673-67-04, Main rotor rotating clockwise,* identified various events that occur with single-rotor helicopters during flight close to the ground, at very low speeds and in light wind conditions.

The SL advised that a resulting loss of 'yaw axis' directional control can occur after initiation of a left turn. Unless corrected by the application of right pedal input, continuous rotation of increased strength develops. Instances where correction was not achieved were attributed to insufficient (amplitude/duration) application of the right pedal.

Common actions taken by pilots during these events were identified in the SL as either;

1. Climb to gain height, which increased the main rotor torque and therefore the speed of rotation, or,
2. Descend to land, which resulted in the helicopter tilting to the side.

The SL also stated that:

> In this situation, **immediate action of significant amplitude** applied to the RH [right] yaw pedal must be initiated and **maintained** to stop leftward rotation. Never hesitate to go up to the RH stop Any delay

[3] The ATSB did not attend on-site.

when applying this correction will result in an increase in rotation speed.

SAFETY MESSAGE

This accident highlights the dramatic and rapid effect a loss of directional 'yaw axis' control resulting from LTA or LTE can have on helicopters.

It is therefore essential that pilots are fully aware of the conditions that may lead to such an event and the immediate actions to take on initiation to ensure correction can be achieved. The following ATSB reports, the US National Transportation Safety Board (NTSB) report and the FAA AC provide further information on LTE accidents and research:

- ATSB investigation 200003293 http://www.atsb.gov.au/publications/investigation_reports/2000/aair/aair200003293.aspx
- ATSB investigation 200606570 http://www.atsb.gov.au/media/24338/aair200606570_001.pdf
- ATSB investigation 200606570 http://www.atsb.gov.au/publications/investigation_reports/2006/aair/aair200606570.aspx
- ATSB investigation AO-2008-043 http://www.atsb.gov.au/media/1525155/ao2008043.pdf
- NTSB investigation CH102FA174 http://www.ntsb.gov/aviationquery/brief.aspx?ev_id=20020701X01007&key=1
- The following Eurocopter service letter, 1673-67-04, is a reminder concerning the yaw axis control for all helicopters in some flight conditions. http://www.eurocopter.com/site/docs_wsw/RUB_36/1673-67-04en.pdf

ATSB COMMENT

The ATSB did not attend the accident site, or examine the wreckage to assess the likelihood of a mechanical malfunction. The ATSB did, however, review maintenance documentation for the helicopter which confirmed there were no known problems with the flight controls or systems that may have affected yaw axis directional control. Based on the prevailing winds at the time and that the helicopter was in a stationary hover, the ATSB considered that XXW was in conditions conducive to loss of tail rotor effectiveness.

Figure 5: VH-XXW Wreckage

Photograph courtesy of the helicopter maintenance engineer.

AO-2011-067: VH-BHU, Wirestrike

Date and time:	1 June 2011, 12:31 EST	
Location:	Near Mossman Hospital (HLS), Queensland	
Occurrence category:	Accident	
Occurrence type:	Wirestrike	
Aircraft registration:	VH-BHU	
Aircraft manufacturer and model:	Bell Helicopter Co 206B (III)	
Type of operation:	Charter	
Persons on board:	Crew – 1	Passengers – 3
Injuries:	Crew – 1 (serious)	Passengers – 1 (serious), 2 (minor)
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 1 June 2011 at 1100 EST[1], a Bell Helicopter Co. 206B (III), registered VH-BHU (BHU), departed Mossman Sports Ground, Queensland for a local area charter flight. The flight was conducted as a weed spotting operation with one pilot and three passengers, acting as weed spotters, on board.

The accident flight was the second flight for the day and involved flying at tree top level, using the downwash of the main rotor to turn over the ground cover to help identify the purple underside of a specific weed.

The pilot reported being aware of a number of powerlines in the area, having conducted earlier flights at higher altitudes. The pilot also recalled that the weather conditions were well suited to the operation with good visibility and light winds.

