

Australian Government

Australian Transport Safety Bureau



ATSB TRANSPORT SAFETY REPORT Aviation Short Investigations AB-2011-040 Final

Aviation Short Investigation Bulletin: First Quarter 2011

Issue 5



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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 a *Safety Message* that is 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 between the period 1 January 2011 and 31 March 2011.

AO-2010-086: VH-EBF, Avionics event

Date and time:	1 November 2010, 1605 UTC			
Location:	Overhead Kuala Lumpur International Airport, Malaysia			
Occurrence category:	Incident			
Occurrence type:	Avionics / Flig	ics / Flight Instruments		
Aircraft registration:	VH-EBF			
Aircraft manufacturer and model:	Airbus A330-202			
Type of operation:	Air transport	-high capacity		
Persons on board:	Crew - 11	Passengers – 280		
Injuries:	Crew - Nil	Passengers – Nil		
Damage to aircraft:	Nil			

FACTUAL INFORMATION

At 1528 Coordinated Universal Time¹ on 1 November 2010, an Airbus A330-302, registered VH-EBF (EBF), departed Phuket, Thailand on a scheduled passenger flight to Sydney, New South Wales. There were 11 crew and 280 passengers on board.

At 1605 at flight level (FL) 350² (Figure 1) and shortly after the aircraft exited cloud, the flight management system (FMS) displayed a number of error messages³. Following this, both autopilots and the autothrottle disconnected and the associated electronic centralized aircraft monitor (ECAM)⁴ warnings were displayed. The flight crew attempted to reconnect both autopilot systems, but were unsuccessful.

- ² Flight level (FL) is a level of constant atmospheric pressure related to a datum of 1013.25 hectopascals, expressed in hundreds of feet. Therefore, FL120 indicates 12,000 ft.
- ³ The error messages showed a difference in target speeds of more than 5 knots between the two FMS systems and warned the flight crew that the cruise altitude entered into the FMS was above the maximum computed altitude.
- ⁴ ECAM was a system designed to display information to pilots.

After consultation with company operational and maintenance personnel, the flight crew elected to divert to Singapore and at 1747, EBF landed in Singapore without further incident.





Image courtesy of Google Earth

Recorded data

The flight data recorder (FDR) was retrieved from the aircraft and downloaded. The data indicated that the autopilot and autothrottle disengaged at 1605, about 37 minutes after takeoff, while in the cruise at FL350. The aircraft remained operating under 'normal law'⁵ and the airspeed, heading and altitude information remained valid.

¹ The 24-hour clock is used in this report to describe the time of day, Coordinated Universal Time (UTC), as particular events occurred.

⁵ The flight control system operates under 3 laws: normal law, alternate law and direct law (in

The FDR did not record total air temperature⁶ (TAT) data, but did register three separate static air temperature (SAT) parameters⁷ which were calculated from the TAT probes. The FDR indicated that the SAT data from one TAT probe failed at 1604. One minute later, the SAT data from the other probe failed and resulted in the loss of both autopilot and autothrottle capabilities. The failure of all the recorded SAT parameters suggested that both the captain's TAT probe and the first officer's TAT probe failed within one minute of each other.

Post flight action and investigation

Post flight testing confirmed that both the captain's and the first officer's TAT probes were unserviceable and were subsequently replaced.

The operator contacted the aircraft manufacturer and, based on a description of the event, the manufacturer suspected that the TAT probe failure was due to icing caused by severe environmental conditions. The manufacturer concluded that the probes failed when the sensing elements within the probes were affected by high mechanical stress due to ice expansion.

A heavy landing check was also conducted due to the aircraft landing above the maximum landing weight. The check confirmed that there were no defects due to the overweight landing.

Aircraft Systems

The aircraft had two TAT probes (P/N 102LA2AG) which were electrically heated. Each probe fed temperature data into independent air data inertial reference units (ADIRU). That data was used to calculate SAT and true airspeed (Figure 2). The loss of this information from the ADIRU resulted in a loss of autoflight capabilities.

The manufacturer was contacted and reported that, since the introduction of the A330, a number of

descending order of protection). The flight control system will revert to alternate law when the flight control system senses it is receiving faulty data.

- ⁶ Total air temperature is static air temperature increased by an amount accounted for by the forward motion of the aircraft through the air.
- ⁷ Each TAT probe had two sensing elements used to calculate SAT, however only one of the elements in the first officer's probe was designed to send information to the ADIRU.

similar multiple TAT probe failures have been reported. Due to the previous failures, a new TAT probe was certified and issued through an optional service bulletin in 2008. There have been no reported events of multiple failures involving the new TAT probe.

Meteorological information

The crew reported that they had experienced heavy rain and cloud, both on their departure from Phuket, and during the early stages of the climb. They reported still being in cloud, possibly cirrostratus⁸, early in the cruise at Flight Level 350.

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 incident.

Aircraft operator

TAT probe replacement

The operator has committed to modifying their A330 fleet with the new TAT probe. The implementation plan is currently being developed in conjunction with the TAT probe supplier.

SAFETY MESSAGE

Recent probe sensor failures on A320 and A330 aircraft have highlighted the importance of flight crew awareness of the potential risks to flight of unreliable data from flight instruments.

The following ATSB investigations have examined probe failures on the A320/A330 aircraft:

 A0-2009-065 Airbus A330-202, VH-EBA, 710 km south of Guam International Airport, 28 October 2009

http://www.atsb.gov.au/publications/investigati on_reports/2009/aair/ao-2009-065.aspx

⁸ Cirrostratus clouds are associated with an approaching warm front and increased moisture which can signify a greater risk of icing. A0-2010-070 VH-JQX – Avionics/Flight Instruments near Mackay Aerodrome 20 September 2010 www.atsb.gov.au/publications/investigation_rep orts/2010/aair/ao-2010-070.aspx

The U.S. National Transport Safety Board (NTSB) is currently investigating two similar incidents involving A330 aircraft. The investigations are ongoing, however the initial details of the events can be found at <u>www.ntsb.gov</u>:

- Avionics/Flight•DCA09IA055 TAM Flight 8091, May 21 2009.erodrome20Loss of primary speed and altitude information.
 - DCA09IA064 Northwest Airlines Flight 8, June 23 2009. Airspeed anomaly.

In addition, a number of international authorities are currently conducting more extensive testing of aircraft air data probes in light of recent failures.



Figure 2: A330 Air Data System

Image - A330-200/300 Technical Training Manual

AO-2010-090: VH-OJD, Number one engine failure

Date and time:	5 November 2010, 1217 UTC		
Location:	Near Changi Airport, Singapore		
Occurrence category:	Incident		
Occurrence type:	Total power loss		
Aircraft registration:	VH-OJD		
Aircraft manufacturer and model:	The Boeing Company 747-438		
Type of operation:	Air transport -high capacity		
Persons on board:	Crew – 19 Passengers – 413		
Injuries:	Crew – Nil Passengers – Nil		
Damage to aircraft:	Serious		

FACTUAL INFORMATION

On 5 November 2010, a Boeing Company 747-438 aircraft, registered VH-OJD (OJD), departed Changi Airport, Singapore on a scheduled flight to Sydney, New South Wales. At about 1217 Universal Coordinated Time¹, on departure and climbing through 2,000 ft above mean sea level, a loud bang was heard accompanied with aircraft yaw and vibration. The EICAS² indicated that number one engine vibration was high and exhaust gas temperature (EGT) had risen rapidly above redline, peaking at 962° C. The crew completed the nonnormal procedures checklist, shut down the number one engine, declared a PAN³ and received approval from air traffic control (ATC) for a return to Singapore. About forty minutes later, when the required fuel jettison was completed, radar vectors were provided by ATC for a normal three-engine approach and landing. Emergency services were in attendance when the aircraft landed a short time later.

During a post-flight examination, pieces of metal were found in the exhaust area of the number one engine. A preliminary borescope inspection revealed

that the engine had sustained serious damage to all six stages of the high pressure compressor (HPC) however the damage was contained within the engine. The engine was then removed for shipping to the operator's repair facility and was replaced with a serviceable engine. After a satisfactory engine ground run, the aircraft was returned to service.

Engine examination

A borescope inspection confirmed that a HPC stage 1 blade had liberated at the blade root. The liberated blade resulted in severe damage to all stages of the HPC. There were no titanium fire symptoms evident and no obvious defects found in other areas of the engine. The HPC stage 1 blade root failure, and secondary HPC damage of the engine, was consistent with previous HPC stage 1 blade root failures. The engine was inducted into the operator's engine overhaul facility where the HPC 41 module (Figure 1) was removed for overhaul.

Engine history

The RB211-524GT engine, serial number 13243, had accumulated 27,019 hours and 2,923 cycles since its last overhaul, which occurred on 23 March 2004.

The last major shop visit was 9 April 2008. At this time various HPC modifications were embodied.

An 'A' check on the engine was completed on 1 September 2010. On 27 September 2010, a borescope inspection of the low, intermediate and HPC and turbine stages were conducted. There were no significant findings from the borescope

¹ The 24-hour clock is used in this report to describe the time of day in Universal Coordinated Time (UTC), as particular events occurred.

² Engine indicating and crew alerting system display.

³ Radio broadcast indicating uncertainty or alert, in the form of a general broadcast to the widest area but not yet at the level of a Mayday.

inspection, however the operator advised that there is currently no effective inspection program available for detection of a pending HPC stage 1 blade root failure.

The engine was fitted to OJD on 21 October 2010.

Recorded information

A download of the aircraft's central maintenance computer (CMC), revealed that the engine had exceeded the maximum recorded exhaust gas temperature, which was 963° C.

The download from the aircraft's quick access recorder (QAR) showed that the largest increase in vibration occurred in the number one engine N3 (high pressure spool). The measurement reached 5 units, which was full scale.

Service bulletins issued in response to previous occurrences

The following service bulletins were introduced by Rolls-Royce during the period 2003 to 2009 to address HPC stage 1 blade root failures.

Service bulletin RB211-72-D574 was released in September 2003 to address loss of radial location in the HPC resulting in excessive blade tip rub and loss of surge margin due to locating feature wear.

Service bulletin RB211-72-F002 was released in January 2006 to reduce compressor case distortion leading to blade tip rub that would eventually lead to cracking of a HPC blade root. Service bulletins RB211-72-D524 and RB211-72-F002 had been incorporated onto the engine that failed on OJD at the previous major shop visit.

Following the failure of two engines in the world fleet that had been modified to SB RB211-72-F002, additional engineering analysis was performed by Rolls-Royce. That analysis identified that subtle modification of the HPC stage 1 blade could provide protection against root failures. As a result of that analysis, SB RB211-72-G036 was released in February 2009. The SB introduced a HPC 1 blade with a revised geometry. The revised geometry was designed to be more tolerant to stresses induced by blade tip rub. That SB had not been incorporated onto the engine that failed on OJD.

Operator's fleet component status

This is the operator's ninth blade root failure of HPC stage 1 blades. There were four post-SB RB211-72-F002 failures, including this engine. Three of these failures occurred in 2010. Statistical modelling by Rolls-Royce indicates that the operator should be susceptible to about 0.8 events per year due to HPC stage 1 root failure while operating engines built to the SB RB211-72-F002 standard.

The operator's fleet of RB211-524G engines are currently all at SB RB211-72-D574 modification standard. Ninety five percent of fleet engines have also been modified to the RB211-72-F002 standard and eighteen percent to the RB21-72-G036 standard.

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 incident.

Aircraft operator

Engine modification

The operator is continuing to embody SB RB211-72-G036, issued in 2009, at engine shop visits where the HPC module is removed. However, should the rate of failures increase significantly, a review of current modification policy will be undertaken.

SAFETY MESSAGE

The ATSB has investigated a number of HPC stage 1 blade root failures in the Rolls Royce RB211 engine. These investigations include:

- 200205895, 15 December 2002, Boeing Company 747-438, VH-OJU, Los Angeles.
 www.atsb.gov.au/publications/investigation_rep orts/2002/aair/aair200205895.aspx
- 200304815, 17 November 2003, Boeing Company 747-438, VH-OJE, Singapore.
 www.atsb.gov.au/publications/investigation_rep orts/2003/aair/aair200304815.aspx

 200700356, In-flight engine failure, Sydney, 3 February 2007, Boeing Company 747-438, VH-OJM.
www.atsb.gov.au/publications/investigation_rep

orts/2007/aair/aair200700356.aspx





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AO-2010-095: VH-OEI, Cockpit fumes and smoke event

Date and time:	15 November 2010, 1200 EDT		
Location:	Near Sydney Airport, New South Wales		
Occurrence category:	Incident		
Occurrence type:	Cockpit fumes and smoke event		
Aircraft registration:	VH-OEI		
Aircraft manufacturer and model:	Boeing Company 747-438		
Type of operation:	Air transport – high capacity		
Persons on board:	Crew – 17 Passengers – 205		
Injuries:	Crew – Nil Passengers – Nil		
Damage to aircraft:	Nil		

FACTUAL INFORMATION

On 15 November 2010, a Boeing Company 747-438 aircraft, registered VH-OEI, departed Sydney, New South Wales on a scheduled passenger service to Buenos Aires, Argentina. On board the aircraft were four flight crew (captain, first officer and two second officers), 13 cabin crew and 205 passengers.

At about 1200 Eastern Daylight-saving Time¹, while passing flight level (FL)² 270 on climb to FL320, the flight crew noticed a strong electrical smell in the cockpit. Shortly after, smoke was observed emanating from the left electronic flight instrument system (EFIS) control panel³. At that time, the captain and a second officer were seated at the aircraft control stations, while the first officer and the other second officer were in the observer seats.

The second officer seated at the controls immediately called for the flight crew to put their oxygen masks on. The first officer resumed his

³ The left EFIS control panel controls the left primary flight display (PFD) and navigation display.

position at the controls, while the second officer relocated to the observer's seat. All flight crew then donned their masks.

The flight crew actioned the non-normal checklist. While completing the checklist, the flight crew observed that the circuit breaker for the left EFIS control panel had tripped and the engine indication and crew alerting system (EICAS)⁴ was displaying the message 'EFIS CONTROL L'.

About seven minutes later, the captain requested that the second officers lift their oxygen masks and assess the air quality in the cockpit. Both officers reported that the fumes were still present and were very strong, despite the fact that the smoke had ceased. After discussing the situation, the flight crew elected to return to Sydney.

The flight crew advised air traffic control (ATC) of the situation and that operations were normal.

Soon after, the microphone on the first officer's oxygen mask failed to operate for about 1-2 minutes, affecting flight crew communications and coordination⁵. One of the second officers assisted the first officer in re-checking the oxygen mask donning procedures and confirmed that the fittings on the mask had not become detached.

¹ The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time, as particular events occurred. Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

² Flight level (FL) is a level of constant atmospheric pressure related to a datum of 1013.25 hectopascals, expressed in hundreds of feet. Therefore, flight level 270 indicates 27,000 ft.

⁴ The EICAS consolidates engine and aircraft system indications and is the primary means of displaying system indications and alerts to the flight crew.

⁵ During pre-flight preparations, the first officer's microphone was tested and found serviceable.

Throughout this time, the flight crew used hand signals to assist with inter-cockpit communications.

Due to the increased workload, the captain reassigned duties among the flight crew, with one of the second officers tasked with maintaining communications with the cabin crew, passengers and operator.

During the return, a fuel dump was commenced to reduce the landing weight of the aircraft and a descent to 10,000 ft was initiated. The first officer broadcast a PAN⁶ call to ATC and the rescue and fire fighting services at Sydney Airport were placed on standby.

The flight crew assessed the weather conditions at Sydney as acceptable, but requested that ATC advise of any significant changes due to a passing weather system.

During the descent, the second officers again assessed the air quality in the cockpit and determined that the fumes had stabilised. Shortly after, the flight crew determined that the likely cause of the fumes and smoke was a faulty EFIS control panel unit.

The flight crew requested from ATC that they be positioned in a holding pattern in close proximity to Sydney Airport to continue the fuel dump and a descent to 7,000 ft was conducted. They also elected to remain on oxygen, even though this affected their ability to communicate effectively.

Due to weather conditions, the holding pattern was commenced further away from the airport than initially requested.

The flight crew prepared the aircraft for the arrival into Sydney and assessed the threats for the approach, which included the failure of the left EFIS. As a precaution, one of the second officers was assigned to monitor the aircraft's standby instruments for the approach.

Prior to the completion of the fuel dump, the crew received a 'CREW OXY LOW' EICAS message. The captain reviewed the situation and an immediate approach was requested from ATC. By this time, the aircraft's weight had reduced to the maximum landing weight and the fuel dump was discontinued.

