Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY BULLETIN
Aviation Level 5 Investigations AB-2010-061
Final

Level 5 Factual Investigations:

July 2010 to September 2010

Issue 3

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1 July 2010 to 30 September 2010

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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.

The summary reports detailed herein were compiled from information provided to the ATSB by individuals or organisations involved in an accident or serious incident between the period 1 July 2010 and 30 September 2010.

AO-2009-024: VH-NXM, Runway lighting failure

Date and time:	22 May 2009, 1840 CST	
Location:	Darwin aerodrome, Northern Territory	
Occurrence category:	Incident	
Occurrence type:	Aerodrome lighting	
Aircraft registration:	VH-NXM	
Aircraft manufacturer and model:	Boeing Company 717-200	
Type of operation:	Air transport – high capacity	
Persons on board:	Crew – 6	Passengers – 111
Injuries:	Crew – Nil	Passengers –Nil
Damage to aircraft:	Nil	

SYNOPSIS

On 22 May 2009, a temporary modification was made to the runway 11/29 lighting at Darwin aerodrome, Northern Territory (NT), due to runway works being conducted on the runway 11 threshold. At 1840 Central Standard Time[1], 10 minutes prior to last light, Darwin air traffic control (ATC) attempted to activate the runway lights; however, the runway 11/29 edge lights failed to turn on. Due to the lighting failure, ATC asked all aircraft intending to land at Darwin to hold. After requesting the reason for holding, the crew of a Boeing Company 717-200 aircraft, registered VH-NXM, on a scheduled passenger service with 117 people on board, advised that they had 30 minutes of holding fuel available (equivalent to 1920).

Just prior to 1910, ATC notified the crew of the 717 the lighting was still unavailable and reported asking the crew if they could divert. Initially the crew advised ATC that they did not have diversion fuel. However, after further calculations, they determined that they had enough fuel for an immediate diversion to Tindal aerodrome, NT. The aircraft was diverted to Tindal and landed without further incident. The pilot in command (PIC) reported that it landed with 1,000 kg of fuel remaining, equating to the fixed fuel reserve.

The lighting at the aerodrome was subsequently restored and the other aircraft holding landed safely at Darwin.

The aerodrome operator advised the ATSB that, as a result of this incident, it has implemented a number of safety actions, including:

- they introduced standard operating procedures for placing night displaced thresholds
- on the recommendation of an independent consultant, they employed an electrical engineer as the engineering manager
- investigated alternative options for establishing a cross runway primary circuit
- purchased temporary portable lighting which can be pre deployed where similar works on the aeronautical ground lights are proposed.

In addition to having robust practices and procedures in place for conducting runway works, this incident highlights the importance of using clear and consistent radio phraseology to avoid confusion between ATC and crews.

FACTUAL INFORMATION

On 22 May 2009, works were being conducted on runway 11/29 at Darwin aerodrome. Due to the works, the threshold of runway 11 had been displaced and a temporary modification made to the runway lighting. At 0800, work commenced on the modification to the runway lighting and by 1130 they had been completed and the lighting system tested and inspected. During the testing, a lighting fault was found with one of the fittings. This fitting

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

was replaced at 1400, after which the lights were reinstated and re-engaged and found to be working correctly.

At 1840, 10 minutes prior to last light, the air traffic controller functioning as the Tower and Surface Movement Controller (SMC) activated the runway lighting; however, the runway 11/29 (the main runway) edge lights failed to turn on. The aerodrome safety officer inspected the runway and identified a loose cable at the displaced threshold for runway 11. At 1848, the duty technician was called back to the aerodrome to fix the lighting.

At this stage a Boeing 717-200 aircraft, registered VH-NXM[2], was conducting a STAR[3] arrival into Darwin. At around 110 km from Darwin, Darwin Approach requested the aircraft enter a holding pattern. Due to the type of holding pattern requested, it took the crew a couple of minutes to enter it into their flight management system (FMS). Once this was done, they contacted ATC and asked why they were holding. ATC informed the crew of the lighting problem, that a technician was on the way and that portable lighting was being laid out. The crew then advised ATC that they had 30 minutes of holding fuel available[4] (30 minutes was equivalent to 1920).

The crew of the 717 stated that, based on the information provided by ATC, they assumed that the runway lighting would be restored or that the portable lighting would be laid prior to them requiring to land.

ATC reported that they asked all aircraft intending to land at Darwin to enter a holding pattern. A Lockheed P-3C Orion aircraft operated by the Royal Australian Air Force advised a latest hold time of 1920, while two other incoming aircraft advised later times.

Prior to 1910, ATC reported that they advised all holding aircraft that they should start planning to divert, as the technician had not yet arrived and the portable lighting was not available. The crew of the 717 informed ATC that they did not have diversion fuel. However, after re-assessing the fuel status of the aircraft, they determined that they had enough fuel if they diverted immediately and were cleared direct to Tindal (about 280 km from Darwin). At 1914, the crew of the Orion advised ATC that they did not have adequate fuel to divert and would run out of fuel at 1944.

The duty technician arrived at the aerodrome at 1910, and found that the cables used to enable the displaced threshold for runway 11 had pulled apart, most likely due to jet blast. The cables were reconnected, the lighting circuit breaker reset, and the runway lighting system re-energised. At 1923, the runway edge lighting was restored. The Orion landed soon after, with the other holding aircraft landing a short time later.

The crew of the 717 continued the diversion to Tindal. After landing, the PIC reported that the aircraft had about 1,000 kg of fuel remaining, which equated to the fixed fuel reserve[5].

Runway lighting at Darwin aerodrome

Runway 11/29 at Darwin aerodrome had high intensity runway lighting, with standby power available.

A portable lighting system was listed in the En Route Supplement Australia (ERSA) available for the shorter runway, runway 18/36. This portable lighting system was to be used in the event that the crosswind on runway 11/29 exceeded the aircraft limits and therefore required an aircraft to land on runway 18/36 at night. The portable lighting would have been insufficient for use on Runway 11/29, as runway 11/29 is significantly longer than Runway 18/36.

In addition, about 2 months prior to the incident, a training exercise had been conducted by the aerodrome operator. This identified inadequacies in the portable lighting system and determined that it would take 90 to 120 minutes to set up.

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2 The Boeing Company 717 aircraft, registered VH-NXM, had been conducting a scheduled passenger flight from Alice Springs to Darwin. On board the aircraft were six crew and 111 passengers.

3 STAR – standard terminal arrival route.

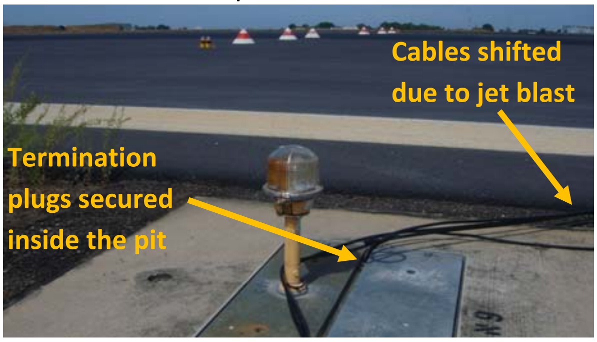
4 On the day of the incident, there were no additional fuel requirements for Darwin and the crew advised that they were carrying their normal fuel reserves.

5 The fixed fuel reserve was an amount of fuel, enough to allow for 30 minutes of unplanned manoeuvring in the vicinity of the landing aerodrome. It would normally be retained in the aircraft until the final landing.

Lighting modification

To modify the lighting system on runway 11/29, temporary cables were placed behind the displaced threshold from a lighting pit on the northern side to a lighting pit on the southern side of the runway. The lighting pit on the northern side was a newer style and the termination plugs connecting the cables were placed inside the pit and the cover screwed down to secure it (Figure 1).

Figure 1: Runway 11 displaced threshold and northern pit

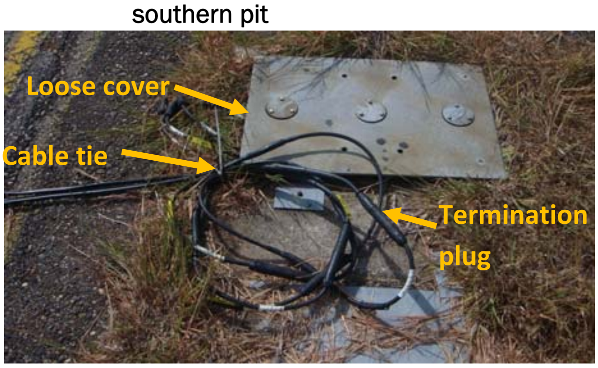


Photograph courtesy of Northern Territory Airports (Darwin)

On the southern side of the runway, the pit was an older style and had a cover that could not be secured. During the lighting modification, the termination plugs were placed inside the pit and the cover loosely fitted over the top. The lighting technicians reported that because the cover for the pit could not be secured, jet blast had pulled the cables out of the pit and separated the plugs, resulting in the lighting failure.

After the incident, the cables were looped and cable tied so that they could not be separated from undue tension (Figure 2).

Figure 2: Runway 11 displaced threshold and southern pit



Photograph courtesy of Northern Territory Airports (Darwin)

Communications

Darwin ATC advised that after the runway lights failed, all incoming aircraft advised them of their latest holding times. ATC believed this was the latest time the aircraft could hold prior to diverting to another aerodrome, which was not the case for either the 717 or Orion.

Neither the Manual of Air Traffic Services (MATS) nor the Aeronautical Information Publication (AIP) contain standard phraseology for divert times. However, both publications use the terminology '*latest divert time'* and '*latest divert times'*. No reference was found in either publication to ATC asking or a pilot advising a '*holding time'*.

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.

Aerodrome operator

Operating procedures

The aerodrome operator introduced a standard operating procedure for placing night displaced thresholds, including written instruction for the securing of primary cables should this method be used in future.

Review of lighting practises

The aerodrome operator arranged for an independent review of the technical inspection and maintenance procedures of the aeronautical ground lights (AGL) at the aerodrome. One of the main recommendations was to review the maintenance management roles.

As a result of the review, in late 2009, an electrical engineer was appointed as the engineering manager to oversee maintenance practices and review the processes for AGL maintenance. In addition, in mid 2010, another electrical engineer was appointed whose duties include the 'sign off' of future proposed changes to AGL circuitry.

Cross runway primary circuit

The aerodrome operator investigated alternative options for establishing a cross runway primary circuit.