At about 1220 EST, while conducting a survey line at about 10-15 ft above tree top level, the pilot checked for obstacles to the left and right and then initiated a slow left turn. During the turn, the helicopter struck a dual-line powerline that had not previously been identified. The pilot was unable to maintain full control of the helicopter, but applied appropriate control inputs to keep the helicopter level as it descended though the tree canopy. The helicopter landed in an upright position (Figure 2).

The pilot and three passengers were able to exit the helicopter. The pilot and one passenger sustained serious injuries, and the other two passengers sustained minor injuries.

Emergency services attended the accident site and medical assistance was provided. The helicopter was seriously damaged.

Powerline information

The obstruction was a dual-line, single-phase 22,000 volt powerline (Figure 1) which ran from underneath the tree canopy to a house positioned on a hill. The pilot had not seen the house prior to striking the powerlines. He reported that houses in the area were generally set in small cleared areas amongst trees and were difficult to observe until positioned almost directly overhead.

The pilot reported that he was also unable to see the power pole supporting the powerline, due to the overhang from the trees having grown over the pole.

The power supply company reported that, to the best of their knowledge, a marker ball had been fitted to the powerline at the time of the accident and must have been damaged during the collision. A local resident informed the pilot that a marker had been fitted to the powerline, but it had detached during a recent cyclone.

Pilot Information

The pilot had over 11,000 hours total flying experience with more than 7,000 hours on the helicopter type. He also had several thousand hours of low-level survey experience.

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

The pilot had been on duty for four hours prior to the occurrence and had received sufficient sleep prior to commencing the duty. He did not consider fatigue was a factor in the accident.

The task required a well organised flying pattern at slow speed and the pilot reported a comfortable workload level. The passengers did not provide a distraction to the pilot.

Figure 1: Powerline

Image courtesy of Queensland Police

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.

Helicopter operator

As a result of the accident, the helicopter operator conducted a pilots meeting to discuss the factors that led to the accident and highlight the hazards associated with that particular task as well as other similar tasks.

A wire awareness information pack was also sent to all active pilots.

The operator modified their pilot briefing notifications to highlight the potential hazards of operating at low level and to encourage increased pre-flight awareness and planning.

The Operations Manual was also being updated to enhance the section on low level reconnaissance.

Updates were also made to the Emergency Response Plan.

SAFETY MESSAGE

Powerlines continue to present a threat to fixed wing and rotary aircraft operating at low level. A video produced by the Helicopter Association International provides an excellent resource for helicopter pilots and operators. The video highlights the importance of wirestrike prevention training and reconnaissance flights to help identify the hazards in the area.

http://www.rotor.com/Publications/HAIVideosLibrary/SurvivingtheWiresEnvironment.aspx

CASA has also written a number of articles in their safety publication *Flight Safety Australia*, highlighting the potential hazards of operating near powerlines. These articles include

- 'Watching the wire' p12-15, March-April 2011

  http://casa.realviewtechnologies.com/?iid=46007&pnum=2

- 'One strike and you're out' p37-39, November – December 2005

  http://www.casa.gov.au/wcmswr/_assets/main/fsa/2005/dec/37-39.pdf

- 'Wire worry' p34-35, March – April 2005

  http://casa.gov.au/wcmswr/_assets/main/fsa/2005/apr/mar-apr05.pdf

- 'High voltage shock and roll' p12-14, January – February 2001

  http://www.casa.gov.au/wcmswr/_assets/main/fsa/2001/jan/12-15.pdf

Figure 6: VH-BHU accident side

Image courtesy of Queensland Police

AO-2011-069: VH-XAA, Loss of control

Date and time:	3 June 2011, 0845 EST	
Location:	42 km WSW of Canberra Airport, New South Wales	
Occurrence category:	Accident	
Occurrence type:	Loss of control	
Aircraft registration:	VH-XAA	
Aircraft manufacturer and model:	Kawasaki Heavy Industries 369HS	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – 1 (serious)	Passengers – 1 (minor)
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 3 June 2011, at about 0845 Eastern Standard Time[1], a Kawasaki Heavy Industries 369HS helicopter, registered VH-XAA (XAA), impacted terrain 42 km west-south-west of Canberra Airport, New South Wales. The pilot sustained serious head lacerations while the passenger sustained minor injuries. Neither of the occupants was wearing helmets, nor was there a requirement for them to do so. The helicopter sustained serious damage.

