Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY REPORT
Aviation Short Investigations
AB-2011-077
Final

Aviation Short Investigation Bulletin:

Second Quarter 2011

Issue 6

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CONTENTS

Jet aircraft

Turboprop aircraft

Piston aircraft

Helicopters

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 Level 5 Investigation Team. The primary objective of the team is to undertake limited-scope, fact-gathering investigations, which result in a short summary report. The summary report is a compilation of the information the ATSB has gathered, sourced from individuals or organisations involved in the occurrences, on the circumstances surrounding the occurrence and what safety action may have been taken or identified as a result of the occurrence. In addition, the ATSB may include an ***ATSB Comment*** that is a safety message directed to the broader aviation community.
The summary reports detailed herein were compiled from information provided to the ATSB by individuals or organisations involved in an accident or serious incident investigations completed between the period 1 April 2011 and 30 June 2011.

AO-2010-050: VH-OGG / VH-VNC, Breakdown of separation

Date and time:	1 July 2010, 1003 EST
Location:	40 NM (74 km) NW of Tamworth Airport, New South Wales
Occurrence category:	Incident
Occurrence type:	Breakdown of separation
Aircraft registration:	VH-OGG and VH-VNC
Aircraft manufacturer and model:	VH-OGG: Boeing Company 767-338 VH-VNC: Airbus A320-232
Type of operation:	High capacity - air transport
Persons on board:	VH-OGG: Crew - 9 Passengers – 223 VH-VNC: Crew - 6 Passengers – Unknown
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Nil

FACTUAL INFORMATION

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

On 1 July 2010, an Airbus A320 (A320) aircraft, registered VH-VNC, being operated on a scheduled passenger flight from Brisbane, Queensland (Qld) to Melbourne, Victoria, under instrument flight rules (IFR). The aircraft departed at 0917 Eastern Standard Time[1] and air traffic control (ATC) assigned climb to Flight Level (FL)[2] 340 to the flight crew, which was their planned level.

At 0934, a Boeing Company 767-338 (767) aircraft, departed Sydney, New South Wales (NSW), on a scheduled passenger flight to Cairns, Qld, under IFR, with a planned level of FL360. The flight crew were initially assigned FL280 by ATC, which was the standard assignable level for aircraft departing Sydney that planned to operate at or above FL280. At 0941, the en-route controller assigned FL360 to the flight crew of the 767. As Restricted Area[3] R559A was active from 7,500 ft to FL260, the flight crew of the 767 were required to plan their route around that airspace to ensure that it would not be infringed during their departure and climb. At 0943, when the 767 was established above the Restricted Area, the controller re-cleared the aircraft from a position 65 NM (120.4 km) south east of Mudgee, NSW, direct to Narrabri, NSW, which was on their planned route.

The 767 and A320 were operating on crossing tracks at standard cruising levels. When the controller re-cleared the 767 direct to Narrabri, the intersection of the crossing tracks moved about 15

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

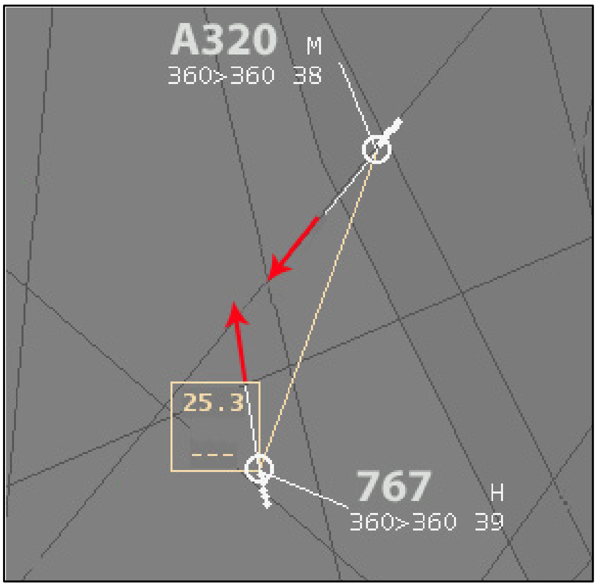
2 A Flight Level (FL) is a standard nominal altitude of an aircraft, used over 10,000 ft in Australia and denominated in up to three digits that represent hundreds of feet (FL 170 equates to 17,000 feet).

3 A Restricted Area is airspace within which the flight of aircraft is restricted in accordance with certain specified conditions. This designation is normally used whenever the activities within the airspace are a hazard to other users; or other users could constitute a hazard to the activities.

NM (27.78 km) to the east of the original crossing point. At 0946, the flight crew of the A320, which was operating in another controller's airspace, requested climb to FL360, which was issued. The controller responsible for the 767 was not aware of the change of assigned level for the A320.

At 1000, the incident controller accepted control of the A320 and identified the confliction between it and the 767, which were both maintaining FL360 and 26.2 NM (48.5 km) apart. About 1 minute later, the controller instructed the flight crew of the 767 to climb to FL370. The radar data indicated that there was 25.3 NM (46.86 km) between the aircraft at that time (Figure 1). The pilot of the 767 responded with a request for a different level, which delayed the climb.

Figure 1: Position of aircraft at 1001



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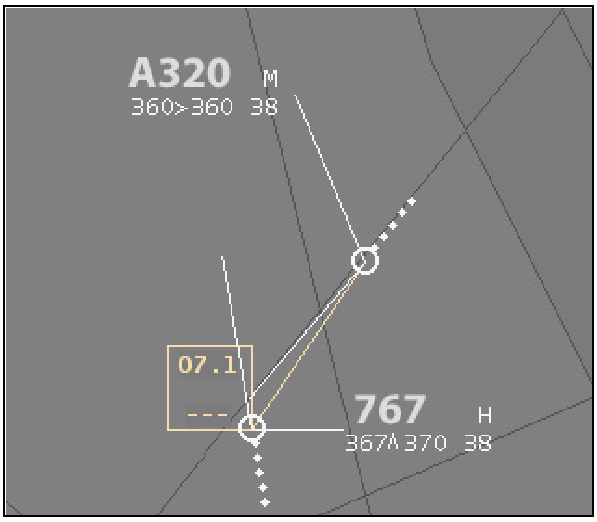
Note: The red arrows indicate direction of travel.

A further minute later, the controller instructed the flight crew of the 767 to expedite their aircraft's climb to FL370. At that time, the radar data indicated that there was 14.6 NM (27.04 km) between the aircraft.

At 1003, the flight crew of the A320 advised the controller that their traffic alert and collision avoidance system[4] indicated traffic ahead of their position and 700 ft above them. The radar data indicated that the 767 was 7.1 NM (13.15 km) ahead of the A320 (Figure 2).

Figure 2: Position of aircraft at 1003



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The applicable separation standards were either 1,000 ft vertical separation, or 5 NM lateral separation between the aircraft, on radar.

The controller advised the A320 flight crew that the proximity traffic was climbing to FL370. The aircraft were about 40 NM (74 km) to the north-west of Tamworth, NSW at that time. The separation between the aircraft reduced to 3.8 NM (7.04 km) before the 1,000 ft vertical separation had been established, which meant that a breakdown of separation[5] had occurred.

The controller then asked the 767 flight crew to confirm that their aircraft was maintaining FL370, which was confirmed about 10 seconds later, re-establishing separation with the A320. This was also

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4 The traffic alert and collision avoidance system (TCAS) is designed to independently alert flight crews to possible conflicting traffic. TCAS identifies a three-dimensional airspace around appropriately-equipped aircraft based on the closure rate of other similarly-equipped traffic and, if the defined vertical and horizontal parameters are satisfied by the evolving potential conflict, TCAS generates a visual and aural alert.

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

verified by the radar data indication. The flight crew of the A320 subsequently reported that their aircraft was clear of the conflicting traffic.

Air traffic control

The flight crew of the A320 were issued, at their request, a change of level from FL340 to FL360 by another controller, about 130 NM (240.76 km) from the planned crossing point of the two aircraft. This was an authorised procedure and no voice coordination of the level change was required.

Airservices Australia (Airservices) had a documented national procedure that required controllers to highlight the 'cleared flight level' (CFL) indication on their air situation displays, for tracks which were planned to enter their airspace and on which they had received coordination from another sector controller. The aircraft's flight level would then not be changed without further coordination. Prior to the national procedure implementation, which occurred about 3½ months prior to this occurrence, the ATC group, of which the incident controller was a member, had previously employed a local instruction that stated 'the CFL highlight may be used for non-jurisdiction tracks as required to aid situational awareness'. The local instruction for that ATC Group was changed about 2½ months prior to this occurrence. The incident controller later reported that they considered that adherence to the new procedures meant their situational awareness of the A320's level had been reduced, as they were no longer able to highlight the CFL of the A320 for situational awareness purposes only. Airservices reported that the revised procedures allowed for the controller to highlight the CFL of the A320 after it had crossed the airspace boundary between the Inverell and Armidale ATC sectors located to the north, which was the vicinity in which the level of the aircraft had changed.

In an attempt to establish vertical separation with the A320, the controller climbed the 767 to FL370. The aircraft's climb was delayed as the pilot had requested a different level in response to the controller's first climb instruction. The Airservices investigation report noted that the option for the controller to vector the 767 to the left, following the climb instruction, was limited due to other traffic at FL370. The controller later reported monitoring the situation between the aircraft closely and that they had realised that the 767 was not climbing at a high a rate as had been expected after the level change assignment. The controller subsequently instructed the flight crew of the 767 to expedite the aircraft's climb in an attempt to achieve a 1,000 ft separation standard before the 5 NM radar standard was infringed. The recovery from the compromised separation situation was not effectively managed as a breakdown of separation occurred.

The controller reported to the ATSB that they had not completed compromised separation training as a component of either the initial or ATC Group training some years previously. The Airservices investigation report stated that the controller may have resolved the breakdown of separation in a more effective manner had compromised separation refresher training been completed.

The controller reported that the workload and complexity of the ATC sector was high at the time of the incident, with Restricted Area activation, multiple lateral and longitudinal traffic scenarios, and constant level change requests due to turbulence.

The controller also reported having been subject to the long term effects of fatigue due to a number of issues, including working additional shifts and limited access to annual leave, and that they had implemented processes to manage that fatigue. The Airservices investigation report stated that the effects of the fatigue reported by the controller could not be accurately determined.

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

In addition, Airservices has implemented a Compromised Separation Recovery training module for en-route ATC groups, with the intention that all controllers would undertake that training in the 2010/11 financial year. Training for the ATC group, of which the incident controller was a member, was completed within the defined period. Each controller within that group will also complete Compromised Separation Recovery refresher training on at least an annual basis. All sector training courses for that group have had Compromised Separation Recovery training modules incorporated, to ensure that all internal trainees and new entrants routinely receive the training, supplementary to the refresher modules.

ATSB COMMENT

The air traffic controller did not provide a reason for the expedited climb request to the flight crew of the 767 or provide them with traffic information on the A320, when in close proximity. The flight crew of the A320 received traffic advice from the controller after querying the traffic indication received on the aircraft's traffic alert and collision avoidance system.

When a breakdown of separation occurs, ATC 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 ATC, can significantly enhance pilots' situational awareness. It also supports the opportunity for flight crew to enhance the situational awareness of ATC, such as in providing direct information regarding individual aircraft performance.

AO-2010-072: VH-EBM, Weather related event

Date and time:	21 September 2010, 2354 EST
Location:	Melbourne Airport, Victoria
Occurrence category:	Incident
Occurrence type:	Weather related event
Aircraft registration:	VH-EBM
Aircraft manufacturer and model:	Airbus A330-202
Type of operation:	Air transport – high capacity
Persons on board:	Crew – 11 Passengers – 268
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Nil

FACTUAL INFORMATION

On 21 September 2010, an Airbus A330-200 aircraft, registered VH-EBM (EBM), was being operated by Qantas Airways on a scheduled passenger service from Perth, Western Australia to Melbourne, Victoria. The estimated time of arrival was 2342 Eastern Standard Time[1].

At 2259, the en-route air traffic controller issued the flight crew with a descent clearance for runway 16 at Melbourne Airport. The flight crew commenced the aircraft's descent at 2318. The controller made an all stations broadcast 2 minutes later, advising the traffic on the en-route frequency that Melbourne aerodrome's Computerised Automated Terminal Information Service (CATIS)[2] identifier 'tango' was now current with two changes: the cloud, which was scattered at 200 ft and 3,500 ft, and the temperature was 1^{0} lower.

The flight crew of EBM then asked the controller if a Category (CAT) III instrument landing system (ILS) approach would be available. The controller advised that they could expect the approach but that the ILS critical areas would not be protected[3].

At 2335, EBM was transferred to the Melbourne Departures controller. About 1 minute later, the controller made an all stations broadcast advising that Melbourne Tower had reported that low cloud had reduced to the ILS minima[4]. The flight crew of EBM confirmed with the controller that they would require an autoland[5].

The controller cleared EBM for the runway 16 ILS approach at 2347. The flight crew asked if the ILS critical areas were protected for the approach, to which the controller responded 'not yet' before contacting the aerodrome controller (ADC) with the same query.

The ADC advised that they were still waiting for the Airside Safety Officer (ASO) to report back, but as

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 CATIS is a weather information service.

3 To maintain ILS signal integrity, the critical areas needed to remain clear of vehicles, aircraft and equipment to ensure there was no signal interference. When an aircraft conducted a CAT III ILS or autoland, it was required that the critical and sensitive areas be protected.

4 Lower limit of weather for particular aircraft and type of flight operation under ILS conditons.

5 An autoland is a precision instrument approach to touchdown performed by the aircraft autopilot, which receives position information and/or steering commands from onboard navigation equipment.

the ASO had commenced securing the airport about half an hour before, they should be finished by the time EBM reached the airport. The ADC also reported that the visibility was significantly reduced.

When EBM was 11 NM (20.4 km) from touchdown, the flight crew were instructed to transfer to the ADC frequency and advised to ask the ADC for more information on the ILS critical area.

At about 2349, the ADC contacted the ASO for an update on securing the airport. The ASO reported that the process would probably take another 10 minutes.

The ADC advised the flight crew that the critical areas were not yet protected, before issuing a landing clearance. At 2354, EBM landed; this was prior to the critical areas being protected, but the crew did not report any interference with the ILS signal.

While taxiing to the terminal, the flight crew advised the ADC that the cloud base was around 160-170 ft and the Runway Visual Range[6] (RVR) at the touchdown area was down to between 300-400 m.

At 0002, low visibility procedures[7] were implemented and broadcast on CATIS identifier ‘uniform’.

Airport information

The ILS critical areas encompassed both the glideslope and localiser areas and constituted a zone of defined dimensions where vehicles, including aircraft, would cause unacceptable disturbances to the performance of the ILS. The ILS sensitive areas were a zone that extended beyond the critical area, where the parking and/or movement of vehicles, including aircraft, might have affected the ILS performance.

Low visibility procedures represented the activation of additional procedures at an airport for the restriction of access to the aerodrome movement area by vehicles and pedestrians, and the management of ground traffic, including taxiing aircraft.

Melbourne Airport had promulgated low visibility procedures in accordance with the En Route Supplement Australia publication, which stated that the procedures would be implemented when the visibility deteriorated below 550 m RVR, the ILS critical and sensitive areas were protected and the CATIS broadcast included the message: ‘low visibility procedures in progress’.

The airport operator had detailed safety requirements and procedures for low visibility operations for the ASO, which included restriction of access to the manoeuvring area, erection of ‘Low Visibility Operations’ signs on all automatic access gates, stoppage of any airside works, and limitation of airport access at manned access points.

Air traffic control (ATC) advised the ASO of the declaration of multipath conditions[8] at 2328 and the ASO commenced an airfield check 2 minutes later. At 2345, ATC advised that low visibility procedures were declared and the ASO continued to secure the airfield, as required by the airport operator’s documented procedures. The ASO advised ATC when the airfield was ‘secure’ and ATC, upon receiving this message, updated the CATIS.

The airfield logbook recorded at 0007 that the airport was secured, and the ASO’s written observation that visibility at the western end had reduced to about 30 m, with poor visibility to the north and good visibility to the south. A runway inspection was also conducted, in accordance with the airport operator’s low visibility procedures, and completed at 0020.

6 Value representing the horizontal distance a pilot will see the centerline or edge lights or runway markings down the runway from the approach end. RVR observations for the touchdown, midpoint and end zones of the runway were based on information provided by electronic sensors installed on the aerodrome, with the information displayed to the ADC.

7 Refer to the ‘Airport information’ section.

8 Air traffic control placed restrictions on airport movements to avoid ILS signal fluctuations that may be caused by an aircraft passing in front of the glide path antenna or operating in close proximity to the localizer antenna.

Meteorological information

Before the flight departed from Perth, a Code Grey[9] had been issued for a 20 per cent chance of low cloud for arrival into Melbourne, from midnight.

The aerodrome trend forecast (TTF) for Melbourne Airport, issued at 2330, indicated that the visibility was 6,000 m and there were few[10] clouds at 100 ft, and broken clouds at 200 ft and 3,800 ft. The next TTF, issued at 2346, indicated that the visibility had reduced to 900 m in fog, and there was broken cloud at 100 ft and 3,800 ft. On the TTF issued 5 minutes later, the visibility had reduced further to 200 m in fog, with the same cloud as the previous TTF. That TTF indicated that the weather conditions at Melbourne Airport had significantly deteriorated.

Commencing at 2309, the Melbourne Airport CATIS identifier 'sierra' broadcast that pilots were to expect an instrument approach, the visibility was greater than 10 km and cloud scattered at 800 ft and broken at 3,500 ft.

At 2320, CATIS identifier 'tango' broadcast that the cloud was scattered at 200 ft and broken at 3,500 ft, and visibility was still greater than 10 km. That CATIS remained current until 0002 when CATIS identifier 'uniform' became current, advertising that low visibility procedures were in place and the RVR for runway 16 was 450 m in the touchdown zone, 650 m in the middle of the runway and 400 m at the end.

Fuel planning requirements

There was no requirement for the aircraft to carry additional fuel for weather related holding or alternate[11] considerations when the flight plan was compiled and fuel uplift conducted, prior to the departure from Perth.

The weather at Melbourne Airport deteriorated after the aircraft had passed the Designated Point All Engines Operating (DPA)[12] and had commenced descent. At and prior to the DPA, both the TTF and CATIS indicated that the weather conditions were above the minima that would have required a diversion to an alternate airport.

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

Unrelated to this occurrence, on 16 November 2010, Airservices Australia issued a Safety Bulletin to pilots titled 'ILS Multipath Protection Issues'.