Portable lighting

Temporary portable lighting has been purchased by the aerodrome operator as a contingency, which could be pre-deployed where similar works on the AGL are proposed.

Department of Defence

Radio Telephony

The Department of Defence advised the ATSB that Darwin air traffic controllers have received a refresher in radio telephony procedures.

ATSB COMMENT

In addition to having robust practices and procedures in place for conducting runway works, this incident highlights the importance of the use of clear and consistent radio phraseology to avoid confusion and misunderstandings between crews and ATC.

It also is a reminder to ATC to keep flight crew promptly updated of any problems at the aerodrome so that the crew can make timely decisions regarding the necessity to divert.

AO-2009-040: VH-NXN, Mode awareness issue

Date and time:	14 July 2009, 0948 CST
Location:	Near Ayers Rock aerodrome, Northern Teritory
Occurrence category:	Incident
Occurrence type:	Incorrect system configuration
Aircraft registration:	VH-NXN
Aircraft manufacturer and model:	Boeing Aircraft Company 717-200
Type of operation:	Air transport – high capacity
Persons on board:	Crew – 6 Passengers – 42
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Nil

SYNOPSIS

On 14 July 2009, at about 0948 Central Standard Time[1], the flight crew of a Boeing 717-200 aircraft, registered VH-NXN, were conducting a visual approach to runway 13 at Ayers Rock, Northern Territory. While carrying out a practise circling approach, the pilot in command observed what he believed to be abnormal engine response.

While the flight crew addressed the apparent engine problem, the aircraft's airspeed reduced below the normal manoeuvring speed on two occasions. However, the aircraft landed without further incident and a subsequent analysis of recorded data indicated that safe control of the aircraft was maintained throughout.

In response to this incident, the operator issued a Notice to Pilots regarding autothrottle mode awareness and made a number of changes to the Boeing 717 operations manuals.

Those changes described a number of restrictions on the automation modes used during critical stages of flight that the operator believed were appropriate to prevent automation 'surprises'.

FACTUAL INFORMATION

On 14 July 2009 a Boeing 717-200 aircraft (717), registered VH-NXN, was being operated on a scheduled passenger service from Cairns, Queensland to Ayers Rock, Northern Territory. On board were six crew, and 62 passengers. The weather at Ayers Rock was reported as CAVOK[2] and the pilot in command (PIC), who was the handling pilot, briefed his intention to practise a manual (hand flown) circling approach to runway 13.

The aircraft's flight management system (FMS) had been programmed with a flight plan to Ayers Rock aerodrome via a waypoint, with an altitude constraint of 3,100 ft, at a position 3 NM (5.6 km) east of the Ayers Rock non-directional beacon (NDB). As a practise circling approach was intended, the only other waypoint programmed into the FMS was the runway threshold. That was the operator's standard procedure for a circling approach, the visual segment of an instrument flight rules (IFR) non-precision approach that required a circling manoeuvre to align the aircraft with the landing runway, rather than a visual approach conducted in Visual Meteorological Conditions (VMC). A visual approach conducted in VMC would have required

1 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) + 9½ hours.

2 The abbreviation CAVOK (Ceiling and Visibility and weather OK) is used when the following conditions are forecast simultaneously: visibility, 10 kilometres or more; no cloud below 5,000 ft above the aerodrome level or the highest 25 NM (46 km) minimum sector altitude, whichever is the higher, and no cumulonimbus or towering cumulus cloud at any height; and no significance to aviation.

the crew to enter into the FMS an additional two waypoints prior to the runway threshold.

At about 0948, as the aircraft approached Ayers Rock aerodrome, the PIC adjusted the flight control panel (FCP) altitude window to 2,300 ft, which was 600 ft above aerodrome level (AAL), the operator's standard operating procedure used when carrying out a visual approach. On passing the waypoint 3 NM east of the NDB, the PIC disconnected the autopilot and his flight director, turned the aircraft to track left downwind in the circuit and maintained 3,100 ft, which was 1,500 ft AAL. Flap 18 was selected and the airspeed was reducing toward the flap 18 manoeuvring speed[3] of 160 kts, as selected on the FCP. At that stage, both crew members were experiencing a high workload. The PIC was manoeuvring the aircraft manually, without the aid of a flight director, and the copilot was configuring flap and making FCP selections requested by the PIC.

Although the autothrottle system (ATS) remained engaged, the airspeed reduced below 160 kts and the PIC reacted by moving the throttles forward to correct the speed loss. The PIC detected a lack of response from the engines, alerted the copilot to that effect and advanced the throttles to the normal maximum thrust position. As the airspeed continued to reduce, further flap was selected for increased stall protection and, believing the engines were not responding to the throttle input, the PIC minimised speed loss by sacrificing altitude. The engines then appeared to respond and the airspeed recovered to about 162 kts. The PIC recalled that there seemed to be a lengthy delay, estimated at 5 or 6 seconds, before the engines responded to the throttle movement.

As the aircraft's airspeed increased, the PIC retarded the throttle for normal speed management. However, the airspeed again reduced below the FCP selected speed of 160 kts and once more he reacted with manual movement of the throttles to the maximum thrust position. He then commenced a descending base turn and requested the copilot to select a direct track to the runway threshold in the FMS. At that time, the ATS held the demanded speed and appeared to operate normally. The approach to land on runway 13 was continued and was accomplished without further incident.

Aircraft information

The 717 was powered by two Rolls-Royce BR715 high-bypass turbo fan engines controlled by an autothrottle system (ATS), incorporating a speed protection mode that would automatically engage to maintain aircraft speed above stall speed. The ATS, which could be manually overridden at any time, was part of the aircraft's automatic flight system (AFS) that supplied automatic flight control and flight crew guidance during flight.

Pitch and roll modes of the aircraft were controlled from the flight control panel (FCP), which provided the means for the flight crew to select speed, heading, vertical speed/flight path angle, and altitude references to be used by the AFS. Among the selectable pitch modes was the:

- profile mode (PROF), where the aircraft responded to flight management system (FMS) pitch commands
- airspeed/mach select, where specific speeds could be engaged
- altitude select, where specific altitudes could be engaged.

The modes of the auto flight system that were armed or engaged were displayed on the flight mode annunciator (FMA) at the top of the pilots' primary flight display (PFD). However, there was limited information displayed on the FMA whenever a pilot's flight director was switched off.

Following the aircraft's arrival at Ayers Rock aerodrome, the PIC reported his observations of lack of engine response to the operator's maintenance engineer, who conducted tests on various systems, but found no sign of any faults. Prior to returning the aircraft to service, the operator provided downloaded data to the aircraft manufacturer with a request to review that data for any anomalies with the operation of the engine. The manufacturer advised that the engines responded when commanded as expected for the power settings at the time of the event, spooling up from approach idle speed to maximum power in

3 For each flap setting there is an applicable speed range and associated normal manoeuvring speed for a particular aircraft weight.

8 seconds. They did not see any signs of anomalous engine behaviour.

Recorded data

An analysis of the aircraft's flight data recorder (FDR) showed that over a period of about 15 seconds, at about the time the aircraft transited the waypoint 3 NM east of the NDB, the following occurred:

- the autopilot was disconnected
- flap 18 was selected
- the aircraft commenced levelling out at circuit altitude while decelerating through 190 kts
- a turn was commenced onto the downwind heading
- the AFS speed mode changed from speed-on-thrust (that is, speed controlled by varying the engine thrust level) to speed-on-pitch (that is, speed controlled by varying the aircraft's pitch attitude).

While tracking the downwind leg of the circuit, the airspeed continued to reduce and once flap 18 had been set, it had reached 160 kts, the airspeed the crew expected the autothottle to maintain. The airspeed continued to reduce to about 146 kts, at which time the power levers were advanced and 8 seconds later the engine power reached maximum. During that time interval, the altitude had decreased by 200 ft and the airspeed had reduced to 134 kts, which was 6 kts above the FMC–calculated minimum operating speed appropriate for the configuration and weight of the aircraft, before increasing to 162 kts as the engine thrust took effect.

As the airspeed increased to 162 kts, the throttles were manually retarded and there was a subsequent speed reduction as a similar cycle occurred. At about 1,000 ft AAL, while turning toward final approach, the AFS thrust mode changed from speed-on-pitch to speed-on-thrust, by which time the airspeed had been stabilised at the FMC-calculated approach speed for landing.

During the occurrence, the automatic minimum speed protection function was not engaged and no FOQA[4] alerts were triggered.

Automation

The automatic flight systems of modern aircraft are especially reliable and consequently flight crews have become increasingly dependent on that automation. Additionally, in learning to operate the automatic systems, pilots have formed expectations about how it normally behaves. That can have a negative effect on flight crew monitoring if their experience is that the expected behaviour always occurs. When the automation does not behave as expected, the flight crews' over-reliance on automation can hamper their ability to recognise unexpected automation behaviour.

Automation dependency was recognised by the operator as a risk to B717 operations and one of the risk mitigators was to promote practise of flight management without all elements of the automatic flight system operative. Crews were expected to take advantage of sensible opportunities to practise manual flying skills in order to retain proficiency.

Flight crew comments

Both flight crew members advised that they had not noticed the mode change that occurred as the waypoint 3 NM east of the NDB was passed. The PIC also noted that he could not recall having experienced an engine spool up from flight idle to maximum power in circumstances similar to those at the time of the occurrence. In day to day operations, the flight crews did not experience idle thrust during the approach.

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[4] FOQA (Flight Operational Quality Assurance) was the process of collecting and analysing data from flights for any exceedance of a defined parameter or any other special event. Deviations from standard procedures or operating limitations would be detected, with the objective of improving safety and efficiency of flight 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 incident.

Aircraft operator

In response to this incident, the operator issued a Notice to Pilots regarding autothrottle mode awareness and made a number of changes to the Boeing 717 operations manuals.

Those changes described a number of restrictions on the automation modes used during critical stages of flight that the operator believed were appropriate to prevent automation 'surprises'.

ATSB COMMENT

The occurrence resulted from a response to an apparent engine malfunction that was, in fact, the result of an automatic flight system (AFS) mode change. There was no engine malfunction identified, and the aircraft's engines and autothrottle system (ATS) performed in a conventional way.