Earlier that day, at about 0820, XAA departed a private helicopter landing site (HLS) about 22 km north-west of Canberra Airport. The pilot had hired the helicopter for his annual currency training to carry out navigation operations through the Brindabella Ranges, New South Wales. Pre-departure checks had been normal and the weather was clear.

A small confined clearing within heavily timbered terrain in the Ranges was identified as a suitable landing site and an approach to the landing site from a north-north-westerly direction was commenced. The helicopter transitioned from approach to a high hover above the clearing at about 50-70 ft above ground level (AGL). The pilot believed he had adequate power margins, to carry out an ‘out of ground effect’[2] hovering operation and a 180° right pedal turn to position for landing. He stated that there was no wind and the outside temperature was 8ºC.

The pilot then commenced the right ‘pedal’ turn. As the right turn progressed towards 180º, the pilot applied left pedal to stop the turn, however, the helicopter continued to turn to the right. The pilot assessed that he had experienced a loss of tail rotor effectiveness[3] (LTE) and commenced recovery actions.

The pilot applied full left pedal to counter the continuing right yaw. However, XAA continued to yaw at a faster rate through a number of 360º turns within a wider orbit over the clearing and above tree height. The pilot then lowered the collective[4] lever and applied forward cyclic[5] input to generate

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

2 Helicopters require less power to hover close to the ground due to a cushioning effect created by the main rotor downwash striking the ground. Under those conditions, the helicopter is operating ‘in ground effect’. The US Federal Aviation Administration’s Rotorcraft Flying Handbook stated that flight in ground effect usually occurs at less than one rotor diameter above the surface. Operations above that height are defined as being conducted ‘out of ground effect’.

3 LTE is a critical, low speed aerodynamic flight characteristic which can result in an uncommanded rapid right yaw rate which does not subside of its own accord and, if not corrected, can result in loss of aircraft control.

4 Pilot control in helicopters that simultaneously affects the pitch of all blades of a lifting rotor. Collective is the main control for vertical velocity.

5 A primary helicopter flight control that is similar to an aircraft control column. Cyclic input tilts the main

forward airspeed and arrest the yaw. With the helicopter approaching trees at the edge of the clearing, at about 30 ft AGL, the pilot ceased lowering the collective lever and introduced rear and right cyclic. This action significantly increased the rate of yaw, but slowed the rate of forward descent. The pilot was concerned that a collision with the trees was imminent, and decided to close the throttle and conduct an emergency landing in the clearing. However, due to forces associated with the high rate of yaw, the pilot was only able to reduce the throttle to ground idle.

As XAA rapidly descended towards the terrain, the pilot pulled the collective lever up to cushion the landing. It landed heavily near the edge of the clearing, in a level attitude without yaw and then struck a large log with one of the landing skids. After rapidly rolling through trees and down a bank, XAA came to rest in the Flea Creek bed (Figure 1). During the initial impact sequence, the tail rotor assembly was severed from the helicopter.

Both occupants exited through the right door. After they attended to their immediate injuries, they activated the helicopter's portable emergency locator beacon. They were later airlifted out by a rescue helicopter.

Tail rotor anti-torque system

On single rotor helicopters such as the Kawasaki Heavy Industries 369HS, the main rotor rotates counter-clockwise as viewed from above. The torque produced by the main rotor causes the fuselage of the helicopter to rotate in the opposite direction (nose right). The anti-torque system (tail rotor) provides thrust which counteracts this torque and provides directional control while hovering. The following phenomena have a direct effect on a helicopter's directional control:

- Loss of tail rotor authority (LTA) - attributed to a mechanical failure, or a mechanical malfunction, resulting in the loss of tail rotor control.
- Loss of tail rotor effectiveness (LTE) - attributed solely to aerodynamic phenomena that may occur in varying degrees in all single main rotor helicopters at airspeeds less than 30 kts. It affects the tail rotor's ability to provide directional control about the vertical axis.