The Safety Bulletin stated, in part:

> There seems to be a widespread expectation that ILS signals are protected by ATC whenever an aircraft is flying an ILS approach in IMC. This is not the case. ILS signals are only protected in certain conditions.
>
> To avoid multipath effects, ATC places restrictions on airport movements when:
>
> - an aircraft flying an ILS is between the Outer Marker and the landing threshold or, if the Outer Marker is not available, between 4 NM final and the landing threshold; and
> - the runway is not in sight; and
> - in the following meteorological conditions:

9 Code Grey provided early advice of a possible later amendment to the aerodrome forecast (TAF). It was used if there was a small, but realistic chance of a thunderstorm or below special alternate conditions between midnight and 1000.

10 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.

11 An airport specified in the flight plan to which a flight may proceed when it becomes inadvisable to land at, or continue toward, the airport of intended landing.

12 The position on the fuel flight plan furthest removed from the departure airport to which an aircraft may fly and then divert to a suitable alternate airport with all engines operating whilst meeting in-flight fuel requirements.

- broken or overcast cloud at or below 600ft, and/or
- visibility at or below 2,000 m.

Furthermore, localiser interference restrictions are not applied when a preceding aircraft will pass over or through the protected area while taking off, landing, or making a missed approach on the same or another runway.

SAFETY MESSAGE

Despite the ASO commencing the low visibility procedures and airfield checks before required to do so, there was still insufficient time to secure the critical and sensitive areas of the ILS before the aircraft arrived. This highlights that the time required to physically secure the airport as part of the low visibility procedures can be lengthy. ATC and aircraft operators need to be aware of and give appropriate consideration to the time required for the airport operator to secure the airport.

In addition, the incident demonstrates the importance of air traffic control providing timely and current information to flight crew regarding deteriorating weather conditions, including the update of the Automated Terminal Information Service, to assist in their flight planning.

AO-2010-093: VH-OGO, Abnormal engine indications

Date and time:	12 November 2010, 1526 WST
Location:	Near Perth Airport, Western Australia
Occurrence category:	Incident
Occurrence type:	Abnormal engine indications
Aircraft registration:	VH-OGO
Aircraft manufacturer and model:	Boeing Company 767-338
Type of operation:	Air transport – high capacity
Persons on board:	Crew – 19 Passengers – 234
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Minor

FACTUAL INFORMATION

On 12 November 2010, at about 1450 Western Standard Time[1], a Boeing Company 767-338 aircraft, registered VH-OGO and operated by Qantas Airways, departed Perth Airport, Western Australia, on a scheduled passenger flight to Melbourne, Victoria. At about 1455, during climb through 7,000 ft, the flight crew heard a popping sound followed by vibration, coming from the left engine. Engine vibration gradually increased to a peak value of about 4 units while all other engine parameters were noted as normal. The vibration decreased when the crew retarded the engine power lever to the flight idle position.

At 1504, the crew declared a PAN[2] and requested a return to Perth, then notified all passengers of the situation. The turn back and subsequent single-engine landing were uneventful. Emergency services were in attendance when the aircraft landed at 1525.

1 The 24-hour clock 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.

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

The aircraft operator carried out an initial examination of the aircraft and engine. The engine was found to have seized and metal pieces were found in the tail pipe. The engine was replaced and the aircraft returned to service.

Engine examination

The General Electric Company CF6-80C2 engine was inducted into the operator's engine overhaul facility for a full overhaul. The low pressure turbine (LPT) module, which contained five stages of blades and nozzles, was removed and disassembled and the following damage was found:

- one LPT stage 3 nozzle segment was found, with cracking to 4 airfoils
- the distance of the cracks from each aerofoil's outer platform, ranged between 1 and 2 inches
- three of the airfoils were found to be partially liberated and severely damaged (Figure 1).

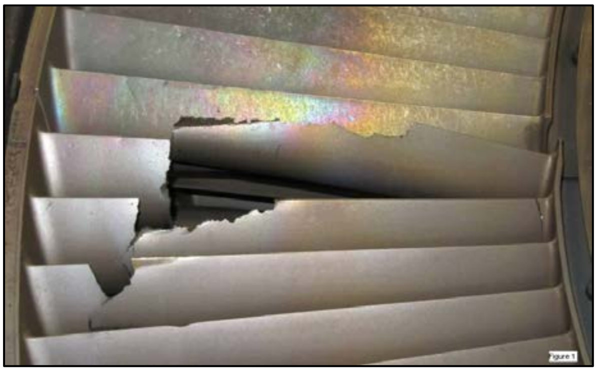
There was also significant damage to an LPT stage 3 blade and two LPT stage 3 shroud segments. Other damage was noted on LPT stages 4 and 5 nozzles and blades, which included small holes, dents and scratches. A bulge and a slight crack were also noticed on the LPT case. No damage was detected upstream of LPT stage 3. The LPT stage 1 and 2 blades and nozzles and the high pressure turbine (HPT) stage 2 blades, were found to be in good condition. All damage was contained within the engine.

The damaged LPT stage 3 nozzle segment and the LPT stage 3 blade were retained for analysis to determine the reason for the damage.

Engine history

The engine had eight previous shop visits and had a total time in service of 63,691 hours, 20,028 cycles[3], and a total of 13,567 hours and 6,671 cycles since its last overhaul.

Figure 1: Damaged LPT stage 3 nozzle segment



Photograph courtesy of aircraft operator

Engine manufacturer

The engine manufacturer conducted an investigation into the failure of the LPT stage 3 nozzle segments. The investigation identified that the most probable reason for the failure was a transient mean stress of the segments during take-off, coupled with other operational stress and mechanical factors.

Recorded data

Data from the aircraft's flight data recorder was provided to the Australian Transport Safety Bureau (ATSB) for analysis. The analysis showed that the following had occurred.

At 1455:19, the engine 1 vibrations began to increase rapidly from about 1.44 to around 3.7 units. The vibration reached 3.7 units of the recordable maximum of 5.12 units at 1455:29. No corresponding change in any other engine parameter was recorded. The number 1 engine thrust lever was reduced to the flight idle detent, at 1504:05.

Examination of the flight data for both engines showed that the low pressure compressor rotational speed (N1), the high pressure compressor rotational speed (N2), and the exhaust gas temperature (EGT) were all symmetrical until the incident. However, the number 1 engine had a higher amplitude and variation in its vibration characteristics, compared to the number 2 engine. This was consistent throughout the entirety of the recorded data provided for 81 flights.

SAFETY ACTION

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

Engine manufacturer

Introduction of new LPT stage 3 nozzle

The engine manufacturer introduced a new design CF6-80C2 LPT stage 3 nozzle that was released on 19 January 2011, via GE CF6-80C2 service bulletin 72-1354.

Aircraft operator

Additional inspections

The aircraft operator advised that many of the fleet's'engines have undergone their last full refurbishment before fleet retirement. Therefore, the operator will only incorporate GE CF6-80C2 service bulletin 72-1354 on an attrition basis.

In the interim, the operator has introduced additional inspections for pre service bulletin 72-1354 LPT stage 3 nozzles that should detect any signs of airfoil cracking well in advance of a potential operational event.

[3] One cycle is the period from engine start-up, through aircraft take-off and landing, to engine shut down.

AO-2011-039: VH-VQT, Windshear event

Date and time:	31 October 2010, 0202 CST	
Location:	Darwin Airport, Northern Territory	
Occurrence category:	Incident	
Occurrence type:	Windshear event	
Aircraft registration:	VH-VQT	
Aircraft manufacturer and model:	Airbus A320-232	
Type of operation:	Air transport – high capacity	
Persons on board:	Crew – 6	Passengers – 141
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

BACKGROUND

The ATSB received notification from Jetstar Airways on 2 November 2010 of a windshear[1] event that occurred during takeoff at Darwin Airport, Northern Territory on 31 October 2010.

The initial flight crew occurrence notification did not indicate that the aircraft had sustained any significant degradation in climb performance due to windshear. The report also did not suggest that the flight crew felt the event was of a serious nature or that an accident almost occurred.

The initial report received by the ATSB from Jetstar, verified as the same report submitted by the pilots, stated that:

- windshear had been encountered on departure, at rotation
- there were no thunderstorm cells within 5 NM of the airfield
- the company/Airbus windshear procedure was applied and that the aircraft climbed out without further incident
- the crew received a wind check from ATC prior to departing of a 5 kt head wind
- ATC did not provide any weather observations to the crew.

The occurrence notification also contained other routine information, including the date, time, place and aircraft details. Based on that information, the ATSB assessed that the event did not require a safety investigation.

During the Australian Senate's Inquiry into pilot training and airline safety including consideration of the Transport Safety Investigation Amendment (Incident Reports) Bill 2010, representatives of the Australian and International Pilots Association (AIPA) gave evidence that they believed the windshear event was serious and almost resulted in a hull loss.

In light of these comments, the ATSB initiated an investigation to verify the details of the event and to establish whether any safety lessons or messages could be drawn from the incident.

FACTUAL INFORMATION

On 31 October 2010, at 0202 Central Standard Time[2], a Jetstar Airways operated Airbus A320-232 aircraft, registered VH-VQT (VQT), departed Darwin,

1 Windshear is a significant change of wind speed and/or direction over a short distance, along the flight path.

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

Northern Territory on a scheduled passenger service to Adelaide, South Australia.

Before departure, the flight crew noted that the weather forecast for the flight included some thunderstorm activity both in the Darwin area and en-route. The Captain considered the weather forecast to be normal for the location and time of year.

The Captain completed a walk around check of the aircraft and observed the weather in the local area. He noted that there was no rain or apparent thunderstorm activity, but it was night time and close observations were difficult.

After the aircraft was pushed back, air traffic control (ATC) informed the flight crew that the designated runway had changed from runway 29 to runway 11 due to a change in wind direction. The crew recalculated the take-off figures and taxied for runway 11.

As the aircraft entered and backtracked along runway 11, the flight crew noticed light rain falling. The flight crew lined up for takeoff at the end of runway 11 and were awaiting a take-off clearance when ATC informed them that the runway had changed again and they were now required to take off on runway 29. This required the aircraft to taxi to the other end of the runway.

While the aircraft taxied down runway 29, the Captain used the onboard weather radar to observe rain activity in the local area. There was no indication of storm cells[3] in the immediate vicinity of the airport, although the radar returns showed some significant weather to the south. The flight crew then recalculated the take-off figures for runway 29, using calculations for a wet runway with up to 5 kts of tailwind. ATC assigned them a standard instrument departure, which would have taken the aircraft to the south of the airport after takeoff. They discussed their departure flight path with ATC and agreed that due to the weather returns to the south, they would change to a radar departure, and requested a right turn to the north after takeoff.

The flight crew recalled that they discussed the weather conditions with the tower controller and enquired about any weather activity above the airfield, as onboard weather radar systems were unable to detect weather more than 15°above the horizon. Both flight crew stated that the tower controller informed them that they didn't have any weather cells above the airfield shown on their radar at that time. They requested a final wind check and were informed that the wind was from 280° at 5 kts.

The Captain elected to use full power for the takeoff given the weather conditions in the area. The aircraft accelerated normally until about 130 kts, when both flight crew felt an abrupt wind change. This coincided with the sudden onset of torrential rain and reduced visibility. The Captain chose to continue the takeoff as the remainder of the runway was very wet and the aircraft was approaching rotation speed.

As the First Officer, who was the pilot flying, rotated the aircraft, the nose lifted off the runway, but the main landing gear remained on the ground. The aircraft continued along the runway in this configuration for a few seconds before becoming airborne. Both flight crew reported being aware that the aircraft's performance was reduced during the take off roll.

Following selection of the landing gear up, at about 50 ft, the flight crew reported that they received a reactive windshear alert[4] and initiated the windshear escape manoeuvre[5]. At about 300 ft, the flight crew experienced a second, less severe, windshear event. The windshear alert was not activated during this second event.

The flight crew informed the tower controller that they had experienced a windshear event. A company aircraft was inbound from Singapore at the time and the flight crew of VQT did not hear ATC pass on the information about windshear to the arriving aircraft. The flight crew of VQT then notified the departures

3 Weather radars generally detect precipitation (rain, hail, etc) and display weather patterns based on the intensity of that precipitation.

4 A reactive windshear alert is triggered when the aircraft's systems detect changes in performance associated with windshear conditions.

5 The windshear escape manoeuvre is a memory item which required the flight crew to carry out the procedure from memory.

controller about the event while the inbound aircraft was on the same frequency to ensure they were aware of the possibility of severe windshear on approach to Darwin. The Captain reported that the departures controller stated that the airport wind reading had shown a 16 kt tailwind during their take off roll.

The Captain of VQT spoke to the Captain of the inbound aircraft following the flight and they reported that they did not experience any windshear during their approach and arrival into Darwin.

The summary of the event is based on the recollection of the flight crew and does not include data from the control tower tapes, as they had been erased prior to the commencement of the investigation in accordance with standard storage procedures. When asked, the tower controller could not recall the event and was unaware a windshear incident had occurred.

Aircraft performance

The Quick Access Recorder data was provided to the ATSB by the operator for analysis. The data showed that:

- fluctuations were apparent in the computed airspeed for a period of 20 seconds that were characteristic of a windshear event
- during the initial stages of flight, the aircraft's vertical speed (rate of climb) fluctuated, but always remained positive
- the rate of climb was below 1,000 ft/minute for up to 5 seconds, reducing momentarily to a minimum rate of climb of 466 ft/minute
- the aircraft climbed to 1,500 ft in about 40 seconds, with an average climb rate of 2,250 ft/minute
- at all times during the takeoff, the aircraft was climbing with airspeed above 140 kts.

While there are limitations with the accuracy of the wind data during the initial stages of flight, recorded data showed that the wind was a tailwind from about 120°M at 11 kts shortly after take-off. During the windshear event, a wind gust was recorded at 23 kts from 079°M.

Weather

Forecast

The aerodrome forecast (TAF) for Darwin forecast winds of 12 kts and scattered[6] cloud at 3,500 ft. There was also a 30 per cent probability that, from 0030 to 0730 there would be periods of up to an hour where the weather would deteriorate with wind gusting 35 kts, visibility reduced to 1,000 m, thunderstorms, rain and cloud broken[7] at 1,000 ft.

Actual weather

The Bureau of Meteorology (BoM) issued a report detailing weather conditions at Darwin Airport at the time of the incident. The report noted an unstable air mass in the vicinity of the airport and that there was a shift in wind through the lower atmosphere. It also stated that the radar image around the time of the incident showed a 'shower virtually over the top of Darwin Airport' and that no thunder had been heard during meteorological observations.

According to the BoM report, it was possible that VQT flew into a wet microburst during takeoff.

The US Federal Aviation Administration published the Aeronautical Information Manual (AIM) to provide the aviation community with general flight information. Chapter 7, Safety of Flight, of that manual was titled Meteorology. It included the following information regarding microbursts:

> **7-1-26. Microbursts**
>
> a. Relatively recent meteorological studies have confirmed the existence of microburst phenomenon. Microbursts are small scale intense downdrafts which, on reaching the surface, spread outward in all directions from the downdraft center. This causes the presence of both vertical and horizontal wind shears that can be extremely hazardous to all types and categories of aircraft, especially at low altitudes. Due to their small size, short life span, and the fact that they can occur over areas without

---

6 Scattered refers to 3 to 4 eighths of the sky obscured by cloud.

7 Broken refers to 5 to 7 eighths of the sky obscured by cloud.

surface precipitation, microbursts are not easily detectable using conventional weather radar or wind shear alert systems.

b. Parent clouds producing microburst activity can be any of the low or middle layer convective cloud types. Note, however, that microbursts commonly occur within the heavy rain portion of thunderstorms, and in much weaker, benign appearing convective cells that have little or no precipitation reaching the ground.

Air traffic control

The Darwin air traffic control tower had a number of sources of information to help assess the weather in the vicinity of the airport. The BoM issued weather reports every half an hour on the half hour, which included the recorded wind strength and direction, visibility, cloud height, coverage and temperature. The report for 0130 showed wind from 210° at 5 kts, visibility greater than 10 km and scattered cloud at 2,500 ft.

The BoM also issued a SPECI[8] report at 0158, 4 minutes prior to takeoff, which reported wind from 270°at up to 18 kts, visibility reduced to 3,000 m, showers, rain and broken cloud at 2,500 ft.

The controller's situation data display showed information from the Automated Thunderstorm Alert System (ATSAS) which used weather radar and a number of software and instrumentation technologies to identify thunderstorms. The software was able to calculate the size, location, direction of movement and speed of the thunderstorm. The ATSAS image issued at the time VQT took off showed a moderate thunderstorm cell overhead Darwin Airport. There were no lighting strikes recorded at the time (Figure 1).

Figure 2: ATSAS image (issued at 0202 CST)

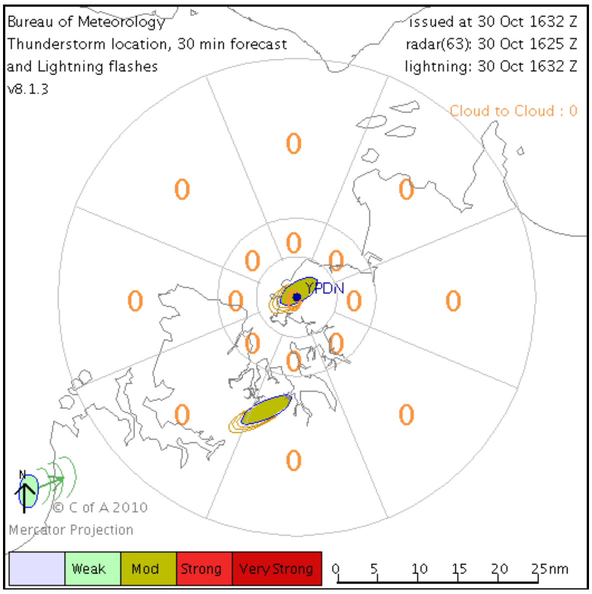


Image courtesy of the Bureau of Meteorology

The controller could also determine the surface wind at the airport from an anemometer[9]. The anemometer did not store information, so no data was available post-event for the incident flight.

The tower also had access to radar images which were updated every 10 minutes and show rainfall intensity. The first radar image (Figure 2) shows the weather at 0155, 7 minutes prior to takeoff and Figure 3 shows the weather at 0205, 3 minutes after VQT took off.

It is likely that the tower controller had the weather radar image for 0155 (Figure 2) available at the time VQT took off. That image showed a moderate thunderstorm cell overhead the airport with some moderate rainfall and a small section of heavy rainfall. The Manual of Air Traffic Services Part 3-10-410 states that 'Tower Controllers are responsible for ensuring that aircraft under their control are advised of sudden and unexpected changes to the aerodrome information, pending an amended ATIS.'

8 Weather observations issued when either, conditions are below a specified criteria or when there has been significant changes since the previous report.