The aircraft landed at about 1320, without further incident.

After landing, the captain's weather radar could not be de-selected due to the EFIS failure. The circuit breaker for the radar was pulled and the aircraft was taxied to the terminal.

The aircraft was shut down and deemed safe by the rescue and fire fighting services personnel.

EFIS control panel

On the previous flight from Los Angeles, United States of America to Sydney, the flight crew reported that the 'BARO' selector⁷ on the left EFIS control panel was operating intermittently. As a result, the panel was replaced on arrival at Sydney.

Following the incident on the Buenos Aires bound flight, the left EFIS control panel was removed by the operator's engineering personnel and a strong burning smell was observed. The electrical connector for the panel was inspected, with no evidence of overheating, bent contacts or mechanical damaged found. The panel was replaced and tested serviceable.

SAFETY MESSAGE

The use of supplemental breathing equipment by flight crews is an important defence against pilot incapacitation in the event of a fumes and smoke event. The following publications provide guidance and a useful insight into these types of events:

In 2006, the Royal Aeronautical Society and the Guild of Air Pilots and Air Navigators London produced a report entitled Reducing the Risk of Smoke, Fire and Fumes in Transport Aircraft – Past History, Current Risk and Recommended Mitigations. The report discusses the history of smoke, fumes and fire events and provides recommendations encompassing airworthiness, protective equipment, maintenance, procedures and training.

www.safeopsys.com/docs/SOS_SAFITA.pdf

⁶ A PAN radio broadcast is an international radio urgency call indicating a threat to the safety of an aircraft or its passengers.

⁷ The 'BARO' selector allows the pilot to select the standard barometric setting of 29.92 inches Hg (inches or mercury) or 1013 hPa (hectopascals); adjust the barometric reference unit from inches Hg to HPA; or adjust the barometric reference on the PFD.

 Research published by the ATSB in 2007 identified that smoke and fumes were the second most common cause of in-flight medical and incapacitation events sustained by pilots in the period between 1 January 1975 and 31 March 2006. http://www.atsb.gov.au/publications/2007/b20

http://www.atsb.gov.au/publications/2007/b20 060170.aspx

• A recent 'Information for Operators' bulletin published by United States (US) Federal Aviation Administration (FAA) found that about 900 smoke or fumes events occur each year in the US involving transport category aircraft. Many of these events prompted the flight crew to declare an emergency and either divert, turn back or request priority handling to their destination. Released in January 2011, the bulletin recommends that operators should record and track smoke related events and use this data to definitively resolve, and ultimately reduced these types of incidents.

http://www.faa.gov/other_visit/aviation_industry /airline_operators/airline_safety/info/all_infos/ media/2011/InF011002.pdf

AO-2010-099: VH-VUX, Runway Overrun

Date and time:	24 November 2010, 1700 EDT		
Location:	Hobart Airport		
Occurrence category:	Occurrence category: Serious incident		
Occurrence type:	Runway excursion – overrun		
Aircraft registration:	VH-VUX		
Aircraft manufacturer and model:	Boeing Company 737-8FE		
Type of operation:	Air transport –high		
Persons on board:	Crew – 6 Passengers – 158		
Injuries:	Crew – Nil Passengers – Nil		
Damage to aircraft:	Nil		

FACTUAL INFORMATION

On 24 November 2010 at about 1600 Eastern Daylight-saving Time¹, a Boeing Company 737-8FE aircraft, registered VH-VUX (VUX), departed Melbourne, Victoria, on a scheduled passenger flight to Hobart, Tasmania. On board the aircraft were six crew and 158 passengers. The copilot was designated as the pilot flying and the pilot in command (PIC) was the pilot monitoring.

The flight to Hobart was uneventful and the crew planned to conduct an instrument landing system (ILS) approach to runway 12. The crew were informed that the runway was wet, but understood that the braking was good. Based on the reported weather, aircraft weight and airport conditions, the copilot calculated that a landing with the flaps set at 30° and the use of auto brakes 3 would provide sufficient braking for the landing distance available.

The crew reported that there had been rain during the day; however, at the time of the approach the conditions were clear. They became visual at about 13 NM (24 km) from the airport and at 3,000 ft.

The crew reported that they were informed that the wind was about 4 kts from 030°. The crew were advised by air traffic control (ATC), at about 1,000 ft, that the wind was tending more northerly and

offered the crew the option of conducting a visual circuit for a landing onto runway 30. Due to the scattered cloud² in the area, the limited experience of the copilot, the small tailwind component and an observation by the copilot that the windsock on the airport indicated nil wind, the crew elected to continue the approach to runway 12.

The touchdown and initial deceleration was reported to be normal, with the thrust reversers and autobraking operating correctly. Both crew believed that the touchdown was normal.

At about 60 kts, the PIC took over control of the landing and braking. At that point, the aircraft was about three quarters of the way through the landing roll, with the thrust reversers stowed and the autobrakes disengaged. He stated that soon after taking the controls he did not get the braking response he expected. The PIC increased the braking pressure until he could not apply any more. The copilot reported that in the last 1,000 ft (300 m) of the runway, the aircraft felt like it was sliding or aquaplaning. The cabin crew also reported that the deceleration did not feel normal in the last portion of the landing.

The PIC then re-introduced the thrust reversers. The copilot noted that once the aircraft reached the

¹ The 24-hour clock is used in this report to describe the ² local time of day, Eastern Daylight-saving Time, as particular events occurred. Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

² Cloud amounts are reported in oktas. An okta is a unit of sky area equal to one-eighth of total sky visible to the celestial horizon. Few = 1 to 2 oktas, scattered = 3 to 4 oktas, broken = 5 to 7 oktas and overcast = 8 oktas.

runway threshold markings at the southern end of the runway the speed decreased significantly.

The crew reported that the aircraft overran the runway onto the sealed stopway³ at a walking pace. The aircraft came to a stop, with the cockpit about 4 m beyond the end of the runway.

The crew turned the aircraft around, with one main gear on the overrun area and the other inside the runway. They informed ATC of the overrun and taxied the aircraft to the gate.

The runway and stopway was inspected and no damage was found.

Once the aircraft was shutdown, the PIC inspected the tyres and brakes and determined that there was no damage. The PIC and copilot returned the aircraft to Melbourne where the aircraft landed without further incident. The braking was reported as normal for the return landing at Melbourne.

Weather

The Bureau of Meteorology recorded 10.8 mm of rainfall at Hobart Airport on 24 November 2010. It was reported that there were showers all day, although at the time of the incident the rain had stopped.

Prior to touchdown, the copilot observed the windsock and noted that it indicated nil wind and that the last wind had been from the north. After the landing, the copilot looked at the windsock again and noted that it had not moved and still indicated nil wind.

Recorded information

The flight data recorder (FDR) was removed from the aircraft for download and analysis. The data indicated that VUX touched down about 660 m (2,200 ft) along the 2,251 m (7,385 ft) runway, with a computed airspeed (CAS) of 143 kts. Based on the data, there was about a 10 kt tailwind at the time of the landing. The brakes were applied and the aircraft decelerated to 60 kts (CAS) about 1,800 m (5,900 ft) along the runway. Significant brake pressure was applied in the last section of the landing roll.

Flight data from a previous flight into Hobart was also examined. The flight had occurred the previous day, when the aircraft had landed on runway 30. The conditions on the day were dry with the data indicating a tailwind of about 3.5 kts. On that flight, the aircraft touched down at 590 m (1,900 ft) and the CAS had reduced to 60 kts at 1,980 m (6,500 ft) (Figure 1).

Pilot information

The PIC had about 5,000 hours on the Boeing 737 aircraft type. The copilot had completed line training 2 days prior to the incident. He had a total of around 3,500 hours, with about 150 hours on the aircraft type. He had flown into Hobart on runway 12 a few days prior to the incident on his check to line.

Hobart Airport

Hobart Airport consisted of one runway aligned 12/30, with a length of 2,251 m (7,385 ft). The runway was level, with a grooved surface.

The runway at Hobart was scheduled for a full resurfacing in 2012/2013. To lengthen the life of the runway it was resealed with a spray treatment called 'Liquid Road' in February 2010, to prevent the runway surface breaking up. Some sections of the runway had broken up and required patching, the patching was not grooved.

On 16 September 2010, another crew of the aircraft operator had reported to the airport operator that the runway was slippery and performed as if it was ice-affected. After the report, the runway condition was reviewed by an airport pavement engineer and found to be satisfactory. The engineer advised not to groove the patched sections, consisting of about 1.5 % of the runway surface.

On the day of the incident, the crew of another aircraft reported to ATC that the runway was slippery. However this report was not passed onto the crew of VUX.

After the incident, the runway and stopway area were inspected. While no damage was found it was noted that there was rubber build-up around the runway 30 touchdown area; runway patching in this area had not been re-grooved.

³ The stopway was rated to accommodate a Boeing 737.

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 incident.

Aircraft operator

As a result of this occurrence, the aircraft operator issued a flight crew operation notice (FCON), which informed flight crews of the incident and that in wet conditions, there had been less than the expected braking action reported at Hobart. Due to these reports, the FCON detailed modified wet runway takeoff and landing procedures for Hobart.

issued stating that the runway may be slippery when wet, based on pilot reports of aquaplaning in heavy rain. On 10 December, the NOTAM was modified to advise jet aircraft crew to maximise use of reverse thrust to mitigate potential aquaplaning. In addition, on 14 December 2010, the NOTAM was reissued stating that the runway was not grooved and the En-Route Supplement Australia entry for Hobart Airport was amended to state that the runway was ungrooved.

The operator also elected to remove the majority of the 'liquid road' on 8 m either side of the runway centreline. This was completed on 11 January 2011.

They have also brought forward a planned full resurfacing of the runway to November 2011.

Airport operator

As a result of the occurrence, the airport operator conducted a review of the runway condition. On 25 November 2010, a Notice to Airmen (NOTAM) was





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AO-2011-009: VH-VPH, Turbulence event

Date and time:	31 January 2011		
Location:	170 NM (315 km) N of Jakarta, Indonesia		
Occurrence category:	Incident		
Occurrence type:	Turbulence		
Aircraft registration:	VH-VPH		
Aircraft manufacturer and model:	Boeing 777-3ZGER		
Type of operation:	Air transport – high capacity		
Persons on board:	Crew – 14 Passengers – 361		
Injuries:	Crew – 6 (Minor) Passengers – 4 (Min		
Damage to aircraft:	Nil		

FACTUAL INFORMATION

On 31 January 2011 at 1426 Coordinated Universal Time¹, a Boeing Company Aircraft 777-3ZGER, registered VH-VPH, was 170 NM (315 km) north of Jakarta, Indonesia en-route from Phuket, Thailand to Melbourne, Victoria (Figure 1). On board the aircraft were 14 crew and 361 passengers.

Figure 1: VH-VPH Flight path



© GoogleEarth

During pre-flight planning, the flight crew examined the weather forecast and noted significant weather overhead Jakarta with occasional embedded cumulonimbus clouds. There was no other notable forecast weather en-route. The pilot in command (PIC) was operating as the 'Pilot Flying' and the copilot was operating as the 'Pilot Monitoring' for the sector.

The aircraft was established in the cruise at flight level (FL) 330² and was operating in stratiform³ cloud when they experienced a 20 second period of severe turbulence⁴ which caused the aircraft to descend 130 ft in 2 seconds, then climb 257 ft in 2 seconds followed by a another, less severe, descent and climb. The PIC immediately switched on the seatbelt sign and disengaged the autopilot to aid the recovery of the aircraft.

During the turbulence event the copilot made a public address announcement to the cabin crew and passengers instructing them to return to their seats immediately.

The cabin crew had almost completed the meal service when the turbulence occurred. A crew member in the business class section was injured when his head hit equipment in the galley. A number of other cabin crew members were unable to secure themselves during the turbulence event and received minor injuries from contact with the cabin ceiling, seats and floor. All cabin crew members managed to subsequently secure themselves by

- ³ Sheets of cloud in stable thin layers.
- ⁴ Turbulence is caused by the irregular movement of air, and often cannot be seen. Severe turbulence can influence large, abrupt changes in aircraft altitude/attitude, with large variation in indicated airspeed. Aircraft may be temporarily out of control.

¹ The 24 hour clock is used in this report to describe the Coordinated Universal Time (UTC) of day when particular events occurred.

² Flight level (FL) is a level of constant atmospheric pressure related to a datum of 1013.25 hectopascals, expressed in hundreds of feet. Therefore, FL 330 indicates 33,000 ft.

reaching their crew seat, holding on to a nearby **Figure 2:** fixture or sitting in a passenger seat.

Following the turbulence event, the copilot contacted the cabin crew and requested reports of injuries and damage. The cabin crew made an assessment of the aircraft and reported that four passengers and six cabin crew members had experienced from minor injuries and there was no damage to the aircraft. One crew member received a minor head injury and was relieved of duties and placed in the crew rest area to recover.

The flight crew contacted Jakarta air traffic control to report the incident and liaised with another aircraft in the vicinity about the occurrence.

The flight crew continued the flight to Melbourne and kept in regular communication with the cabin crew to ensure no further reports of injuries were received.

At Melbourne, the aircraft was met by paramedics and quarantine officers, due to a report of a sick passenger. Two cabin crew members consulted with paramedics, but no medical treatment was required.

Following the flight, the flight crew determined that it was likely the turbulence occurred due to rising air from the formation of a low-precipitation cloud below the aircraft's flight path. They suspected this because there was no significant precipitation in the area, the wind direction did not change and there was no indication of clear air turbulence conditions in the region.

Weather Radar

The aircraft was fitted with a Rockwell Collins WRT-2100 MultiScan[™] Threat Detection System weather radar. This system had an automatic function which used auto tilt and variable gain⁵ to optimise weather returns.

A dual-system control panel (Figure 2) was fitted to the aircraft to allow the PIC and the copilot to have independent control of mode, gain and tilt. The tan colour represented the PIC's controls and the blue area represented the copilot's controls.

e 2: Boeing split-function control areas of the weather radar panel



© Boeing Company Aircraft

The flight crew reported that the weather radar was set on the automatic function at the time of the turbulence event. The PIC recalled that he had his weather radar selected on auto gain and the copilot's weather radar was selected to a setting one higher in sensitivity than the auto setting, which provided a higher sensitivity on his display.

There was no indication of precipitation in the immediate vicinity. The crew observed some weather returns indicating areas of heavy precipitation on their weather radar to both the north and south of their flight path, although these were over 40 NM (74 km) away.

The operator stated that it is generally advocated that the automatic function remain selected throughout the flight, however manual mode is also acceptable to be used at the discretion of the flight crew. It is common practice for one crew member to adjust the gain on their display and the other to keep their display set on auto gain for a comparative result.

The operator stated that there was no evidence to suggest that different use of the weather radar would have detected significant weather that could have caused the turbulence.

Flight Data Recorder

The flight data recorder (FDR) and cockpit voice recorder (CVR) were sent to the Australian Transport Safety Bureau (ATSB) facilities in Canberra and downloaded for analysis. The quick access recorder (QAR) data was sent to the ATSB by the operator following the incident.

The FDR data showed a vertical acceleration range of between $0.01g^6$ and +1.55g for the 30 second

⁵ General term for increase in signal power in transmission.

⁶ g measures acceleration due to the earth's gravity. Vertical acceleration is referenced to zero as the

time frame surrounding the incident. The FDR also showed that in the initial stages of the event the aircraft's altitude decreased 130 ft in two second, then increased 256 ft in the following two seconds.

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 incident.

Aircraft Operator

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

Crew training

The operator is considering including details of this occurrence in flight crew and cabin crew training to improve general crew awareness on the practical aspects of turbulence management. Cabin crew training will also include the importance of cabin discipline particularly relating to the handling of cabin equipment in the event of unexpected turbulence. The effective actions of the cabin crew in this incident will be used to highlight that following standard operating procedures can reduce injuries and damage during turbulence events.

The operator is also considering changing a number of internal procedures to improve or standardise processes related to reporting injuries, providing support to crew in remote ports and assessing when crew are fit to return to duty.

SAFETY MESSAGE

The ATSB has issued a publication providing useful information on in-flight turbulence. The bulletin provides an explanation of common types of turbulence and offers advice on how to stay safe in the event of turbulence.

The Flight Safety Foundation also published a paper in 2001 outlining the risk of injury from turbulence to passengers and flight attendants. The paper also

looked at the methods for avoiding turbulence and mitigating the effects of turbulence.