Susceptibility to LTE in right turns

The US Federal Aviation Administration, in publication AC 90-95, highlights that there is a greater susceptibility for LTE in right turns as this can introduce accelerating right yaw rates. This is especially relevant during flight at low airspeed due to high power demands and corresponding anti-torque requirements without the assistance normally provided by the vertical fin above 30 kts airspeed.

Correct and timely response to an unanticipated right yaw is critical to prevent loss of control. Recovery requires full opposing pedal and simultaneous forward cyclic to increase speed. If the response is incorrect or slow, the yaw rate may rapidly increase to a point where recovery is not possible.

Pilot information

The pilot held a Private Pilot (Helicopter) Licence with a total of 1634.7 hours experience and 6.2 hours on the Kawasaki Heavy Industries 369HS helicopter. He also held a valid Class 1 medical certificate without restrictions.

The pilot had received Australian Defence Force (ADF) training for LTE recognition and recovery.

Pilot comment

The pilot stated that it was possible the right turn in high hover had induced LTE. He also commented that he had previously recovered from an incipient LTE situation in the ADF equivalent of the Bell 206 helicopter.

SAFETY MESSAGE

This accident highlights the dramatic and rapid effect that a loss of 'yaw axis' directional control resulting from LTE can have on helicopters.

A United States Federal Aviation Administration (FAA) Advisory Circular (AC 90-95) advises of conditions that may result in unanticipated right yaw, on counter-clockwise turning single main rotor helicopters and the recommended recovery actions.

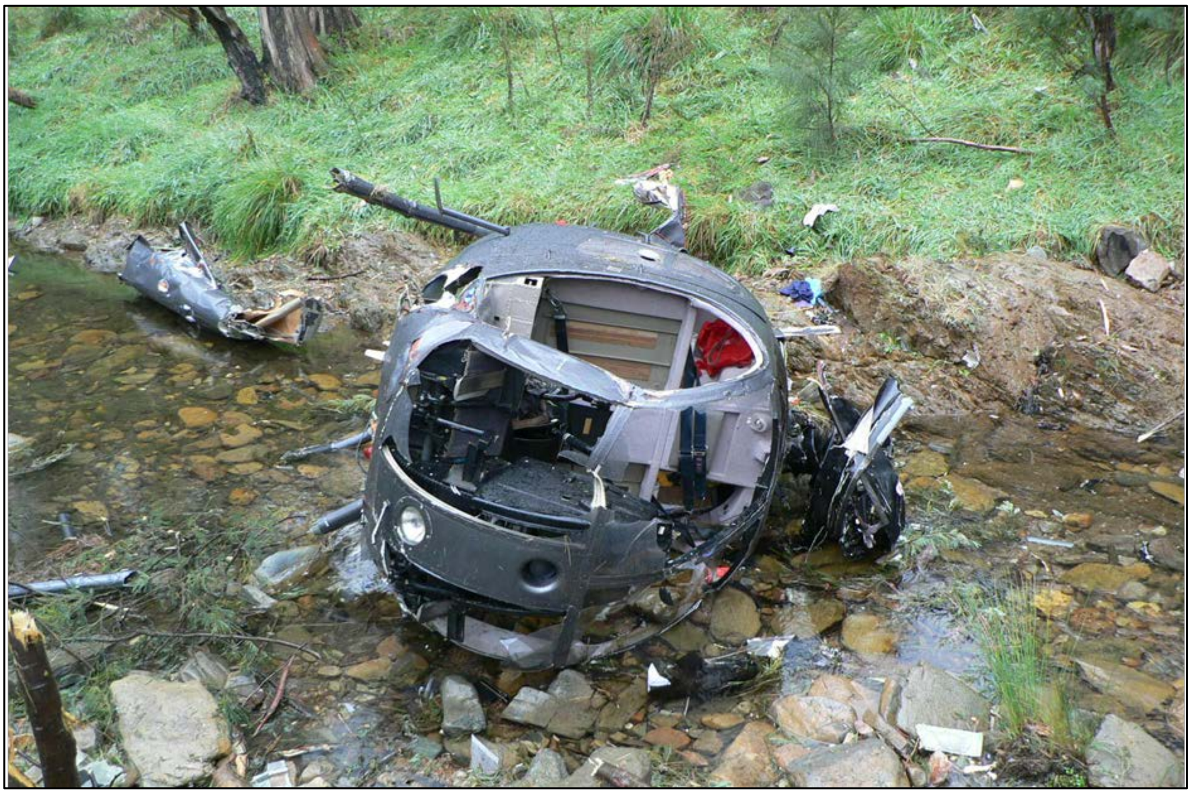
rotor disc varying the attitude of the helicopter and hence the lateral direction.