9 Device used for measuring wind speed.

Figure 2: Darwin weather radar image (0155 CST)

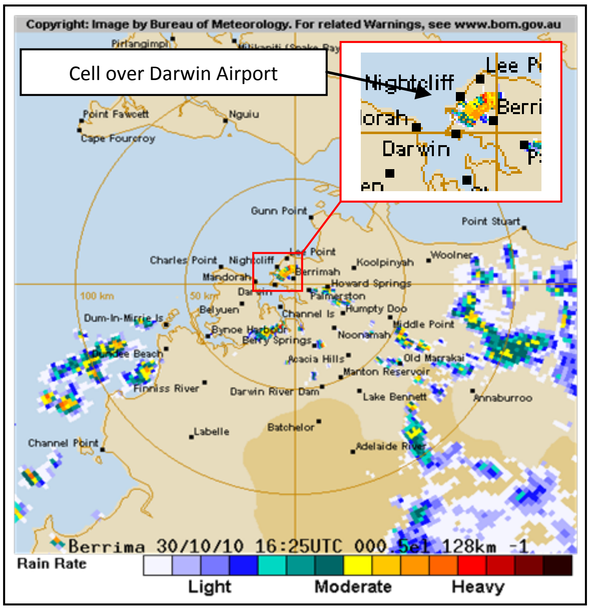


Image courtesy of the Bureau of Meteorology

Figure 3: Darwin weather radar image (0205 CST)

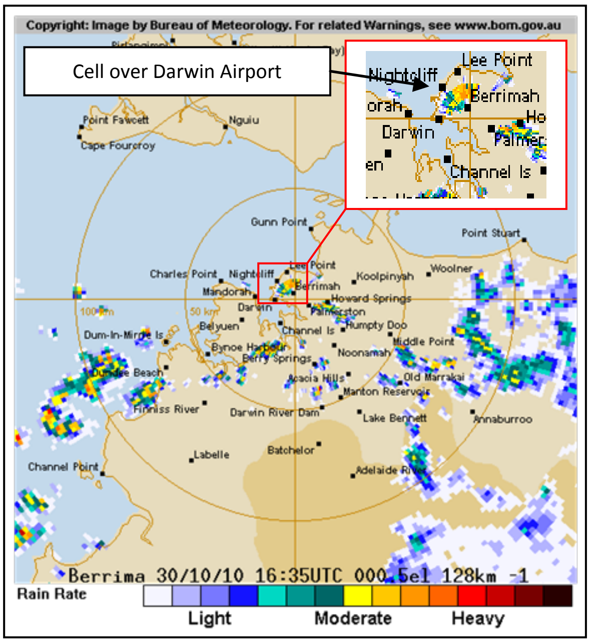


Image courtesy of the Bureau of Meteorology

According to a report compiled by the BoM, observation platforms available at Darwin Aerodrome Tower, i.e. weather reports and radar images, do not readily indicate the presence of wet microburst activity and subsequent windshear.

Aircraft equipment

The aircraft had a weather radar system to assist the flight crew with seeing weather ahead of the aircraft, both on the ground and in the air. The effectiveness of the system on the ground was limited to the maximum tilt angle of the radar, which for this aircraft was 15°. Therefore, the flight crew were unable to see any weather radar returns higher than 15° above the horizon.

The Captain stated that he adjusted the tilt and range on the weather radar system to gain an accurate indication of the weather on the departure path. However, as with the radar available to ATC, the aircraft radar only measured rainfall intensity.

The aircraft was also fitted with a windshear alert system that had both predictive and reactive functions. The predictive function scanned the airspace within a range of 5 NM ahead of the aircraft for evidence of windshear. If windshear was detected the system issued an aural alert, together with a warning, caution or advisory message, depending on the aircraft height. The reactive function triggered an alert if the aircraft encountered actual windshear conditions, but was inhibited between 100 kts and the selection of the landing gear to up.

SAFETY ACTION

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

Jetstar Airways

Safety update

Jetstar Airways issued a Safety Update to all flight crew describing the details of this event. They reminded crew to be extra vigilant in situations where the wind is constantly changing and there is weather in the area. They reiterated that maximum radar tilt may be beneficial when on the ground in order to assess local weather. Flight crew were also reminded of the effectiveness of knowing the memory items in the Flight Crew Operations Manual Abnormal and Emergency section.

Department of Defence – Air traffic control

Safety update

The Department of Defence advised that they have issued a Safety Flash to all Australian Defence Force air traffic controllers describing the details of this event. Controllers were reminded of the importance of accurate and timely sharing of information in a changing environment like that experienced during this occurrence.

SAFETY MESSAGE

This incident highlights the importance of sharing information so that everyone involved can improve their situational awareness. In a dynamic and changing environment like that experienced during this event, accurate and timely information sharing is essential to being able to make informed, safety critical decisions.

While ATC towers do not have the tools available to predict windshear activity, reporting the presence of significant weather returns in the airport vicinity may assist flight crew in gaining a more accurate appreciation of the weather conditions and possible windshear risk.

The Flight Safety Foundation (FSF) Approach and Landing Accident Reduction (ALAR) tool kit provides guidance on avoiding, recognising and recovering from windshear. The tool kit reinforces the importance of following the wind shear recovery technique recommended in the aircraft operating manual.

Additional information on windshear can be found at http://flightsafety.org/files/alar_bn5-4-windshear.pdf.

AO-2011-041: VH-EBL, Airframe event

Date and time:	22 March 2011, 1638 UTC
Location:	365 NM (676 km) NW of Cairns Airport, Queensland
Occurrence category:	Serious incident
Occurrence type:	Airframe event
Aircraft registration:	VH-EBL
Aircraft manufacturer and model:	Airbus A330-203
Type of operation:	Air transport – high capacity
Persons on board:	Crew – 11 Passengers – 147
Injuries:	Crew – 0 Passengers – 0
Damage to aircraft:	Minor

FACTUAL INFORMATION

On 22 March 2011, an Airbus A330-203 aircraft, registered VH-EBL, was being operated by Qantas Airways, on a scheduled flight from Manila, Philippines to Sydney, New South Wales. On board the aircraft were 11 crew and 147 passengers. At about 1626 Coordinated Universal Time[1] (UTC), while 365 NM (676 km) northwest of Cairns and at 39,000 ft, a smell became noticeable on the flight deck and the passenger cabin. The flight crew actioned the aircraft quick reference handbook checklist for Smoke/Fumes/Avionics in an attempt to minimise the smell and cabin crew confirmed that this was successful.

Following the smell and electrical arcing of the left windshield heater, a small flame appeared from the bottom left corner of the Captain's windshield. The flight crew donned oxygen masks and extinguished the flame using the cockpit BCF fire extinguisher. An Electronic Centralized Aircraft Monitoring (ECAM)[2] fault message, A.ICE L WSHLD HEAT alerted the crew to action the quick reference handbook section, Cockpit Windshield/Window Arcing, resulting in the window heat computer (WHC 1) reset button being activated. About 20 minutes later a subsequent ECAM fault message L WINDOW HEAT and accompanied procedure appeared. Despite following that procedure, a further four occasions of arcing and flames occurred over the next 6 minutes, all of which were extinguished.

The aircraft operator's maintenance watch advised the crew to de-select the probe window heat, although there was no assurance that action would remove power from the windshield. The crew advised air traffic control (ATC) that, due to a technical issue, they would be diverting to Cairns. The crew also advised ATC that they had extinguished repeated fires, the result of electrical arcing from an electrical short circuit in the Captain's windshield heater. ATC then declared an INCERFA[3] and the Captain advised ATC that emergency services were not required, but they would advise if the situation changed. The aircraft completed an uneventful landing at Cairns about 1717 UTC and the INCERFA was cancelled.

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

[2] The ECAM provides information on the status of the aircraft and its systems, including warning and caution messages and relevant actions required by the crew.

[3] The code word to designate an uncertainty phase where there is uncertainty as to the safety of an aircraft and its occupants.

Post flight maintenance

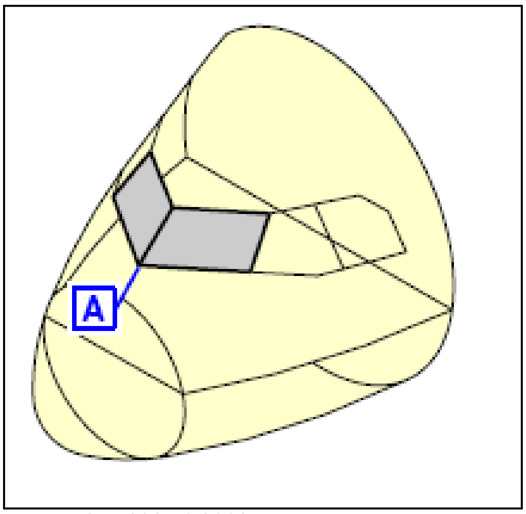
Due to previous similar events, the windshield had previously been identified to the operator by an Airbus service bulletin (SB) A330-56-3009, as requiring replacement when spares became available.

A burn mark was noticed at the bottom left corner of the windshield prior to its removal and the number one window heat computer was replaced. The windshield was also replaced with a serviceable windshield that complied with the SB and the aircraft was returned to service.

Airbus service bulletin

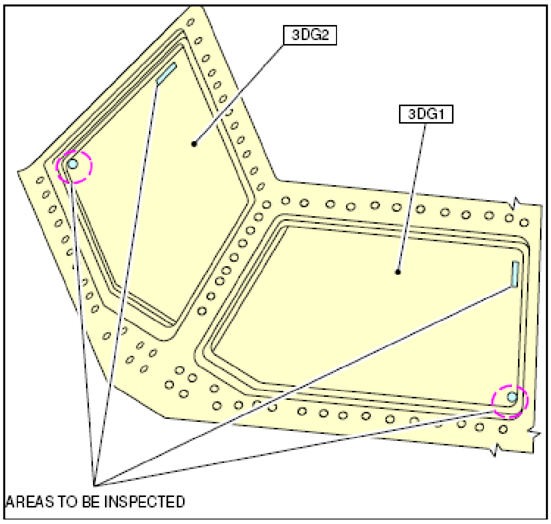
Due to similar windshield events, the aircraft manufacturer, Airbus, issued SB A330-56-3009 on 04 May 2010, with revision 1 dated 27 January 2011. The SB recommended a visual inspection of the left and right windshields (Figures 1 and 2) to determine if their part number and serial numbers were part of the batch identified in the SB. The identified windshields were required to be replaced within 900 flight hours of the SB being issued.

Figure 1: A330 Windshield identification



© Airbus SB A330-56-3009

Figure 2: A330 Windshield inspection areas



© Airbus SB A330-56-3009

Projected failure rate

In April 2011, Airbus, via the BEA[4], informed the ATSB that five windshield heat connector overheat events had occurred on the worldwide A330 aircraft fleet. Service records for each of the affected aircraft indicated the time-to-failure from manufacture was indiscriminate, with no particular correlation identified.

Operator's previous occurrence

There had been a previous windshield in-flight fire event on a Jetstar A330-202 aircraft, registered VH-EBF, on 10 June 2009. That windshield fell into the SB criteria for replacement. The windshield had polysulfide sealant (PR1829 sealant) injected into the heater terminal blocks and the ATSB investigation, AO-2009-027, found that this had probably contributed to the in-flight fire.

Operator's fleet component status

At 29 March 2011, the combined Qantas and Jetstar fleets had 11 windshields identified by serial number in SB 330-56-3009 that required replacement. There were no reported failures or

[4] The BEA (Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile) is the French body responsible for technical investigations into civil aviation accidents or incidents and also acts in this capacity abroad.

fires in either fleet of windscreens not identified in the SB.

SAFETY ACTION

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

Qantas Airways

Windshield replacement program

The aircraft operator's current windshield replacement program projects a completion date for the replacement of identified windshields, by end of September 2011. That was well within the Airbus, recommended compliance date of May 2012, for this operator.

SAFETY MESSAGE

In-flight fires – advisory material

In their flight operations briefing notes, 'Managing In-Flight Fires', Airbus state that:

- An in-flight fire is probably the most serious in-flight emergency, and must be brought under control as soon as possible. Considering the crucial role that time plays in this type of emergency, it is imperative that no time is lost when attempting to extinguish the fire.
- Any fire, no matter how small, may rapidly become out of control, if not dealt with quickly.
- The first priority will always be to put it out.

Guidance material has also been published by the United States (US) Federal Aviation Administration (FAA) for crew members and operators of transport category aircraft to assist in the preparation and training in the event of in-flight fire. The FAA advisories were developed in response to recommendations made after the US National Transportation Safety Board (NTSB) reviewed commercial aviation accidents involving in-flight fires during the period (1983 – 2000).

- FAA Advisory Circular AC 120-80 'In-flight fires'
- FAA Advisory Circular AC 20-42C 'Hand fire extinguishers for use in aircraft'

The advisory circulars provide a range of advice and information with particular emphasis on the importance for crew members (for both flight and cabin crew) to recognise, assess and then take immediate and aggressive action in response to the indications of an in-flight fire. The circulars also emphasized the criticality of small in-flight fires that can spread and become uncontrollable if not immediately managed.

ATSB COMMENT

The ATSB is investigating one previous A330, windshield fire event. The final report for that investigation, AO-2009-027, once completed, can be accessed through the ATSB website at:

http://www.atsb.gov.au/publications/investigation_reports/2009/aair/ao-2009-027.aspx

AO-2011-038: VH-SBI, Engine over-torque event

Date and time:	8 March 2011, 2030 EDT	
Location:	12 NM (22 km) NE of Devonport Airport, Tasmania	
Occurrence category:	Incident	
Occurrence type:	Abnormal engine indications	
Aircraft registration:	VH-SBI	
Aircraft manufacturer and model:	Bombardier Inc. DHC-8-315	
Type of operation:	Air transport –high capacity	
Persons on board:	Crew – 4	Passengers – 43
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

FACTUAL INFORMATION

On 8 March 2011, a Bombardier Inc. DHC-8-315 aircraft, registered VH-SBI and operated by Eastern Australia Airlines, departed Melbourne, Victoria on a scheduled passenger service to Devonport, Tasmania. On board the aircraft were two flight crew (the crew), two cabin crew and 43 passengers. The copilot was designated as the pilot flying for the flight and the pilot in command (PIC) was the pilot monitoring.

When about 110 NM (204 km) from Devonport, the PIC listened to the aerodrome weather information service (AWIS)[1] broadcast, which indicated low cloud and rain in the area. The weather forecast for Devonport also indicated periods of low cloud and rain.

Prior to commencing the descent, the crew formulated a plan in the event they were unable to land at Devonport due to the prevailing weather conditions. This involved conducting a missed approach and proceeding to the holding pattern where they would consult company personnel. If required, they would then conduct a second approach. If they were unable to land, they would divert to Launceston. If conditions were also poor at Launceston, they planned to divert to Hobart.

A second AWIS broadcast confirmed that the rainfall had increased over the last 10 minutes.

The crew prepared for a runway 24 area navigation global navigation satellite system (RNAV (GNSS)) approach. As the crew had not become visual with the runway at the missed approach point[2], a missed approach was conducted. The aircraft was climbed to 3,100 ft and tracked to waypoint 'DPOEB', where a holding pattern was commenced (Figure 1).

After discussion with the operator, the crew elected to conduct a second approach.

On passing waypoint DPOEB on completion of the holding pattern, the PIC attempted to engage the vertical navigation (VNAV)[3] mode in the flight management system (FMS) to provide vertical guidance to the next waypoint, 'DPOEI' (Figure 1), but it would not engage. The PIC then attempted to

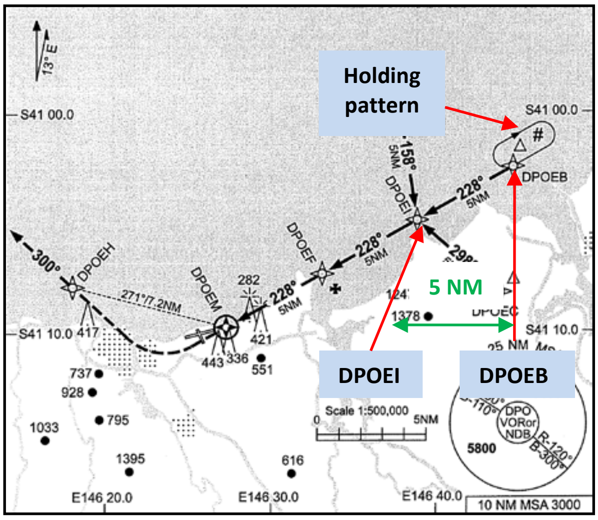
1 The aerodrome weather information service (AWIS) provides actual weather conditions, via telephone or radio broadcast, from Bureau of Meteorology automatic weather stations.

2 A point during the instrument approach at which, if the pilot is unable to observe (does not 'become visual with') the runway or visual guidance to the runway, a missed approach procedure is conducted.

3 VNAV is an auto-pilot function that directs the vertical movement of an aircraft. Engaging the VNAV function allows the aircraft to climb or descend to a pre-programmed flight plan in the flight management system (FMS).

apply a ‘vertical to’ selection to waypoint DPOEI on the FMS, but it also did not engage[4].

Figure 1: Devonport RNAV (GNSS) approach



© Airservices Australia 2009

The PIC then instructed the copilot to conduct a vertical speed descent. The copilot selected a 600-700 feet per minute rate of descent, and the descent was commenced.

Shortly after, the copilot configured the aircraft for the approach and moved the power levers on both engines to the flight idle position. The copilot intended configuring the aircraft early to allow the aircraft to stabilise and the crew to concentrate on the approach. At that time, the PIC noticed that the airspeed had reduced to about 130 kts and instructed the copilot to monitor it.

The auto-pilot captured[5] the minimum sector altitude of 2,500 ft between waypoints DPOEB and DPOEI about 1-1.5 NM prior to reaching DPOEI. As the aircraft levelled off at that altitude, the airspeed had decayed to below 120 kts. The PIC made an ‘airspeed’ advisory call[6] and the copilot responded by increasing engine power.

While both crew members examined the runway 24 RNAV (GNSS) approach chart, the airspeed continued to reduce. The PIC again called ‘airspeed’. The copilot noted that the airspeed was just above 110 kts, and in response, applied additional power.

The two power applications failed to accelerate the aircraft and the PIC observed the airspeed reduce to 5kts below the approach reference speed of 112 kts. The PIC called assertively for more power to be applied and the copilot immediately responded by moving the power levers to what he believed was the normal take-off power position. The copilot thought that both engines advanced to near ‘redline’ (engine torque setting of 115%) for about 3-4 seconds, resulting in an over-torque situation[7]. He immediately reduced the power to about 90%. The operator’s transient over-torque limit was 115% for 20 seconds.

The aircraft stabilised at the target speed of 120-130 kts and the approach was continued. A second missed approach was conducted and the flight was diverted to Launceston.

At the time of the incident, the PIC reported that they were operating in instrument meteorological conditions with heavy rain and light turbulence, and that the airspeed indication was fluctuating.

On discussing the incident further, the copilot recalled observing 121% torque. It was later determined that the engine manufacturer had a transient over-torque limit of 122.4% for 20 seconds, which was not exceeded, therefore no maintenance action was required.