Copies of both publications are available at the following websites:

- Staying Safe against In-flight Turbulence www.atsb.gov.au/publications/2008/ar200803 <u>4.aspx</u>
- Strategies Target Turbulence-related Injuries to Flight Attendants and Passengers www.flightsafety.org/ccs/ccs jan_feb01.pdf

reference point, contrary to 1 being the normal reference point for level flight.

AO-2011-026: VH-OQC, Engine oil loss

Date and time:	15 February 2011, 0333 UTC		
Location:	Near New Delhi International Airport, India		
Occurrence category:	Incident		
Occurrence type:	Engine oil loss		
Aircraft registration:	VH-OQC		
Aircraft manufacturer and model:	Airbus A380-842		
Type of operation:	Air transport -high capacity		
Persons on board:	Crew – 26 Passengers –230		
Injuries:	Crew – Nil Passengers – Nil		
Damage to aircraft:	Nil		

FACTUAL INFORMATION

On 15 February 2011, during a scheduled passenger service from Singapore to London, United Kingdom, the flight crew of an Airbus A380-842 aircraft, registered VH-OQC, observed a decrease in oil quantity on the number-4 engine. The aircraft was about 3 hours into the cruise near Delhi International Airport.

The number-4 engine's oil quantity continued decreasing slowly until, at about 7.5 hours into the cruise, 3.5 quarts was indicated and the oil pressure had dropped from 100 pounds/square inch (psi) to 75 psi. At that point, the flight crew sought advice from the operator, who recommended that the number-4 engine be reduced to idle thrust setting for the remainder of the flight.

That action resulted in the oil quantity stabilising and pressure settling around 45 psi. The flight then continued to its destination without further oil variation.

Upon arrival at the destination, only 0.7 quarts of oil remained. An inspection of the number-4 engine identified an oil leak as being from an external high pressure/intermediate pressure (HP/IP) oil tube at its connection to the engine case (Figure 1).

Figure 1: Leaking HP/IP oil tube



©Rolls Royce

A torque check of the tube revealed the attaching Bnut was at 80 pound force/inch (lbf/in). The correct torque value for the B nut was 240 lbf/in. The tube was replaced with no further leaks found.

Previous maintenance on HP/IP oil tube.

The investigation found that all of the engines fitted to the operator's fleet of A380 aircraft had recently been subject to a number of inspections as a result of an uncontained engine failure that occurred on another aircraft within the fleet. Those inspections included the removal of the HP/IP oil tube to provide access for an internal borescope inspection of the engine. Specific torque procedures for the reinstallation of the tube were required on completion of the borescope. A review of the operator's maintenance documentation, confirmed the correct installation procedure had been carried out. That inspection had been conducted on the number-4 engine 20 days prior to the leak developing. During the intervening period, the engine had completed 20 cycles (start up/shut down) and about 241 flight hours. There had not been any other maintenance carried out on the HP/IP tube within that period.

The investigation also determined that the oil leak was not an isolated event. The operator and another international A380 operator advised that a combined total of 7 HP/IP oil tube leaks were reported due to low torque of the attachment fitting. All of these incidents were following removal/installation of the oil tube to facilitate a borescope inspection.

SAFETY MESSAGE

As a result of the multiple events, the ATSB initiated an investigation, AO-2011-034, to conduct a holistic investigation into the factors surrounding these failures. The results of that investigation will be published on the ATSB website:

www.atsb.gov.au/publications/investigation_reports /2011/aair/ao-2011-034.aspx

AO-2010-091: VH-MVX, Depressurisation

Date and time:	5 November 2010, 0715 EDT		
Location:	39 NM (74 km) W of Dubbo Airport, New South Wales		
Occurrence category:	Serious incident		
Occurrence type:	Depressurisation		
Aircraft registration:	VH-MVX		
Aircraft manufacturer and model:	Hawker Bee	echcraft Corporation B200C	
Type of operation:	Aerial work		
Persons on board:	Crew - 1	Passengers – 1	
Injuries:	Crew – 0	Passengers – 0	
Damage to aircraft:	Nil		

FACTUAL INFORMATION

On 5 November 2010, at about 0715 Eastern Daylight-saving Time¹, a Hawker Beechcraft Corporation B200C aircraft registered VH-MVX (MVX) departed Dubbo, New South Wales on a positioning flight for a charter medical service from Cobar, New South Wales. On board the aircraft were the pilot and a flight nurse. The pilot stated that he was suffering from hay fever with sleep loss at the time, but believed this would be construed as insufficient grounds to cancel the scheduled flight operation. It was the pilot's first flight after two rostered days off.

On entering the cockpit, the pilot checked that the three-position (Dump/Pressure/Test) cabin pressure control switch (Figure 1) was in the central position for cabin pressurisation. This was a mandated check introduced by the operator after a recent cabin pressurisation event in MVX (See previous pressurisation event in MVX section below). Before departure, the pilot had set the aircraft altitude on the pressurisation controller for a cabin altitude² of

3,000 ft at flight level (FL) of 200^3 . The pilot checked the pressurisation differential at FL015 and found no problems.





Image courtesy of the operator.

While climbing through FL100, the pilot noticed the cabin altitude was about 5,000 ft as opposed to 3000 ft with the pressurisation set to FL200. He noted this as a lag in pressurisation and rechecked

¹ The 24-hour clock used in this report to describe the local time of day, Eastern Daylight-saving Time s particular events occurred. Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

² Cabin air pressure is measured by reference to atmospheric pressure at a given height above the ground.

³ Flight Level (FL) is a level of constant atmospheric pressure related to a datum Of 1013.25 hectopascals, expressed in hundreds of feet. Therefore FL180 indicates 18,000ft.

the pressurisation panel. His only adjustment was to turn the pressurisation rate control knob to change the pressurisation rate, as he felt this may have something to do with the pressure fluctuation. He had previously experienced pressure fluctuations of up to 2,000 ft on this aircraft type, so thought this was one of those occasions. He then continued to climb to the cruise height of FL180.

After levelling the aircraft at FL180, the pilot checked the cockpit instruments and switches. When the pilot deselected the propeller auto feather, a master caution light and the altitude warning light illuminated. The pilot then noticed that the cabin altitude was approaching 10,000 ft. As a result, he notified the nurse that they were losing cabin pressure and that he was going to descend.

The pilot checked the pressurisation panel again and decided to momentarily move the pressurisation control switch to the test position. He did this to ensure that the switch had not inadvertently moved to the dump position. At the same time, the pilot noticed a rapid rise in cabin altitude to 17,000 ft as the aircraft depressurised. The oxygen masks deployed and the pilot instructed the flight nurse to don her oxygen mask. The pilot then transmitted a PAN⁴, announced an emergency descent and his intentions to return to Dubbo.

Although aware of the altitude warning light illumination and cabin depressurisation, the pilot did not don his oxygen mask, despite this being the first action listed in the pressurisation loss alternate warning emergency procedure in the aircraft pilot operating handbooks (POH). He only donned his oxygen mask after numerous prompts from the flight nurse. By this time, the pilot reported that he had become hypoxic⁵ and found it difficult to detach the mask from its mount. After a few deep breaths of oxygen, the pilot realised he had not completed the full emergency descent procedure, as he had not deployed the landing gear. At about 14,000 ft, the pilot slowed the aircraft descent rate and consulted the POH for the depressurisation procedure.

⁴ Radio broadcast indicating uncertainty or alert.

During the rapid descent, the flight nurse advised that there appeared to be smoke in the cabin. The pilot saw an isolated haze at the rear of the cabin which quickly dissipated. At 10,000 ft, the pilot contacted ATC. When asked if he needed emergency services, he advised that they had smoke in the cabin. The pilot then continued a normal descent and landed at Dubbo at about 0745.

Pilot comments

After the event, the pilot stated that it was likely he became hypoxic before he had levelled the aircraft out at 18,000 ft. He felt that this was brought on earlier than expected, from the effects of hay fever and loss of sleep. He also felt in retrospect, that given past pressurisation events with the aircraft, he should have monitored the pressurisation system more closely or, even returned to Dubbo when the cabin pressure reached 5,000 ft.

Post-flight engineering action

A replacement controller and cabin pressurisation switch were fitted to the aircraft. Satisfactory pressurisation tests and a verification flight were conducted and the aircraft returned to service.

The pressurisation controller was forwarded to the equipment manufacturer for examination. The unit was found to be out of tolerance, a condition that would affect the responsiveness of the rate of cabin pressure change. The cabin pressurisation switch from the aircraft was also tested and found serviceable. No defect was found that would have contributed to the rapid depressurisation.

Previous pressurisation event in MVX

On 15 October 2010, the aircraft failed to pressurise. A test showed that actuation of the Dump/Pressure/Test switch had considerable lag of the preset and safety solenoids. Action taken to resolve this was to conduct multiple activations of the switch which rapidly improved the response of the solenoids. The aircraft was then tested as airworthy.

⁵ When the body is deprived of adequate oxygen supply, a person's critical judgement and reasoning is affected, resulting in confusion and decreased muscular coordination. These initial symptoms can occur when breathing air at a cabin altitude between FL 150 to FL 200.

Operator comments

In response to this investigation, the aircraft operator advised that it had an operations manual requirement that stated:

No pilot shall operate or prepare to operate an [operator] aircraft if he/she is not physically or mentally fit for the task

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 incident.

Operator

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

- All pilots to be given a cabin depressurisation exercise requiring an emergency descent as part of their next proficiency check.
- This incident will be raised as an article in the operator's next flight safety newsletter to increase awareness to all pilots.

SAFETY MESSAGE

This incident is a timely reminder to all pilots of the importance of correctly assessing their medical fitness for the safe completion of flight operations. With this in mind, any risk assessment prior to flight, is to be based on the worst case scenario. Dr David Newman in an article for the Civil Aviation Safety Authority's (CASA) Flight Safety Australia magazine discusses methods pilot's can use to determine their fitness to fly. He suggests a useful method is the "I'M SAFE" checklist, which stands for illness, medication, stress, alcohol, fatigue and eating. The complete article is available at:

www.casa.gov.au/wcmswr/_assets/main/fsa/1999 /nov/fsa32-34.pdf.

The Australian Transport Safety Bureau (ATSB) has published research into aircraft depressurisation accidents and incidents between 1 January 1975 and 31 March 2006. The study found that, in

general, there is a high chance of surviving a pressurisation system failure, provided that the failure is recognised and the corresponding emergency procedures are carried out expeditiously. Aircrew should maintain a high level of vigilance with respect to the potential hazards of cabin pressurisation system failure. Further information on this research report can be found at: http://www.atsb.gov.au/publications/2006/b2006 0142.aspx

In response to a previous ATSB safety recommendation, R20000288 issued 17 December 2000, in relation to the installation of audible alerting systems in the event of a cabin pressurisation event (see ATSB report A0-2009-044 once publically released), the Civil Aviation Safety Authority (CASA) circulated a two page letter to owners and operators of aircraft affected, advising them, in part of the following proposed action:

Due to continued occurrences of depressurisation events in single pilot turbine powered aircraft, CASA is now considering mandating the fitment of aural cabin pressure warning systems to all single pilot, turbine powered, pressurised aircraft.

CASA had requested responses to their proposal by Friday 19 November 2010, for their consideration.

ATSB recommendation R20000288 issued 17 December 2000 can be found at:

http://www.atsb.gov.au/publications/recommen dations/2000/r20000288.aspx

AO-2010-094: VH-MKK, Total power loss

Date and time:	14 November 2010, 1100 CST		
Location:	12 NM (22 km) SE of Marree, South Australia		
Occurrence category:	Accident		
Occurrence type:	Total power loss		
Aircraft registration:	VH-MKK		
Aircraft manufacturer and model:	Piper Aircraft Corporation PA-31-350		
Type of operation:	Charter – passenger		
Persons on board:	Crew - 1	Passengers – 7	
Injuries:	Crew – Nil	Passengers – 1 (Minor), 6 (Nil)	
Damage to aircraft:	Serious		

FACTUAL INFORMATION

On 14 November 2010, a Piper PA-31-350 aircraft registered VH-MKK (MKK), was being operated on a passenger charter flight from Marree, South Australia to Broken Hill, New South Wales. On board were the pilot and seven passengers.

Climbing through 2,500 ft, the pilot noticed an unusual ticking noise in the right engine and elected to return to Marree. During the turn back, the right engine performance decreased, however the pilot assessed that the engine was still producing power.

The aircraft lost height during the turn back and was between 1,500 ft and 2,000 ft above ground level (AGL) on completion of the turn. The pilot believed that the power in the right engine gradually reduced, and noted that, despite maintaining the best single engine rate of climb speed, the aircraft continued to descend at approximately 500 feet per minute. The pilot determined that the aircraft could not reach Marree aerodrome and elected to conduct a forced landing.

Due to the forced landing, the right main landing gear was sheared off and the right wing, right propeller and tailplane were damaged. All of the passengers were able to exit the aircraft through the main exits. One passenger received a slight cut to the head, but the remaining passengers and pilot were not injured (Figure 1).

The pilot activated the emergency beacon which was detected by AusSAR¹ and an emergency response effort was initiated.

The aircraft had sufficient fuel for the flight and was operated within the weight and balance limitations of the aircraft. The weather was CAVOK² with a temperature of approximately 25° Celsius.

Figure 1: Accident site



Photograph courtesy of the South Australian Police Force

- ¹ Australian Search and Rescue operates a 24-hour rescue coordination centre and is responsible for the national coordination of aviation search and rescue.
- ² Ceiling and visibility OK for Visual Flight Rules conditions including no clouds below 5,000 feet, visibility at least 10 km and no current or forecast significant weather.

Aircraft performance

The pilot reported that following the reduction in engine performance he selected full propeller pitch and full thrust. Despite maintaining the best single engine rate of climb speed, the aircraft continued to descend at approximately 500 feet per minute.

As the pilot thought that the right engine was still producing power he did not feather³ the right propeller. Following the event, the pilot believed that the right engine gradually failed, however this wasn't noticed and actioned due to the high workload in the cockpit and uncertainty surrounding the engine indications for a windmilling⁴ propeller. The unfeathered propeller significantly reduced the aircraft's single-engine performance.

Engine information

Aircraft maintenance

Two days prior to the incident, the pilot detected a magneto problem in the right engine during preflight engine checks. A third party maintenance provider replaced the magneto. The pilot repeated the pre-flight engine checks and determined that the engine was operating within normal limits.

The aircraft had flown for 4 hours following the magneto change before experiencing the right engine failure. All engine performance indications were normal from the time of the magneto being replaced to the time of the engine failure.

Before the incident flight, the pilot conducted routine engine checks as a part of the pre-flight inspection and reported that the magnetos were performing within normal limitations. During the preflight aircraft walk around inspection, oil was noticed around the right engine and cowling vents. The pilot assumed that the oil was left on the engine when maintenance work was carried out on the magnetos two days prior.

The engine performance was again checked during the takeoff, with both engines operating within normal limits.

Engine failure

The pilot detected an unusual ticking noise in the right engine while passing through 2500 ft on climb. The exhaust gas temperature (EGT) gauge showed an increase in temperature, however after lowering the nose and reducing the thrust, the EGT began to reduce.

After commencing the turn back to Marree the engine performance gradually reduced and a decrease in EGT was noted, as well as a reduction in manifold pressure and engine revolutions per minute (RPM). The engine instruments and fuel pressure and fuel flow gauges were still indicating some performance, so the pilot assessed that the engine was still producing some power. The pilot could not recall any significant yawing motion with the reduction in engine performance.

Following the initial degradation in engine performance, the pilot did not recheck the engine indications, as he was concentrating on maintaining a safe speed and conducting a forced landing.

Engine examination

Following the accident, the Civil Aviation Safety Authority (CASA) supervised an engine examination. The examination found four bearing retainer plate screws missing from the right engine magneto. This had allowed oil to enter the magneto through the empty screw holes. The presence of oil in the magneto degraded the magneto performance, and damage was observed to the magneto internal components which lead to the subsequent engine failure.

The bearing retainer plate within the magneto was last checked during a 500 hourly inspection conducted by the maintenance organisation. The magneto had not been used since that inspection. prior to being installed on the aircraft two days before the accident

Forced landing

The pilot determined that the aircraft was unable to reach Marree and elected to conduct a forced landing.

The pilot selected an open area directly ahead of the aircraft avoiding areas of rough terrain and a small hill. From the air, the selected area looked sandy, however during the landing the pilot found the area was clay and described it as "boggy".

³ An angular setting giving zero windmilling torque for the stopped propeller and therefore minimum drag.

⁴ Windmilling is the term used to describe a propeller that is driven by the airflow passing through it.