- FAA AC 90-95
http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/23136

The following ATSB reports provide further information on LTE accidents:

- 200600738
http://www.atsb.gov.au/publications/investigation_reports/2006/aair/aair200600738.aspx
- 200606570
http://www.atsb.gov.au/publications/investigation_reports/2006/aair/aair200606570.aspx
- AO-2008-043
http://www.atsb.gov.au/media/1525155/ao2008043.pdf
- AO-2011-055
http://www.atsb.gov.au/publications/investigation_reports/2011/aair/ao-2011-055.aspx

Figure 1: Wreckage of VH-XAA



Photograph courtesy of the aircraft owner.

ATSB COMMENT

The ATSB did not attend the accident site, or examine the wreckage to assess the likelihood of a mechanical malfunction resulting in LTA. The ATSB did however, review the helicopter's maintenance documentation and receive advice from pilots who had flown XAA in the days preceding the accident. Those sources indicated there were no known problems with the helicopter's flight controls or systems that may have affected yaw axis directional control.

The ATSB did determine that the increased power required for hovering OGE, coupled with a right pedal turn, increased the risk of LTE.

AO-2011-080: VH-HSW, Wirestrike

Date and time:	12 July 2011, 10:10 EST	
Location:	90km SW Cunnamulla, Queensland	
Occurrence category:	Accident	
Occurrence type:	Wirestrike	
Aircraft registration:	VH-HSW	
Aircraft manufacturer and model:	Robinson Helicopter Co R22 BETA II	
Type of operation:	Aerial Work	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Serious	Passengers – Nil
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 12 July 2011, at about 1010 EST[1] a Robinson Helicopter Co R22 BETA II, registered VH-HSW, departed the rural property "Tinnenburra", about 90km SW of Cunnamulla, Queensland, for a local cattle mustering flight.

The pilot took off from the property's airstrip located to the east of the homestead. The cattle were to the west of the homestead and were being mustered over a creek, through the house paddocks and over the airstrip (Figure 1). The cattle had begun to cross the creek by the time the helicopter became airborne. The pilot noticed that the lead cattle were heading in the wrong direction and used the helicopter to redirect them. The lead cattle then reached a fence on the northern boundary of the house paddock. The pilot was aware that the fence was low so descended the helicopter to redirect the cattle away from the fence.

Following the descent, and while focusing on the cattle, the pilot suddenly noticed a powerline near the helicopter skid, but was unable to avoid the wire. After colliding with the powerline, the pilot could not maintain control of the helicopter and it impacted with terrain (Figure 2).

A number of ground musterers witnessed the accident. One witness, positioned about 500 m from the accident site, reported hearing a loud crack and observed the helicopter twist in the air before impacting the ground.

The pilot was trapped in the fuselage and was cut from the seatbelt and freed from the wreckage by a witness. The pilot was wearing a three point safety harness, a helmet and Kevlar pants. The pilot sustained serious injuries and was airlifted to Brisbane for medical treatment.

Workload and distraction

Immediately prior to the flight, the pilot had been conducting routine pre-flight inspections, when a staff member informed her that a dog had been injured and requested assistance. The pilot shut down the helicopter and provided support. After about 15 minutes the pilot resumed the pre-flight duties, however reported feeling upset and distracted by the injury to the dog.

The pilot reported that the delay also increased the time pressure to become airborne as the cattle were approaching the house paddock by the time the pre-flight inspection had resumed.