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4 A subsequent analysis by the operator identified that the likely reason for the VNAV not engaging was that, the aircraft’s altitude at that time was below the height programmed for the next waypoint (DPOEI at 3,494 ft) and the FMS would not allow a climbing VNAV path.

5 Altitude capture: an autopilot function that automatically levels the aircraft at a pre-selected altitude.

6 The PIC reported that, in accordance with the operator’s standard operating procedures, an advisory call was made when the airspeed was within 10 kts of the limiting airspeed. The crew’s target speed at that time was 120-130 kts.

7 A condition where the engine has exceeded the maximum operating limits stipulated by the engine manufacturer or the maximum allowable limits for a given operating condition or time. The normal take-off torque limit for the aircraft was 90% and the maximum take-off power limit was 105.6% for 5 minutes.

The operator reported that the aircraft's ability to accelerate after the initial two power applications may have been affected by:

- the landing weight of the aircraft, which was about 1,000 kg less than the maximum landing weight
- heavy rain and possible associated down drafts
- the change in aircraft attitude from descending to maintaining 2,500 ft.

Workload

As the holding pattern had been defined in the FMS at waypoint DPOEB, the PIC was unable to prepare the aircraft for the approach and attempt to engage the VNAV mode until passing the waypoint. As a result, this led to a compressed time to prepare for the approach, as the sector between DPOEB and DPOEI was only 5 NM. The crew's workload was further increased by the VNAV mode failing to engage on two occasions and the marginal weather conditions.

SAFETY ACTION

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

Eastern Australia Airlines

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

Safety alert

The operator recognised that low speed situations that potentially de-stabilise the approach should be avoided, and that the use of any abnormal power setting for the given condition, such as the continued use of flight idle, should be treated with caution, and the normal power setting restored as soon as possible.

In response to this incident, and a stickshaker[8] warning event involving a Eastern Australian Airlines Bombardier Inc. DHC-8-315 aircraft on 1 March 2011 (ATSB investigation AO-2011-036), the operator issued a safety alert to its pilots. Some of the key points highlighted in that alert included:

- The primary consideration for pilots is to maintain an awareness of the aircraft's speed, altitude and position; and controlling its flight path.
- The crew must remain vigilant and continuously monitor the airspeed when the power levers are at the flight idle position or the aircraft is in a low speed configuration.
- Pilots should avoid becoming distracted to a point where airspeed awareness is lost.
- The pilot monitoring must be aware of the aircraft's speed, altitude and configuration, and make the required advisory calls where required.

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8 The stall warning system provides the crew with a stick shaker warning to indicate an impending stall.

AO-2010-105: VH-XDA, Right engine failure

Date and time:	9 December 2010, 1500 EST	
Location:	Near Mount Gordon (ALA), Queensland	
Occurrence category:	Incident	
Occurrence type:	Total power loss	
Aircraft registration:	VH-XDA	
Aircraft manufacturer and model:	Cessna Aircraft Company 404	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 1	Passengers – 8
Injuries:	Crew – Nil	Passengers –Nil
Damage to aircraft:	Nil	

FACTUAL INFORMATION

On 9 December 2010, at about 0900 Eastern Standard Time[1], a Cessna Aircraft Company 404 aircraft, registered VH-XDA (XDA), departed Mount Isa, Queensland, on a return charter passenger flight to Century Mine, Queensland, under instrument flight rules. On board the aircraft were the pilot and eight passengers.

After spending several hours at Century Mine, the passengers boarded for the return flight. The aircraft was taxied to the runway, with the pilot reporting operations normal. At about 1430, the flight departed for Mount Isa.

During the climb, passing through 1,000 ft, the pilot noticed that the right alternator annunciator light, R ALT OUT, was 'flickering'. The pilot reset the annunciator light in an attempt to resolve the issue, but the light remained illuminated. The pilot also noticed that the right ammeter was reading zero, indicating that there was no output from the right alternator. The pilot switched the right alternator off[2] and the flight continued. The aircraft was climbed to 9,000 ft and established in the cruise, with the pilot remaining visual on top of cloud. About 10-15 minutes later, the pilot noticed that the right engine oil pressure gauge was indicating zero. At the time, the pilot believed that the gauge was faulty as the other engine parameters were normal. The pilot also reported that the engine was developing the required power and no unusual sounds were heard.

To avoid having to descend in instrument meteorological conditions at a later stage if the engine failed, the pilot commenced a descent to below the cloud base.

On descent, passing through 6,000 ft, the pilot observed the right engine cylinder head temperature (CHT), oil temperature, and manifold air pressure (MAP) decline. The power began to decrease and the engine subsequently shut down. The pilot also reported hearing a loud bang and observed smoke emanating from the right engine. The pilot actioned the emergency procedures checklist and transmitted a MAYDAY[3] call on the Brisbane Centre frequency.

The pilot elected to divert to the Mount Gordon aeroplane landing area (ALA), which was located on

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 This action electrically disconnected the alternator from the aircraft's electrical system. The alternator still remained connected to the engine and continued to rotate, but no electrical output was produced.

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

the Century Mine - Mount Isa track. The pilot programmed the global positioning system (GPS) unit for Mount Gordon, which indicated that the aircraft was 15 NM (28 km) to the south of the airstrip.

During the diversion to Mount Gordon, while continuing the emergency procedures checklist, the pilot noticed that the right engine fire light had illuminated. The pilot attempted to discharge the engine fire extinguisher, but he was unable to depress the extinguisher button. During his training he had been advised that the button should depress about 1 inch (2.54 cm). The pilot placed additional pressure on the button, but it did not move. The pilot asked the passenger seated behind, if he could reach over and press the button. The passenger pressed the button, but without effect.

While the pilot was unable to confirm if the engine fire extinguisher had activated[4], he noted that the smoke dissipated about 30 seconds later.

As a precaution, the pilot assumed that an engine fire had occurred and, in response, placed the emergency fuel crossfeed shutoff valve into the OFF position and selected the fuel to the right engine off. At that stage, the aircraft was maintaining 2,500 ft, with full power applied on the left engine.

The pilot broadcast a second MAYDAY[5] call advising that he was diverting to Mount Gordon. Soon after, when about 8-9 NM (15-17 km) from the airstrip, the pilot conducted a passenger brief.

A further descent was commenced and the aircraft joined the circuit on base for runway 27. The approach and landing were conducted without further incident.

After landing, the pilot visually inspected the right engine and observed an excessive amount of oil on the inside of the engine cowl.

Engine examination

The right engine, a Teledyne Continental Motors (TCM) GTSIO-520-M engine, was removed from the aircraft and transported to an engineering facility for further examination.

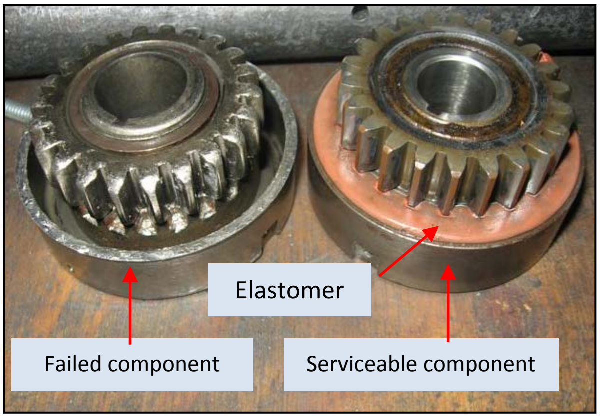
A visual inspection of the engine identified that there were a number of holes in the crankcase (Figure 1). The number-1 connecting rod had become detached and punctured the crankcase, subsequently dislodging the right magneto. A 5/16 inch bolt was also observed protruding through the crankcase. The gear-driven alternator, positioned near this bolt, was removed for further examination.

Alternator examination

Examination of the alternator identified that the alternator drive coupling[6] had failed.

The alternator drive coupling contained a red rubber 'elastomer' material that provided vibration dampening and a form of 'shear' relief if the alternator failed. This material had become separated from the alternator drive coupling (Figure 1).

Figure 1: Alternator drive coupling with missing elastomer



Photograph courtesy of aircraft operator

As a result, the alternator drive gear and outer section were no longer connected (Figure 2). The alternator drive gear, which was still engaged with the aircraft engine's drive gear, continued to rotate,

4 A post flight inspection of the aircraft determined that the fire extinguisher bottle for the right engine had activated. There was no reported evidence of an engine fire.

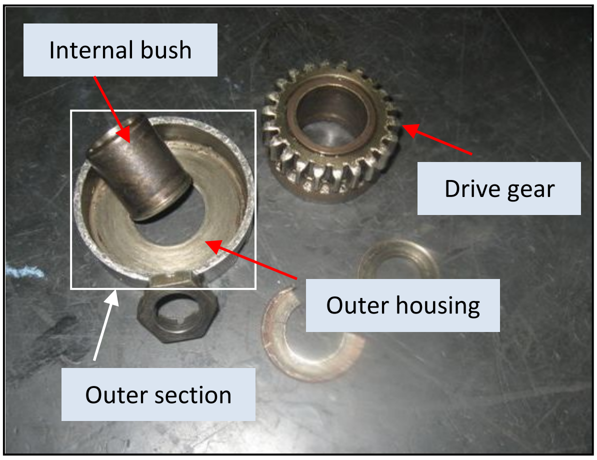
5 The pilot reported that reception on the Brisbane Centre frequency was intermittent, most likely due to the aircraft's low altitude. As a precaution, the MAYDAY call was broadcast on high frequency.

6 The alternator drive coupling is the geared interface between an aircraft's engine and the alternator.

while the outer section rotated independently reducing the alternators output.

The four 5/16 inch attachment bolts on the engine drive gear face became overloaded, resulting in the engine drive gear becoming dislodged.

Figure 2: Alternator drive coupling components



Photograph courtesy of aircraft operator

Liberated pieces of the alternator drive coupling's elastomer material were ingested into the engine's oil system and sump (Figure 3).

Figure 3: Debris in oil sump

Photograph courtesy of aircraft operator

The oil pick-up strainer became blocked and starved the engine of oil required for lubrication and cooling, resulting in its failure.

Alternator history

In September 2010, the right voltage regulator[7] on the aircraft was reported as unserviceable. The right alternator was replaced on 25 September 2010 with an overhauled component. The existing alternator drive coupling was inspected at that time and reused.

The right alternator had been fitted to the aircraft for about 77 hours when the incident occurred.

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

Fleet inspection

A preliminary investigation by the engineering organisation identified that the likely cause of the engine failure was a result of the alternator drive coupling failing. The investigation also identified that the incorrect alternators were installed on XDA.

In response, the operator initiated an inspection of its TCM engines fitted with gear-driven alternators (15 aircraft in total). The purpose of the inspection was to confirm the serviceability of the alternators and alternator drive couplings, and to verify the correct application of the fitted components. As a result of the fleet inspection, the following was identified:

- seven aircraft had one unserviceable alternator drive coupling
- one aircraft had an unserviceable alternator.

The operator also reported that scheduled maintenance inspections conducted on some of the aircraft prior to the incident involving XDA had identified one aircraft with an unserviceable

7 An electrical component used to maintain a constant level of voltage supply despite changes in input voltage or electrical load.

alternator and a second aircraft with a ‘noisy’ alternator.

Maintenance schedule

As a result of the fleet inspection and subsequent findings, the operator advised the ATSB that they intend to amend their maintenance schedule for aircraft fitted with TCM engines and gear driven alternators.

Inspections of the alternators and alternator drive couplings are conducted at intervals up to 500 hours, as specified by the aircraft manufacturer; however the operator has specified that the inspections will now occur at, or before, 220 hours in service.

AO-2010-109: VH-DOK, Collision with terrain

Date and time:	18 December 2010, 1224 EST	
Location:	Great Keppel Island (ALA), Queensland	
Occurrence category:	Accident	
Occurrence type:	Collision with terrain	
Aircraft registration:	VH-DOK	
Aircraft manufacturer and model:	Cessna Aircraft Company TR182	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 1	Passengers – 3
Injuries:	Crew – 1 (minor)	Passengers – 2 (minor)
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 18 December 2010, at about 1157 Eastern Standard Time[1], a Cessna Aircraft Company TR182 aircraft, registered VH-DOK (DOK), departed Rockhampton, Queensland, on a charter flight to Great Keppel Island, Queensland, under visual flight rules. On board the aircraft were the pilot and three passengers.

At the time of departure, the pilot noted the wind at Rockhampton was from a northerly direction and anticipated similar conditions at the Island.

On arrival at the Great Keppel Island aeroplane landing area (ALA), the pilot overflew the airstrip at about 1,500 ft to assess the wind conditions. The pilot reported that neither of the two windsocks was operational[2].

The aircraft joined the circuit on a left downwind for runway 12. The pilot elected to extend the leg so that he could assess the surface of the water and obtain an indication of the wind conditions. The pilot reported that the wind appeared to be from a northerly direction and that no white caps were observed on the water surface, indicating a wind strength of about 3-5 kts. These conditions resulted in a light tailwind, which the pilot assessed as acceptable for the landing.

The pilot conducted his pre-landing checks and had selected a runway aiming point adjacent to the passenger boarding/disembarkation area (Figure 1). The pilot reported that a normal approach with full flap was conducted and that the wind did not appear to be strong.

Figure 1: Great Keppel Island (ALA)

© Google Earth

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

2 The windsocks were positioned on the north and south side of the airstrip. The pilot reported that both windsocks were missing.

During the landing, the flare[3] was commenced adjacent to the passenger area and shortly after, the hold-off[4] was initiated. The pilot reported that during the hold-off, DOK floated in ground effect[5] for an unusually long time.

When about one-third along the runway, DOK momentarily touched down and then ballooned[6]. The pilot applied slight rearward pressure on the control column in an attempt to cushion the subsequent touchdown and the stall warning horn activated. The aircraft landed about half way along the runway.

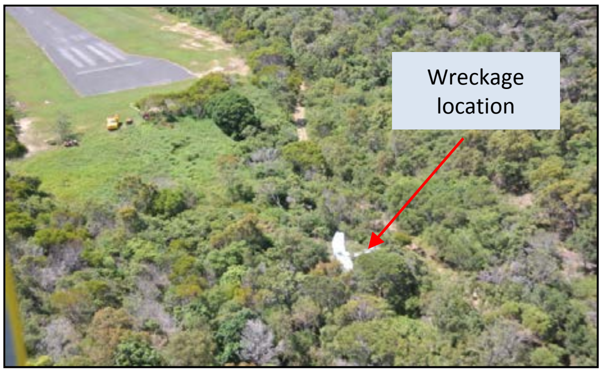
The pilot applied the brakes, but without effect. He released and re-applied the brakes several times, but they did not respond. Immediately after, the pilot determined that DOK could not be stopped by the runway end and elected to go-around. The pilot applied full power; the flap configuration remained unchanged.

After becoming airborne, the pilot attempted to manoeuvre DOK towards a clearing in the trees. In order to avoid the right wing contacting the trees, the pilot banked the aircraft to the left. The left wing tip subsequently collided with trees. DOK spun around to the left before coming to rest upright (Figure 2).

The pilot and passengers exited the aircraft and commenced walking back to the airstrip. The pilot and two passengers sustained minor injuries, while the third passenger was not injured. The aircraft sustained serious damage (Figure 3).

After the accident, the pilot reassessed that the tailwind was in excess of 10 kts.

Figure 2: Wreckage location



Photograph courtesy of the Queensland Police Service

The pilot reported that the stronger than anticipated tailwind component during the landing resulted in the round-out and flare being much longer than expected. Also, when full power was applied for the go-around, the tailwind and full flap configuration prevented DOK from achieving an adequate climb performance in order to clear the trees at the end of the runway.

Figure 3: Aircraft wreckage

Photograph courtesy of the Queensland Police Service

Pilot information

The pilot held a Commercial Pilot (Aeroplane) Licence, with a total of 521 hours experience, of which 123 hours were on the Cessna Aircraft Company 182 aircraft.

The pilot had conducted his flying training in the Rockhampton area and had completed in excess of 100 landings at the Great Keppel Island airstrip. He had last flown to the Island about 6 months prior to the accident flight. When the Great Keppel Island

3 the final nose-up of a landing aircraft to reduce the rate of descent to about zero at touchdown

4 when the pilot increases rearward pressure on the control column to postpone landing in order to do so at a lower airspeed

5 Increased wing lift when flying in close proximity to the ground.

6 Ballooning is a sudden, unwanted gain in aircraft height during the landing.

Resort was operating[7], the pilot reported that he would fly to the Island about 2-3 times per week.

Airstrip information

The Great Keppel Island airstrip was an uncertified, unregistered aeroplane landing area (ALA), located about 52 km to the east-north-east of Rockhampton. The airstrip was 70 ft above mean sea level, with one runway aligned 120/300°.

The Aircraft Owners and Pilots Association of Australia (AOPA) National Airfield Directory 2010 stated that runway 12/30 had a sealed bitumen surface, was 875 m long, and sloped down to the north-west[8]. Runway 12 had a displaced threshold of about 48 m; this was the preferred runway for landing.

The Directory also stated that crosswinds were frequent and the windsocks, positioned on the north and south side of the airstrip, may indicate contradictory wind conditions due to the venturi effect through the cutting in the hills. Turbulence was expected on short finals.

The Great Keppel Island Resort airstrip information sheet also stated that the airstrip was subject to localised wind variation as a result of the adjacent terrain and that landing on runway 30 was not recommended due to the possibility of severe turbulence on final approach.

The pilot reported that it was normal to experience turbulence about 100-150 ft above ground level when on approach and that the wind between the hills was often variable. During previous flights to the Island, the pilot noted that on numerous occasions, the windsocks located at either end of the airstrip indicated opposing wind conditions.

The pilot also stated that it was standard practice for aircraft operating at the Island to land on runway 12 and takeoff on runway 30 due to the runway slope and prevailing wind conditions.

7 The Great Keppel Island Resort closed in February 2008 for rebuilding and refurbishment.

8 The Great Keppel Island Resort airstrip information sheet indicated that the runway slope was 1.92 per cent down to the north-west.

Windsock requirements

While there was no mandatory requirement for a wind sock at an ALA, Civil Aviation Regulation 92 (1) states that an aircraft shall not land or take-off from any place unless that place is suitable for use as an aerodrome for the purposes of landing or taking-off; and, having regard to all the circumstances of the landing or take-off, including the prevailing weather conditions. However, Civil Aviation Advisory Publication (CAAP) 92-1(1), does suggests that a method for determining the surface wind at an ALA was desirable, with a wind sock cited as the preferred method.

Meteorological information

The Bureau of Meteorology's weather observations at Rockhampton aerodrome indicated that the wind at 1200 was 9 kts gusting to 13 kts from the north-west.