During the flare phase of the landing, the pilot discussed the symptoms of a windmilling propeller closed both throttles and the mixture levers. On touchdown, the right main landing gear sheared off and the right wing, right propeller and tailplane were damaged (Figure 2).

Figure 2: Damaged landing gear



Photograph courtesy of the South Australian Police Force

Flight training

The pilot completed his PA-31-350 Chieftain endorsement in 2010. During the endorsement, he conducted asymmetric training, but engine failures were only simulated during the take off phase. This training was conducted in a Chieftain used by his current employer. The pilot recalled that during his training, with two people on board and 20kg of ballast, the aircraft would climb at approximately 200 feet per minute on a single engine with the failed engine feathered.

Since commencing flying with his current employer, he had not completed any further asymmetric 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 incident.

Aircraft Operator

Training

The operator conducted a brief with all company pilots revising engine failure procedures. They also

and partial engine failure indications and procedures.

The operator has introduced a check and training exercise that includes an engine failure on takeoff and a slowly induced engine failure in the circling area. This sequence will be included in the 6monthly check flight as well as during initial training flights.

The operator has also recently obtained a simulator and will conduct a variety of simulated engine failure exercises with line pilots at 6 monthly intervals.

The operator has also amended their procedures to mandate that all IFR renewal flights are to be conducted in the Piper PA-31 (Chieftain).

Maintenance Organisation

All magnetos used or stored by the maintenance organisation have had the bearing plate screws inspected. They were found to be fitted in accordance with the manufacturer's maintenance manual.

SAFETY MESSAGE

The failure to identify and manage an engine failure has been cited in numerous multi-engine aircraft incidents and accidents. It is important that gradual engine failures in all stages of flight are demonstrated and practiced during multi engine asymmetric training

It is also important to note that a windmilling propeller drives the engine and will produce abovezero readings on the engine performance gauges even though it is not producing any power.

Following the engine failure, the pilot focussed on flying the aircraft at a safe speed despite being unable to maintain altitude. The decision to make a controlled forced landing rather than persist in attempting to reach the aerodrome resulted in a safe outcome.

The following CASA article provides useful information on multi-engine aircraft performance with one engine inoperative and a windmilling propeller.

Windmilling warning (2005) Flight Safety • Australia, May-June

http://www.casa.gov.au/wcmswr/_assets/main/ fsa/2005/jun/32-33.pdf

AO-2010-100: VH-SDA and VH-VFG, Aircraft separation event

Date and time:	25 November 2010, 1527 EDT		
Location:	Port Macquarie Airport, New South Wales		
Occurrence category:	Incident		
Occurrence type:	Aircraft separation event		
Aircraft registration:	VH-SDA and VH-VFG		
Aircraft manufacturer and model:	VH-SDA:	De Havilland Canada DHC-8-20	
	VH-VFG:	Beech Aire	craft Corporation 58
Type of operation:	VH-SDA:	Air transp	ort – low capacity
	VH-VFG:	Charter - ferry	
Persons on board:	VH-SDA:	Crew – 3	Passengers – 36
	VH-VFG:	Crew - 2	Passengers - 1
Injuries:	Crew - Nil	Passer	ngers – Nil
Damage to aircraft:	Nil		

FACTUAL INFORMATION

Sequence of events

De Havilland Canada DHC-8-202, VH-SDA

On 25 November 2010, a De Havilland Canada DHC-8-202 aircraft, registered VH-SDA (SDA), departed Sydney, New South Wales on a scheduled return passenger service to Port Macquarie, under instrument flight rules (IFR). The pilot in command (PIC) was designated as the pilot flying for the return flight.

After arriving at Port Macquarie, the passengers disembarked and the crew prepared for the return flight to Sydney. The copilot listened to the aerodrome weather information service (AWIS)¹ broadcast on the aircraft's very high frequency (VHF) 2² radio and then monitored the company frequency. When the passengers commenced boarding, the VHF 2 radio was transferred to the Port Macquarie common traffic advisory frequency

(CTAF) of 118.1 MHz. The crew monitored the Brisbane Centre frequency on the VHF 1 radio.

After engine start, the copilot broadcast a taxi call on the Brisbane Centre frequency and was issued a discrete transponder code by air traffic control (ATC). The PIC recalled being advised of an inbound IFR aircraft, which was on descent from 10,000 ft³. The PIC reported that they noted the traffic and determined that there would be no conflict during the takeoff.

Prior to the copilot making a broadcast on the CTAF, the PIC verified the frequency selection on the VHF 2 radio in accordance with the operator's procedures. While the PIC recalled only partially sighting the frequency of '118', he believed it had been set correctly. The copilot reported broadcasting a taxi call on the CTAF.

The aircraft was taxied to the runway. Prior to entering runway 03/21, the crew conducted a visual scan for traffic; with no aircraft sighted in the circuit or on approach. The copilot reported broadcasting a call on the CTAF advising that they were entering

¹ The aerodrome weather information service (AWIS) provides actual weather conditions, via telephone or radio broadcast, from Bureau of Meteorology automatic weather stations.

² The aircraft was equipped with two VHF communication systems (VHF 1 and VHF 2).

³ A review of the Brisbane Centre frequency transmissions indicated that the crew of SDA were advised of an inbound IFR Piper Warrior aircraft, about 46 NM (85 km) to the south-west of Port Macquarie, on descent from 10,000 ft.

and backtracking on runway 03. The crew stated at Port Macquarie that no broadcasts were heard on the CTAF in frequency. response nor did they recall receiving a 'beep back' from the aerodrome frequency response unit (AFRU).⁴

While backtracking, the crew continued to maintain a lookout for traffic. At that time, no aircraft were observed, either visually, or on the aircraft's traffic alert and collision avoidance system (TCAS).

The aircraft was then lined up on runway 03 for takeoff.

Beech Aircraft Corporation 58, VH-VFG

At about 1400 Eastern Daylight-saving Time⁵, a Beech Aircraft Corporation 58 aircraft, registered VH-VFG (VFG), departed Bankstown, New South Wales with two pilots and a flight nurse on board. The aircraft was returning to Port Macquarie after having completed a medical patient transfer flight to Bankstown. The PIC was designated as the pilot flying, while the copilot operated the radio. The flight was to be conducted under IFR, but due to ATC delays with obtaining the appropriate clearance and the visual meteorological conditions forecast, the flight was downgraded to visual flight rules (VFR) prior to departing Bankstown.

While inbound to Port Macquarie, the PIC reported that the copilot made a number of inbound broadcasts on the CTAF, including a 20 NM (37 km) call advising that they were maintaining 1,500 ft; and a 10 NM (19 km) call advising of their intention to conduct a straight in approach on runway 03.

When about 5 NM (9 km) to the south of the airport, the PIC heard the crew of SDA broadcast a taxi call

at Port Macquarie on the Brisbane Centre frequency.

Soon after, the crew of VFG observed SDA at the holding point for runway 21. The PIC reported that they had not heard any broadcasts from SDA on the CTAF.

Once established on final for runway 03, SDA was observed to enter the runway and back track. The copilot of VFG attempted to establish contact with the crew of SDA on the CTAF, but received no response. The crew of VFG continued the approach.

The incident

After lining up on runway 03 and while conducting the pre-takeoff checks, the PIC of SDA observed a 'proximate traffic' return on the TCAS indicating that an aircraft was behind them, about 400 ft above and descending. As a precaution, the PIC elected to expedite the takeoff.

At the same time, the crew of VFG had observed SDA commence the take-off roll. In response, at about 300 ft, the PIC initiated a go-around. The PIC positioned the aircraft to the right of the runway centreline to maintain visual separation from SDA.

Immediately after takeoff, the PIC of SDA checked the TCAS display, which indicated that VFG was within 2 NM (4 km), 400 ft above and behind, and climbing. The PIC expressed his concern to the copilot, who was attempting to sight and make radio contact with VFG on the CTAF. The TCAS also appeared to show that VFG was overtaking SDA.

The PIC of SDA reported that the aircraft was climbed to 600 ft, where he called for the after takeoff drills to be conducted. The copilot stated that he did not hear this call from the PIC. At the time, the copilot was still attempting to sight and establish communications with VFG.

The TCAS was now indicating that VFG was about 100 ft above SDA and climbing. In order to maintain separation between the two aircraft, the PIC of SDA discontinued the aircraft's climb at about 650-670 ft and turned left onto a westerly heading. The PIC reported that once clear of any conflict a climb to 800 ft was conducted.

Shortly after, the PIC of SDA reviewed the aircraft's configuration and observed that the flaps were at the 'flap 5' position and the airspeed had increased to about 167 kts, exceeding the maximum flap

⁴ AFRU: A facility installed at certain non-towered aerodromes that provides an automatic response to pilots when transmitting on the CTAF. The AFRU indicates to the pilot that the correct radio frequency has been selected and confirms the operation of the aircraft's transmitted and receiver, and volume setting. The pilot will receive either a voice identification, for example 'Port Macquarie CTAF', or a 300 millisecond tone or 'beep'.

⁵ The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time, as particular events occurred. Eastern Daylight- saving Time was Coordinated Universal Time (UTC) + 11 hours.

extension speed by 19 kts. The copilot reported that inspection determined that there was no damage as he observed the PIC place his hand on the flap lever. The copilot asked the PIC if he wanted to conduct the after take-off drills, at which time the PIC reportedly advised that they were above the maximum extension speed. The aircraft's speed was reduced to 148 kts and the flaps were retracted. The aircraft was turned onto a wide downwind.

Neither the PIC nor the copilot of SDA sighted VFG throughout the incident.

The crew of VFG continued on the upwind leg, maintaining 1,000 ft, and observed SDA turn to the left. While maintaining visual separation with SDA, VFG was turned onto crosswind, with more than 1 NM (2 km) separation between the aircraft. The aircraft was then turned onto downwind, where separation increased to more than 1.6 NM (3 km).

The PIC of VFG reported that they attempted to contact SDA on the CTAF, but received no response. They then attempted to contact SDA on the Brisbane Centre frequency.

The copilot of SDA reported hearing the broadcast from VFG on the Brisbane Centre frequency. The copilot then attempted to contact the pilot of VFG on the CTAF, but received no response. Shortly after, the two crews commenced communications on the Brisbane Centre frequency.

During those communications, the pilot of VFG advised that he had made numerous calls on the CTAF in attempt to contact SDA, but received no response. The crew of SDA were confident that they had made the required broadcasts, but stated that they had not received any responses to their broadcasts on the CTAF.

After conversing with the pilot of VFG, SDA departed for Sydney and VFG landed at Port Macquarie, without further incident.

The operator of SDA reported that the incident was observed by a witness at the airport who believed the aircraft were not in close proximity and that a lateral separation of at least 1 NM (2 km) was maintained between the aircraft.

On approach to Sydney, the crew contacted the operator's maintenance personnel using the VHF 2 radio to advise that they had experienced a flap overspeed. The PIC reported that they had some initial difficulties, but contact was established, with the reception considered 'scratchy'. A post flight

a result of the flap overspeed.

Communications

CTAF recordings

The crew of SDA reported that they did not hear any broadcasts from other aircraft on the CTAF nor did they recall receiving any 'beep backs'.

The Australian Transport Safety Bureau (ATSB) examined recordings of the transmissions broadcast on the Port Macquarie CTAF. That examination revealed that when inbound to Port Macquarie, a number of transmissions were made by the crew of SDA. However, after broadcasting that they were clear of the runway after landing, no further transmissions from SDA were recorded on the CTAF.

The CTAF recordings also revealed that a number of broadcasts were made by the crew of VFG. these included:

- inbound transmissions at 20 NM (37 km) and 9 NM (17 km)
- an attempt to contact SDA at 6 NM (11km), stating their position and intentions
- two further attempts to contact SDA
- a transmission advising that they were on a 2¹/₂ NM (5 km) final for runway 03 and that they had no communications with SDA positioned on the runway
- ٠ the crew advising that they were conducting a go-around and attempted to contact SDA
- the crew attempting to contact SDA and advise that they had backtracked in front of VFG when they were on final for runway 03 and that were in a go-around.

Recorded data

An analysis of SDA's flight data recorder (FDR) by the operator showed that the push-to-talk button for the VHF 2 radio was pressed several times during taxi and after becoming airborne at Port Macquarie.

Radio serviceability

The PIC reported that both VHF radios in SDA were functional, but 'weak and scratchy'. The crew also stated that they had used the VHF 2 radio when

inbound to Port Macquarie and on descent into Aircraft operator of VH-SDA Sydney.

The VHF 2 radio was later inspected by maintenance personnel where the antenna was removed, the base was cleaned, and a new gasket installed. Testing of the VHF 2 transceiver found it to be faulty and it was subsequently replaced.

Radio frequency selection

The copilot of SDA reported that he may have mistuned the CTAF of 118.1 MHz on the VHF 2 radio when on the ground at Port Macquarie. The PIC recalled partially sighting the frequency of '118' prior to taxiing, but also recalled observing '118.1' at about the same time the flap overspeed was noticed.

Traffic information service

When operating at a non-towered aerodrome⁶, the following traffic information service is provided by ATC to IFR operated aircraft⁷:

- an IFR flight reporting taxiing or airborne will be advised of conflicting IFR traffic that is not on the CTAF
- an IFR flight inbound will be advised of conflicting IFR traffic, but when the pilot reports changing to the CTAF, the provision of traffic information is ceased.

SAFETY ACTION

Whether or not the ATSB identifies safety issues in relevant the course of an investigation, 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 incident.

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

Safety alert

The operator issued a safety alert reminding pilots of the requirements regarding the confirmation and verification of frequency selection; the importance of maintaining a listening watch on the CTAF during ground operations; and emphasising the use of the AFRU 'beep back' system.

CTAF procedural review

The operator intends to conduct a systematic and procedural review of the organisation's CTAF operating procedures, particular, in the requirements regarding the use of the VHF 2 radio for monitoring both the CTAF and company frequency.

Aircraft operator of VH-VFG

The operator conducted an investigation into the incident and made a number of recommendations, which will be communicated to the organisation's pilots at the next staff training meeting. These included:

- when operating at non-towered aerodromes that are equipped with an AFRU, pilots could conduct a radio serviceability check by utilising the 'beep back' function⁸
- where possible, flights are to be conducted under IFR to utilise the traffic information services provided by ATC
- if communications cannot be made with an observed or known aircraft, an attempt to establish contact on another frequency, such as the area frequency, may be conducted.

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

Aeronautical Information Publication GEN 3.3 paragraph 2.15.

⁸ In addition to receiving a voice identification or 'beep back' after broadcasting on the CTAF, pilots are able to activate the AFRU by conducting a series of three microphone clicks within a period of 5 seconds. This would result in the AFRU transmitting a voice identification for that particular aerodrome.

AO-2010-102: VH-VFG, VH-SBA, Breakdown of separation

Date and time:	1 December 2010, 1412 EDT		
Location:	Near Taree Airport, New South Wales		
Occurrence category:	Incident		
Occurrence type:	Breakdown of separation		
Aircraft registration:	VH-VFG and VH-SBA		
Aircraft manufacturer and model:	VH-VFG: Beech Aircraft Corporation BE58 VH-SBA: SAAB Aircraft Company S340B		
Type of operation:	VH-VFG: Private VH-SBA: Air transport – Iow	capacity	
Persons on board:	VH-VFG: Crew - 1 VH-SBA: Crew – 3	Passengers – Unknown Passengers – 21	
Injuries:	Crew – Nil Passengers –	Nil	
Damage to aircraft:	Nil		

FACTUAL INFORMATION

On 1 December 2010, a Beech Aircraft Corporation Barron BE58 (BE58) aircraft, registered VH-VFG, was conducting a private flight, under instrument flight rules (IFR), from Bankstown to Port Macquarie, New South Wales (NSW). At about 1406 Eastern Daylight-saving Time¹ the aircraft was tracking on air route W106 from NICLA² to Port Macquarie, at 9,000 ft above mean sea level (AMSL). The BE58 was in Class E airspace, under radar surveillance and subject to an air traffic control (ATC) control service.

At 1406, a SAAB Aircraft Company S340B (S340) aircraft, registered VH-SBA, departed Taree, NSW, on a scheduled passenger service to Sydney, NSW, under the IFR. Taree Airport was located in Class G airspace and aircraft were not subject to an ATC control service. The overlying Class E airspace commenced at 8,500 ft and aircraft operating under IFR required an ATC clearance to enter.

At 1409, the crew of the S340 contacted the en route air traffic controller. They advised the

² NICLA was an IFR waypoint

controller of their departure from Taree, and that they were climbing to flight level $(FL)^3$ 140 via air route W608, with an estimated arrival time at SORTI⁴ of 1419 (Figure 1).