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

Figure 1: Accident site and surrounding area

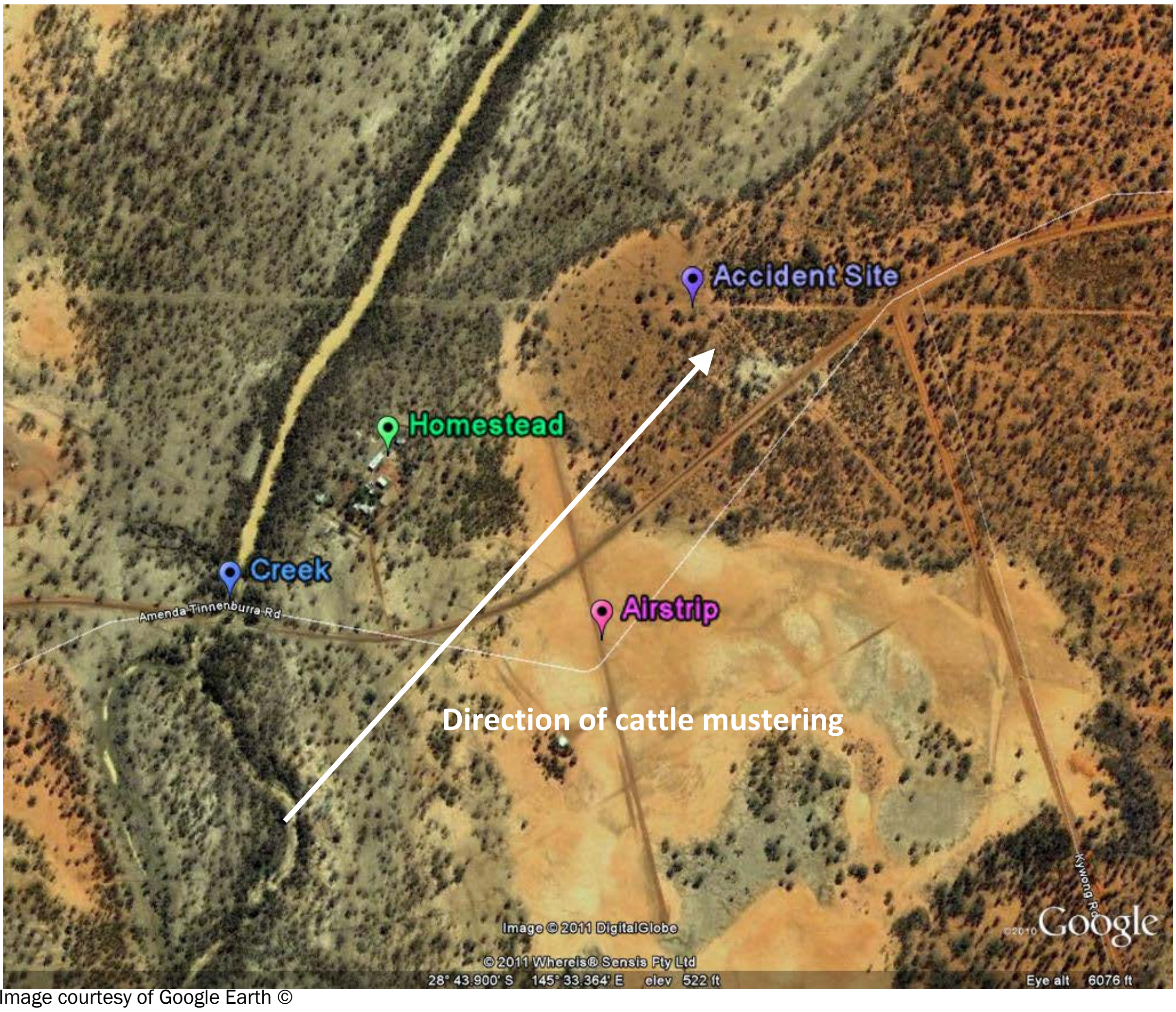


Image courtesy of Google Earth ©

Figure 2: Accident Site

Image courtesy of Queensland Police

Powerline information

The powerline was a single line supported by timber powerpoles. Local police estimated the height of the powerline at the point of collision to be about 8-9 m above the ground (Figure 3).