AO-2010-014: VH-NXK and Dingo 42, Breakdown of separation

Date and time:	4 March 2010, 1039 WST		
Location:	22 km NW of Perth aerodrome, Western Australia		
Occurrence category:	Serious incident		
Occurrence type:	Breakdown of separation		
Aircraft registration:	VH-NXK and Dingo 42		
Aircraft manufacturer and model:	VH-NXK:	Boeing Company 717-200	
	Dingo 42:	Raytheon Aircraft Company 350 (King Air)	
Type of operation:	VH-NXK:	Air transport – high capacity	
	Dingo 42:	Military	
Persons on board:	VH-NXK:	Crew – 6	Passengers – 40
	Dingo 42:	Crew – 2	Passengers – 2
Injuries:	Crew – Nil	Passengers – Nil	
Damage to aircraft:	Nil		

SYNOPSIS

On 4 March 2010, a Boeing Company 717-200 (717) departed Perth, Western Australia (WA) on a scheduled passenger service to Port Hedland, WA. The aircraft was tracking on a GURAK 3 standard instrument departure, which involved transiting through Pearce military controlled airspace. While maintaining flight level (FL) 120[1] and turning left onto a heading of 330 degrees under the control of Pearce air traffic control (ATC), the crew received a traffic advisory (TA) warning from the traffic alert and collision avoidance system (TCAS). The crew advised ATC and were instructed to continue the turn onto a heading of 360 degrees. During the turn, the crew received a resolution advisory (RA). The crew responded and climbed the aircraft to FL125.

The crew were advised by ATC that the conflicting aircraft, a military-operated Raytheon Aircraft Company 350 (King Air) descending through FL120 on a reciprocal track, had the 717 in sight and was maintaining separation. By this time, the radar separation standard had reduced below the required distance of 3 NM (5.6 km).

This occurrence reinforces the importance of effective coordination between ATC positions, and highlights the challenges faced by air traffic controllers when managing aircraft operating within the same airspace, but under the control of different ATC positions.

FACTUAL INFORMATION

On 4 March 2010, at about 1025 WST[2], a military operated Raytheon Aircraft Company 350 (King Air) aircraft (callsign Dingo 42), with two crew and two passengers on board, was being prepared for departure from Pearce aerodrome to conduct aerial work over the Cottesloe area (Figure 1) at FL200.

At Perth aerodrome, a Boeing Company 717-200 (717) aircraft, with six crew and 40 passengers onboard, was being prepared for departure from Perth to Port Hedland. The aircraft was cleared to track on a GURAK 3 standard instrument departure, which involved transiting through Pearce military controlled airspace.

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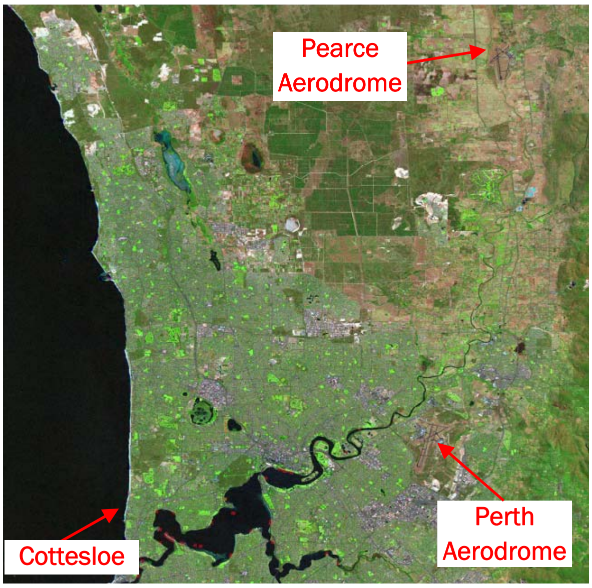
1 Flight level (FL) is a level of constant atmospheric pressure related to a datum of 1013.25 hectopascals, expressed in hundreds of feet. Therefore, FL120 indicates 12,000 feet.

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

Figure 1: Proximity of Perth, Pearce and Cottesloe



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At 1028, the Pearce DEP/APR controller[3][4] contacted the Perth Approach controller to advise that the King Air was about to depart Pearce, with the phrase '*Next runway 18, Dingo 42, Pearce 2, 9,000, direct Cottesloe*'. The Pearce DEP/APR controller expected the Perth Approach controller[5] to reply with a heading and level, but received the response, '*Dingo 42, Rottnest 9,000*'. The Pearce DEP/APR controller then negotiated a heading of 270 degrees on climb to FL200. [6]

At 1031, the Perth Approach controller contacted the Pearce DEP/APR controller and amended the clearance for the King Air to climb '*…not above 6,000…*' and to coordinate with Perth Departures.

At 1033, the Pearce DEP/APR controller contacted Perth Departures and advised that the King Air would be climbing to 6,000 ft. The Perth Departures controller was not aware of the King Air's flight details and appeared confused when the departure was coordinated. The Pearce DEP/APR controller responded by electing to retain the King Air in Pearce airspace and continue the aircraft's climb to FL200.

At about 1034, the crew of the King Air contacted the Pearce DEP/APR controller and advised that they were turning right, passing through 2,500 ft, with an assigned heading of 270 degrees, on climb to FL200.

At about the same time, the crew of the 717 contacted Perth Approach and advised passing through 2,600 ft on climb to 6,000 ft. The Perth Approach controller coordinated the departure of the 717 and asked the Pearce Centre controller what level should be assigned to the crew of the 717 with reference to the King Air. The Pearce Centre controller agreed to accept the 717 on climb to FL120 for the transit through Pearce airspace. To facilitate civil transits of the Pearce Terminal Area (TMA) airspace, the Pearce Centre controller has a blanket clearance for aircraft of 11,000 ft and above[7].

Meanwhile, the Pearce DEP/APR controller was busy with other traffic and at 1036, instructed the King Air to turn right onto a heading of 360 degrees.

Immediately after, the crew of the 717 transferred radio frequency from Perth Approach and contacted the Pearce Centre controller, who acknowledged the 717 crew's transmission. The Pearce Centre controller then contacted the Pearce DEP/APR controller to ensure that they were aware of the 717 with the phrase '*Ident[8] off in Perth, NXK on climb FL120 reference Dingo*'. The Pearce DEP/APR controller, who was responsible for ensuring separation between the two aircraft[9], acknowledged the call and advised the Pearce Centre controller of the position of the King Air and its intentions.

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3 The Pearce approach (APR) position had been concentrated to the Pearce departures (DEP) position. The airspace for both positions was managed by the Pearce departures/approach (DEP/APR) controller.

4 Perth and Pearce controllers are collocated in the Perth Air Traffic Centre and operate common equipment.

5 The Perth Approach controller had just taken over in the control position and was not aware of the intentions of the King Air as details of the flight had not been flight planned or coordinated.

6 Both the Pearce DEP/APR controller and Perth Approach controller were undergoing a proficiency check.

7 44WG DET PEA SI(OPS) 3-5, paragraph 16.

8 Ident – a term used by ATC as an abbreviation of the words 'for identification'.

9 The separation standards and procedures for Pearce Airspace (44 WG DET PEA SI(OPS) 3-5 paragraph 17) state that the Pearce DEP/APR controller is responsible for separating all aircraft under their control with aircraft transiting the TMA.

Table 1 below provides a summary of the subsequent events, recorded between the time 1037 and 1040.

Table 1: Summary of events between 1037 and 1040

717 (*under Pearce Centre control*)	Time	King Air (*under Pearce DEP/APR control*)
	≈1037	The Pearce DEP/APR controller instructed the King Air to continue the right turn onto a heading of 210 degrees, which was towards the 717. [19]
The crew of the 717 reported maintaining FL120 and requested a higher level.	*1038:27*	
	1038:53	The Pearce DEP/APR controller observing the 717 in transit, instructed the crew of the King Air to stop the climb and descend to FL120. [20]
The Pearce Centre controller instructed the crew to turn left onto a heading of 330 degrees to facilitate the climb.	*1038:59*	
	1039:07	The Pearce DEP/APR controller noted on his air situation display that the 717 was maintaining FL120 and instructed the crew of the King Air to descend further to FL110 and requested the '...*best rate of descent'.*
The crew received a TCAS TA. The crew advised Pearce Centre that they had received a TA[21], with traffic noted in their two o'clock position.	*1039:20*	
A short term conflict alert activated on both Pearce Centre and Pearce DEP/APR controllers TAAATS (The Australian Advanced Air Traffic System) air situation display.		
	1039:21	The training officer monitoring the Pearce DEP/APR controller reacted by transmitting to the King Air crew, '*Dingo 42 to 110 and expedite the descent, traffic is a jet aircraft your 12 o'clock 7 miles FL120*'.
The Pearce approach supervisor, monitoring Pearce Centre, instructed the 717 to immediately turn left onto 360 degrees. [22]	*1039:27*	
	1039:31	The crew advised Pearce DEP/APR that they were descending to FL110 and had sighted the 717.
	1039:36	Pearce DEP/APR instructed the crew to maintain separation with the 717.
The crew reported to the Pearce Centre controller that they had received a TCAS RA[23]. The crew climbed the aircraft to FL125.	*1039:37*	
The crew were advised by the Pearce Centre controller that the conflicting aircraft was maintaining separation with them.	*1039:42*	
The crew advised that they were clear of the conflict and were returning to FL120.	*1040:08*	

[19] This was a long way round turn to the right.

[20] The RAAF Pearce SI(OPS) 3-4 paragraph 18 states that 'Civil aircraft are to be afforded standard separation with military aircraft while transiting Pearce restricted areas'.

[21] Traffic advisory (TA): Information sent to the pilot about other traffic within plus or minus 1,200 ft and 45 seconds in time.

[22] This superseded the previous instruction to turn left onto a heading of 330 degrees.

[23] Resolution advisory (RA): Verbal or displayed indication recommending increased vertical separation relative to an intruding aircraft.

The crew of the King Air had the 717 clearly in sight and did not consider the proximity of the two aircraft to be of any concern. The crew of the 717 were advised by the Pearce Centre controller that the crew of King Air were maintaining separation with them; however, this was not until after the radar separation standard of 3 NM (5.6 km) had been compromised. The distance between the two aircraft reduced to about 2.4 NM (4.4 km) and less than 1,000 ft vertical separation.

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.

Department of Defence

Crew resource management training

The Department of Defence advised the ATSB that all of the Pearce air traffic controllers have received refresher training in crew resource management.