The weather observations for the coastal township of Yeppoon, Queensland[9], located about 21 km to the west-north-west of Great Keppel Island indicated that the wind at 1200 was 9 kts gusting to 14 kts from the west-north-west, while at 1230 the wind was 8 kts gusting to 11 kts from the same direction.

Aircraft brakes

The aircraft operator advised the Australian Transport Safety Bureau that, on 15 December 2010 the right brake pedal was reported as 'spongy'. The aircraft was inspected and the brake fluid in the right brake master cylinder was replenished. The brakes subsequently operated as normal.

On the morning of the accident flight, the pilot reported that when taxiing at Rockhampton the brakes appeared spongy. He released and re-applied the brakes several times, after which, they operated as expected.

During the landing at the Island, the pilot reported that the brakes did not respond when applied and that he did not hear any noises to indicate that they were locked. As a precaution, the pilot released and

9 Yeppoon is the closest reference point for wind speed and direction information.

re-applied the brakes several times, but without effect.

An investigation conducted by the Queensland Police Service identified recent tyre marks on the runway that were considered to be from DOK (Figure 4).

SAFETY MESSAGE

A go-around, the procedure for discontinuing an approach to land, is a standard manoeuvre performed when a pilot is not completely satisfied that the requirements in place for a safe landing have been met.

The need to conduct a go-around may occur at any point in the approach and landing phase, but according to the United States Federal Aviation Administration (FAA), the most critical go-around is one initiated when very close to the ground. Consequently, the sooner a condition that warrants a go-around is recognised, the safer the manoeuvre will be.

It is crucial that pilots establish a decision point along the runway at which a go-around should be commenced in the event the requirements for a safe landing cannot be met.

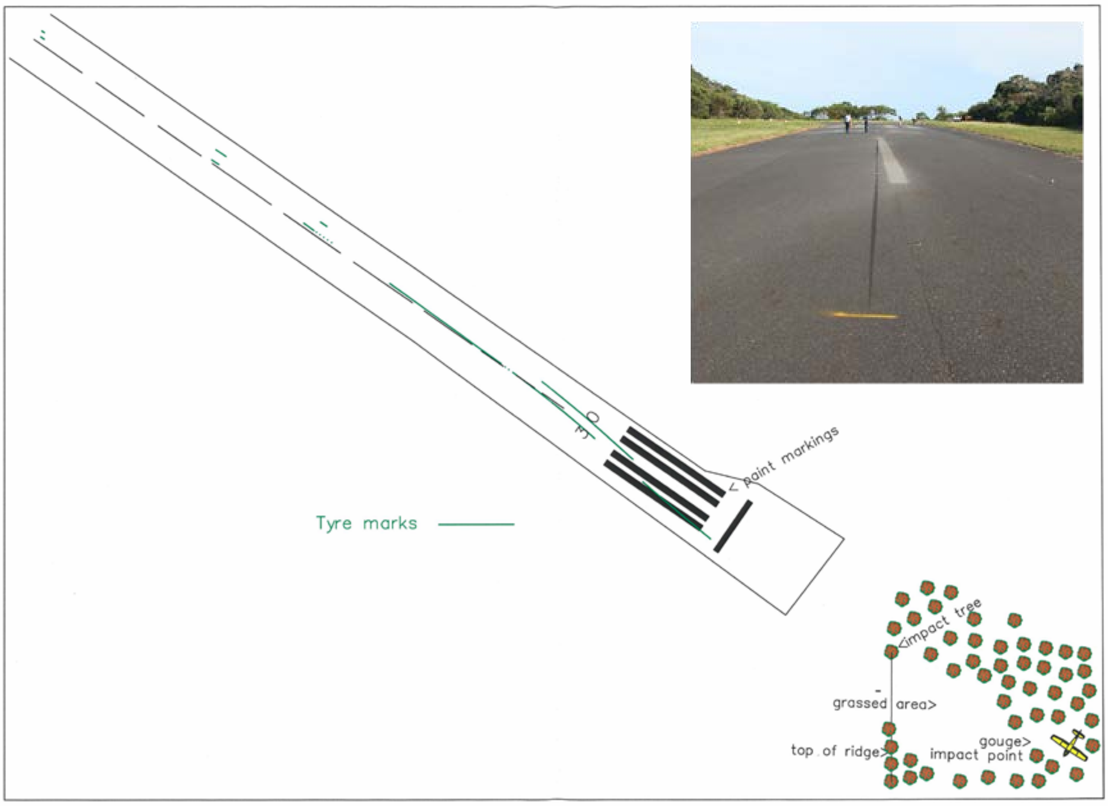
The pilot of DOK reported that when previously landing on runway 12 at Great Keppel Island, he would aim to have touched down and commenced braking well before half way along the runway.

While a stronger than anticipated tailwind component was experienced, this accident highlights the importance of conducting a go-around as soon as landing conditions appear unfavourable.

The following provides some useful information on go-arounds:

- Aviation safety explained - Go-arounds: http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD:1001:pc=PC_91481
- FAA Airplane Flying Handbook, Chapter 8, Approaches and Landings: http://www.faa.gov/library/manuals/aircraft/airplane_handbook/media/faa-h-8083-3a-4of7.pdf

Figure 4: Accident scale plan and aircraft tyre marks



Drawing and photograph courtesy of the Queensland Police Service

AO-2010-111: VH-EFS, Collision with terrain

Date and time:	23 December 2010, 0832 EDT	
Location:	2 km NE of Camden Airport, New South Wales	
Occurrence category:	Accident	
Occurrence type:	Collision with terrain	
Aircraft registration:	VH-EFS	
Aircraft manufacturer and model:	Piper Aircraft Corporation PA-30 (Twin Comanche)	
Type of operation:	Flying training - dual	
Persons on board:	Crew – 2	Passengers – 0
Injuries:	Crew – 1 (minor)	Passengers – Nil
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 23 December 2010, at about 0832 Eastern Daylight-saving Time[1], a flight instructor and student pilot in a Piper Aircraft Corporation PA-30 (Twin Comanche) aircraft, registered VH-EFS (EFS), departed Camden Airport, New South Wales on a training flight.

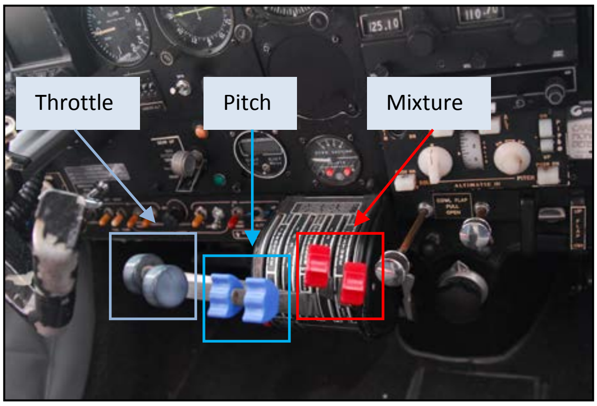
The student was in the process of obtaining a command (multi-engine) instrument rating. The instructor had planned for the flight to include a number of instrument approaches and simulated engine failure exercises (asymmetric operations)[2].

The pre-takeoff checks were completed by the student who also conducted a take-off safety brief, which included reciting the procedures for responding to an engine failure.

After takeoff, the student completed his after-takeoff checks. The instructor contacted air traffic control and requested approval to conduct asymmetric operations; the request was approved.

Shortly after, at about 400 ft above ground level (AGL), the instructor directed the student, ‘practice engine failure’. The instructor, covering the engine mixture controls (Figure 1) with his hand, moved the mixture control on the right engine close to, or at the idle cut-off position. The instructor continued to position his hand on the mixture control.

Figure 1: Engine controls



Photograph courtesy of the NSW Police Service

Note: Figure 1 represents the position of the engine controls after the accident occurred and the aircraft was shutdown.

The instructor and student’s recollection of the events following the initiation of the simulated engine failure is detailed below. The investigation could not reconcile the discrepancy between the recollections.

[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] The terms simulated engine failure and asymmetric operations are used interchangeably in this report.

The instructor's recollection

After moving the mixture control for the right engine close to, or at the idle cut-off position, the instructor reported that the student stated the word 'control'.

The aircraft yawed[3] to the right. At that time, the instructor, who had his feet positioned on the rudder pedals[4], stated that there was no deflection applied on the left rudder pedal to counteract the yaw.

The instructor recalled that the nose of the aircraft had been lowered slightly.

Immediately after, the student then reportedly verbalised 'left engines failed, feathering left engine' and proceeded to move the propeller pitch control on the left engine rearwards, to about half way. The instructor stated to the student that he had incorrectly identified the failed engine. In response, the student reportedly reduced the throttle setting on the left engine to idle.

The aircraft's airspeed then decayed and the aircraft yawed to the right.

The student's recollection

After the simulated engine failure was initiated, the student noticed that the aircraft was yawing to the right. In response, the student reported that he applied left rudder to maintain directional control.

The student lowered the nose of the aircraft to ensure the airspeed remained above the 'blue-line'[5] speed and continued to apply left rudder.

While establishing which engine had failed, the student recalled moving the throttle on the left engine rearwards to half way. The student reported that he was feeling anxious and as a result, he had inadvertently moved the throttle on the operating (left) engine.

The student recalled hearing the instructor make a comment, and he then moved the throttle on the left engine into the full forward position.

The student noted that the airspeed had decayed to below the 'blue-line' speed.

The student stated that once he had selected the incorrect engine, there was insufficient time to complete any other engine failure response actions. He also reported that he did not manipulate any of the other engine controls.

Aircraft response

The airspeed continued to decay and the aircraft stalled. The instructor reported that the aircraft rolled abruptly to the right, with the wing dropping to a 120° angle and the aircraft entered a spin.

The instructor stated to the student that he had control of the aircraft and moved the mixture control on the right engine to the full rich position. The instructor believed that the student had initially resisted his inputs on the controls. The instructor again stated that he was in control of the aircraft and the student appeared to have relinquished the controls. The aircraft was in a near vertical position, pointing towards a housing estate.

As the aircraft began to recover, and the nose of the aircraft started to rise, the instructor applied full power.

To avoid colliding near houses, the instructor rolled the aircraft to the left about 60° towards paddocks. At that stage, the aircraft was still descending.

The instructor began to regain control of the aircraft at about 10 ft AGL, with the aircraft in a relatively level attitude. As the nose of the aircraft was raised the airframe began to shudder, indicating that a stall was imminent, and the instructor elected to land the aircraft. The throttles were then reduced to idle and the aircraft impacted the ground about 2 km from Camden Airport.

The aircraft went through a fence and struck a post. The aircraft continued to skid for another 75 m before colliding with another fence and a small drainage canal (Figure 2).

The instructor and student shut down the aircraft before exiting the aircraft. The student was not injured; however, the instructor sustained minor injuries.

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3 Rotation of the aircraft about the vertical axis.

4 Left and right pedals manipulated by the pilot's feet to counteract yaw. If the aircraft yaws to the right, the left rudder pedal is applied.

5 The best single-engine rate of climb speed.

Pilot information

Flight instructor

The instructor held a Commercial Pilot (Aeroplane) Licence, Grade 1 (Aeroplane) Flight Instructor Rating, and a multi-engine endorsement. He had a total of 15,642 hours, of which about 14,000 hours was instructional time and 5,739 hours was multi-engine time. The instructor had about 1,500 hours on the Twin Comanche and had been flying EFS for about 8 years.

Student pilot

The student pilot held a Private Pilot (Aeroplane) Licence, with a total of 280 hours experience. He had about 21 hours multi-engine time, all of which was conducted on the Twin Comanche.

The student had commenced training with the aircraft operator about 2-3 months prior to the accident. The majority of this had been conducted with the instructor involved in the accident.

Asymmetric training

During December, the instructor and student had undertaken a number of flights where asymmetric operations were conducted at various phases of flight, including a 3 hour asymmetric training flight. Overall, the student had conducted about 8-9 simulated engine failures prior to the accident.

The instructor reported that he did not have any particular concerns with the student's progression. The instructor could not recall if the student had previously misidentified the failed engine.

The student believed his performance with responding to simulated engine failures had improved, and that he had not previously misidentified the failed engine.

Figure 2: VH-EFS

Photograph courtesy of the NSW Police Force

Spin characteristics

The instructor reported that the spin characteristics of the Twin Comanche were not favourable and that it was difficult to recover from a fully developed spin. He also stated that one of his concerns with the aircraft was getting into a yawing situation with fuel in the wing tip tanks.

On the day of the accident, the aircraft's main tanks, auxiliary tanks and tip tanks were full. While the instructor reported that this was the typical fuel load for when conducting an instrument flight, asymmetric training was generally conducted with the tip tanks empty or close to empty.

The instructor stated that, had he not been a qualified aerobatics pilot and recently conducted advanced aerobatic manoeuvres as part of his instructor rating renewal, he may not have been able to recover the aircraft from the spin.

SAFETY ACTION

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

Aircraft operator

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

Multi-engine endorsement syllabus

The operator has introduced a minimum of 1 hour of simulator training into their multi-engine endorsement syllabus for conducting asymmetric operations in more extreme situations, such as when below the take-off safety speed or below the 'blue-line' speed.

Command (multi-engine) instrument rating syllabus

The operator intends to include the following training into their command (multi-engine) instrument rating syllabus:

- an additional 1 hour of asymmetric operations in the simulator
- a minimum of 1.5 hours flight time conducting asymmetric operations under simulated instrument flight rules conditions.

Asymmetric operations below 2,000 ft

The operator amended their operations manual stating that simulated engine failures conducted below 2,000 ft AGL will be by the use of the throttle only.

SAFETY MESSAGE

While the danger of conducting any flight operation at low level is recognised, it is also acknowledged that pilots must be trained to manage an engine failure after takeoff in a multi-engine aircraft.

This type of situation commonly occurs at low altitude, low airspeed, and with close to maximum power on the operating engine, while the pilot's workload is high with competing task demands.

Pilots should also make every effort to familiarise themselves with the handling characteristics of the aircraft, particularly under abnormal situations.

Simulating an engine failure

An article published in the July-August 2004 edition of Flight Safety Australia 'Engine out' stated that:

> 'Accepted practice at most flying schools is to simulate engine failure by cutting the mixture control, resulting in failure of the engine due to fuel starvation, or to close the throttle.'

While the use of the mixture control provides a more realistic representation of an engine failure situation, the Civil Aviation Safety Authority (CASA) states that moving the mixture control to the idle cut-off position to simulate an engine failure should never be used at low altitude as it may compromise the ability to restore power to the failed engine promptly.

This accident highlights the critical importance of conducting the appropriate response actions following both an actual or simulated engine failure in a multi-engine aircraft; and the inherent risks of using the mixture control to simulate a failure at low altitude.

The following publications provide useful information on asymmetric operations:

- Civil Aviation Advisory Publication 5.23-1(1) – Multi-engine Aeroplane Operations and Training http://www.casa.gov.au/wcmswr/_assets/main/download/caaps/ops/5_23_1.pdf
- Handling Sense Leaflet - Twin Piston Aeroplanes http://www.caa.co.uk/docs/33/20110217HSL01.pdf
- Flight Safety Australia - Engine out http://www.casa.gov.au/wcmswr/_assets/main/fsa/2004/aug/36-37.pdf
- Flight Safety Australia – Even worse than the real thing http://www.casa.gov.au/wcmswr/_assets/main/fsa/2002/mar/30_35.pdf

The risks associated with conducting simulated engine failures after takeoff were also highlighted in a fatal accident involving a Beech Aircraft Corporation BE76 Duchess aircraft at Camden Airport in 2003 (ATSB investigation 200300224) http://www.atsb.gov.au/publications/investigation_reports/2003/aair/aair200300224.aspx

Spin characteristics

An article published on the Australian Flying website (http://www.australianflying.com.au/news/learn-to-fly-slowly) describes a situation of an instructor and student in a Twin Comanche struggling to regain control of the aircraft from a spin. The aircraft, with the full tip tanks, failed to respond to the normal spin recovery techniques applied by the instructor.

The instructor recalled the account of another pilot who had experienced a similar situation in a Twin Comanche with full wing tip tanks, who stated that he recovered by extending the landing gear and wing flaps. The instructor conducted the same actions and the aircraft began to ease out of the dive at about 50 ft above the water.

AO-2011-005: VH-WHW, Aircraft loss of control

Date and time:	16 January 2011, 1820 EST	
Location:	6 NM (11 km) SE of Toowoomba, Queensland	
Occurrence category:	Accident	
Occurrence type:	Loss of control	
Aircraft registration:	VH-WHW	
Aircraft manufacturer and model:	De Havilland Aircraft DH-82A	
Type of operation:	Private	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – 2 (serious)	Passengers – Nil
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 24 January 2011, at about 1800 Eastern Standard Time[1], a De Havilland Aircraft DH-82A (Tiger Moth) aircraft, registered VH-WHW (WHW), departed Toowoomba, Queensland on a private local flight.

On board was the pilot in command (PIC) and a flying instructor from the local Aero Club. The PIC conducted a pre-flight inspection, which included a check of the fuel, oil and control cables. He determined that WHW was serviceable and had sufficient fuel for the flight. There were no loose items in the aircraft's storage locker or in the cockpit.

About 15 minutes after takeoff, the flying instructor, who was acting as the handling pilot at the time, initiated a left turn to return to the airport. The PIC recalled that, during the turn, WHW suddenly pitched down followed by a second, even more severe, pitch down motion. Both the PIC and the handling pilot recalled that the control stick did not move when WHW pitched down.

In response to the sudden and uncommanded nose down motion, both pilots attempted to raise the nose by applying back pressure on the control stick. Their actions had no effect and WHW continued to pitch nose down until the aircraft became inverted.

The aircraft was about 100 ft above the trees and inverted when it began to climb. Both pilots felt significant g-force followed by the collision with the trees.

The aircraft came to rest upside down on the side of Mount Davidson in bushland (Figure 1). Both occupants sustained serious injuries.

Figure 1: VH-WHW accident site

Photograph courtesy of the PIC

Aircraft history

The aircraft (Figure 2) was manufactured in 1941 and was used for pilot training by the British Royal Air Force until 1946. WHW then was used to tow

[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.

gliders until 1972 when it entered storage until the 1980's. The aircraft was restored in 1989 in Johannesburg, South Africa and was shipped to Australia in 1996 where it was used in charter and aerial flying operations.

About 7 years prior to the accident, the aircraft had been incorrectly lifted during a repair to the undercarriage. As a result of damage sustained, WHW had required three new wings, a new engine and a new propeller prior to being returned to service.

Figure 2: VH-WHW

Photograph courtesy of Robert Frola

Aircraft damage

The aircraft sustained serious damage in the accident. The aircraft was winched from the accident site to a clearing and then subsequently moved to Toowoomba Airport. A number of interested parties, including a licensed aircraft maintenance engineer, examined the wreckage and were unable to observe any structural or mechanical faults that may have contributed to the accident.