There were no powerline markers on the line, nor was there any requirement for them under the Australian Standard (AS 3891.1-2008 Air Navigation – Cables and their supporting structures – Marking and safety requirements).

The pilot was aware of the location of the powerline prior to the accident.

Meteorological information

The weather was reported to be fine, with a light breeze from the east-southeast and no cloud. The weather recorded at Cunnamulla an hour prior to the accident, showed a temperature of 6.7 degrees and an easterly wind at 7 km/h.

Figure 3: Powerline above ground level

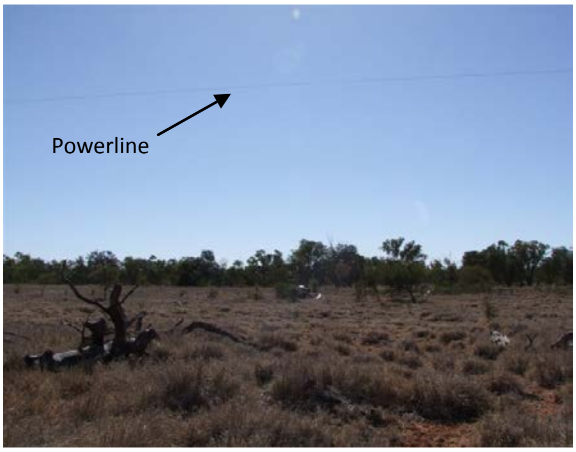


Image courtesy of Queensland Police

Helicopter damage

The helicopter sustained serious damage during the accident. The police conducted an onsite examination of the wreckage and reported that ground contact damage was evident to the front lower left section of the helicopter. An impact mark on the ground beside the helicopter contained the front section of the left skid.

The police also noted impact marks on the power line (Figure 4). An inspection of the helicopter revealed suspected wirestrike markings on the upper surface of the right side skid and the main rotor blades.

Figure 4: Contact point with powerline

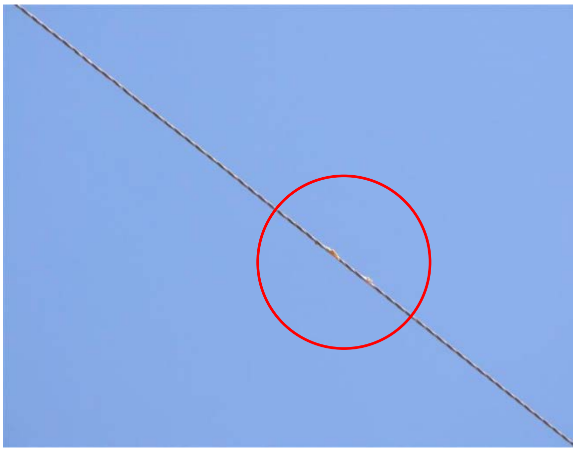


Image courtesy of Queensland Police

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.

Helicopter operator

GPS Technology

The helicopter operator has previously looked into a wire alerting system using the onboard Global Positioning System (GPS). They are continuing to examine ways in which this technology could be incorporated into their operation.

SAFETY MESSAGE

A research report published by the ATSB in 2005 identified sources of pilot distraction between the period of January 1997 and September 2004. Of the events where the source of distraction could be identified, 2.4% involved agricultural tasks.

This accident highlights that pilot distractions can be particularly unforgiving during low level operations.

The following publications provide additional information on pilot distractions:

- Dangerous Distraction: An examination of accidents and incidents involving pilot distraction in Australia between 1997 and 2004

  http://atsb.gov.au/media/36244/distraction_report.pdf

Powerlines continue to present a threat to aircraft operating at low level, including mustering activity. The Helicopter Association International has produced a video highlighting the importance of wirestrike prevention training.