Simulator training

The 44 Wing Detachment at Pearce has incorporated this incident into their simulator training exercises.

Coordination changes

Coordination of aircraft in Pearce military airspace has been altered such that Pearce Centre is now responsible for the airspace within which this incident occurred. There is no longer a requirement for Pearce Centre to coordinate aircraft with Pearce Approach.

ATSB COMMENT

Effective coordination between ATC positions is essential for ensuring the efficient management of air traffic. This occurrence reinforces the importance of effective coordination and highlights the challenges faced by air traffic controllers when managing aircraft operating within the same airspace, but under the control of different ATC positions.

AO-2010-016: VH-VQO, Powerplant/propulsion event

Date and time:	15 March 2010, 2232 CST	
Location:	74 km NNW of Adelaide, South Australia	
Occurrence category:	Incident	
Occurrence type:	Mechanical, engine	
Aircraft registration:	VH-VQO	
Aircraft manufacturer and model:	Airbus A-320-232	
Type of operation:	Air transport – high capacity	
Persons on board:	Crew – 6	Passengers – 175
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Minor	

SYNOPSIS

On 15 March 2010, an Airbus A320-232, registered VH-VQO, departed Adelaide, South Australia on a scheduled passenger flight to Darwin, Northern Territory. On board were six crew and 175 passengers. When climbing through 12,000 ft, the flight crew observed a loss of thrust from the number-2 (right) engine, accompanied by a loud bang and several warning indications. Passengers also reported seeing flames and smoke emanating from the right engine tailpipe.

The crew shut down and discharged both fire bottles into the right engine. They then returned and landed at Adelaide.

A post-landing inspection by maintenance personnel found metal debris and evidence of a fire in the tailpipe of the right engine. Removal and examination of the engine revealed evidence of a titanium fire that originated in the vicinity of the 6th stage high pressure compressor.

The engine was identified in an engine manufacturer service bulletin. This included new production engines that received a limited number of High Pressure Compressor Stage 6 Stator Vanes from the suspect batch. The engine manufacturer recommended certain serial number engines (which included the incident engine) in this category remain in service until the next scheduled overhaul shop visit. It was considered likely that the partial power loss was initiated by a failure of one or more of these vanes.

The operator advised the Australian Transport Safety Bureau (ATSB) that it had been operating four engines (one on each of four aircraft) that were identified within the service bulletin.

At the time of writing this report, the operator was working with the engine manufacturer to remove all four engines from service by September 2010.

FACTUAL INFORMATION

On 15 March 2010, an Airbus A320-232, registered VH-VQO, departed Adelaide for Darwin on a scheduled flight with six crew and 175 passengers on board. When climbing through 12,000 ft, the crew observed a loss of thrust from the number-2 (right) engine, accompanied by a loud bang and several warning indications. Passengers also reported seeing flames and smoke emanating from the right engine tailpipe.

The crew shut down and discharged both fire bottles into the right engine. They reported that at no time was any fire indication observed in the cockpit. They then returned to Adelaide and landed a short time later.

A post landing inspection by maintenance personnel found metal debris and evidence of a fire in the tailpipe of the right engine.

Figure 1: Debris in engine tailpipe

Image courtesy of the aircraft operator

Aircraft information

The aircraft had accumulated 16,035.20 flight hours and 9,813 cycles since new. The right engine was fitted at airframe manufacture and had accumulated the same hours and cycles since new.

Engine description

The aircraft was fitted with two Aero Engine International V2527-A5 series engines. The engine was a two spool, axial flow, high bypass ratio turbofan engine.

The engine's compression system featured a single stage fan and a four-stage low pressure booster, which comprised the low pressure compressor (LPC), and a ten stage high pressure compressor (HPC). The LPC was driven by a five-stage low pressure turbine (LPT) and the HPC by a two-stage high pressure turbine (HPT). The HPT also drove a gearbox, which in turn, drove the engine and aircraft mounted accessories.

Previous engine events

Five previous HPC stage 6 stator vane fractures and subsequent engine events have occurred across the world fleet. An investigation by the engine manufacturer determined that a certain number of HPC stage 6 stator vanes produced in August/September 2004 had been affected during manufacture. The defect manifested itself as a crack or feature on the trailing edge of the HPC stage 6 stator vane. In August 2006, service bulletin V2500-ENG-72-0528 was released to address the findings and specified remedial action.

Engine examination

The right engine was removed and shipped to an engine overhaul facility for disassembly and inspection under the supervision of an accredited representative from the New Zealand Transport Accident Investigation Commission (TAIC).

During the inspection, the HPC stages 6 to 11 vane airfoil surfaces were found to be broken and/or missing. Impact damage to some stage 5 vane trailing edges was also noted. A build up of molten blade and/or vane material had been deposited on all vane and rotor path surfaces from the stage 5 vane trailing edges downstream, which was consistent with an internal titanium fire.

Evidence of excessive local heating was also noted in the area of the stage 6 rotor path and around the outside of the stage 7 bleed air annulus area of the rear outer case.

Prior to disassembly (after the loose debris had been cleared) a high pressure compressor variable stator vane (VSV) hardware survey was performed to check the integrity of the VSV system. The VSV system passed all system play, security, rigging position and force checks.

The right engine of VH-VQO was identified within the service bulletin, V2500-ENG-72-0528, as possibly being affected by the HPC stage 6 stator vane manufacturing defect. The examination of the engine indicated that the partial power loss event initiated from material failures in the same location as the suspect stage 6 stator vanes. Due to the extensive damage, it was not possible to precisely determine the reason for the event; however, the engine manufacturer considered a vane failure was likely. Corroborating this was that some previous stage 6 vane failures had lead to titanium fires, similar to the one which occurred in VH-VQO after the power loss.

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.

Organisation

Early removal of engines potentially affected by service bulletin

The operator advised that it had been operating four engines in their fleet (one on each of four aircraft) that were identified within the service bulletin as being affected.

At the time of writing this report, the operator was working with the engine manufacturer to remove all four engines from service by September 2010.

Engine manufacturer

After this occurrence, the engine manufacturer reviewed its risk analysis for the HPC stage 6 stator vane, by including this latest engine in the calculations. The inclusion demonstrated a continued decrease in risk with no change to present fleet management programs recommended.

AO-2010-031: VH-VHD, Operational event

Date and time:	9 May 2010, 1700 local time
Location:	Cocos (Keeling) Island aerodrome
Occurrence category:	Incident
Occurrence type:	Operational event, flight preparation
Aircraft registration:	VH-VHD
Aircraft manufacturer and model:	Airbus Industrie A319-115
Type of operation:	Charter - passenger
Persons on board:	Crew – 7 Passengers – 82
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Nil

SYNOPSIS

On 9 May 2010 at 1700 local time[1], an Airbus Industrie A319-115 aircraft, registered VH-VHD, was being operated on a charter flight from Cocos (Keeling) Island to Christmas Island[2]. On departure, the aircraft taxied with its forward integral air stairs still extended. The aircraft was brought to a halt, the stairs were inspected and then retracted, and the flight continued normally. The warning system designed to inform the crew that the air stairs were extended did not function correctly in this instance.

The operator has advised the Australian Transport Safety Bureau (ATSB) that as a result of this occurrence, it has introduced a number of safety actions, including:

- revised procedures for the management and operation of internal stairs on the A319
- a clear definition of the duties of company engineers when carried on operational flights.

FACTUAL INFORMATION

On 9 May 2010 at 1700, an Airbus Industrie A319-115 aircraft, registered VH-VHD (Figure 1), was being operated on a charter flight from Cocos (Keeling) Island to Christmas Island. On board were seven crew and 82 passengers.

Figure 1: VH-VHD

Source: Wikipedia

At about 1715, when loading was almost complete, the company Licensed Aircraft Maintenance Engineer (LAME)[3] commenced his final walk round check and removed the fan restraining straps[4] from the engines. Once completed, the LAME made his way up the aircraft's forward air stairs. After some distractions, he detached the stair's hand rail from the aircraft, with the intention of immediately retracting the stairs. However, after another

[1] The 24 hour clock is used in this report to describe the local time of day on Cocos (Keeling) Islands, as particular events occurred. The local time was Coordinated Universal Time (UTC) + 6.5 hours.

[2] Cocos (Keeling) Island and Christmas Island are Indian Ocean Territories of Australia

[3] The operator did not have any ground handling staff at Cocos Island and a LAME was being carried on board the aircraft.

[4] It is common practice for some operators to restrain the fan blades on aircraft engines when the aircraft is parked overnight.

distraction, he closed the forward aircraft door without stowing the stairs.

During preparation for departure, the pilot in command (PIC) reported observing the amber air stairs extended symbol at the left hand forward entry door (L1)[5] and the L1 door open indication on the Electronic Centralised Aircraft Monitor (ECAM)[6] doors page. The PIC reported that prior to engine start, he believed that all the aircraft doors were closed. After the engine start sequence was complete, the ECAM doors page was checked and the PIC observed that all doors were closed and the air stairs retracted. The flight crew then commenced taxiing the aircraft.

After departing the parking bay, the aircraft entered and back tracked along runway 15 in preparation for takeoff. At about 1720, one of the aerodrome ground staff, who was conducting a runway inspection, observed the aircraft taxiing with its forward air stairs in the down position. He alerted the flight crew via Very High Frequency (VHF)[7] radio. At the same time, several onlookers also observed the aircraft taxiing with the air stairs extended and they visually alerted the crew as the aircraft travelled about 50 m along the runway. Subsequently, the flight crew brought the aircraft to a halt.

The air stairs were visually inspected, then retracted by the LAME. After discussion with the PIC, the LAME made an aircraft technical log entry requiring that the retraction process of the stairs be confirmed by visual inspection. This process was necessary as the ECAM indication system could not be relied upon and the process complied with the minimum equipment list (MEL)[8] requirements. The aircraft then continued the taxi to the threshold of runway 15 for departure. The remainder of the flight was uneventful.

Aircraft information

The aircraft was equipped with integral air stairs fitted to the L1 passenger entry door. There were two indication systems associated with the air stairs; one that displayed to the flight crew on the ECAM and the other that displayed on a panel beside the L1 door.

The ECAM system was controlled from a plunger type switch on the air stair compartment door, which operated once the air stairs were retracted and the door had closed. A stairs symbol was displayed on the ECAM doors page while the stairs were extended and the indication was removed when the stairs were retracted. In addition, the system was designed so that if an engine was started with the air stairs inadvertently extended, an ECAM warning would be displayed; however, on this occasion no warnings were evident to the crew.