Aircraft maintenance

The aircraft had completed a 100-hourly inspection on 23 December 2010 with an approved maintenance provider. The inspection included a check of the flight control system and surfaces with no defects found. The PIC had been the only person to fly WHW since it had completed the 100 hourly inspection, and reported that WHW was operating normally.

Previous flight

The PIC conducted an aerobatics flight with a passenger immediately prior to the accident flight. The PIC performed two aileron rolls and one loop before returning to the airport. The PIC reported that the aircraft flew normally and there were no control issues.

Pilot experience

The PIC had a commercial pilot's licence with about 670 hours total flying time. He had about 50 hours flying experience in command on a Tiger Moth, which he had gained over the previous 12 months. The PIC was a flying instructor and held an aerobatics rating.

The flying instructor had over 6,000 hours total flying experience; however, he had not flown a Tiger Moth prior to this flight.

Witness reports

There were two separate witnesses to the event. One witness was on his property located about 2 km south-east of the accident site. He recalled that the aircraft was about 1,000 ft above terrain when he saw the aircraft pitch up steeply and bank right, followed by an abrupt nose-down movement. The aircraft completed a half loop and continued to fly level inverted. He did not see the aircraft hit the terrain.

The second witness recalled that the aircraft was flying straight and level then suddenly pitched down and completed a half loop. He saw the aircraft flying inverted and then impact with the side of the mountain. It was not possible to reconcile the differing accounts provided by the two witnesses.

ATSB COMMENT

While the reason for the loss of control could not be determined, there have been a number of previous ATSB investigations into De Havilland Aircraft DH-82A accidents.

The following Tiger Moth loss of control accident investigation reports have examined issues including adhesive failure, inadvertent slat extension during aerobatics and loss of control due to stall.

- VH-AJG, 16 February 2002, Williamtown, New South Wales
  www.atsb.gov.au/publications/investigation_reports/2002/aair/aair200200377.aspx
- VH-TMK, 28 February 1998, Wellard, Western Australia
  www.atsb.gov.au/publications/investigation_reports/1998/aair/aair199800648.aspx
- VH-LJM, 20 November 1988, 2 km SE of Coldstream, Victoria
  www.atsb.gov.au/publications/investigation_reports/1988/aair/aair198801406.aspx

AO-2011-023: VH-MAC, Turbulence event

Date and time:	16 February 2011, 1047 EDT	
Location:	Near Albury Airport, New South Wales	
Occurrence category:	Incident	
Occurrence type:	Turbulence event	
Aircraft registration:	VH-MAC	
Aircraft manufacturer and model:	Piper Aircraft Corporation PA-30	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – 0	Passengers – 0
Damage to aircraft:	Nil	

FACTUAL INFORMATION

On 16 February 2011, a Piper Aircraft Corporation PA-30 aircraft, registered VH-MAC (MAC), departed Coldstream aerodrome at 0915 Eastern Daylight-saving Time[1], for a private flight from Coldstream, Victoria (Vic.), to Canberra, Australian Capital Territory via Strathbogie and Wangaratta Vic. and Albury, New South Wales. The flight was conducted under instrument flight rules (IFR). On board the aircraft were the pilot and one passenger. In preparation for the flight, the pilot had submitted a flight plan and obtained an aviation meteorological area forecast (ARFOR) for areas 30 and 32 the previous evening.

After departure from Coldstream aerodrome, the pilot obtained clearance to 9,000 ft above mean sea level (AMSL). At about 1030, while flying in instrument meteorological conditions (IMC) in light cloud north-east of Albury, the aircraft encountered severe turbulence[2] and entered an uncommanded dive, losing height rapidly. The pilot disconnected the autopilot and manually controlled the aircraft. Although the pilot tried to raise the aircraft's nose, the descent continued for about 3,000 ft. At about 6,000 ft AMSL, and after a number of uncontrollable steep descents and climbs in dark cloud and rain, the pilot eventually regained control of the aircraft. During one encounter with a strong downdraft, the aircraft descended from 8,000 ft to 5,500 ft AMSL.

At about 1047, the pilot radioed Melbourne Centre to inform air traffic control that he was experiencing navigational and control difficulties, due to the severe turbulence. The controller declared an INCERFA[3] and attempted to re-contact the pilot, but due to the high pilot workload associated with attempting to control the aircraft, the pilot was unable to reply. MAC was approximately 20 NM (37 km) north-east of Albury and in a strong updraft at that time.

When the pilot regained control of MAC he requested radar vectors for guidance to the west of his position. He was concerned about rising terrain east of the planned route, having a lowest safe altitude of 7,700 ft AMSL. The controller was unable to comply with the request as there was no radar coverage in that area. At about 1055, the controller contacted the pilot to provide navigational assistance. However, MAC was in another powerful updraft and the pilot advised that all his instruments

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 Severe turbulence can influence large, abrupt changes in aircraft altitude and attitude, with large variations in indicated airspeed. Aircraft may be temporarily out of control.

3 The code word to designate an uncertainty phase where there is uncertainty as to the safety of an aircraft and its occupants.

were ‘spinning madly’ and that he was unable to establish a heading. The pilot reported that he was not sure of the aircraft’s direction and that the primary attitude indicator (AI)[4] had toppled[5]. The secondary AI showed the aircraft in a continuous 90º bank, but the pilot believed the secondary AI reading was incorrect. The only instrument, that appeared stable, was the altimeter. The controller then declared an ALERFA[6] and advised Australian Search and Rescue (AusSAR).

The pilot reported that after recovering from another uncommanded descent, the aircraft was thrust upward through 10,000 ft where it started to shake violently and entered a stall. On recovering from the stall, MAC entered another downdraft and descended uncontrollably again. It was reported that MAC climbed and descended continually for nearly 35 minutes, at times becoming inverted.

Eventually, the pilot saw terrain through a break in the cloud and was able to fly the aircraft clear of cloud. At about 1105, the pilot radioed Melbourne Centre to advise that he was clear of the turbulence and requested clearance to land at Albury. At 1127 the aircraft landed safely at Albury.

Post flight inspection

The pilot reported that the wings and engine cowls were smeared with engine oil and that each engine had lost 2 quarts of oil. Personal effects, and mats from beneath the pilot’s and the passenger’s feet, were found in the rear of the aircraft cabin.

At the pilot’s request, a post flight inspection of the aircraft was completed at Albury Airport, in accordance with Civil Aviation Advisory Publication CAAP42L-1(0) *Inspection of aircraft after abnormal fight loads, heavy landing or lightning strike*. After the inspection was completed, the aircraft’s maintenance release was endorsed with a limitation to fly by visual flight rules (VFR) until the primary AI was repaired.

Meteorological information

The pilot reported that the ARFOR for areas 30 and 32 (Figure 1) that he obtained the previous evening, for the outbound flight to Canberra, contained no significant weather. However, there were thunderstorms forecast in area 30 for the return flight later that day. He had not updated the forecast he obtained the previous evening, nor requested any weather information en-route.

An ARFOR for areas 30 and 32 was issued by the Bureau of Meteorology (BoM) at 0246, with validity from 0400 to 1600. That forecast identified isolated thunderstorms developing to the west of the pilot’s intended route. The associated cloud was forecast as isolated[7] cumulonimbus clouds from 5,000 ft to 35,000 ft, and scattered towering cumulus and stratocumulus clouds from 5,000 ft to 10,000 ft, with the tops of the clouds extending to 20,000 ft. Severe turbulence was forecast, associated with cumulonimbus clouds, and moderate turbulence forecast in cumulus clouds.

An amended ARFOR for areas 30 and 32 was issued at 0420 with the same validity and forecasting the same thunderstorm activity.

An airmen’s meteorological report (AIRMET)[8] for area 30 and 32, was issued at 0420 and was valid for 6 hours. It advised that thunderstorms had been observed northeast of a line that intersected the pilot’s planned route about 20 NM north of Albury.

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4 A gyroscopic flight instrument, driven either pneumatically or electrically, that provides a pilot with an artificial horizon when flying in cloud.

5 A gyroscopic instrument is said to ‘topple’ when its gimbals have for any reason ceased to maintain the correct axis in space, so that further rotation of its mounting results in violent direct precession. Traditional gyroscopic instruments, such as the older pneumatically driven attitude indicators, can be toppled by aerobatics, or by turbulence if any rotation of the aircraft’s axes travels beyond defined limits. The instrument then becomes useless as an attitude reference until the gyro has settled again into normal operation.

6 The code word used to designate and alert phase where apprehension exists as to the safety of an aircraft and its occupants.

7 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.

8 An AIRMET is issued to advise of meteorological phenomena, such as isolated thunderstorms, that are of a lesser severity than SIGMET (significant) information.

Pilot information

The pilot held a current Private Pilot (Aeroplane) Licence and a valid Class 2 medical certificate. He had completed 1,385 hours total flying time, with 1,000 hours of command time and 450 hours total multi-engine time. The pilot was appropriately rated for IFR flight and held a command (multi-engine) instrument rating with 226 hours total instrument time.

Pilot comment

The pilot reported that MAC was equipped with a STORMSCOPE[9], but not weather radar. He had not suspected any thunderstorms to be in the area, as there were no indications of any lightning activity prior to encountering the turbulence. In addition to the STORMSCOPE, he was used to hearing other pilot broadcasts warning of poor weather in the area. On this occasion he had not heard any pilot reports of thunderstorms or turbulence and had assumed the weather, to be the same as the forecast that he obtained the previous evening.

The pilot reported that for future flights, he would check the ARFOR prior to departure.

The pilot also reported that the secondary AI appeared to be operating correctly on the return flight to Coldstream.

Flight planning

It is a pilot's responsibility to obtain the current weather reports and forecasts for the route to be flown.

The revised ARFOR for areas 30 and 32, current at the time of departure from Coldstream, predicted the possibility of thunderstorm activity along the planned track developing earlier than the forecast obtained by the pilot the previous evening. Air traffic control initiated flight information, such as forecast deterioration to weather conditions or the development of hazardous weather, was not normally relayed to a pilot unless that weather was described in a current meteorological product.

Instrument flight

During instrument flight, the primary reference is the pilot's AI. A secondary AI, where provided, is used if the pilot's AI fails or becomes unusable. During training, a pilot is taught to cross-reference the flight instruments and to ignore indications that do not correlate. That is especially important if an AI fails or 'topples' during an in-flight upset.

ATSB COMMENT

In the unlikely event that both AIs fail, a pilot can use a turn coordinator or turn and slip[10] indicator and compass to provide lateral orientation, and the pressure instruments, airspeed, altitude and vertical speed, to determine pitch attitude. Using these instruments to control an aircraft is known as 'emergency panel' instrument flight. Even under ideal conditions, it is difficult for a pilot who is not well practiced to maintain control of an aircraft on emergency panel. Using the indirect information of the rate of change of those instrument's indications to interpret aircraft attitude, requires much greater skill and practice than using an AI for attitude reference. In extreme turbulence it is almost impossible for a pilot to perform.

SAFETY MESSAGE

This occurrence highlights the need for pilots to obtain the most recent weather forecasts available and not rely solely on aircraft weather detection equipment or third party broadcasts to identify poor weather conditions.

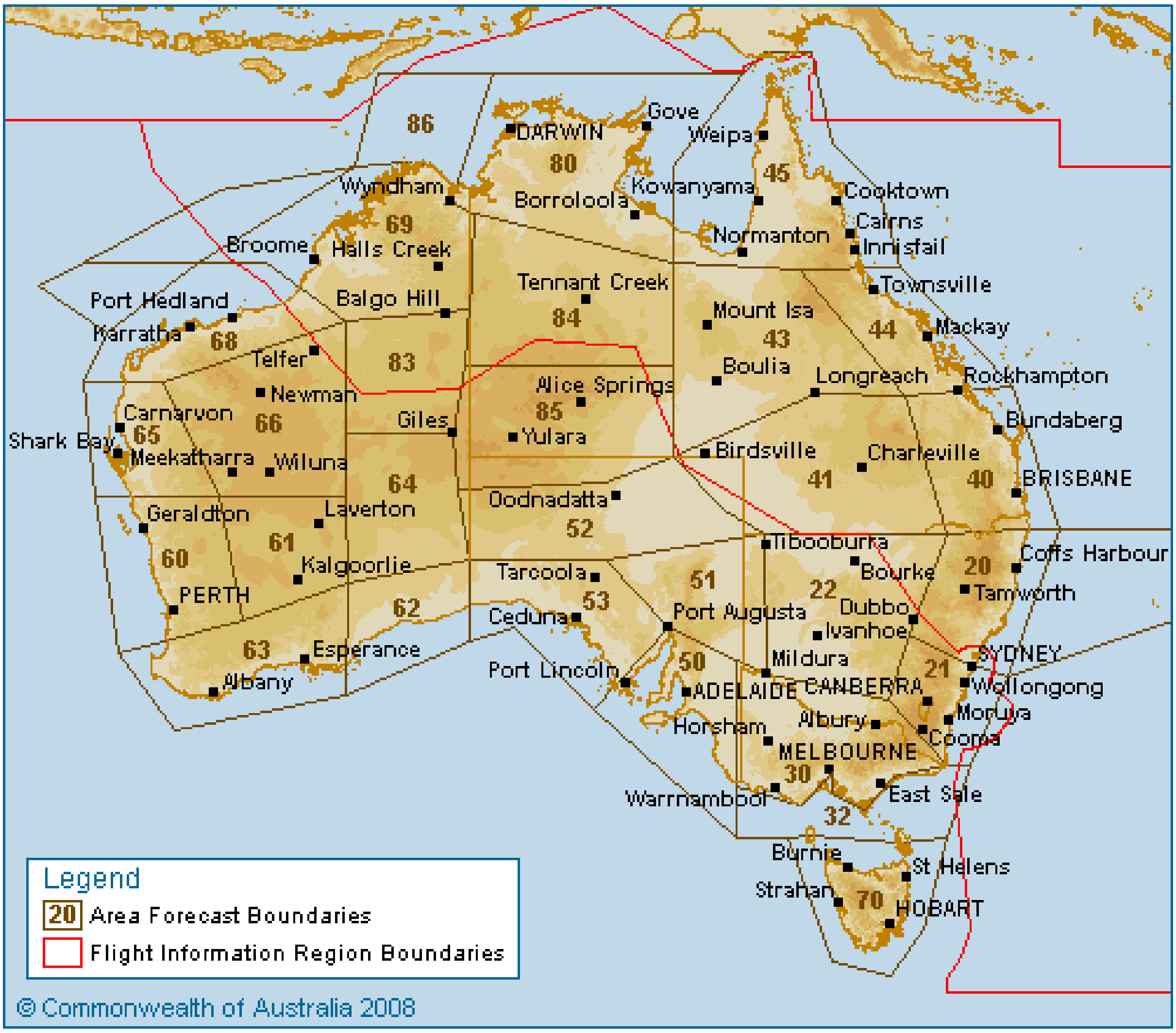
The ability to fly an aircraft on 'emergency panel' is essential when an in-flight upset occurs in cloud to prevent situations of momentarily loss of control and becoming inverted.

9 A cockpit instrument developed specifically to detect and map thunderstorms by analysing the radiated signals of electrical discharges from storm cells. The information is displayed both in azimuth and range, determined by the intensity of the discharge, and presented in real-time.

10 A gyroscopic flight instrument with a needle showing rate of turn left or right and a lateral, curved tube containing an oil-damped slip/skid ball to indicate balanced flight.

Following an in-flight upset and loss of the primary AI, an extreme attitude on the secondary AI, should not be assumed to indicate a failure of that instrument also, without first cross-referencing the other instruments to confirm attitude. Without that procedure a pilot might hastily reject a valuable attitude reference.

Figure 1: Area forecast boundaries map



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AO-2011-030: VH-AQS, Wirestrike

Date and time:	9 February 2011, 1600 EST
Location:	10 NM (19 km) SW of Cootamundra, New South Wales
Occurrence category:	Accident
Occurrence type:	Wirestrike
Aircraft registration:	VH-AQS
Aircraft manufacturer and model:	Cessna Aircraft Company 210L
Type of operation:	Aerial Work - survey
Persons on board:	Crew – 1 Passengers – Nil
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Serious

FACTUAL INFORMATION

On 9 February 2011, at 1600 Eastern Standard Time[1], a Cessna Aircraft Company 210L aircraft, registered VH-AQS (AQS), departed Temora, New South Wales. The pilot was conducting a local low-level survey flight to the south-east of Temora between Junee and Cootamundra, New South Wales.

The survey was conducted at 133 ft above ground level (AGL) in a north-south pattern. Each survey line was about 15 km long with 100 metre spacing. The pilot described the terrain as hilly and heavily treed with sections of clear pasture land.

The flight had been operating for about 1 hour and 20 minutes, and the aircraft was established 5 km into a northerly survey line, when it struck a powerline. The wire was strung from low terrain to the left of the aircraft, over a gully, to the top of a ridgeline on the right. The pilot reported that he saw the wire at the last moment and attempted to fly under it, but was unable to clear the wire. The wire struck the top left side of the aircraft, damaging the windscreen and the left wing.

The pilot diverted to Cootamundra aerodrome and reported that the aircraft did not have any control issues following the wirestrike. The pilot conducted a flapless approach and landing, due to potential damage to the flap, and landed without incident.

Powerline information

The powerline was a single phase 3/2.75 Gz[2] conductor that spanned 907 m between two poles. The contact with the powerline damaged the power poles, cross arms and conductor (Figure 1) and resulted in loss of electrical power to a nearby property.

The pilot reported that the power poles were camouflaged among the trees and there were no markers on the powerlines to help identify them. During the repair work of the powerline, the energy company estimated that the mid-span height of the powerline was higher than 25 m, although an exact measurement could not be determined.

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 Strands/Wire Diameter (mm) galvanised powerline.

Figure 1: Powerline damage

Photograph courtesy of Essential Energy

Aircraft damage

The wire sliced through the leading edge of the left wing (Figures 2 and 3) and punctured the windscreen. The flap and aileron on the left wing were also damaged.

Figure 2: Wing damage

Photograph courtesy of Essential Energy

Figure 3: Windscreen and leading edge damage

Photograph courtesy of the aircraft operator

The pilot reported that the aircraft handled normally and was unaware of the damage to the aileron and flaps during the flight.

Pre-flight planning

Prior to beginning the survey task, a safety meeting was conducted to discuss potential hazards and obstacles in the survey area, including terrain, built up areas, powerlines, masts and bird life. The terrain was undulating with dense vegetation and low level powerlines were expected in the area.

As per standard practice, a reconnaissance flight was conducted prior to the commencement of the survey task to identify possible hazards, including powerlines. A number of powerlines were identified during this process; however, the powerline that was struck was not identified. The reconnaissance flight was conducted at 1,000 ft and the operator reported that it was intended to spot general hazards and it was not expected that every powerline would be identified during the process.

Pilot information

The pilot had a commercial pilot's licence and held both an instructor rating and an agricultural rating. He had over 4,800 hours total flying time of which about 2,500 hours were conducted during low-level survey operations.