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The controller identified the S340 on radar and enquired if the aircraft could reach an altitude of 10,000 ft above mean sea level (AMSL) by 10 NM (18.52 km) to the west of Taree. This position was about 2.5 NM (4.6 km) east of the crossing track of the BE58, who was at an altitude of 9,000 ft. At that time, the BE58 was about 20.6 NM (38.2 km) westsouth-west of Taree, tracking towards Port Macquarie (Figure 2).

4 SORTI was an IFR waypoint

¹ The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time (EDT), as particular events occurred. Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

³ Flight level (FL) is a level of constant atmospheric pressure related to a datum of 1013.25 hectopascals, expressed in hundreds of feet. Therefore, FL140 indicates 14,000 ft.

The flight crew of the S340 advised that they would try to meet the height requirement. The controller then issued the S340 with a clearance to enter controlled airspace via position SORTI, on climb to FL120.

Figure 2: Positions of aircraft at 1410



© Airservices Australia

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

At 1410, the pilot of the BE58 contacted the controller to request a clearance to commence descent into Port Macquarie. The controller instructed the pilot to leave controlled airspace descending and that there was no IFR traffic. In addition, they advised the pilot that the air traffic control service would terminate passing through 8,500 ft, which was the base of the Class E airspace. After the incident, the controller reported that he had anticipated that any potential confliction would now occur in Class G airspace and if necessary, had planned to provide traffic information.

At 1411, the S340 was climbing through 7,200 ft, in Class G airspace. The controller instructed the flight crew of the S340 to turn left 20°. The reason for this instruction was to maintain separation with the BE58. The flight crew of the S340 reported an aircraft heading of 250° . This heading was 15° left of the original track (Figure 3).





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

At 1413, the radar indicated that the lateral separation between the BE58 and the S340 reduced to less than 5 NM (9.3 km), and that the altitudes of the aircraft were 8,700 ft and 9,600 ft respectively (Figure 4). At this point, a breakdown of separation had occurred, as the required separation was either 1,000 ft vertical separation or a distance of 5 NM (9.3 km) between the aircraft on radar. The distance between the aircraft continued to reduce to 3.6 NM (6.7 km).





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

At 1413, the S340 was 8.8 NM (16.3 km) from Taree and the flight crew informed the controller that they were climbing through 10,000 ft. At this point, the separation standard was no longer infringed, as there was greater than 1,000 ft vertical separation between the two aircraft.

The aircraft continued to their destinations without further incident.

Air traffic control

The radar display data indicated that the pilot of the BE58 commenced a slow rate of descent within one minute of the controller having issued the clearance. When the controller assigned descent to the pilot of the BE58, he had anticipated that the rate of descent of the aircraft would be greater than that at which the aircraft actually descended. After the occurrence, the controller reported that he had expected the S340 to climb above the descending BE58 without incident.

The controller also reported that he did not issue the aircraft involved with a safety alert, when the separation reduced to less than 5 NM (9.3 km), as the BE58 was north of the crossing track and the displayed altitudes indicated that the descending BE58 was below the climbing S340.

Air traffic control is required to separate aircraft operating under IFR in Class E airspace from other IFR aircraft. Air traffic control is required to issue traffic information about other IFR aircraft to IFR aircraft operating in Class G airspace but not to provide separation.

Though the flight crew of the S340 were in receipt of an ATC clearance to enter Class E airspace, at the time the controller issued them a heading instruction, the aircraft was still in Class G airspace. The flight crew were not provided traffic information on the crossing BE58 which had been cleared by ATC to descend.

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 incident.

Airservices Australia

Airservices Australia (Airservices) has advised that they are conducting a systemic review of a number of Breakdown of Separation (BoS) occurrences, with a specific focus on the BoS that have occurred in the en-route environment. Outcomes from that review will be considered in terms of further safety improvement.

As a short term safety intervention, Airservices will be conducting an awareness program for Air Traffic Controllers following the publication of this report.

SAFETY MESSAGE

Neither the BE58 nor the S340 received traffic information on the other aircraft when in close proximity. When a breakdown of separation occurs, air traffic control are required to provide the aircraft involved with a safety alert, which includes traffic information about the proximity of the other aircraft, its tracking and altitude. The provision of timely and appropriate traffic information to flight crew, by air traffic control, can significantly enhance pilots' situational awareness.

This incident also highlights the importance for air traffic controllers of continually monitoring and reassessing their separation plans and implement required changes to assure that separation standards are maintained.

AO-2011-006: VH-KPY, Wirestrike

Date and time:	20 January 2011, 1300 EST		
Location:	31 km SE of Bingara (ALA), New South Wales		
Occurrence category:	Accident		
Occurrence type:	Wirestrike		
Aircraft registration:	VH – KPY		
Aircraft manufacturer and model:	Pacific Aerospace Corporation Cresco 08-600		
Type of operation:	Aerial Work		
Persons on board:	Crew - 1	Passengers – Nil	
Injuries:	Crew – Nil	Passengers – Nil	
Damage to aircraft:	Serious		

FACTUAL INFORMATION

On 20 January 2011 at 1200 Eastern Daylightsaving Time,¹ a Pacific Aerospace Corporation Cresco 08-600 aircraft, registered VH-KPY (KPY), departed Inverell, New South Wales. The pilot was conducting a low-level survey flight to the south-west of Inverell in the vicinity of Bingara, New South Wales.

The survey flight involved flying an east-west grid pattern with lines about 60 km long and 100 m apart. The aircraft was established about 15 km into the fourth survey line, heading in an easterly direction at 130 ft when it struck a powerline. The powerline was positioned between two hilltops covering a span of about 1,000 m. The pilot saw the powerline at the same time at he felt the impact. He was not aware of the powerline prior to the collision.

Following the impact, the pilot reported significant shuddering and vibration through the airframe. He noticed a 30 cm hole in the upper surface of the right wing and observed fuel venting overboard. The pilot found that KPY was sluggish in response to control inputs, so he elected to conduct a forced landing.

During the approach and landing, the pilot reported that KPY had limited elevator control and he needed

full back elevator pressure to arrest the rate of descent. After touching down in the field, the aircraft collided with a hay bale (Figure 1).

Figure 1: Accident Site



Photograph courtesy of the operator

The pilot was able to exit the aircraft and a farmer working in the field was quickly at the site and able to assist the pilot. The pilot was uninjured.

Flight planning

Prior to deployment to the survey site, the survey grid was plotted over topographical maps and Google Earth images to gain an appreciation of the terrain and potential hazards. The powerlines were not marked or identified during this assessment.

Before commencing the survey task, the pilot conducted a reconnaissance flight of the area to observe any hazards. The powerlines were not identified during this flight or on any subsequent

¹ The 24 hour clock is used in this report to describe local time of day, Australian Eastern Daylight-saving Time, as particular events occurred. Australian Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

survey flights by the pilot or by another pilot who Aircraft Operator was also conducting the survey flights.

Powerline information

Following the accident, the pilot returned to the collision site and identified the location where the aircraft had struck the powerlines.

The pilot identified two thin wires strung 2-3 m apart. One powerline was broken and a small scrub fire had started as a result of the severed powerline.

He noted that the powerlines were strung between two hilltops about 1,000 m apart at a height of 130 ft. The power poles were difficult to identify and were camouflaged by the surrounding trees. The powerlines did not have any powerline markers to help identify them, nor were they required to under the relevant Australian Standard.

Aircraft Damage

The aircraft sustained serious damage during the collision with the wire and the subsequent forced landing. Wirestrike protection system equipment was fitted to the aircraft windscreen; however, in this circumstance it was not effective. The pilot believed that the aircraft passed in between the two wires without the windscreen coming into contact with the wires.

The right wing spar fractured due to the impact with a hay bale, which occurred during the forced landing. An inspection of the damage from the wirestrike indicated that the tailplane was twisted and there were sections of skin missing from the right wing. The left elevator had been torn away and there was damage to the right elevator. A number of antennas were missing from the empennage² and wire abrasion marks were visible on the top of the fuselage.

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 incident.

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

Pre-survey flight planning

The operator intends to contact the power authority in each state to request the location of powerlines which they will overlay onto their Google Earth and topographic plans. It is proposed that this will occur on all surveying flights that present a risk.

Survey height

The operator is also considering increasing the minimum height at which a survey can be conducted. If lower survey heights are required, and assessed to be suitable, they will be conducted by more experienced flight crew.

Flight crew awareness

The operator will email all company pilots with details of this accident and the proposed safety action.

SAFETY MESSAGE

Powerlines continue to present a threat to low level flight operations. The Australian Standard (AS 3891.1-2008 Air navigation - Cables and their supporting structures - Marking and safety requirements) for powerline marking requires that markers be attached to powerlines that are more than 90 m (about 300 ft) above the ground, so the threat is increased for operations below that height.

Research published by the ATSB found the capacity for the human eye to detect items like power poles is limited to about 70° horizontally. When the wire span is long and the poles are placed several hundred metres apart, the pilot's ability to focus on the pole and recognise a potential wire hazard is decreased.

The following ATSB publications provide further 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/wirestri kes_20050055.pdf)

² Complete tail section of the aircraft.

- A0-2009-030 VH-CAP Wirestrike 24 km NNE of Albury, NSW (<u>http://www.atsb.gov.au/media/1572022/ao20</u> 09030.pdf)
- A0-2008-082 VH-ROO Wirestrike 25 km NW Leongatha, Vic (<u>http://www.atsb.gov.au/media/51245/ao2008</u> 082.pdf)
- A0-2007-058 VH-WLQ Wirestrike 20 km north of Elliot, NT. (<u>http://www.atsb.gov.au/media/24498/A0-2007058.pdf</u>)
- AO-2006-155 VH-MFI Wirestrike 15 km east of Parkes, NSW. (<u>http://atsb.gov.au/publications/investigation_r</u> <u>eports/2006/aair/ao-2006-155.aspx</u>)
- 200404590 VH-CSH Wirestrike 10 km southwest Dubbo, NSW. (<u>http://atsb.gov.au/publications/investigation_r</u> eports/2004/aair/aair200404590.aspx)

AO-2010-084: VH-IYI and VH-JXY, Aircraft proximity event

Date and time:	23 October 2010, 1508 WST		
Location:	Jandakot Airport, Western Australia		
Occurrence category:	Serious incident		
Occurrence type:	Airprox		
Aircraft registration:	VH-IYI and VH-JXY		
Aircraft manufacturer and model:	VH-IYI: Partenavia Costruzioni Aeronautiche SPA P.68B VH-JXY: Avions Pierre Robin R-2160		
Type of operation:	VH-IYI: Private VH-JXY: Flying train	ning	
Persons on board:	VH-IYI: Crew – 1 VH-JXY: Crew – 2	Passengers -3 Passengers - Nil	
Injuries:	Crew – Nil	Passengers -Nil	
Damage to aircraft:	Nil		

FACTUAL INFORMATION

Pilot of VH-IYI's recollection of events

On 23 October 2010, a Partenavia P.68B aircraft, registered VH-IYI (IYI), departed Jandakot Airport, Western Australia on a private flight. On board the aircraft were the pilot and three passengers. The pilot flew down to Murray Field where they conducted a touch and go. They returned to Jandakot overflying Mandurah and then tracked along the coast to the visual flight rules (VFR) Jandakot inbound reporting point Boatyard.

The pilot reported that they saw another aircraft, a Cessna 152 (C152), to their right, which was flying at a slower speed than the Partenavia. After observing the C152, the pilot made an inbound call to Jandakot Tower at Boatyard. The Jandakot Tower aerodrome controller responded and requested that they maintain 1,500 ft.

The pilot stated that they then proceeded towards the VFR reporting point of 'Adventure World'. Between Boatyard and Adventure World, the controller called IYI and made reference to three aircraft in the area. The pilot of IYI knew of the C152 and then sighted a Robin aircraft VH-JXY (JXY) about 3 NM (5.6 km) ahead of their position approaching Adventure World. They confirmed that they had the Robin in sight and the controller then requested that

IYI track as number one¹. IYI was cleared to land on runway 24 Right (24R).

After the clearance, the pilot of IYI did not continue tracking to Adventure World and instead descended and tracked towards downwind for runway 24R.

As the aircraft approached downwind for runway 24R, the pilot heard JXY report that they were at Adventure World and the controller request that JXY maintain 1,500 ft. The pilot continued on the downwind leg of the circuit. About halfway through the downwind leg, the pilot saw JXY fly over the top of their aircraft at about 1,500 ft. At this point, IYI was at an altitude of about 1,150 ft.

Just prior to IYI reaching the base leg of the circuit, the pilot recalled JXY called the Tower and requested the position of the Partenavia (IYI). The controller responded that IYI was below JXY. The pilot of IYI stated that they then reported they were on downwind and were informed by the controller that they were number one in the sequence.

The pilot then turned IYI onto a right base. As they turned with the left wing high, they observed JXY come across the canopy of their aircraft, on a downwind heading, about 100 ft above IYI. The pilot of IYI then transmitted a comment '*that was close*'; they did not receive any response. They continued tracking onto base and landed. After landing, the

¹ The lead aircraft to the aerodrome.

pilot heard JXY report that they were going to the pilot made their first sighting of IYI. Late in JXY's conduct a go-around. downwind leg they were informed by the controller



Figure 1: Flight paths of the aircraft

© Airservices Australia

Pilot of VH-JXY's recollection of events

On the same day, an Avions Pierre Robin R-2160 aircraft, registered VH-JXY (JXY), departed Jandakot to conduct flying training under visual flight rules. On board the aircraft were the flight instructor and a student. The flight instructor was the pilot flying the aircraft.

When returning to the airport, the pilot of JXY recalled IYI reporting to the Jandakot Tower that they were at Boatyard. At this point, JXY was overhead Boatyard and, as the pilot did not have IYI in sight, informed Jandakot Tower about this. Based on not being able to see IYI ahead or abeam of their aircraft, the pilot assumed that IYI must have reported prior to reaching Boatyard.

When JXY was approaching Adventure World, the pilot recalled the controller asking IYI if they were number one or following. The pilot of IYI responded that they were following. The controller then gave IYI the option of becoming number one, which the pilot of IYI accepted. The pilot of JXY then recalled IYI being instructed to 'from present position make visual approach, join downwind'. After this, the pilot of JXY reported to the controller that they were at Adventure World. They were instructed to maintain 1,500 ft and track for downwind on runway 24R.

Early on JXY's downwind leg, the pilot recalled being informed that IYI was in their 4 o'clock position and

the pilot made their first sighting of IYI. Late in JXY's downwind leg they were informed by the controller that IYI was now beneath them and were cleared for a visual approach.

Due to JXY being a low wing aircraft, they could not see IYI and the pilot asked the controller if IYI had turned onto base. The controller responded that they had. The pilot of JXY then extended their downwind leg and turned onto base. At this point, the pilot of JXY saw IYI just off to their right.

When JXY turned onto final, the pilot elected to discontinue the landing and conducted a go-around. The pilot conducted another circuit and landed without further incident.

The pilot of JXY believed that IYI was following JXY, from Boatyard, until the controller informed them that IYI was beneath JXY on the downwind leg of the circuit.

Air traffic control information

Air traffic control (ATC) audio recordings for Jandakot Airport tower for the time of the incident were reviewed by the Australian Transport Safety Bureau (ATSB). The audio recordings indicated that at 1504:15 Western Standard Time², the pilot of IYI reported that they were at Boatyard at 1,500 ft, to which they were told to maintain 1,500 ft, which was acknowledged by the pilot.

About 2 seconds later, the pilot of JXY reported that they were at Boatyard at the same altitude and did not have the Partenavia (IYI) sighted. The controller responded that JXY was to maintain 1,500 ft. The pilot of IYI stated that they did not hear either the call from JXY or the response from the controller.

Shortly afterwards, the controller asked IYI if they had JXY in sight. Initially the pilot responded no but then they responded that the traffic was sighted.

The controller then requested that the pilot of IYI inform him if their aircraft was behind JXY, the Robin. The pilot of IYI responded that they were behind JXY, who was just approaching Adventure World. The controller then instructed IYI to make number one, track for downwind and cleared them for a visual approach.

² The 24-hour clock is used in this report to describe the local time of day, Western Standard Time, as particular events occurred. Western Standard Time was Coordinated Universal Time (UTC) + 8 hours.

At this point, the pilot of JXY reported that they were • at Adventure World and still did not have IYI in sight. The controller informed them that IYI was behind them and had broken off early to join downwind. They then requested JXY maintain 1,500 ft and track for downwind.