The panel adjacent to the L1 door contained switches to extend and retract the air stairs. The panel also contained red warning lights that illuminated while the stairs were extended and extinguished once the hand rail was attached. Upon disconnection of the handrail, the warning light would again activate and then extinguish when the stairs were fully retracted. As the control panel had a cover that was closed during ground operations, it was not possible to establish if the warning light was illuminated at that time. The switching of those lights was controlled from an independent source to the ECAM warning.

Operating procedures

On completion of passenger boarding, it was usual for the LAME to retract the air stairs. This process had evolved over time, but had not been specifically defined or documented. Occasionally, the cabin crew would complete this task. However, where a company LAME was carried, the task would normally be completed by the LAME. The cabin crew would then arm the door slides at the appropriate time.

Due to the nature of the charter operations that the aircraft was engaged in, there were no specific ground handling staff at Cocos Island. The LAME largely assumed control of the ground handling at out ports such as this. As a result, there were no ground staff supervising engine start, or the dispatch process once the aircraft doors had been shut.

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5 L1 was an abbreviation used to denote the left forward passenger entry door.

6 ECAM was a system designed to display information to pilots.

7 VHF was the frequency used by the aircraft for ground communications.

8 The MEL was the manual that details the allowable deficiencies an aircraft is permitted to operate with.

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

Management and operation of internal stairs A319

The aircraft operator has issued a notice to crew revising the procedure for the management of the internal air stairs. When the internal stairs are used, the pilot not flying (PNF) will be the responsible crew member for both the retraction and extension of the stairs in relation to operations. This will ensure that there is confirmation of the position of the stairs as indicated on the ECAM by visual confirmation. This procedure is to stay in place until the company is comfortable that all indication systems on the stairs are fully reliable.

At all times when the stairs are extended, the hand rails are to be attached to the aircraft. They are only to be unattached from the aircraft immediately prior to retraction and the retraction process and door closing is to take place in a continuous process. i.e. handrails unattached from the aircraft and moved into the stowed position, stairs are then to be immediately retracted into the aircraft, the position lights at the L1 stair switch position checked and then the main cabin door closed.

Duties of LAMEs in relation to operations

The operator has issued a notice to crew with the clear definition of duties of company LAMEs when carried on flights. They are not to have a role in the actual operation of the flight and by definition they are not to be classed as flight crew.

The LAME is responsible for the preparation and certification of the aircraft for flight and management of ground handling in relation to arrival/departures. This includes removal of all component covers and pins installed for overnight stowage of the aircraft. They will open the door on initial arrival at the aircraft in preparation for flight. They will also close the door after final shutdown of the aircraft after a flight, once all passengers and crew have disembarked. Once passengers board in any phase of the flight they are not to arm/disarm or close/open the doors on departure or arrival. They have no defined role as crew and any action requested must be supervised while the aircraft is in operation.

Incident handling

While the operator was satisfied that no damage was found during the runway inspection or on the ground at Christmas Island, it believes a more thorough inspection by the LAME on the apron prior to departure from Cocos Island may have been more appropriate.

Therefore, the operator has stressed to all staff that for any future incidents of a similar nature, the operator should be contacted, so a joint decision on the most appropriate course of action to take can be discussed.

Design changes

The aircraft operator has advised the ATSB that it has discussed this incident with Airbus and the plunger switch on the air stairs housing door may be the subject of an Airbus service bulletin.

ATSB COMMENT

While this incident could not be fully attributable to human factors, the distractions during the boarding phase serve to highlight the possibility that even the most intuitive tasks can be missed. The ATSB has published a number of research reports examining human factors.

- An overview of Human Factors in Aviation Maintenance (2008)
- A Layman's Introduction to Human Factors in Aircraft Accident and Incident Investigation (2006)
- Human Factors in Airline Maintenance: A Study of Incident Reports (1997)

For a full copy of these reports, please visit the ATSB's website at www.atsb.gov.au

AO-2010-034: VH-ZPF, Aircraft loading issue

Date and time:	16 May 2010	
Location:	Adelaide aerodrome, South Australia	
Occurrence category:	Incident	
Occurrence type:	Aircraft loading event	
Aircraft registration:	VH-ZPF	
Aircraft manufacturer and model:	Embraer ERJ 190	
Type of operation:	Air transport – high capacity	
Persons on board:	Crew – 5	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

SYNOPSIS

On 16 May 2010, an Embraer ERJ 190 aircraft, registered VH-ZPF, was being operated on a positioning flight from Adelaide, South Australia (SA) to Brisbane, Queensland (Qld). After arriving in Brisbane, the pilot in command (PIC) reported that the load and trim sheet for the aircraft was inaccurate due to certain items being counted twice in the aircraft's load and trim calculations.

It was found that an error occurred when the Adelaide airport movements coordinator (AMCO), during a period of high workload, inadvertently selected the incorrect aircraft configuration in the company's computerised load and trim system.

The aircraft was not operated outside its weight and balance limitations; however, there were implications for how the pitch trim was set prior to takeoff.

The operator has raised an amendment to its flight operations manual to clarify the correct configuration to use when compiling a load and trim sheet for a positioning flight. The operator has also implemented changes to its load control system software to prevent the inadvertent selection of the incorrect configuration while preparing a load and trim sheet.

FACTUAL INFORMATION

On 16 May 2010, an Embraer ERJ 190 aircraft, registered VH-ZPF, was scheduled to be operated on a passenger service from Adelaide, SA to Brisbane, Qld.

Shortly after signing on, the PIC was informed that due to a cabin crew member being unfit to fly, the aircraft was to be repositioned to Brisbane without passengers.

The PIC discussed configuration and ballast requirements with the Adelaide AMCO and then proceeded to the aircraft. When the flight crew received the load and trim sheet for the flight, it showed that in addition to the standard domestic passenger configuration load, additional catering, potable water and 100 kg of ballast had been added to the aircraft.

The PIC queried the addition of the potable water and catering to the load and trim sheet, believing they were accounted for in the domestic configuration. He was reassured that the load and trim sheet was correct.

After the aircraft departed Adelaide, the PIC investigated the query further and determined that an error had been made. The flight continued to Brisbane without incident.

Figure 1: Embraer ERJ 190

Photograph courtesy - Terry Sheng

Load and trim sheet

To determine if an aircraft is loaded within its weight and balance limits, a load and trim sheet is generated. The aircraft's empty weight and centre of gravity (CG)[1] position is entered into the sheet, followed by the weight and position of flight and cabin crew, passengers, baggage, cargo, fuel, catering, potable water, life rafts and other items carried on board. From this information, calculations can be made to determine if the aircraft's loaded weight and CG position are within limits.

If an aircraft is allowed to operate outside these limits, the flight crew may encounter control difficulties due to CG position, or climb performance reduction if the aircraft's maximum take-off weight is exceeded.

EMB 190 loading information

To reduce the work required to produce a load and trim sheet from the beginning of the process for each flight, standard load and trim sheets are produced (Figure 2). These sheets incorporate the minimum items that must be carried for a particular type of flight. Any additional items loaded are then added to the standard load and trim sheet.

There were two standard load and trim sheets available for VH-ZPF; a training/ferry configuration and domestic passenger carrying configuration.

The training/ferry configuration included the empty weight of the aircraft plus two flight crew.

The domestic configuration included the empty weight of the aircraft, two flight crew, three cabin crew, full potable water and standard catering.

There was some confusion as to whether the training/ferry or domestic configuration was appropriate for a positioning flight, due to conflicting information contained in the ground and flight operations manuals. The ground operations manual required the training/ferry configuration to be used. This is the configuration the AMCO believed he had selected in the load control software, but he inadvertently selected the domestic configuration.

The AMCO then added the additional catering and potable water to the empty weight of the aircraft in the load control software, as would be standard practice if the aircraft was in the training/ferry configuration. As a result, the weight of the catering and potable water was included twice on the load and trim sheet; once as part of the standard domestic configuration load and trim sheet and again manually by the AMCO. This resulted in an additional 700 kg and 5.1 index (trim) units being added to the aircraft's load and trim sheet.

The load and trim sheet presented to the PIC showed that although within the load and trim limitations, the aircrafts CG was further aft than if the CG had been correctly calculated. While the error would have resulted in the PIC setting the aircraft's pitch trim slightly more nose-down than necessary prior to takeoff, it was not reported to have had any effect on the aircraft's controllability.

Load control software

The Adelaide AMCO load officer reported that in order to change an aircraft's configuration in the load control software, two fields were required to be modified. The AMCO reported changing the first field without changing the second, resulting in the aircraft being inadvertently left in the wrong configuration. The AMCO commented that an automatic link between the fields or a warning would prevent the error from recurring.

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1 The centre-of-gravity (CG) is the point at which an aircraft would balance if it were possible to suspend it at that point and is affected by how loads are distributed within an aircraft. The CG affects the stability of the aircraft and must fall within specified fore and aft limits, established by the manufacturer.

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

Procedures

The operator has raised an amendment to their flight operations manual to align it with their ground operations manual. This amendment will clarify the correct configuration to use when compiling a load and trim sheet for a positioning flight.