SAFETY ACTION

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

Aircraft operator

Memo to flight crew

The aircraft operator issued a memo to their flight crew outlining the details of this event. The memo also highlighted a recent wirestrike accident in Bingara, New South Wales also involving a fixed-wing aircraft conducting low-level survey work. The memo discussed the similarity between the two events and discussed the risk of flying over undulating terrain where single earth wire return lines are common.

Survey height

As a result of this incident, the operator will change the way survey tasks are assessed at the planning stage. The Chief Pilot and/or senior survey pilots will ensure that the contractual requirements are suitable for the terrain. For survey flights over high risk areas, including undulating terrain in semi rural locations, the minimum survey height will be 180 ft AGL.

The Chief Pilot has also reiterated to pilots that they are encouraged to raise the survey height if they believe a safety hazard exists.

Rostering

Although experience wasn't considered a factor in this incident, the operator will attempt to roster the most experienced pilots on the high risk survey tasks. If that is not possible, they will have an experienced pilot mentoring a less experienced pilot as a minimum requirement.

SAFETY MESSAGE

This was the second wirestrike accident involving a fixed-wing survey aircraft in 2011 (see investigation AO-2011-006 www.atsb.gov.au/publications/investigation_reports/2011/aair/ao-2011-006.aspx). Both events involved experienced flight crew flying over undulating terrain in semi-rural areas. Both flight crew had conducted a pre-survey flight to examine possible hazards in the area and had completed a pre-deployment safety brief. Neither crew were aware of the powerline prior to the wirestrike.

Following these events, the aircraft operators involved are conducting further examination into technology and planning processes that may improve awareness of the location of wires. A working group consisting of representatives of the Department of Infrastructure, the Civil Aviation Safety Authority, Airservices Australia, and the Department of Defence has been cooperating with Geoscience Australia to examine ways of establishing an electronic terrain and obstacle database, know as an eTOD. At the time of publishing, the work of the group was ongoing.

The March-April 2011 edition of *Flight Safety Australia* published an article on wirestrikes. The article 'Watching the wire' included data on the types of aircraft and operations involved in wirestrikes in Australia. The author also examined possible causes for wirestrikes and emphasised the importance of vigilance and training for operating in a hazardous environment.

- Wilson, R 'Watching the wire'. Flight Safety Australia (79), 15-18 http://casa.gov.au/wcmswr/_assets/main/lib100059/mar-apr11.pdf

The Flight Safety Australia article referenced a number of sources for further information including a video discussing wirestrikes in helicopter operations.

- Online video 'Surviving the wires environment' http://www.rotor.com/Publications/HAIVideosLibrary/SurvivingtheWiresEnvironment.aspx

AO-2011-008: VH-HFG, Partial power loss

Date and time:	26 January 2011, 1330 EST
Location:	51 NM (95 km) NNE of Hamilton Island Airport, Queensland
Occurrence category:	Accident
Occurrence type:	Partial power loss
Aircraft registration:	VH-HFG
Aircraft manufacturer and model:	Robinson Helicopter Company R44 Clipper II
Type of operation:	Charter
Persons on board:	Crew – 1 Passengers – 3
Injuries:	Crew – 0 Passengers – 0
Damage to aircraft:	Destroyed

FACTUAL INFORMATION

On 26 January 2011, at about 1315 Eastern Standard Time[1], a Robinson Company R44 Clipper II helicopter, registered VH-HFG (HFG), departed the Knuckle Reef Helipad, Queensland, for a 20-minute charter flight. On board the helicopter, were the pilot and three passengers. HFG had 130 L of fuel on board at departure and a weight and balance calculation had been completed. The passengers were given a safety briefing and fitted with life preservers before the flight.

While returning to the Helipad 15 minutes later, at about 950 ft above mean sea level (AMSL), the pilot noticed the cylinder head temperature reading suddenly drop to zero. The oil temperature had quickly risen to 240°C, with no change to the oil pressure. The pilot stated that the engine manifold pressure began changing, from the normal cruise reading of 22 inches HG, up to 28 inches HG, then down to 19 inches HG. During these continual manifold pressure variations, the main rotor revolutions per minutes (RPM) remained at a constant 100 per cent. The pilot reported that HFG had started descending at a rate of 200 ft per minute. He was unable to stop the rate of descent, and that while descending at a forward speed of 60 kts, the helicopter started to shudder.

At about 700 ft AMSL, the pilot made contact with VH-RTS (RTS), a fixed-wing aircraft, on the common traffic advisory frequency (CTAF) and requested that the pilot inform Hamilton Island air traffic control (ATC) that he was experiencing mechanical difficulties and would be conducting a precautionary water landing about 3.5 NM (6.5 km) south of Knuckle Reef (Figure 1) and 0.5 NM (0.9 km) east of Line Reef. The pilot then inflated the emergency floats, informed the passengers of the difficulties he was experiencing and asked them to fully don their life preservers. He then commenced an auto rotation from 500 ft AMSL and landed on the sea in a 1.5 m swell. The pilot shut down the engine and applied the rotor brake. During the shutdown process, the pilot noticed the tail rotor chip light illuminate and several shudders through the airframe, as HFG pitched and rolled in the swell.

With the helicopter secured, the pilot contacted the pilot of RTS and informed him that they had safely landed on the water. The pilot then gave his GPS coordinates to the pilot of VH-VTO (VTO), another helicopter in the area. The pilot of VTO relayed the information to the Hamilton Island Tower and arranged for the passenger transfer boat from Knuckle Reef to pick up the pilot and passengers.

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

While waiting 1.5 hours for the transfer boat, the pilot assisted and comforted those passengers who had become seasick. During this time, the pilot accessed the right side of HFG to look for any apparent damage to the main rotor, engine nacelle, tail boom and rotors. He did not notice any damage or fluid leaks.

Following the safe recovery of the occupants, the helicopter was unable to be recovered before it drifted into the path of an oncoming cyclone about two days later. A subsequent search failed to locate the helicopter, which was presumed to have sunk.

Aircraft history

HFG was manufactured June 2007 and at the time of the precautionary water landing had completed 1946.7 airframe and engine hours. The engine was due for overhaul in 53.3 hours. The last 100 hour inspection was completed 8 December 2010.

SAFETY MESSAGE

With the loss of the helicopter, the reasons for the engine power fluctuations and the failure of the helicopter to maintain height was unable to be determined.

The helicopter operator's safety management requirements mandated 6-monthly emergency training that included helicopter autorotation training. The pilot also possessed a float endorsement and had completed helicopter underwater escape training. The float endorsement provides pilots with insight on how to autorotate into water, how a helicopter reacts in water and the most appropriate way to land with an ocean swell.

The pilot's currency in this training underpinned the successful precautionary autorotation water landing onto a 1.5 m swell, preventing significant injuries to the occupants. Passenger wellbeing was also attended to and essential communications were maintained by the pilot during and after the ditching.

While in this instance a successful precautionary water landing was conducted, in many cases the outcome is less successful. Helicopter underwater escape training (HUET) teaches pilots, other aircrew and regular passengers an instinctive escape procedure providing them with an improved chance of survival in the event of a helicopter becoming submerged.

http://www.casa.gov.au/wcmswr/_assets/main/fsa/1999/sep/huet.pdf

Figure 1: Knuckle Reef and Hamilton Island Airport

© Google Earth

AO-2011-046: VH-HUL, Wirestrike

Date and time:	02 April 2011, 13.30 EDT
Location:	Near Maitland (HLS), New South Wales
Occurrence category:	Accident
Occurrence type:	Wirestrike
Aircraft registration:	VH-HUL
Aircraft manufacturer and model:	Robinson Helicopter Company R44 Raven 1
Type of operation:	Charter
Persons on board:	Crew – 1 Passengers – 2
Injuries:	Crew – Nil Passengers – Nil Bystander - Serious
Damage to aircraft:	Minor

FACTUAL INFORMATION

On 2 April 2011, a Robinson Helicopter Company R44 Raven 1, registered VH-HUL (HUL), was conducting charter operations from a company approved helicopter landing site (HLS), at the Lorn Reserve on the east bank of the Hunter River, near Maitland, New South Wales (NSW) (Figure 2). The helicopter had been positioned on flat ground, facing north-east, 23 m south of three overhead 11kv power conductors spanning the River, next to the Belmore Bridge. Ground crew had placed bunting along the eastern and northern boundaries. The bunting on the northern boundary was positioned a few metres south of the nearest power conductor to provide a visual ground reference point for that hazard. The pilot reported that the first flight of the day was about 1045 Eastern Daylight-saving Time[1], and the flight had departed the HLS in a southerly direction into the forecast south-east wind.

On the second flight of the day, at about 1330, the pilot lifted off from the helicopter landing site to commence hover checks. The pilot had used the trees on the eastern river bank as a visual cue to wind direction and observed the wind to be gusting straight across the river from a south-west direction. As a result, the pilot reported making the decision to change the previous departure direction, intending to turn left to come around into the wind.

After completion of the hover checks, the pilot flew the helicopter forward and commenced the left (northerly) U-turn to face the river (Figure 2). On facing the river, the pilot saw the bunting and observed the trees swaying directly towards the nose of HUL. The pilot then increased power and flew towards the river, parallel with the bridge.

The pilot reported losing visual reference with the trees while flying towards the river. At about 50 ft above ground level, the pilot reported that the helicopter was caught in a southerly wind gust. Being mindful of the power conductors and feeling the helicopter drifting, the pilot commanded an early left turn toward the south. During the turn, the helicopter main rotor blades severed one of the seven-strand, unshielded, aluminium-wound power conductors (Figure 1). After hearing a loud noise and feeling a slight shudder, the pilot checked for system alerts, established that the flight controls were still effective and landed back at the Reserve.

The pilot had assessed that the power conductors ran parallel with the bridge in a westerly direction, but their actual path diverged away from the bridge to the southwest (Figure 2).

[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.

Witness accounts

Two independent witnesses, one positioned 156 m south of the Belmore Bridge on the opposite side of the river, and one positioned on the eastern side of the river, estimated the wind as coming from the south-south-east and south-east, at 10-15 kts, with possible stronger gusts. Both witnessed the accident flight and thought it unusual that the pilot had turned tail into the wind, facing the power conductors, before flying in a wide U turn towards the river.

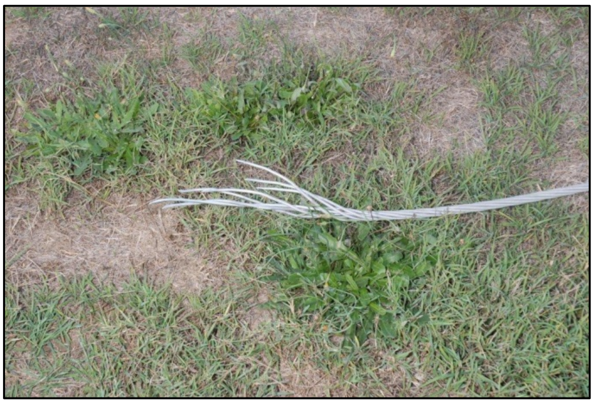
They both observed the severed 11kv power conductor fall as the helicopter turned south.

Injuries to a bystander

One section of the severed power conductor fell across a safety railing, on the western side of the Hunter River, about 30 m south of the bridge. The other section fell into the river.

An electrical discharge from the section of power conductor that fell onto the safety railing, was transmitted through the railing and resulted in a full thickness burn to one leg and burns to the hands, of a 3 year old child, that was in contact with the railing, about 156m south of the bridge.

Figure 1: End of severed 11kv power conductor



Photograph courtesy of the NSW Police Force

Pilot information

The pilot held a current Commercial Pilot (Helicopter) Pilot Licence, with a low level endorsement. The pilot had accrued a total of 238.8 hours experience, 148.1 hours in command and 108.4 hours on Robinson R44 helicopters. The pilot also held a valid Class 1 medical certificate and had completed wirestrike avoidance training two years previously.

Pilot comment

The pilot reported misjudging the wind direction and strength, losing visual reference with ground features and misjudging the angle of the power lines in relation to the Belmore Bridge.

Helicopter landing site assessment

It was normal for the HLS to be visually assessed and approved by the Chief Pilot before operations could commence. Once operations were approved, the pilot in command held sole responsibility for the safe operation at the site.

HLS assessments were completed in accordance with the operator's operations manual. Wherever possible, while conducting company operations, the recommended minimum physical characteristics for a standard HLS, as specified in Civil Aviation Advisory Publication CAAP 92-2 (1) *Guidelines for the establishment and use of helicopter landing sites (HLS)* applied.

As the operator of HUL had not previously operated from the Lorn Reserve, a site assessment was required. The Chief Pilot was not available for the assessment, so the pilot of HUL was delegated the task. A previous operator was contacted as part of the assessment process and provided information about the power conductors running parallel to the bridge. The power conductors were entered into the operators HLS register, as an obstacle and hazard. At completion of the site assessment all operations and risks were discussed with the Chief Pilot before the Chief Pilot approved the site.

Meteorological information

The pilot reported looking at the Williamtown[2], NSW general forecast for the area at the start of the day. The wind had been forecast to get stronger in the afternoon. The forecast was for 15 kts gusting to 25 kts from the south-east.

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2 Williamtown is located approximately 28 km to the south-east of the HLS.

The Bureau of Meteorology, Williamtown Airport, hourly forecast for 1330, reported a southerly wind of 19 kts with visibility greater than 10 km. An amended forecast issued for 1347, showed a southerly wind at 18 kts gusting to 28 kts. The Cessnock Airport, NSW[3], hourly forecast for 1330 was for a south-east wind of 13 kts with no cloud.

Communications

Radio communications between the pilot and a company employee on the ground were available and could have provided an additional assessment of potential hazards and the wind direction. This capability, however, was not utilised, nor was there a mandated requirement for it.

SAFETY ACTION

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

Aircraft operator

As a result of this occurrence the aircraft operator has introduced and documented new processes and completed a number of amendments to their operations manual and safety manual regarding HLS/aeroplane landing area (ALA) procedures, pilot qualifications and HLS records.

Operations manual amendments

- amended the HLS/ALA procedures, pilot's qualifications and HLS records
- introduced the HLS approach plate, identifying way points, tracking, circuit and distances for pilot knee board application
- introduced a checklist for minimum safety equipment required for an HLS
- amended the methods of accident/incident reporting and pilot qualification in relation to low level flying.

Safety management system manual amendments

- amended the company safety management system, specifically hazard reporting, risk assessments, accident/incident investigation and safety awareness/training
- introduced a company flight/ground accident/incident reporting system
- introduced a company safety alert information system.

SAFETY MESSAGE

Pilots should ensure that the mental picture they have built, of any area in which their aircraft is to operate, is as accurate as possible. This can be achieved by using as many means as they have at their disposal to check and re-check the positioning and heights of any identified hazards.

Pilots should also ensure that any decisions they make to change planned and risk-assessed departure routes do not inadvertently introduce new risks. In these types of situations, all modes of communication should be used to ensure an initial risk management plan is re-assessed appropriately.

ATSB COMMENT

Powerlines continue to be 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)* mandates that powerlines at a height above 90 m (300 ft) have markers attached. Although this serves to alert pilots to their presence, awareness of the hazards powerlines present during flight operations below 90 m also needs to be considered.

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.

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[3] Cessnock is located about 21 km to the south-west of the HLS.

The following ATSB publications provide further reading on wirestrike accidents and research:

- Improving the odds: Trends in fatal and non-fatal accidents in private flying operations http://www.atsb.gov.au/media/1569697/ar2008045.pdf

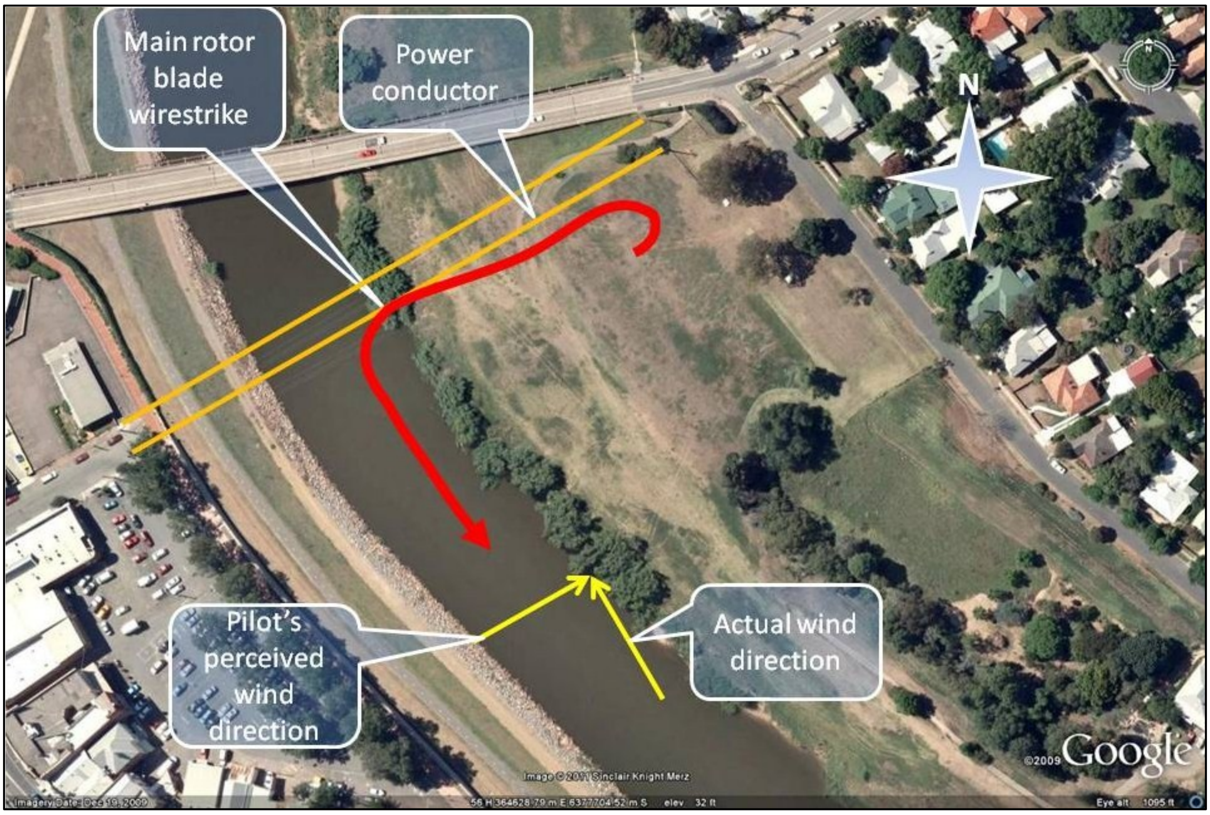
A key message from that report highlights the fact, that action errors and decision errors were both common to fatal accidents. Violations, while less frequently found, were mostly associated with fatal accidents.