At 1507:18, the pilot of IYI reported that they were on the downwind leg. The controller acknowledged this and stated that they were number one, which was accepted by the pilot. At 1508:02, the controller informed JXY that IYI was beneath them and asked them to widen out to the left a bit. They then cleared JXY for a visual approach, following IYI. The pilot of JXY acknowledged that they were cleared for a visual approach.

About 30 seconds later, JXY asked the controller if IYI had turned base. They were informed that IYI was turning base at that point. At 1508:57, IYI exclaimed on the frequency '*that was a bit close*'. There was no response.

At 1509:33, IYI was cleared to land. About 30 seconds later, JXY reported that they were going to go-around. At about 1513, JXY was again cleared to land.

SAFETY MESSAGE

This incident highlights the importance of air traffic control and pilots maintaining situational awareness and an accurate mental picture of the location of other traffic in the alerted see and avoid environment. To assist pilots in maintaining situational awareness air traffic control need to provide timely traffic information to aircraft to ensure they are aware of the proximity of other aircraft and pilots should inform air traffic control when they do not have other aircraft in sight.

The following articles provide further information on Class D airspace and the limitations of the see and avoid principle:

- Pilots' role in collision avoidance (Federal Aviation Administration Advisory Circular AC 90-48C), available at <u>www.rgl.faa.gov/Regulatory and Guidance Libr</u> ary/rgAdvisoryCircular.nsf/0/7373cdbc7158f4c 286256a03006e1551/\$FILE/AC90-48c.pdf

- The Civil Aviation Safety Authority (CASA) produces Visual Pilot Guides for a number of Class D aerodromes including Jandakot. These guides are available at <u>www.casa.gov.au/scripts/nc.dll?WCMS:STANDA</u> <u>RD::pc=PC 90007</u>
- Further information on Class D procedures is available from CASA at <u>www.casa.gov.au/scripts/nc.dll?WCMS:STANDA</u> <u>RD::pc=PC 93379</u>

AO-2010-106: VH-CNW and VH-AIZ, Aircraft proximity event

Date and time:	4 December 2010, 1200 EDT		
Location:	Ballarat Airport, Victoria		
Occurrence category:	Serious incident		
Occurrence type:	Airprox		
Aircraft registration:	VH-CNW and VH-AIZ		
Aircraft manufacturer and model:	VH-CNW: Cessna Aircraft Company 172S VH-AIZ: Piper Aircraft Corp PA-28R-201		
Type of operation:	VH-CNW: Flying training VH-AIZ: Flying training		
Persons on board:	VH-CNW: Crew – 2 Passengers – Nil		
Injuries:	VH-AIX: Crew – Nil Passengers – Nil		
Damage to aircraft:	Nil		

FACTUAL INFORMATION

Sequence of events

Cessna 172, VH-CNW

On 4 December 2010 at 1200 Eastern Daylightsaving Time¹, a Cessna Company aircraft 172S, registered VH-CNW (CNW), was operating a training flight from Point Cook, via Essendon, Kyneton, and Ballarat, Victoria before returning to Point Cook. The flight was operated with an instructor and student pilot on board.

When about 8 NM (15 km) north of Ballarat Airport, the student pilot made an inbound call announcing his intention to conduct a touch-and-go on runway 36. The instructor was aware of another aircraft, VH-FPG (FPG) joining the circuit ahead of CNW to conduct a landing on runway 05. He also observed that there were gliders operating on runway 36, inside the runway landing strip.

Due to the gliding activity and the runway selection of the preceding aircraft, the instructor decided that runway 05 would be safer to use (Figure 1).





Image courtesy of Airservices Australia

During the turn onto the base leg of the circuit for runway 05, the instructor on board CNW observed VH-AIZ (AIZ) lined up on runway 36. He had not heard any radio communication from this aircraft. The student pilot continued the approach and made radio broadcasts on the base leg and the final leg of the circuit announcing their intentions for a touchand-go on runway 05. The instructor lost sight of AIZ at approximately 150 ft on the final approach, due to the position of hangars obstructing the view of the threshold of runway 36.

The student on board CNW had just completed the touch-and-go manoeuvre and was airborne at approximately 70 ft when the instructor of CNW observed an aircraft to his right, flying from right to left at about the same altitude. The instructor of CNW estimated that the horizontal separation

¹ The 24 hour clock is used in this report to describe local time of day, Australian Eastern Daylight-saving Time, as particular events occurred. Australian Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

between the two aircraft was between 15 and 30 m and on a collision course. The instructor took control of the aircraft and initiated a descending left turn with a change of heading of approximately 90 degrees. Following the avoidance manoeuvre, the instructor noted AIZ in a climbing turn to the right.

The instructor on board CNW attempted to contact AIZ on the common traffic advisory frequency (CTAF) a number of times before receiving a response. After making contact with the aircraft they exchanged flight registration details and coordinated their separation.

Piper PA-28, VH-AIZ

At about 1200, an instructor and student were on board a Piper PA-28R-201 aircraft registered VH-AIZ (AIZ). They were taxiing the aircraft for runway 36 at Ballarat Airport to conduct a training flight in the Ballarat training area. The instructor decided that the student should take off from runway 36 as it was the most into-wind runway. The student had not flown recently and therefore the instructor felt that he may not be comfortable with a crosswind takeoff. He recalled that the wind was 8-10 kts from 350 degrees with CAVOK² conditions.

The instructor on board AIZ recalled being aware of FPG in the circuit and heard radio calls from that aircraft during taxi.

The student pilot lined up on runway 36 and held for about 1 minute while a glider was towed clear of the runway. The instructor recalled that the student pilot made a rolling call as they began the take off sequence.

The first time the instructor became aware of CNW was just after takeoff, when he saw CNW airborne from runway 05. The instructor felt there was enough time to take evasive action.

The instructor reported hearing a number of radio broadcasts from CNW following the incident, however he was busy carrying out the collision avoidance manoeuvre. After ensuring separation between the two aircraft the instructor responded to CNW's radio transmission and was able to communicate his intentions.

Piper PA-28, VH-FPG

The third aircraft in the circuit, FPG, was also being used on a training flight. The instructor recalled being able to hear radio transmissions from both AIZ and CNW during the approach and landing at Ballarat Airport. The instructor was not sure if he had two-way communication with either aircraft. He remembered hearing a taxi call from AIZ but could not recall if he heard an entering and rolling call from the pilot of AIZ.

The instructor saw the incident and stated that they were at about the same altitude with about 15 m of horizontal separation.

Ballarat CTAF

The pilots of both aircraft reported using the Ballarat CTAF. Witnesses on the ground also recalled hearing radio broadcasts from both aircraft. It could not be determined why the two aircraft were unable to establish radio contact with each other prior to the incident.

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 incident.

Operator of VH-AIZ

The aircraft operator of AIZ has planned the following safety action in response to this incident:

- Institute a training procedure for trainee pilots to positively identify the location of any aircraft making a radio broadcast on the CTAF at Ballarat Airport.
- Conduct a workshop for all staff and trainees on situational awareness.

Operator of VH-CNW

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

They have alerted all staff and students to be extra vigilant when operating in and around Ballarat

² Ceiling and visibility OK for Visual Flight Rules conditions including no clouds below 5,000 feet, visibility at least 10km and no current or forecast significant weather.

airport and have limited student pilots from entering the circuit at Ballarat.

SAFETY MESSAGE

This incident highlights the importance of situational awareness in the circuit area. While the pilots of CNW were aware of AIZ, they could not determine their intentions through radio contact. The pilots of AIZ were not aware of CNW prior to the incident.

The ATSB has released a safety report titled *A pilot's guide to staying safe in the vicinity of non-towered aerodromes.* Included in this report was a section titled *Communicating effectively.* The report found that there were over 200 occurrences between 2003 and 2008 where pilots were not broadcasting or maintaining a continuous listening watch on the CTAF due to incorrect frequency selection, low radio volume, faulty radio equipment, insufficient broadcasts or distraction. The report highlighted the importance of correct radio use to increase situational awareness in the circuit.

The report also emphasised the importance maintaining a thorough visual lookout and not relying solely on radio broadcasts to ascertain traffic awareness.

The ATSB report *Limitations of the see-and-avoid principle* has shown that the effectiveness of a search for other traffic is eight times greater when a radio is used effectively compared with no radio use.

The following publications may provide some useful information on the importance of correct radio use and limitations of see-and-avoid methods.

- A pilot's guide to staying safe in the vicinity of non-towered aerodromes (AR-2008-044(1)) available from the ATSB's website at <u>http://atsb.gov.au/media/2097901/ar200804</u> <u>4(1).pdf</u>
- Limitations of the see-and-avoid principle (1991), available from the ATSB's website at http://www.atsb.gov.au/media/32918/limit_see_avoid.pdf
- Pilots' responsibility for collision avoidance in the vicinity of non-towered (non-controlled) aerodromes using "see-and-avoid" (Civil Aviation Advisory Publication CAAP 166-2(0), available at <u>http://www.casa.gov.au/wcmswr/_assets/main/</u> <u>download/caaps/ops/166-2.pdf</u>

AO-2010-108: VH-KAV, Cockpit fumes and smoke

Date and time:	14 December 2010, 1530 EST		
Location:	180 NM (333 km) E of Brisbane Airport, Queensland		
Occurrence category:	Serious incident		
Occurrence type:	Cockpit fumes and smoke		
Aircraft registration:	VH-KAV		
Aircraft manufacturer and model:	Aero Commander 500-S		
Type of operation:	Private – ferry		
Persons on board:	Crew – 2	Passengers – Nil	
Injuries:	Crew – Nil	Passengers – Nil	
Damage to aircraft:	Nil		

FACTUAL INFORMATION

On 13 December 2010, an Aero Commander 500-S aircraft, registered VH-KAV, departed New Plymouth for Kerikeri, New Zealand with two pilots onboard. The purpose of the flight was to ferry the aircraft from New Zealand to Brisbane, Australia (Figure 1).

Figure 1: VH-KAV



Photograph courtesy of Andrei Bezmylov

The aircraft was landed at Kerikeri, with the crew reporting operations normal. After spending the night at Kerikeri, the flight departed at about 2030 Coordinated Universal Time (UTC)¹ on 13 December 2010 (0930 New Zealand local time on 14 December 2010) for Norfolk Island. About 3.5 hours

later, the aircraft landed at Norfolk Island. The crew refuelled the aircraft and departed for Brisbane at about 2330 UTC, under the instrument flight rules.

About 2¹/₂ hours after departing, the crew encountered instrument meteorological conditions for an hour, which included heavy rain. Due to the weather, the crew were cleared by air traffic control (ATC) to operate between 6,000 and 8,000 ft. At that time, the pilot in command (PIC) reported that the aircraft had performed as expected.

Shortly after becoming clear of the weather, the crew noticed intense fumes in the cockpit followed by smoke emanating from between the automatic direction finder (ADF) receiver and transponder located in the avionics panel² between the pilot seats.

In response, the PIC shutdown the aircraft's electrical system and discharged the portable fire extinguisher, and opened the pilot's storm window for ventilation. The smoke dissipated immediately after. The PIC reported that neither crew member was affected by the fumes or smoke.

Soon after, the PIC contacted ATC by satellite phone to advise of the situation and to confirm that a visual approach into Brisbane was available.

The crew prepared for a precautionary ditching by donning life jackets and personal emergency

¹ The 24-hour clock is used in this report to describe the local time of day, New Zealand local time, Norfolk Island local time, and Eastern Standard Time (EST), as particular events occurred. New Zealand local time was Coordinated Universal Time (UTC) +13 hours, Norfolk Island local time was Coordinated Universal Time (UTC) +11:30 hours, and Eastern Standard Time was coordinated Universal Time (UTC) +10 hours.

² The panel consisted of the high frequency radio, very high frequency NAV/COM system, transponder, and the ADF receiver.

position indicating radio beacons (EPIRB), and preparing the survival equipment.

About 30 minutes after the fumes and smoke were observed, the crew noticed that the hydraulic pressure³ had reduced and the unsafe landing gear light was illuminated⁴. The crew elected to restore the auxiliary hydraulic pump⁵, which required electrics to operate. The aircraft's electrical system was reinstated and the affected avionics system isolated.

The PIC attempted to restore the auxiliary hydraulic pump, but it did not respond. The low hydraulic pressure indication remained.

The crew attempted to maintain communications with ATC using the satellite phone, but this worked intermittently. As a result, the crew restored power to one of the aircraft's radios. They contacted ATC and advised of the hydraulic issue, and the need to conduct an emergency landing gear extension in preparation for their arrival into Brisbane. The crew also requested that the rescue and fire fighting services at the airport be placed on standby.

When about 35 NM (65 km) from Brisbane, the crew received approach instructions from ATC advising that they were cleared to descend and conduct a visual approach to join a left downwind for runway 14. Prior to commencing the descent, while maintaining 6,000 ft, the crew successfully conducted the emergency landing gear extension and notified ATC accordingly.

- ³ The aircraft's landing gear, nose wheel steering and wing flaps were operated by hydraulics. The aircraft was fitted with two engine driven hydraulic pumps and an electrically driven auxiliary hydraulic pump. The hydraulic pressure gauge indicated pressure from the engine driven pumps and auxiliary pump.
- ⁴ When a loss of hydraulic pressure occurs, the nose landing gear automatically drops and locks into the down position; the unsafe landing gear light will illuminate. Conducting an emergency landing gear extension lowers the main landing gear. If successfully completed, the unsafe landing gear light will extinguish and the three gear down lights will illuminate.
- ⁵ The auxiliary hydraulic pump supplied pressure to the flaps, brakes and nose wheel steering when a loss of pressure from the engine driven pumps was experienced. The auxiliary pump does not operate the landing gear hydraulic system.

Due to the low hydraulic pressure of about 200-300 Psi⁶, the crew elected to perform a short field landing to maximise the runway distance available in the event problems were experienced with braking or steering.

The aircraft landed and vacated the runway. While taxiing to the general aviation (GA) parking area, the aerodrome rescue and fire fighting services personnel noticed smoke emanating from the left engine. The PIC immediately shut down the aircraft and the crew egressed. It was determined that fluid from the hydraulic reservoir in the left engine was leaking onto the aircraft's hot brakes causing the smoke. The aircraft was subsequently towed to the GA parking area.

Aircraft information

In late 2009, the aircraft was ferried to New Zealand from Australia for the purposes of conducting aerial surveying operations. According to the maintenance release, the aircraft had not been flown since February 2010. Prior to the return flight in December 2010, the aircraft had undergone a period of routine maintenance.

Prior to departing Kerikeri, the PIC reported that he had conducted a flight test and that the aircraft performed without incident. He also noted that all unserviceable items were placard and documented on the aircraft's maintenance release.

Aircraft examination

Automatic direction finder (ADF)

The ADF receiver unit was removed from the aircraft and examined. The inspection found a burnt resistor and that a circuit board in close proximity had been damaged. A capacitor was found to have short circuited, which caused the resistor to burn.

Repairs were performed on the circuit board and new components fitted. The receiver was reassembled, tested, and found serviceable.

Hydraulic line

An inspection of the left engine identified some pinhole corrosion on the hydraulic pressure line

⁶ The PIC reported that the hydraulic pressure is normally about 1,000 Psi.

connected to the hydraulic accumulator. The line was replaced, with operations reported as normal.

A 100 hourly inspection had been performed on the aircraft since that time, with surface corrosion identified on four additional hydraulic lines. The lines were subsequently replaced.

SAFETY MESSAGE

The crew were adequately equipped to meet the typical overwater contingencies, but were confronted with an unusual emergency situation.

This incident demonstrates the benefits of being appropriately prepared for long, overwater, flights. The crew were able to establish initial contact with ATC through the use of an alternative means of communication: a satellite phone. The phone was also used throughout the flight to obtain updates on the weather conditions. The crew also ensured that the appropriate survival equipment was onboard, such as life jackets and EPIRBs in the event a ditching was required.

AO-2011-002: VH-LAD, Fuel exhaustion

Date and time:	31 December 2010, 1650 EST		
Location:	Emerald, Queensland.		
Occurrence category:	Serious incident		
Occurrence type:	Fuel exhaustion		
Aircraft registration:	VH-LAD		
Aircraft manufacturer and model:	Cessna Aircraft Company C404 Tita		
Type of operation:	Aerial work		
Persons on board:	Crew – 3	Passengers – Nil	
Injuries:	Crew – Nil	Passengers – Nil	
Damage to aircraft:	Nil		

FACTUAL INFORMATION

On 31 December 2010, at about 1530 Eastern Standard Time¹, a Cessna Aircraft Company C404 Titan aircraft, registered VH-LAD (LAD), departed Alpha aerodrome, Queensland, to conduct aerial work. Onboard the aircraft were the pilot and two navigators. The flight was the third of the day after leaving Mackay, with previous landings at Emerald and two at Alpha.