Load Control System Software

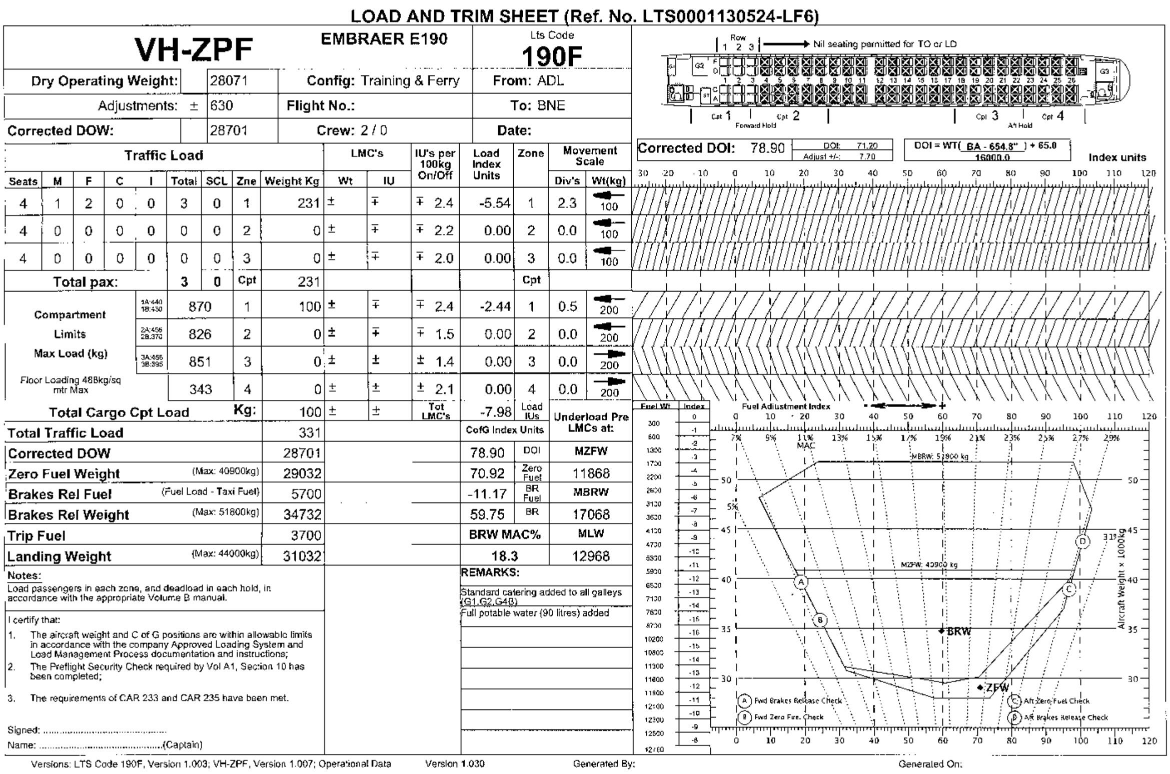
The operator has implemented changes to their load control system software to prevent the inadvertent selection of the incorrect configuration while preparing a load and trim sheet.

ATSB COMMENT

While use of an incorrect trim setting for the aircraft's actual weight and balance in this particular event did not have any adverse impact on the aircraft's controllability during takeoff, a larger discrepancy in the weight and balance calculations could have had a significant effect. The following reports provide examples of weight and balance, and aircraft loading related occurrences:

- G.W.H. Van Es (2007) Analysis of aircraft weight and balance related safety occurrences (NRL-TP-2007-153), p17, National Aerospace Laboratory, available from: http://www.skybrary.aero/bookshelf/books/1149.pdf
- ATSB transport safety investigation report 200405064 - Weight and balance event, Airbus A330-301, Changi Singapore, VH-QPC
- ATSB transport safety investigation report 200100596 - Boeing Co 767-338ER, VH-OGU

Figure 2: Example load and trim sheet



LOAD AND TRIM SHEET (Ref. No. LTS0001130524-LF6)

VH-ZPF		EMBRAER E190	Lts Code 190F
Dry Operating Weight:	28071	Config: Training & Ferry	From: ADL
Adjustments: ±	630	Flight No.:	To: BNE
Corrected DOW:	28701	Crew: 2 / 0	Date:

Seats	M	F	C	I	Total	SCL	Zne	Weight Kg	LMC's Wt	LMC's IU	IU's per 100kg On/Off	Load Index Units	Zone	Movement Scale Div's	Movement Scale Wt(kg)
4	1	2	0	0	3	0	1	231	±	∓	∓ 2.4	-5.54	1	2.3	100
4	0	0	0	0	0	0	2	0	±	∓	∓ 2.2	0.00	2	0.0	100
4	0	0	0	0	0	0	3	0	±	∓	∓ 2.0	0.00	3	0.0	100
Total pax:					3	0	Cpt	231					Cpt		
Compartment Limits Max Load (kg)				1A:440 1B:430	870		1	100	±	∓	∓ 2.4	-2.44	1	0.5	200
				2A:456 2B:370	826		2	0	±	∓	∓ 1.5	0.00	2	0.0	200
				3A:456 3B:395	851		3	0	±	±	± 1.4	0.00	3	0.0	200
Floor Loading 488kg/sq mtr Max					343		4	0	±	±	± 2.1	0.00	4	0.0	200
Total Cargo Cpt Load Kg:								100	±	±	Tot LMC's	-7.98	Load IUs		

			CofG Index Units		Underload Pre LMCs at:
Total Traffic Load		331			
Corrected DOW		28701	78.90	DOI	MZFW
Zero Fuel Weight	(Max: 40900kg)	29032	70.92	Zero Fuel	11868
Brakes Rel Fuel	(Fuel Load - Taxi Fuel)	5700	-11.17	BR Fuel	MBRW
Brakes Rel Weight	(Max: 51800kg)	34732	59.75	BR	17068
Trip Fuel		3700	BRW MAC%		MLW
Landing Weight	(Max: 44000kg)	31032	18.3		12968

Notes:
Load passengers in each zone, and deadload in each hold, in accordance with the appropriate Volume B manual.

I certify that:

1. The aircraft weight and C of G positions are within allowable limits in accordance with the company Approved Loading System and Load Management Process documentation and instructions;
2. The Preflight Security Check required by Vol A1, Section 10 has been completed;
3. The requirements of CAR 233 and CAR 235 have been met.

Signed: ....
Name: ....(Captain)

REMARKS:
Standard catering added to all galleys (G1,G2,G4B)
Full potable water (90 litres) added

Versions: LTS Code 190F, Version 1.003; VH-ZPF, Version 1.007; Operational Data Version 1.030 Generated By: Generated On:

AO-2010-037: VH-VQZ, Operational event

Date and time:	30 May 2010, 1820 EST	
Location:	Gold Coast aerodrome, Queensland	
Occurrence category:	Incident	
Occurrence type:	Operational event	
Aircraft registration:	VH-VQZ	
Aircraft manufacturer and model:	Airbus Industrie A320-232	
Type of operation:	Air transport – high capacity	
Persons on board:	Crew – Unknown	Passengers – Unknown
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

SYNOPSIS

On 30 May 2010, an Airbus Industrie A320-232 aircraft, registered VH-VQZ, departed Sydney, New South Wales (NSW) on a scheduled passenger service to the Gold Coast, Queensland (Qld). The copilot, who was under training, was designated as the pilot flying for the flight.

The aircraft arrived at the Gold Coast and an instrument approach was commenced. During the landing, the flare was initiated early and the aircraft floated along the runway. The pilot in command (PIC) instructed the copilot to lower the nose of the aircraft; however, the aircraft appeared to maintain a level pitch attitude. The PIC determined that the landing could not be achieved and assumed control of the aircraft. The PIC initiated a go around, during which time the aircraft's main landing gear momentarily contacted the runway. The missed approach procedure was commenced and a second approach was made without further incident.

The failure to identify, or execute a go around/missed approach procedure has been cited by the Flight Safety Foundation as one of the major causes of approach-and-landing accidents. This incident highlights the importance of recognising when a go around should be initiated and supports the safety benefits of being 'go-around-prepared' and 'go-around-minded'.

FACTUAL INFORMATION

On 30 May 2010, an Airbus Industrie A320-232 aircraft, registered VH-VQZ, was being operated on a scheduled passenger service from Sydney, NSW to the Gold Coast, Qld. The copilot, who was under training, was designated as the pilot flying for the flight.

On arrival at the Gold Coast, the crew elected to conduct a runway 32 area navigation global navigation satellite system (RNAV (GNSS)) instrument approach for training purposes. The crew received a clearance from air traffic control to commence the approach and subsequently entered the missed approach altitude of 3,000 ft into the aircraft's flight control unit. The crew then reported conducting a stabilised approach.

During the landing, at about 1820 Eastern Standard Time[1], the flare[2] was initiated early and the aircraft floated along the runway. The PIC instructed the copilot to lower the nose of the aircraft to allow it to settle onto the runway; the copilot reportedly complied with the instruction.

At this point, the PIC noted that the radio altimeter indicated a height of 30 ft above ground level and

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

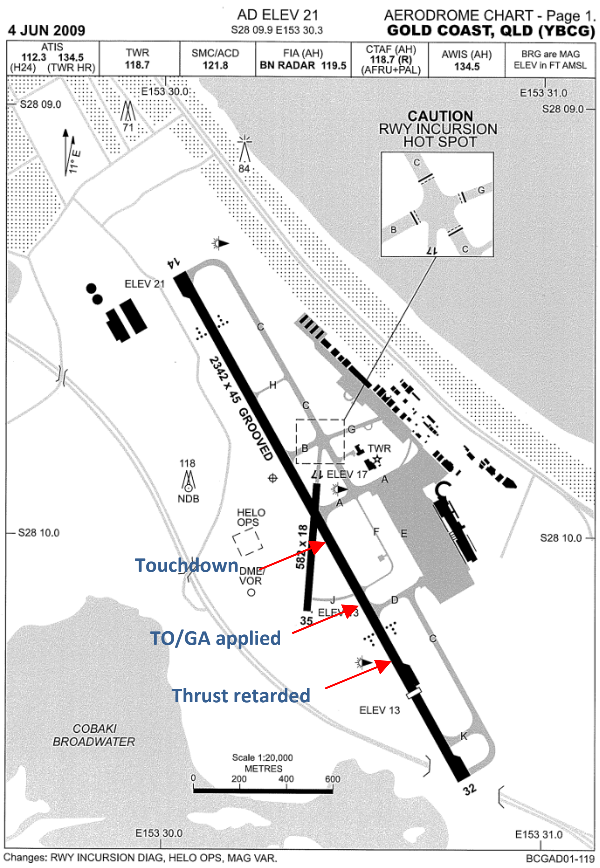
2 The flare is the process of decreasing the aeroplane's rate of descent to about zero for landing by raising the nose of the aircraft.

the aircraft appeared to be in a level pitch attitude. The PIC determined that the landing was not recoverable. He assumed control of the aircraft and initiated a go around by applying takeoff/go around (TO/GA) thrust. The aircraft began to sink, and as engine thrust increased, the aircraft's main landing gear briefly contacted the runway (Figure 1).

After a positive rate of climb was confirmed by both crew members, the copilot selected a flaps 3 setting and retracted the landing gear. The crew then initiated the missed approach procedure.

The crew received instructions from air traffic control and were positioned for a visual approach to runway 32. The aircraft was landed without further incident.