- Wire-strike accidents in General Aviation: Data Analysis 1994 to 2004 (2006) http://www.atsb.gov.au/media/32640/wirestrikes_20050055.pdf

- Wirestrikes involving known wires: A manageable aerial agriculture hazard http://www.atsb.gov.au/media/2487114/ar2011028.pdf

This publication describes recent aerial agricultural wirestrike accidents. In all these cases, the aircraft struck a powerline that was known to the pilot. In many of these accidents, the pilot was not completely focused on the immediate task of flying due to a change in plans.

Figure 2: Lorn Reserve HLS, showing the VH-HUL flight path in red



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AO-2011-047: VH-HXB, Weather related event

Date and time:	2 April 2011, 1820 EDT	
Location:	25 NM (46 km) W of Sydney Airport, New South Wales	
Occurrence category:	Incident	
Occurrence type:	Weather	
Aircraft registration:	VH-HXB	
Aircraft manufacturer and model:	Robinson Helicopter Company R44 Raven 1	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 3
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

FACTUAL INFORMATION

On 2 April 2011, a Robinson Helicopter Company R44 Raven 1 helicopter, registered VH-HXB (HXB), departed Orange, New South Wales on a private flight to a private property in Macquarie Fields, 27 km south-west of Sydney Airport. The flight time was estimated to be about 50 minutes and the helicopter had enough fuel for a 3 hour flight. There was one pilot and three passengers on board.

Approaching 30 NM (55 km) west of Sydney Airport, the pilot noticed the cloud cover increase. He climbed on top of the cloud and lost visual contact with the ground. He was considering returning to Orange, or a friend's property in Oberon, and began discussing these options with his passengers.

At about 1820 Eastern Daylight-saving Time[1], a Sydney Radar controller noticed an unidentified aircraft inside controlled airspace at 7,500 ft, about 25 NM (46 km) to the south-west of Sydney Airport. Communication was established between the controller and the pilot. The controller identified HXB on radar and notified the pilot that he was now 7 NM (13 km) from Bankstown Airport at a bearing of 235° M (Figure 1). The pilot informed the controller that the flight was being conducted as a day visual flight rules (VFR) flight, requiring the pilot to operate during daylight only and remain clear of cloud. He notified the controller that he was on top of a solid layer of cloud and unaware that he had entered controlled airspace. Air traffic control (ATC) declared an ALERFA phase[2] and Australian Search and Rescue (AusSAR) alerted a rescue helicopter at Bankstown.

The pilot of HXB reported that he had been over solid cloud for about 6 minutes. The controller initially instructed the helicopter to turn back in the direction he had come from and the pilot acknowledged the instruction. A review of ATC audio recordings indicated that the pilot initiated a left turn.

The controller then communicated with other nearby aircraft and ground stations to establish the cloud base and coverage in the vicinity. An initial report indicated that there may be thinner cloud cover to the north and the helicopter was given directions to track towards Ryde. The pilot reported that the weather remained overcast to the north of Sydney, so the controller then gave directions to turn east towards Bondi. Once the helicopter reached the coast he was directed to turn south where the cloud was reported to be significantly clearer.

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 Alert phase of a search and rescue operation.

While tracking south along the coast, the controller discussed the possibility of having to descend through cloud to ensure that the pilot could land prior to last light. The pilot was not rated to fly through cloud and had little experience flying under instrument conditions.

The pilot then requested a track to a different destination, Oberon, about 70 NM north-west of Sydney or about 45 minutes flight time away. He advised the controller that he had sufficient endurance and daylight to reach that destination. The controller was concerned that he would not be able to reach Oberon before last light and instructed him to continue south, based on good weather reports in the area.

Abeam Cronulla, about 30 minutes after the initial contact with ATC, the pilot saw a break in the cloud and was able to descend below the cloud base at about 4,000 ft.

The helicopter landed at his original intended destination in Macquarie Fields 10 minutes prior to last light.

During the event, two arriving aircraft and ten departing aircraft from Sydney Airport were affected, by either increased track miles or delayed departure clearances.

Weather

Forecast weather

The pilot used a number of tools to obtain an accurate understanding of the weather for his intended flight route.

He obtained a weather forecast from the Bureau of Meteorology at home, about an hour before departure. The forecast included weather for the Sydney area as well as Orange, Bathurst and Bankstown Airports.

A copy of the weather forecast, valid for the period of flight, showed that the forecast cloud was for areas of broken[3] cloud with a base of 3,000 ft (above mean sea level). The forecast weather for Bankstown Airport indicated scattered[4] cloud at 2,500ft increasing to broken cloud at 2,500 ft at 1900. The pilot was listening to the Bankstown automatic terminal information service (ATIS) shortly before being contacted by ATC and recalled that the cloud was broken at about 4,500 ft.

Prior to departure, the pilot phoned a friend in Katoomba to gain an appreciation of the actual conditions there at the time. The friend reported the weather was fine with clear skies. He also phoned a helicopter pilot in Sydney who stated that there was some cloud in the area, but that he would have no problems reaching his destination.

Actual weather

A copy of the actual weather report for Bankstown Airport at 1830 showed that the cloud was overcast[5] at 5,100 ft.

Last light

Last light for Sydney Airport was 1915. The helicopter landed at 1905.

SAFETY MESSAGE

The pilot reported feeling influenced to continue the flight due to the confidence displayed by the air traffic controller in being able to find a hole in the cloud. Neither the pilot nor the controller discussed the possibility of returning to his departure point, although the pilot was considering this option prior to being contacted by ATC. This example highlights that, while ATC are a valuable source of information, the pilot is ultimately responsible for the safety of the flight.

This incident shows that while weather forecasts are a useful tool for pre-flight planning, actual weather conditions can vary from the forecast. When conducting a flight in marginal conditions, pilots should always be aware that actual weather conditions may have deteriorated, and plan accordingly.

3 Broken cloud refers to 5 to 7 eighths of the sky obscured by cloud.

4 Scattered cloud refers to 3 to 4 eighths of the sky obscured by cloud.

5 Overcast cloud refers to the sky being totally obscured by cloud.

The ATSB has published two relevant research papers that should be referred to for additional information.

- General Aviation Pilot Behaviours in the Face of Adverse Weather (June 2005) (http://atsb.gov.au/media/36438/Pilot_behaviours_adv.pdf)

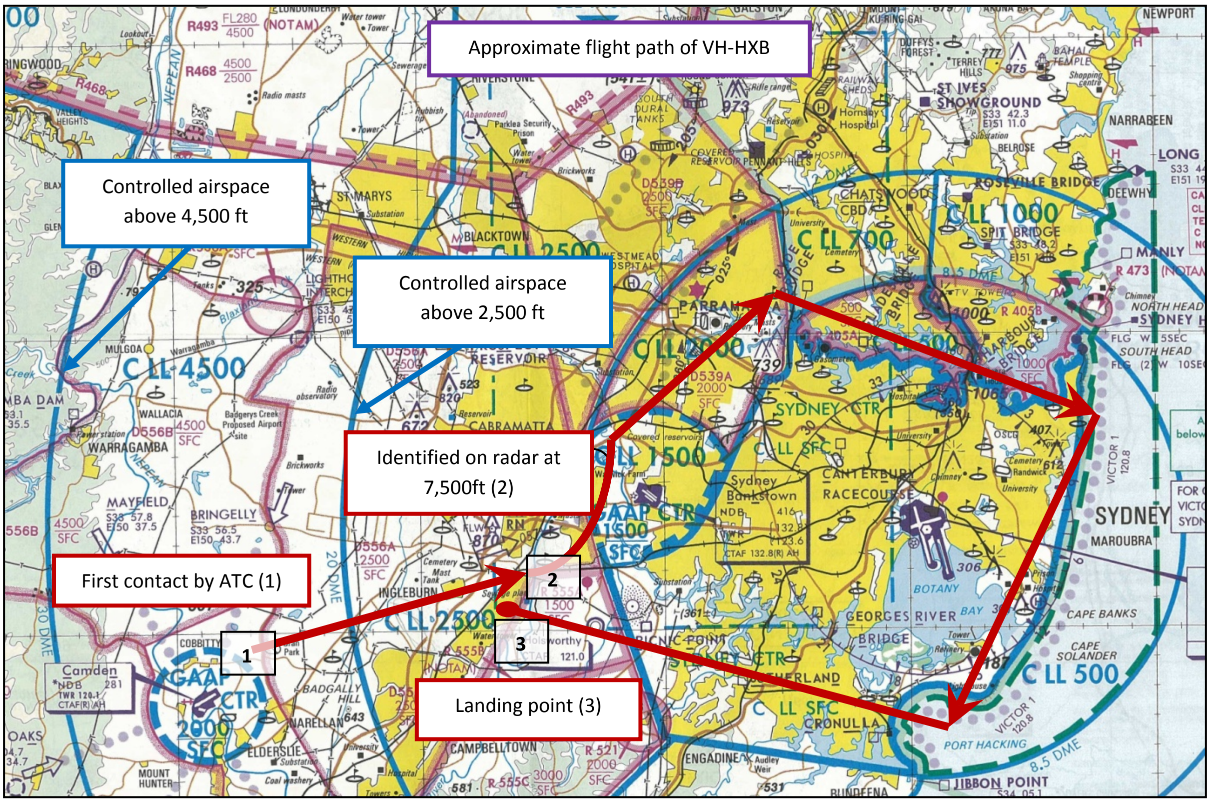
The paper determined pilots who avoid weather tended to make timely decisions to return to their destination or divert.

The second paper examined general aviation accidents:

- General Aviation Fatal Accidents: How do they happen? A review of general aviation accidents 1991 to 2000 (June 2004) http://atsb.gov.au/media/36723/Fatal_accidents_how_happen.pdf

During this incident, the pilot faced the real possibility of having to descend through cloud despite not having an instrument rating. Each year, the ATSB investigates numerous incidents and accidents involving pilots entering cloud during VFR flights. The data in that paper noted that there were 163 fatal aircraft accidents in the 10-year period, of which 22 (or 13.5 per cent) were identified as involving VFR flight into instrument meteorological conditions. Those 22 accidents resulted in 52 fatalities, which corresponded to 15.7 per cent of the 331 fatalities in that period.

Figure 1: Approximate flight path



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AO-2011-053: VH-RTV, Collision with obstacle

Date and time:	30 April 2011, 1410 EST	
Location:	4 NM (8 km) NE of Ballera, Queensland	
Occurrence category:	Accident	
Occurrence type:	Collision with obstacle	
Aircraft registration:	VH-RTV	
Aircraft manufacturer and model:	Aerospatiale AS350BA	
Type of operation:	Aerial work	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Serious	

FACTUAL INFORMATION

On 30 April 2011, at about 1410 Eastern Standard Time[1], the crew (pilot and crewman) of an Aerospatiale AS350BA helicopter, registered VH-RTV (RTV), was conducting sling load operations from Ballera Airport, Queensland, to replenish inhibitor tanks at gas well-heads that were not accessible by road. Up to 600 L of chemical inhibitor, carried in a 1,000 L tank, was attached to the cargo hook on the belly of the helicopter, via a 30 m line and shackle.

The pipe work associated with the well-head was orientated north-south. Two exhaust pipes, part of the well-head pressure regulating system, extended approximately 2 m above the other pipe work. The well-head tanks were at the southern end of the pipe work adjacent to the antenna and solar panels of a remote operating console. The wind was from the east at 6-8 kts.

The well-head was surrounded by shallow water and the closest landing area was about 50 m away from the well-head tanks. The crew's intention was to place the slung load on the ground adjacent to the tanks. To limit potential damage to the shackle from ground impact, it was standard procedure to descend the helicopter to within a few metres of the ground before jettisoning the long line.

The pilot reported that the flight proceeded normally and he flew a clockwise orbit over the well-head during which he and the crewman identified the solar panels and well-head tanks. For best visibility and load control, he approached the drop point in a crabbing approach from the north, with the nose oriented into the easterly wind. The pilot drifted RTV right and placed the load on the ground adjacent to the well-head tanks. He then continued the descent in preparation to jettison the long line.

The pilot had just received confirmation from the crewman that the helicopter was clear of obstacles when he heard and felt a loud bang, accompanied by vibration through the rudder pedals. The pilot reported that he believed that the helicopter had incurred a tail strike. He was aware that the helicopter was overhead the well-head and raised the collective pitch control in an attempt to move clear of the well-head. However, the helicopter began an anti-clockwise rotation so he immediately closed the throttle and the aircraft settled to the ground close to the well-head tanks, accompanied by the sound of the low rotor revolutions per minute (RPM) warning horn.

Neither crew members were injured. Impact damage to the tail rotor resulted in it and the tail fin assembly being separated from the helicopter

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

(Figure 1). Later inspection confirmed that the tail rotor had contacted the pipes associated with the well-head pressure regulating system that protruded above the other pipe work (Figure 2).

Figure 1: Damage to tail section

Photograph courtesy of the helicopter operator

The crewman report that, during the approach to the drop, his primary concern was maintaining main rotor clearance from the solar panel, which was in the 2 o'clock position relative to the helicopter. He was aware of the well-head pipe work, and recalled checking to confirm that the tail rotor was clear of that obstacle. However, he could not recall having seen the pressure regulating system exhaust pipes that the tail rotor struck.

Flight crew information

The pilot held a Commercial Pilot (Helicopter) Licence and had 2,825.6 flying hours at the time of the occurrence. His total experience on the AS350 helicopter was 648.8 hours, and he had flown 52.6 hours sling load operations. He had completed a sling load check flight in October 2010.

During the 48 hours prior to the occurrence, the crew had flown about 17 hours conducting inhibitor replenishment tasks.

Helicopter information

The helicopter was being operated within the approved weight and centre of gravity limits. There was no indication that any mechanical fault concerning the helicopter contributed to the occurrence.

Information from helicopter operator

The helicopter operator undertook an internal investigation into the occurrence and provided the following assessment:

- The pilot's approach to the well was appropriate, considering the orientation of the well-head and the atmospheric conditions.
- The well-head pressure regulating system exhaust pipes were difficult to see against the background water and vegetation.
- During the descent to jettison the long line, the pilot remained over the load to keep the line clear of all the well structures.
- The pilot descended the helicopter lower than necessary before jettisoning the line.

The operator advised that, at the time of the occurrence, it had procedures and guidelines in place covering external load and sling load operations. The operator noted that, while 'the do's and don'ts of inhibitor slinging' were 'obvious', its documentation did not specifically address inhibitor top-ups using sling load operations.

The helicopter operator had been conducting similar activities throughout the Cooper Basin during the previous 12 months without 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 occurrence.

Helicopter operator

On 30 April 2011, the operator issued a notice to aircrew which listed the procedures to be used when inhibitor top-ups were being conducted. The procedures were:

- [The operator's] external load and sling load checklists to be carried out.
- The line must be at least 100 ft long.

- At least one orbit of the facility is to be carried out. If it takes more than one orbit so be it. This is to identify the ROC [remote operating console] unit and its antenna, the PRV [pressure relief valve] exhaust tubes, the well head, the orientation of the pipes associated with the structure, the blow off pipe and pit (these may be star pickets with signs attached at the well heads). A thorough recce [reconnaissance] is to be carried out as with the rain that we have had plant life may hide potential risks.
- During these orbits the approach and departure routes are to be established. The load MUST NEVER be flown over the well structure itself. If the wind requires the well to be flown over then the job will be postponed to a time with more favourable conditions.
- PIC must identify the area that the IBC/Basket etc is to be placed, where the long line is to be lowered and where the helicopter can descend safely to enable it to land or jettison the long line.
- As with all operations below 500 ft a check for power lines is to be carried out. After the load is on the ground the aircraft is not to descend over the well itself.
- If the long line is to be jettisoned, then the PIC is to manoeuvre the helicopter to allow the long line to be jettisoned well clear of the structure.
- If the helicopter can be landed then the PIC will manoeuvre the helicopter to lay down the long line clear of the well structure.

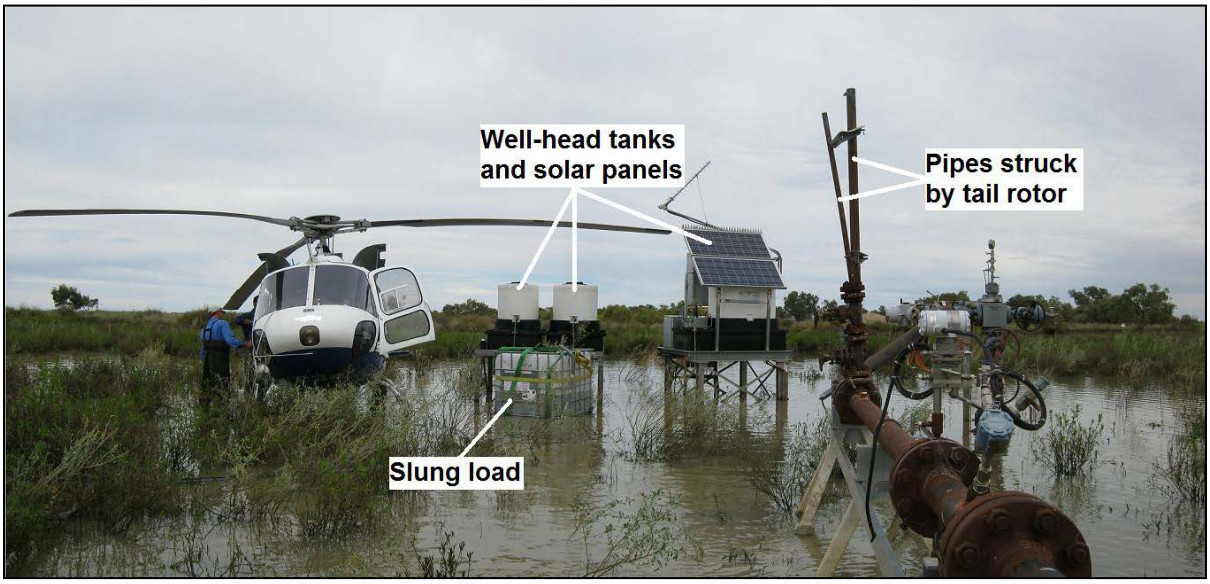
That procedure was amended in late May 2011 to specify that the helicopter must maintain at least 15 m vertical and horizontal separation from well-head structures.

The operator also advised that the well-head operator would be examining the option of marking PRV exhaust tubes to enhance their visibility.

SAFETY MESSAGE

The well-head tank replenishment task included many sub-tasks that were repetitive. Repetitive tasks can increase an individual's susceptibility to attention failure and/or memory lapse and lead to skill based errors. The use of standard checklists and crew vigilance are two means of militating against skill based errors.

Figure 2: The occurrence site, looking south, showing well-head components and position of obstacles relative to position of helicopter



Photograph courtesy of the helicopter operator