At the start of the day, the pilot calculated the maximum take-off weight and estimated a total fuel load of 900 L was available. He uplifted 210 L of fuel and updated the fuel log before departing Mackay and conducting a survey flight of 2.8 hours and landing at Emerald. After landing at Emerald, the pilot rechecked the fuel quantity using a manometer and uplifted 490 L of fuel, to give an estimated total of 900 L.

The aircraft then departed for another survey flight of 2.3 hours, with a subsequent landing at Alpha. The pilot used the manometer again to check the fuel quantity and determined that there was in excess of 600 L remaining. The aircraft then departed on another survey flight, landing 1.1 hours later at Alpha aerodrome, where the pilot checked the fuel quantity with the manometer and reported that it showed 225 L in the left tank and 300 L in the right tank. From previous experience, when

conducting aerial survey and operating at lower than cruise power settings, he concluded that this aligned with a fuel consumption rate of 115 L per hour. The pilot updated the fuel log to show that he had 525 L on board which included 125 L fixed reserve, but did not cross reference the estimated fuel load with the fuel gauges.

The third survey flight was to be conducted at flight level (FL) 180², north of Blackwater after landing at Emerald for refuelling, with LAD then proceeding onto Mackay. After departing Alpha for Emerald there was a change of plan in that LAD was to conduct two survey runs north of Blackwater at FL 160 over an estimated 1.5 hours, then land at Emerald. The pilot calculated he would have sufficient fuel plus reserves to conduct the survey flight and land at Emerald.

On completion of the first survey run at FL 160, the pilot noticed a fluctuation of the left engine fuel flow and decided to discontinue the survey and land at Emerald. He calculated that there was still 300 L of fuel onboard, but did not check the fuel gauges. The pilot reported that while on descent, the left engine failed, followed shortly thereafter by the right engine. Before feathering the right propeller, the pilot said that he used the windmilling propeller to power the engine driven hydraulics and lower the landing gear. At FL 140 and 17 NM from Emerald, the pilot secured both engines and reduced

¹ The 24-hour clock used in this report to describe the local time of day, Eastern Standard Time as particular events occurred. Eastern Standard Time was Coordinated Universal Time (UTC) + 10 hours.

² Flight Level (FL) is a level of constant atmospheric pressure related to a datum Of 1013.25 hectopascals, expressed in hundreds of feet. Therefore FL180 indicates 18,000ft.

airspeed to 115 kts and a 1000ft/min descent rate. At 15 NM from Emerald the pilot then transmitted a PAN³ call informing air traffic control of his intentions. With both propellers feathered, wing flaps up and landing gear down, the pilot made a downwind, straight-in approach and landing on runway 24 at Emerald aerodrome.

After the landing, the pilot reported that he checked the aircraft fuel gauges which showed the tanks as empty. He had not monitored the fuel gauges during flight, partly because these were obscured by a survey screen. A subsequent check with the manometer revealed that little fuel remained. The operator reported that calculations based on the fuel logs and average consumption rates showed that the aircraft departed Alpha with about 200 L of fuel in the tanks, and not the 525 L the pilot had estimated.

Calculating fuel requirements

The Civil Aviation Safety Authority CAAP 234-1(1) *Guidelines for Aircraft Fuel Requirements*, advises how to establish fuel quantity on board and how to complete a fuel quantity cross check. Cross checking is to be completed by using at least two accurate methods. None of the suggested methods alluded to the use of a manometer. The CAAP advised that when using a calibrated dip stick or sight gauge, drip gauge or tank tab, the aircraft must be level to establish what fuel is on board. Any direct reading of a partially filled tank must be discounted or rounded down to a figure consistent with the next lower tab or marking, unless the aircraft is level and the fuel gauge reading corresponds to a dipstick value.

LAD was equipped with fuel gauges only and these had recently been calibrated. It was not fitted with optional fuel low level warning lights, or digital fuel totalisers used to provide more accurate fuel consumption and quantity information. The operator reported that the fuel tanks on the C404 were shallow and the filler points were outboard on the wings, making dip stick or visual measurement of partial tank volumes impossible. The manometer was an attempt to provide a visual means of fuel quantity in each wing tank, but due to the tank dimensions, the small linear scale that resulted was subject to inaccuracies, due to lateral and

longitudinal sloping surfaces and/or uneven compression of the aircraft landing gear struts.

The maximum take-off weight of LAD with the pilot and two navigators, and survey equipment would be exceeded with full fuel tanks, necessitating partial tank operation.

Fuel calculation policy

The approved fuel quantity calculation policy of the operator's parent company was for their pilots to compare the fuel gauge quantity with the manometer reading. This was not the company policy of the subsidiary company, under whose air operating certificate (AOC) the pilot was flying.

When operating under that AOC the pilot was required to use the fuel gauges as the primary fuel quantity check. After refuelling, the pilot was to use the gauges as a cross check against the refuelling installation meter to determine the aircraft fuel quantities. Where a series of flights were conducted by the same pilot and refuelling was not carried out at intermediate stops, cross checks had to be made by checking the aircraft fuel gauges against the company flight and fuel log.

Following the occurrence, the company reported that when relying on the flight and fuel logs, certain survey configurations could result in varying fuel flows, therefore causing an error in the aircraft fuel log.

Manometer description and use

The manometer (Figures 1 and 2) used by the pilot was designed and manufactured under the operator's parent company maintenance authority.

Figure 1: The manometer the pilot used.



Photograph courtesy of the operator

It employed a clear plastic pipe attached to the wing fuel drain cocks and fuel level in the plastic hose

³ Radio broadcast indicating uncertainty or alert.

was measured against hand drawn fuel quantity in order to reduce their safety risk. The ATSB has calibrations on the engine cowlings. Some amount been advised of the following proactive safety action of accuracy could only be assured if the aircraft was laterally and longitudinally level.



Figure 2: Fuel quantity markings on cowls.

Photograph courtesy of the operator

The pilot of LAD had until a short time prior to the • incident flown the C404 aircraft for the parent company. He reported that he was not aware that the fuel gauges on this particular type of aircraft were accurate and reliable. He had over time . developed a mistrust of fuel gauges from previous experiences with similar aircraft. Because of this mistrust, he had become increasingly reliant on the manometer system as his only valid means of fuel . quantity indication and as a reference for fuel burn calculation. It was reported by the operator that the pilot's continued reliance on the manometer as the primary fuel quantity check, with little reference to the fuel gauges, had led him to believe that the aircraft had more than sufficient fuel for the flight.

Lowering of landing gear

The emergency procedures in the pilot's operating handbook advised that the landing gear should be up to achieve best gliding distance. For landing with complete power loss and propellers feathered, the landing gear could be lowered by using the emergency gear extension T-handle. The operator reported that the pilot's decision to lower the landing gear when he did resulted in a less than optimum glide angle because of the adverse effect this would have had on the aircraft's glide performance.

SAFETY ACTION

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action

in response to this incident.

Aircraft operator

The operator initiated an internal investigation into the circumstances that led to the occurrence. As a result of that investigation, the following recommendations made by the chief pilot were adopted.

- This incident was raised as the topic of safety during the January 2011 internal safety meeting.
- An emergency response plan has been developed, implemented and tested ensuring company management and staff can react quickly in the unlikely event of an incident or emergency
- All aircrew are participating in an aviation approved crew resource training management course. Training records will be published in relevant pilot record files.
- Fuel totalisers are scheduled for fitment in both 400 series Cessna aircraft operated by the company to provide a more accurate means of establishing fuel used and quantity remaining.
- The operator's managing director has raised this serious safety incident, with the board of directors of the parent company and has taken steps to reinforce the existing proactive movement towards safety, implemented within both companies.

SAFTEY MESSAGE

Fuel management issues, including fuel starvation⁴ and exhaustion⁵, are not new in aviation, and have been a continuing safety concern for aviation authorities worldwide for many years. In Australia between 1991 and 2002, these issues accounted for 6 per cent of all accidents. The ATSB has published the following research report related to these types of events.

⁵ Fuel exhaustion – the state in which all of the aircraft's useable fuel has been consumed.

Fuel starvation - the state in which all the aircraft's useable fuel has not been consumed, but that fuel is not available to the engine.

 Australian Aviation Accidents Involving Exhaustion and Starvation (2002).
www.atsb.gov.au/publications/2003/fuel exh austion and starvation.aspx

This investigation noted that the use of a less than accurate measuring system for establishing fuel quantities, as used by the pilot, contributed to a miscalculation of fuel quantities and eventual fuel exhaustion.

The measuring practice did not conform to the operator's standard operating procedures, or the CASA CAAP 234-1(1) - *Guidelines for Aircraft Fuel Requirements*. There was no effective cross-check of the fuel quantity for each flight. A copy of this CAAP can be found at:

http://www.casa.gov.au/wcmswr/_assets/main/do wnload/caaps/ops/234_1.pdf

The ATSB also noted that an uninterrupted view of the fuel gauges at all times during flight should not be compromised by aircraft role equipment installations.

AO-2011-003: VH-YTF, Crew incapacitation

Date and time:	27 December 2010, 1535 CST		
Location:	10 NM (19 km) W of Renmark, South Australia		
Occurrence category:	Serious incident		
Occurrence type:	Crew incapacitation		
Aircraft registration:	VH-YTF		
Aircraft manufacturer and model:	S.O.C.A.T.A. – Groupe Aerospatiale TB-10		
Type of operation:	Flying training		
Persons on board:	Crew – 1 Passengers – Nil		
Injuries:	Crew – Nil Passengers – Nil		
Damage to aircraft:	Nil		

FACTUAL INFORMATION

On 27 December 2010, a SOCATA TB-10 Tobago aircraft, registered VH-YTF (YTF), was being operated on a solo flying training exercise from Parafield Airport, South Australia. The pilot completed the first sector to Mildura, Victoria, refuelled the aircraft and consumed lunch and rehydrated. He reported feeling hot and slightly tired on the ground in Mildura, but well enough to continue the flight.

The pilot then flew from Mildura to Renmark, South Australia where he completed a circuit exercise. On climb out of Renmark, he reported feeling hot and began to sweat. He stated that the sun was directly in his eyes and he found it difficult to look out of the windscreen due to the sun glare. He contacted another company pilot who was also departing Renmark on the same flight route and reported his symptoms. The company pilot suggested that he check the air vents were open and the cabin heat was selected off. The pilot confirmed these actions, but was still feeling hot so elected to climb to 6,500 ft to allow cooler air into the aircraft. The other company pilot reported that he didn't have any concerns regarding sun glare and he wasn't feeling hot.

The pilot reported becoming unconscious in the climb with the aircraft operating with the auto-pilot engaged in the heading mode and the elevator pitch setting trimmed for the climb attitude. He recalled selecting full pitch and full throttle which was a normal climb power setting.

The pilot regained consciousness about 55 minutes later over the water and uncertain of his position (Figure 1). The aircraft was established in the cruise with climb power still set.

The pilot had been monitoring the Adelaide Radar frequency prior to becoming unconscious. After regaining awareness he heard a number of radio calls from Adelaide Radar for an unidentified aircraft near Aldinga, South Australia and he responded to the radio call. The controller identified the aircraft and assisted him in returning to Parafield.

Air traffic control

The Australian Transport Safety Bureau (ATSB) reviewed the radar tapes and air traffic control (ATC) communications during the time of the incident. The radar showed YTF outside controlled airspace to the North-East of Adelaide at 8,000 ft at 1530 Central Standard Time¹. The aircraft was then seen to gradually descend to 6,500 ft and enter controlled airspace.

At 1602, ATC noticed a radar return inside controlled airspace, on a bearing of 075°, 35 NM (64 km) from Adelaide, at an altitude of 6,500 ft. Numerous attempts were made to establish contact with the pilot without success. At 1630, as the aircraft approached the southern edge of the

¹ The 24 hour clock is used in this report to describe the local time of day, Central Standard Time, as particular events occurred. Central Standard Time was Coordinated Universal Time (UTC) + 9.5 hours

Adelaide terminal area controlled airspace, the aircraft was observed on radar to turn through 180 degrees and descend to 1,500 ft and track back towards the coastline.

As the aircraft appeared to be uncertain of its position and ATC was unable to contact the pilot, ATC declared an INCERFA phase.² At 1635, the aircraft responded to ATC calls and was identified as YTF. A clearance was issued to Parafield Airport and the INCERFA phase was cancelled.

Weather

The weather was reported to be clear and sunny with a forecast surface temperature at Renmark of 24° C at 1430.

Post flight engineering action

The cabin ventilation system was tested following the flight and was found to be serviceable. An active carbon monoxide tester was used on two flights following this event with no abnormality reported.

Flight and duty times

The pilot reported to have had a normal sleep cycle prior to the event. He had slept from 2300 until 0600 the previous night and reported having a good quality, uninterrupted sleep. He didn't feel tired when he woke in the morning.

He last flew on the 24 December 2010 and had 2 days off prior to the event flight.

Medical information

The pilot reported eating a light breakfast before departing Parafield Airport. He ate lunch and rehydrated during his stop in Mildura. He had a 600ml bottle of water with him in the cockpit and had consumed three quarters of the contents before • losing consciousness.

The day after the incident, the pilot underwent a medical examination at a hospital and the following day he saw a Designated Aviation Medical Examiner. All of the tests were inconclusive and it could not be determined why the incapacitation event occurred.

The pilot's aviation medical records didn't indicate any medical conditions which may have contributed to the event. Following the medical examination, the Civil Aviation Safety Authority suspended the pilot's medical certificate.

SAFETY MESSAGE

Both the Australian Transport Safety Bureau (ATSB) and Civil Aerospace Medical Institute of the U.S. Federal Aviation Administration (FAA) have conducted recent research into pilot incapacitation.

The ATSB study found that between 1 January 1975 and 31 March 2006, 98 occurrences of pilot incapacitation occurred in Australia. These events resulted in 16 accidents, 1 serious incident and 81 incidents. The report highlighted the importance of the aeromedical certification process remaining up to date with modern medical science.

The FAA study examined in-flight medical incapacitation and impairment involving U.S. airline pilots between 1993 and 1998. The study found that during this time, 50 medical events occurred resulting in 2 non-fatal accidents. In-flight medical incapacitation is considered a rare event, with 0.058 events being recorded per 100,000 flight hours.

The most common causes of loss of consciousness were gastrointestinal, neurological, cardiac and urological events.

The following links provide useful information about pilot incapacitation.

- DeJohn, C, Wolbrink, A & Larcher, J (2004) Inflight medical incapacitation and impairment of U.S. pilots: 1993 to 1998, available from <u>http://www.faa.gov/library/reports/medical/oa</u> <u>mtechreports/2000s/media/0416.pdf</u>
- Newman, D.G. (2007) Pilot incapacitation: Analysis of medical conditions affecting pilots involved in accidents and incident 1 January 1975 to 31 March 2006, ATSB, available from <u>http://www.atsb.gov.au/publications/2007/b20</u> 060170.aspx

² INCERFA is a phase where uncertainty exists as to the safety of an aircraft and its occupants.

Figure 1: VH-YTF flight path



© GoogleEarth

AO-2011-007: VH-TXW and VH-TSP, Aircraft proximity event

Date and time:	20 January 2011, 1627 EDT		
Location:	1.5 NM (3km) NW Brighton, Victoria		
Occurrence category:	Serious incident		
Occurrence type:	Airprox		
Aircraft registration:	VH-TXW and VH-TSP		
Aircraft manufacturer and model:	VH-TXW: Piper Aircraft Corporation PA-28-140 VH-TSP: Cessna Aircraft Company 172S		
Type of operation:	VH-TXW: Private VH-TSP: Private		
Persons on board:	VH-TXW: Crew – 1 VH-TSP: Crew – 1	Passengers – 1 Passengers – Nil	
Injuries:	Crew – Nil	Passengers – Nil	
Damage to aircraft:	Nil		

FACTUAL INFORMATION

Sequence of events

Piper PA-28-140, VH-TXW

On 20 January 2011, a Piper Aircraft Corporation PA-28-140 aircraft, registered VH-TXW (TXW), departed Moorabbin, Victoria, on a return private flight via Horsham, Hamilton, Avalon and Point Cook, under visual flight rules (VFR). On board the aircraft were the pilot and one passenger.