Figure 1: Aircraft position during landing



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Note: Aircraft positions detailed above were obtained from data extracted from the quick access recorder provided courtesy of the operator.

Pilot information

On the day of the incident, the copilot was undergoing line training under the supervision of the PIC. The copilot had a total of 50 hours flying time on the Airbus A320 aircraft.

ATSB COMMENT

The failure to identify, or execute a go around/missed approach procedure has been cited by the Flight Safety Foundation as one of the major causes of approach-and-landing accidents. While a go around is considered part of normal aircraft operations, crews must be *go-around-prepared* and *go-around-minded*. According to the Flight Safety Foundation, this implies:

- having a knowledge of the applicable briefings, standard calls, sequences of actions, task-sharing and cross-checking
- being ready to discontinue the approach if weather minima's or stabilised approach criteria are not met, or doubt exists as to the aircraft's position or about aircraft guidance
- the flight crew applies the missed approach procedure after a go around has been initiated.

This incident highlights the importance of recognising when a go around should be initiated and supports the safety benefits of being 'go-around-prepared' and 'go-around-minded'.

The following publications, available from www.flightsafety.org and www.airbus.com, provide additional information on go around preparedness:

- Flight Safety Foundation ALAR Briefing Note 6.1 – Being Prepared to Go Around
- Flight Safety Foundation ALAR Briefing Note 8.3 – Landing Distances
- Airbus Flight Operations Briefing Notes – Descent Management – Being Prepared for Go-Around

AO-2010-038: VH-VQL, Ground handling event

Date and time:	1 June 2010, 0750 EST	
Location:	Sydney aerodrome, New South Wales	
Occurrence category:	Serious incident	
Occurrence type:	Ground handling	
Aircraft registration:	VH-VQL	
Aircraft manufacturer and model:	Airbus A320-232	
Type of operation:	Air transport – high capacity	
Persons on board:	Crew – Unknown	Passengers – Unknown
Injuries:	Crew – Nil	Passengers –Nil
Damage to aircraft:	Serious	

SYNOPSIS

On 1 June 2010, an Airbus A320-232 aircraft, registered VH-VQL, was being operated on a scheduled passenger service from the Gold Coast, Queensland (Qld) to Sydney, New South Wales (NSW). On arrival at Sydney the passengers commenced disembarking through the aircraft's forward and rear doors. During this time, a ground handler drove a cargo loader towards the rear cargo door of the aircraft in preparation for unloading baggage and cargo.

When the loader was about 3 m away from the aircraft, the ground handler stopped the loader, completed the relevant safety checks and then commenced moving towards the aircraft. After moving forward about 0.3 m the loader unexpectedly accelerated towards the aircraft. The ground handler reported he was unable to stop the loader or turn it away from the aircraft prior to it impacting the aircraft just forward of the rear cargo door. The aircraft, cargo loader and rear passenger stairs sustained serious damage. No one was injured in the incident.

A subsequent inspection by the operator identified that when the throttle pedal was depressed to the full open position, the pedal would intermittently become caught on the throttle stop due to a missing striker plate on the back of the pedal assembly.

As a result of this incident, the operator inspected all their cargo loaders of the same model to ensure they were not missing the striker plate. One loader was found to be missing a striker plate and this has since been repaired.

FACTUAL INFORMATION

On 1 June 2010, an Airbus A320-232 aircraft, registered VH-VQL, departed Gold Coast, Qld on a scheduled passenger service to Sydney, NSW. On arrival at Sydney, the aircraft was taxied to its allocated parking bay and the passengers commenced disembarking via the forward and rear doors.

At about 0750 Eastern Standard Time[1], during passenger disembarkation, the leading hand[2] started the cargo loader and drove it towards the aircraft. While still outside the area of the aircraft's wing tips, the leading hand completed a brake test and then continued approaching towards the rear cargo hold at a slow speed.

At about 3 m from the fuselage, the leading hand stopped the cargo loader to complete the required safety checks. This involved applying the park brake, selecting neutral gear, and raising the forward deck of the loader, which initiated the loaders creep mode. The park brake was then released and forward gear selected. The leading hand then

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

2 The leading hand was not tasked with operating the loader; however, he was trained in using the equipment.

attempted to drive the loader forward; however, he reported that the loader did not move. The leading hand lowered the deck and commenced the approach towards the rear cargo door, which required a sharp left turn. After moving forward about 0.3 m, the engine of the loader was heard to 'rev' significantly and the loader unexpectedly accelerated towards the aircraft. The leading hand reported that he was unable to stop the loader or turn it away from the aircraft. The loader made heavy contact with the aircraft just forward of the rear cargo door.

At the time of the incident, cabin crew reported that there were four passengers on the push-up stairs. None of these passengers fell or were injured in the incident. The leading hand was also not injured as a result of the incident.

Damage information

Aircraft

The impact resulted in damage to the wing-to-body fairing and a 0.8 mm gouge in the fuselage skin near the rear cargo door. The force of the impact resulted in movement of the aircraft's tail, which lead to contact being made between the fuselage and rear push-up passenger stairs that were located on the opposite side of the aircraft to the initial impact. This contact resulted in a 0.5 mm dent in the fuselage skin and damage to the passenger stairs.

Cargo loader

The cargo loader was damaged in the incident, with the operator's console bending backwards and the steering wheel coming to rest on the leading hand's legs. The floor forward of the console and the hand rail surrounding the loader operator sustained structural damage.

Cargo loader

The loader was a TLD 727, 3.5 ton cargo loader utilised for loading and unloading baggage and cargo unit load devices from the operator's fleet of Airbus A320 aircraft.

Braking system

The primary braking system for the loader was a hydrostatic system. The primary braking effort available to an operator is by removing the operator's foot from the throttle pedal, which closes the throttle, or by activating one of the emergency stop buttons.

While a brake pedal is fitted to the loader (a drum brake assembly), it is not designed to provide the majority of the braking effort. Depressing the brake pedal does not deactivate the throttle, and when in the full throttle open position, it would only slow the loaders speed and unlikely arrest any movement.

The emergency stop button on the operator's consol was located behind the steering wheel in between the platform roller and control joysticks. The operator had previously noted that this location made it difficult to depress the emergency stop button from the driver's position.

Creep mode

Raising the forward deck of the loader would engage the creep mode, reducing the vehicles speed. It was the operator's standard operating procedure to use the creep mode when in close proximity to aircraft.

The operator reported that the TLD 727 loader had difficulties in moving forward in the creep mode with the forward deck raised after coming to a stop in areas of tarmac undulation. In this instance, the operator reported that if the loader stopped 3 m from the fuselage, the loader's rear wheels would have been sitting in a crack in the apron's concrete. This resulted in the leading hand lowering the forward deck to operate the loader in the normal mode, to achieve forward movement.

The operator spoke to other TLD users who also reported problems where the loader was unable to be driven forward in the creep mode with the forward deck raised due to poor tarmac conditions. This has resulted in loader operators deviating from standard operating procedures by leaving the forward deck in the lowered position to provide more traction and allow for a higher drive speed.

Inspection

The emergency stop button, the gear selector and handbrake function were tested with no faults identified. Both the normal and creep modes were also tested and found to operate correctly.

A subsequent inspection of the throttle pedal assembly identified that a striker plate was missing from the underside of the pedal. Under normal conditions, the striker plate would make contact with the adjustable throttle stop fixed to the floor when the pedal is depressed. The inspection found that if the throttle pedal was depressed to the full open position, the pedal made contact with the adjustable throttle stop and became intermittently caught on a nut on the underside of the pedal, preventing the throttle from returning to the neutral position. The inspection also determined that this only occurred when the throttle pedal assembly was twisted slightly.

Wear on the underside of the pedal was observed, indicating that the striker plate had been absent for some time, and wear on the throttle pedal pivot point allowed for movement of the pedal.

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.

TLD distributor

Inspection of cargo loaders

The day after the incident, the Australasian distributor/service provider for the TLD 727 issued an immediate inspection notice for the operator to identify whether or not the striker plate was present on the underside of the throttle pedal.

Aircraft operator

The operator advised the ATSB that all of their TLD 727 loaders have been inspected, with a missing striker plate being identified on one other loader. This has since been repaired.

ATSB COMMENT

A recent ATSB study identified that 13 per cent of 282 ground operational related occurrences involving high capacity aircraft over an 11 year period were the result of a collision or contact with the aircraft by a vehicle.

In terms of location, collisions with aircraft were the most common occurrence identified when the aircraft was positioned at the gate. Of this, about half occurred as the vehicle or object was being driven up to or away from the aircraft. About 24 per cent involved a cargo or container loader.

- Ground operations occurrences at Australian airports, 1998 to 2008 (2010)

A full copy of this report can be found at www.atsb.gov.au.

AO-2010-003: VH-NTQ, In-flight engine shut down

Date and time:	14 January 2010, 0645 WST
Location:	Beagle Bay, Western Australia
Occurrence category:	Accident
Occurrence type:	Partial power loss (In-flight engine shutdown)
Aircraft registration:	VH-NTQ
Aircraft manufacturer and model:	Cessna Aircraft Co 208B Caravan
Type of operation:	Charter
Persons on board:	Crew – 1 Passengers – 0
Injuries:	Crew – 1 (Minor)
Damage to aircraft:	Seriously damaged

SYNOPSIS

On 14 January 2010, a Cessna Aircraft Co. 208B Caravan, registered VH-NTQ, was en-route from Broome to Koolan Island, Western Australia (WA) at an altitude of about 9,500 ft, when the pilot noticed a drop in the engine torque indication, with a corresponding drop in the engine oil pressure indication. The pilot diverted to the nearest airstrip, which was Beagle Bay, WA. The pilot shut the engine down when the low oil pressure warning light illuminated and conducted a landing at Beagle Bay airstrip. The aircraft overran the airstrip, coming to rest upside down after impacting a mound of dirt. The aircraft was seriously damaged. The pilot, who was the only occupant, sustained minor injuries.

Following the accident, the Civil Aviation Safety Authority (CASA) issued an airworthiness bulletin, AWB 72-004 Issue 1, on 8 February 2010 to all Cessna 208 aircraft operators in Australia. The bulletin highlighted previous service difficulty reports on similar failures and the possibility of the accident aircraft having experienced the same problem. The bulletin recommended the inspection of the engine oil transfer tube attachment lugs for cracks and the inspection of the engine vibration isolator mounts for correct installation. Any defects in the area of the vibration mounts and oil tubes were to be reported to CASA post inspection. At the time of writing this report, one case of an oil tube with a loose fit and wear had been reported.