- Surviving the Wires Environment (Video)

  http://www.rotor.com/Publications/HAIVideosLibrary/SurvivingtheWiresEnvironment.aspx

CASA has written a number of articles in their safety publication *Flight Safety Australia*, examining the potential hazards of operating near powerlines. These articles include

- 'Watching the wire' p12-15, March-April 2011

  http://casa.realviewtechnologies.com/?iid=46007&pnum=2

- 'One strike and you're out' p37-39, November – December 2005

  http://www.casa.gov.au/wcmswr/_assets/main/fsa/2005/dec/37-39.pdf

- 'Wire worry' p34-35, March – April 2005

  http://casa.gov.au/wcmswr/_assets/main/fsa/2005/apr/mar-apr05.pdf

- 'High voltage shock and roll' p12-14, January – February 2001

  http://www.casa.gov.au/wcmswr/_assets/main/fsa/2001/jan/12-15.pdf

AO-2011-124: VH-RTB, Collision with terrain

Date and time:	29 September 2011, 0840 CST	
Location:	23 NM (43 km) ESE of Maningrida, Northern Territory	
Occurrence category:	Accident	
Occurrence type:	Collision with terrain	
Aircraft registration:	VH-RTB	
Aircraft manufacturer and model:	Robinson Helicopter Company R22 Beta II	
Type of operation:	Aerial work	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 29 September 2011, at about 0645 Central Standard Time[1], the pilot of a Robinson Helicopter Company, R22 Beta II helicopter (R22), registered VH-RTB, departed Old Arafura Station, Northern Territory for aerial stock mustering operations. The pilot flew about 6 NM to the north where he began mustering a herd of 60-70 buffalo, along with a second R22 helicopter.

At about 0840, they arrived at the designated yarding area, located 43 km east-south-east of Maningrida.

While mustering the herd into the 'wings'[2], at about 20 ft above ground level, some of the buffalo began to move away from the area towards the south. To prevent them from turning towards a timbered area located outside the yarding area, the pilot re-positioned the helicopter to the south in an attempt to guide the buffalo back into the wings.

Shortly after, the tail rotor struck a tree and the helicopter started spinning. The pilot immediately rolled the throttle off and lowered the collective. The helicopter landed heavily, resulting in serious damage (Figure 1).

1 Central Standard Time (CST) was Coordinated Universal Time (UTC) + 9.5 hours.

2 Wings are hessian covered fences that guide the animals into the yard.

Pilot information

The pilot held a Commercial Pilot (Helicopter) Licence with a total of 7,426 hours, of which about 3,200 hours were on the R22, predominantly conducting mustering operations.

The pilot had conducted mustering operations in the area on about 4 occasions over the previous 4 years.

Figure 1: VH-RTB

Photograph courtesy of the pilot

Yarding area

The yard was positioned in a lightly timbered area. The helicopter struck a tree, which was about 3-4 metres in front of a row of densely foliated trees. The pilot stated that he was aware of the tree prior to the accident.

Ground support

The pilot reported that, when conducting aerial stock mustering, the workload generally became 'heavy' when operating in the vicinity of the yarding area and particularly when guiding the animals into the wings. Once the animals were in the wings, a ground team would complete the muster and assist with moving the animals into the yard.

At the time of the accident, the ground team were not providing support to the pilot. On reflection, the pilot stated that, he should have sought assistance from the ground team when the herd became difficult to control.

SAFETY MESSAGE

Helicopter mustering, the process of locating, rounding up, and moving animals at low-level is an essential feature of stock stations in northern Australia. While the use of helicopters reduces the time needed to muster stock from two weeks on horseback to one day, it is inherently risky. At low levels, there are many obstacles to avoid and it is essential that pilots maintain a high level of awareness.

In 2010, a total of 16 aerial mustering accidents were reported to the ATSB, involving 14 helicopters and two aeroplanes. Of these, one accident involved a helicopter wirestrike, while the remaining 15 accidents involved a collision with terrain, including five where the tail rotor struck the ground or trees.

This accident not only highlights the challenging nature of aerial stock mustering operations, but also the benefits of utilising resources such as the ground support team when operating within a confined or restricted space such as the yarding area.

The following publications provide additional information on aerial mustering operations:

- Reaping the whirlwind
  http://www.casa.gov.au/wcmswr/_assets/main/lib100059/jul-aug11.pdf
- Aviation Occurrence Statistics: 2001 to 2010
  http://www.atsb.gov.au/media/2485752/ar2011020.pdf

Aviation Short Investigation Bulletin:
Third Quarter 2011
Issue 7