On the return flight to Moorabbin, when overhead Werribee, the pilot reported that he broadcast a call on the Point Cook common traffic advisory frequency (CTAF) of his intentions to overfly the aerodrome at 2,500 ft, tracking towards Williamstown.

The pilot continued to monitor the Point Cook CTAF until passing Williamstown, at which time he transferred to the Melbourne Radar frequency¹.

Shortly after, the pilot listened to the Moorabbin automatic terminal information service (ATIS) and then transferred to the Moorabbin Tower frequency to listen for other traffic operating in the vicinity of the Brighton VFR approach point.

Cessna 172, VH-TSP

The pilot of a Cessna Aircraft Company 172 aircraft, registered VH-TSP (TSP), departed Point Cook on a return private flight via Avalon, Warrnambool and Moorabbin, operating under the VFR.

The aircraft approached the Moorabbin control zone (CTR) from the Carrum VFR approach point. The pilot conducted two touch-and-go landings at Moorabbin and then departed the CTR on climb to 2,000 ft, until he was 3 NM (5.6 km) from the airport.

At about 3 NM (5.6 km), the pilot conducted a visual check for other traffic in the area and commenced a descent to 1,500 ft, tracking towards Brighton. The pilot continued to listen to the Moorabbin Tower frequency until he was overhead Brighton and then transferred to the Point Cook CTAF.

The incident

Shortly after changing frequency, descending through 1,600 ft, the pilot of TXW observed TSP in his 12 o'clock position, about 200 ft below and a horizontal distance of 2 km, on a reciprocal track.

In response, the pilot of TXW conducted an evading manoeuvre and turned the aircraft to the right. The pilot reported that both he and his passenger saw the other aircraft pass 100 ft below the left wing of TXW. They did not observe TSP take any evasive action.

¹ The aircraft was equipped with one very high frequency (VHF) communications system.

The pilot of TXW suggested that the pilot of TSP may not have seen them due to TXW being above TSP, and the fact that TSP was a high winged aircraft. The pilot also reported that he had not expected to see an outbound aircraft at an altitude of 1,500 ft as the departure altitude from Moorabbin was 2,000 ft.

The pilot of TSP reported that after passing overhead Brighton, he tracked towards Williamstown at 1,500 ft and then landed at Point Cook aerodrome. The pilot stated that he did not observe TXW.

The pilot of TXW continued his approach to Moorabbin and the aircraft was landed without further incident.

The pilot of TSP reported that when he had the Moorabbin Tower frequency selected he did not use his second radio. This was due to the amount of traffic on the Moorabbin Tower frequency. He recalled tuning his second radio to the Melbourne Radar frequency when approaching Williamstown.

The pilot of TSP discussed the incident with his Chief Flying Instructor who suggested that the pilot, when departing Moorabbin, should maintain a height of 2,000 ft until beyond the Brighton VFR approach point to avoid any conflicts with inbound aircraft.

Entry and departure procedures at Moorabbin Airport

The Brighton VFR approach point is situated 7.5 NM (14 km) north-west of Moorabbin Airport. The recommended inbound altitude at Brighton is 1,500ft.

The VFR Flight Guide for the Melbourne Basin recommends the following for entry to Moorabbin via the Brighton approach point:

Keep a good lookout for traffic due to the proximity of the Melbourne costal light aircraft route and Essendon/Melbourne CTR. ... It is advisable to assess potential traffic in the vicinity by listening to Moorabbin Tower on 123.0 before reporting at Brighton.

The Guide also states that the departure procedure for Moorabbin Airport is:

Depart clear of the VFR approach points and climb to 2000ft (or up to 2500ft if conditions permit) without delay.

If you are departing to remain in class G airspace, change to Melbourne Radar (135.7) when clear of the Moorabbin control zone² (when the tower is active). ATC will not issue specific transfer instruction.

Figure 1: Flight paths of the aircraft



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SAFETY MESSAGE

When flying in the vicinity of busy aerodromes, such as Moorabbin, pilots should be aware of the potential traffic conflicts that may be present, particularly around approach points. The Civil Aviation Safety Authority's (CASA) VFR Flight Guide recommends that aircraft departing Moorabbin should avoid the VFR approach points. For aircraft flying inbound via these approach points, it is important that pilots maintain a vigilant lookout for conflicting traffic and be aware that aircraft may be in unexpected locations.

The following publications provide further information on the limitations of see-and-avoid and the procedures for operating in, and around Class D aerodromes.

² The Moorabbin control zone encompasses the airspace within a 3 NM (5.6 km) radius of the Moorabbin aerodrome up to 2,500 ft. The Brighton approach point is outside the Moorabbin control zone.

- CASA produces Visual Pilot Guides for a number of Class D aerodromes including Moorabbin. These guides are available at www.casa.gov.au/scripts/nc.dll?WCMS:STANDA RD::pc=PC_90007
- Further information on Class D procedures is available from CASA at <u>www.casa.gov.au/scripts/nc.dll?WCMS:STANDA</u> <u>RD::pc=PC 93379</u>
- Produced by CASA the OnTrack is an interactive guide to operating in and around Australia's controlled airspace and general aviation airports. It is available at: www.casa.gov.au/scripts/nc.dll?WCMS:STAN

DARD::pc=PC_100138

AO-2010-107: VH-FDL, Total power loss

Date and time:	13 December 2010, 1600 EST		
Location:	45 NM (9 km) N of Georgetown (ALA), Queensland		
Occurrence category:	Accident		
Occurrence type:	Total power loss		
Aircraft registration:	VH-FDL		
Aircraft manufacturer and model:	Robinson Helicopter Company R22 Alpha		
Type of operation:	Private		
Persons on board:	Crew - 1	Passengers – 1	
Injuries:	Crew - Nil	Passengers – Serious	
Damage to aircraft:	Serious		

FACTUAL INFORMATION

On 13 December 2010, at about 1500 Eastern Standard Time¹, a Robinson Helicopter Company R22 Alpha helicopter, registered VH-FDL, departed the Georgetown aeroplane landing area (ALA), Queensland with one pilot and one passenger onboard. The private flight was being conducted for the purpose of obtaining aerial photographs of local mine sites.

The helicopter was flown between 400 ft and 500 ft above ground level (AGL) to the first mine site located about 50 km to the north of Georgetown. After spending 15 minutes overhead the mine, the helicopter was flown to the second mine site where a further 15 minutes was spent taking photographs. A return to Georgetown was then commenced.

When 9 km to the north of Georgetown on descent from 1,000 ft AGL, passing through 150 ft AGL, the pilot reported that he applied engine power and then heard the engine splutter twice. This was immediately followed by a decrease in engine revolutions per minute (RPM) and the low rotor RPM warning horn sounding. The engine subsequently failed. The pilot reported that carburettor heat was

not applied during the descent and the carburettor temperature was above the yellow arc².

The pilot regained control of the rotor RPM and conducted a forced landing. During the landing, the helicopter's skids struck a tree. The left skid then contacted the ground and the helicopter cart wheeled. The pilot was not injured; however, the passenger sustained serious injuries.

Engine examination

The engine was removed from the helicopter and examined by an independent maintenance organisation nominated by the helicopter insurer. The examination revealed the following:

- the magnetos were tested and found serviceable
- the fuel and oil filters were found clean, with no contaminants identified
- the fuel delivery system was found serviceable, with about 40 L of uncontaminated fuel drained from the left fuel tank; the right fuel tank was empty due to a leak sustained from the accident
- the carburettor was examined and about 7 to 10 ml of water was found in the carburettor bowl³.

¹ The 24-hour clock is used in this report to describe the local time of day, Eastern Standard Time, as particular events occurred. Eastern Standard Time was Coordinated Universal Time (UTC) +10 hours.

² The helicopter was fitted with a carburettor air temperature gauge marked with a yellow 'caution' arc ranging between +5°C and -15°C.

³ Water found in the carburettor bowl generally indicates a source of fuel contamination rather than carburettor icing.

Minor repairs were then made and the engine was re-assembled. A subsequent power test was conducted and the engine performed without fault.

Refuelling

On the morning of the accident, the pilot had conducted mustering operations at a property located about 30 minutes from Georgetown. After completing the task, the helicopter was refuelled from drum stock located at the property.

The pilot used a hand operated fuel pump with an inbuilt strainer to refuel the helicopter. He conducted a fuel drain check after refuelling and prior to departing Georgetown, with no contamination detected.

The pilot reported that the helicopter had been refuelled from the same drum stock about one week prior and that the drum was housed in a waterproof shed. The drum was sealed with a bung and O-ring.

Fuel testing

The ATSB were advised that the property owner tested the fuel drum stock and no contamination was found.

SAFETY MESSAGE

While the engine examination did not find any • anomalies with the engine, it is possible that the small amount of water in the carburettor contributed to the reported engine failure,

Carburettor icing

The pilot reported that he had considered carburettor icing as a possible reason for the engine failure. At the time of the accident, the outside air temperature was 35°C and the relative humidity was about 40-50%. While the dewpoint temperature was unknown, according to the carburettor icing-

probability chart (Figure 1), 'light icing' could have been experienced.

While this could not be confirmed, the Robinson R22 pilot's operating handbook states that:

The pilot may be unaware of carburettor ice formation as the governor will automatically increase throttle and maintain constant manifold pressure and RPM. Therefore, the pilot must apply carburettor heat as required whenever icing conditions are suspected.

An investigation conducted by the United Kingdom Air Accidents Investigation Branch (AAIB) into a fatal R22 accident (AAIB Bulletin 10/2001) also stated that:

Operating advice from the helicopter manufacturer indicated that operation of carburettor heat was required in order to keep the carburettor temperature above the yellow arc, for hover, takeoff, climb or cruise. For descent or autorotation practice, the advice was to ignore the temperature gauge and apply FULL carburettor heat.

The following publications provide additional information on carburettor icing:

- Flight Safety Australia Ice blocked http://www.casa.gov.au/fsa/2004/dec/32-33.pdf
- Melting Moments: Understanding Carburettor lcing <u>http://www.atsb.gov.au/publications/2009/carb</u> <u>urettor-icing.aspx</u>
- Mornington-Sanford Aviation No ice, thank you <u>http://www.morningtonsanfordaviation.com/articles/no_ice.pdf</u>
- Rotorcraft Flying Handbook <u>http://www.faa.gov/library/manuals/aircraft/me</u> <u>dia/faa-h-8083-21.pdf</u>





AO-2011-001: VH-HOT, Ditching

Date and time:	3 January 2011, 1614 EST		
Location:	2 km E of Cairns, Queensland		
Occurrence category:	Accident		
Occurrence type:	Total Power Loss		
Aircraft registration:	VH-HOT		
Aircraft manufacturer and model:	Robinson Helicopter Company R44 I Clipper		
Type of operation:	Charter		
Persons on board:	Crew - 1	Passengers – 3	
Injuries:	Crew – Nil	Passengers – Nil	
Damage to aircraft:	Serious		

FACTUAL INFORMATION

On 3 January 2011, the pilot of a Robinson Company R44 Raven 1 Clipper helicopter, registered VH-HOT (HOT), arrived at work at about 0800 Eastern Standard Time¹ ready to conduct scenic charter flights. A note from the previous pilot advised him that there was a slight vertical vibration of the main rotor and that he had found nothing wrong during his subsequent inspection. However, no entry concerning the defect was made on the maintenance release, which would have required a maintenance inspection before further flight.

After reading the note, the pilot carried out a more detailed examination of the main rotor system during the daily inspection, but no unserviceability was identified. By 1430, the pilot had completed two charter flights and had noticed a more pronounced vertical vibration of the rotor during the second flight. The rotor vibration disappeared when the helicopter was in hover facing into the wind just prior to landing so the pilot thought that only a minor adjustment was required. At 1530, three non-English speaking passengers were assigned to HOT for the third scenic flight of the day. They were issued with emergency briefing cards in their native language and received a safety brief through a translator. The passengers were then weighed, life preserver vests were fitted and the manifest and

weight and balance calculations were completed. With 110 L of fuel onboard, they embarked for a 30 minute scenic flight at 500 ft AMSL² from Cairns to Green Island and Vlassoff Cay, Queensland, and then return.

When HOT departed Cairns for Green Island, the pilot stated that the rotor vibration was significantly more pronounced. When he turned into the wind from Green Island towards Vlassoff Cay, the helicopter shook quite badly. He noticed that as he was trying to make a radio transmission, it was hard to stop his voice shaking because of the marked rotor vibration. When the helicopter reached Vlassoff Cay, he called Cairns Air Traffic Control (ATC) for a clearance to Cairns and noticed that the rotor vibration was getting progressively worse. He decided that he would ground HOT on return to Cairns, as he felt that the increased rotor vibration could be causing other damage. After receiving clearance from ATC, he commenced a descent into Cairns. The outside air temperature was 27° C, carburettor heat was at 10° and the manifold pressure was 22 inches Hg.

The pilot stated that, while descending through 400 ft AMSL, the engine failed without warning and the low rotor rpm horn sounded. The pilot moved the collective lever down to maintain sufficient rotor rpm for autorotation. When he entered the autorotation, the rotor vibration stopped. At that time, the airspeed was 100 kts. Just prior to lowering the collective lever, the pilot noticed a momentary yaw

¹ The 24-hour clock is used in this report to describe the local time of day, Eastern Standard Time, as particular events occurred. Eastern Standard Time was Coordinated Universal Time (UTC) + 10 hours.

² Above mean sea level.

to the left, which he countered with a right pedal input. The pilot reduced speed to 70 kts and, at about 1615, transmitted a Mayday³ call, stating that he was ditching at the mouth of the Barron River. ATC replied by acknowledgement of his call sign. The pilot deployed the inflatable floats at 100 ft before commencing a cyclic flare. The left float inflated instantly, however only the forward section of the right float inflated.

The pilot stated that at 50 ft AMSL, HOT experienced an uncommanded 360° yaw to the left. The pilot applied right pedal to counteract the yaw but it had no effect. The helicopter impacted the water about 300 m from shore and rolled heavily onto its right side, breaking off one rotor blade and damaging the other. The pilot said that as a result of his head impacting the right front door, the window was broken and water quickly filled the right side of the cabin.

Egress from the helicopter

Because of the language barrier, the pilot experienced difficulty in conveying to the passengers how they were to exit the helicopter. The pilot had to systematically remove the passengers, inflate their life preservers and seat them on the left float. He noticed fuel flowing from the helicopter but was unable to convey to the passengers the urgency of the situation, so he quickly pushed them into the water.

He swam away from the helicopter with the passengers and, after about 10 minutes, two fishermen in a small boat arrived and pulled them from the water. The boat then took them over a sand bar to meet the fire rescue boat, which returned them to Cairns. The passengers and pilot were taken to Cairns hospital and were discharged a short time later. Neither the passengers nor the pilot were injured in the accident.

Helicopter damage

It was reported that the helicopter sank in 3 m of sea water and was salvaged four days later. During the salvage operation, the helicopter sustained further damage precluding any in-depth investigation of the main rotor assembly.

After recovery, it was observed that the right skid was broken, the main rotor mast and blades were broken and the tail rotor and tail rotor gear box were missing.

Engine removal and examination

After the helicopter was recovered from the sea, the engine was removed and stripped at a Civil Aviation Safety Authority (CASA) approved facility under guidance from another party. Both magnetos were removed and bench tested satisfactorily. There was no statement received to confirm that the magnetos had been checked for timing before removal from the engine. The engine strip and examination found no fault that would give reason for the engine to fail in flight.

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 incident.

Aircraft Operator

Equipment and processes

As a result of this occurrence, the helicopter operator has advised the ATSB that they have taken a number of safety actions as follows:

- A GPS-based flight monitoring system is to be installed on the operator's passenger carrying aircraft.
- Cutters for harnesses to be carried on aircraft.
- A 406 MHz impact activated emergency locator beacon to be installed on all company aircraft.
- Passengers are to be briefed in small groups of 4-6.
- A review is to be carried out of the emergency response procedure for the operator's Cairns base.
- The operator's latest safety minutes emphasises the requirements and value of using the maintenance release for defect reporting.

³ 'Mayday' is an internationally recognised call for urgent assistance.

SAFETY MESSAGE

In July 2003 the Robinson Helicopter Company released a safety notice SN-39. This notice addressed unusual vibration that can indicate a main rotor blade crack. It directs pilots to make an immediate safe landing if main rotor vibration rapidly increases, or becomes severe during flight. They are not to attempt to continue flight to a convenient destination.

A copy of this safety notice can be found at www.robinsonheli.com/srvclib/rhcsn39.pdf

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