FACTUAL INFORMATION

On 14 January 2010, a Cessna Aircraft Company 208B (Caravan), registered VH-NTQ, departed Broome on a charter flight to Koolan Island, WA. At about 0645 Western Standard Time[1], when the aircraft was at an altitude of about 9,500 ft, the pilot noticed a drop in the engine torque indication with a corresponding drop in the engine oil pressure indication. The pilot increased the power lever setting but the engine torque and oil indications continued to reduce, all other engine indications were normal. During an interview with the Australian Transport Safety Bureau (ATSB) the pilot stated that he felt a power loss associated with the drop in indicated engine torque.

The pilot diverted to the nearest airstrip, which was Beagle Bay, WA. He stated that the low oil pressure warning light illuminated so he shut the engine down and prepared for an emergency landing. The pilot reported that on the final approach to the airstrip he realised that the aircraft was too high and its airspeed was too fast. The aircraft touched down about mid way along the runway and overran the end of the runway by about 200 metres. The aircraft impacted a mound of dirt, coming to rest upside down (Figure 1).

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

Figure 1: Accident site

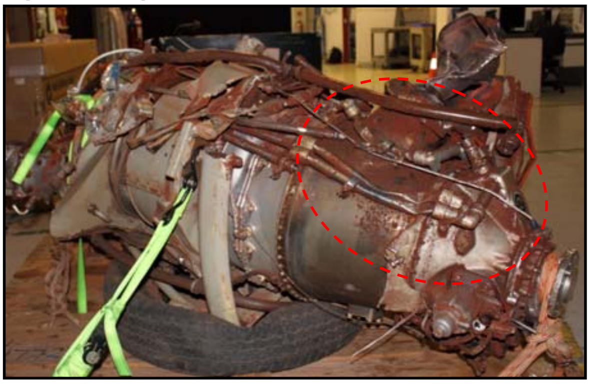
Photograph courtesy of a third party

The pilot, who was the only occupant sustained minor injuries. Examination of the aircraft by a third party and inspection of the photographs taken of the accident site, revealed that the engine, left main gear and nose gear had separated from the airframe during the accident sequence. There was a significant amount of oil present on the underside of the aircraft, indicating that the oil had leaked from the engine during operation. The engine was removed from the accident site as an assembly by a third party. The propeller was removed and the engine was shipped to an engine overhaul facility where a disassembly and examination was conducted under the supervision of the ATSB.

Engine examination

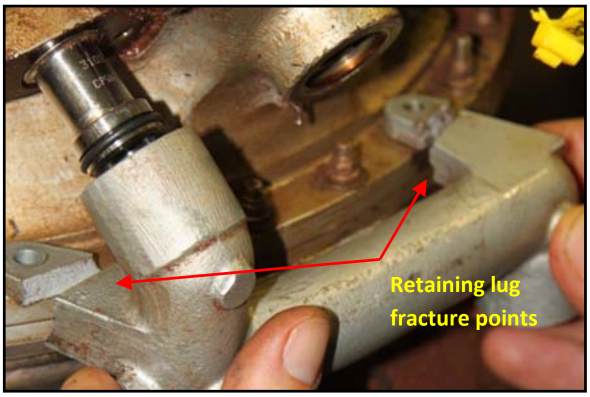
External examination of the engine showed that red dust from the accident site had attached itself to the areas of the engine that had been contaminated with engine oil. It was apparent that there was a high concentration of oil on the outer surface of the reduction gear box between the 4 and 7 o'clock positions, the mid and rear sections of the engine were relatively oil free in comparison. Figure 2 shows the engine assembly as received at the engine overhaul facility, attached to a pallet with the bottom of the engine facing upwards; the highlighted area indicates a high concentration of oil contamination.

Figure 2: Engine assembly



The engine examination revealed accident damage to several components and oil lines. All of the engine's external oil seals were inspected with no pre-accident defects identified. The engine was disassembled at the hot section and accessory gear box, so an internal examination could be conducted. No pre-accident defects were noted during the internal examination. The accessory gear box chip detector, reduction gear box chip detector and the engine's main oil filter were inspected, with no foreign particles or debris noted in the oil system. Approximately 1 quart (0.92 L) of oil was drained from the engine, which had a normal operating capacity of 14 quarts (13.25 L). A sub section of oil pressure tube, that transferred oil from the oil pressure pump to the reduction gear box, was found to have fractured at both attachment lugs (Figure 3).

Figure 3: Oil transfer tube



In order to establish the manner in which the oil tube attachment lugs had fractured and whether or not the failure contributed to the oil pressure issues, the tube was sent to the ATSB engineering facilities for a detailed metallurgical examination.

Oil transfer tube metallurgical examination

The factors that contributed to the oil transfer tube attachment lug failures could not be conclusively identified during the detailed metallurgical examination. There was no evidence of fatigue cracking or a manufacturing defect that may have contributed to the failure.

Oil transfer tube failure history

There have been a total of five documented cases of the same type of oil transfer tube attachment lug failure in Australia. There were three Civil Aviation Safety Authority (CASA) Service Difficulty Report (SDR) cases on two different Cessna 208 aircraft. One of the reported cases led to the total loss of engine oil in flight and the requirement for the aircraft to conduct an emergency landing on a public road. All of the SDR cases were thought to have been caused by the incorrect installation of an engine vibration isolator mount, which led to high cycle fatigue and the eventual failure of the oil tube at the attachment lugs. Recently, the ATSB has investigated two other engine failures involving Cessna 208 aircraft (AO-2008-005, VH-PSQ and AO-2010-005, VH-UMV). In both occurrences, the oil transfer tubes were noted to have fractured at the attachment lugs in the same manner as the oil tube from VH-NTQ. Both engine failures were related to compressor/power turbine blade failures. A comparison of the VH-NTQ lug fracture surfaces was made with the other failures, which revealed them to be remarkably similar in appearance. No evidence of fatigue was found in the VH-PSQ and VH-UMV oil pipe fractures, despite being exposed to considerable levels of vibration from an out-of-balance engine core.

Aircraft maintenance history

The aircraft had a scheduled maintenance check on the day prior to the accident, which included an engine inspection. The aircraft maintainer stated that he did not identify any defects on the engine during the inspection. Engine runs and leak checks were conducted after the scheduled maintenance was carried out. There was no evidence that the maintenance carried out on the aircraft was related to the engine oil leak. The propeller had been balanced on 19 April 2009 and was within limits.

Engine torque indication system

The engine torque indication system utilised an electric torque indicator and a transmitter. The transmitter sensed the difference in engine torque pressure and oil pressure in the reduction gear box case and transmitted that data to the torque indicator. The torque indicator converted the information into an indication of torque in foot-pounds. In the event of a severe reduction in oil pressure due to the total loss of oil in the engine, the torque indication would reduce, even if power to the engine was maintained.

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.

CASA

Airworthiness bulletin

Following the accident, CASA issued an airworthiness bulletin, AWB 72-004 Issue 1, on 8 February 2010 to all Cessna 208 aircraft operators in Australia. The bulletin highlighted previous SDR failures and the possibility of the accident aircraft having experienced the same problem. The bulletin recommended the inspection of the engine oil transfer tube attachment lugs for cracks and the inspection of the engine vibration isolator mounts for correct installation. Any defects in the area of the vibration mounts and oil tubes were to be reported to CASA post inspection. At the time of writing this report one case of an oil tube with a loose fit and wear had been reported.

ATSB COMMENT

From the evidence available it was evident that the engine had a substantial in-flight oil leak, which necessitated the in-flight shut down of the engine and a diversion to the nearest available airstrip.

The accident damage to the engine in the area of the apparent oil leak precluded a conclusive finding as to the source of the leak. Although the detailed examination of the oil tube attachment lug fracture surfaces was inconclusive, the oil tube remained the most likely source of the oil leak. Evidence from other oil tube failures indicated that significant vibratory loading can cause the oil tube attachment lugs to fracture in the manner observed in the oil tube fitted to VH-NTQ. There was no evidence that the transfer tube was subjected to vibration from a compressor turbine or power turbine blade failure or of an incorrectly fitted engine mount. There was also no evidence of a pre-accident defect that would have caused a reduction in actual engine torque.

AO-2010-028: VH-SBA, Runway excursion

Date and time:	6 May 2010, 0815 CST
Location:	Mount Gambier aerodrome, South Australia
Occurrence category:	Incident
Occurrence type:	Runway excursion
Aircraft registration:	VH-SBA
Aircraft manufacturer and model:	Saab Aircraft Company 340B
Type of operation:	Air transport - low capacity
Persons on board:	Crew – 3 Passengers – 31
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Nil

SYNOPSIS

On 9 May 2010 at about 0815 Central Standard Time[1], a Saab 340B aircraft, registered VH-SBA, landed at Mount Gambier aerodrome, South Australia (SA). The crew reported that following a routine approach and touchdown, light braking was applied. At a speed of between 40 and 50 kts, braking pressure was increased because of the speed of the aircraft in relation to its position on the runway.

When braking pressure was increased, the aircraft pulled to the left. The aircraft continued to veer left, until it came to a stop with the nose and left main wheels bogged, off the left side of the runway, at an estimated angle of 50 degrees off runway heading.

The operator's maintenance personnel determined that the left-seat pilot's right brake pedal was producing less braking force than the left pedal. Following extensive fault finding, the associated brake control cable conduit was inspected with a boroscope. A gouge was found on inside radius. The cable was replaced and the aircraft returned to service.

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

FACTUAL INFORMATION

On 9 May 2010 at about 0815, a Saab 340B aircraft, registered VH-SBA, with three crew and 31 passengers on board landed at Mount Gambier aerodrome, SA. The aircraft was being operated on a scheduled passenger service from Adelaide, SA.

The flight crew consisted of a training captain (the pilot in command (PIC)) and a pilot in command under suppervision (ICUS), performing the duties and functions of the PIC while under the supervision of the acutal PIC. [2] The crew reported that following a routine approach and touchdown, the power levers were slowly moved to the ground idle position and light braking was applied at between 50 and 60 kts. At a speed of between 40 and 50 kts, the supervising pilot instructed the pilot under supervision to apply more braking pressure, due to the speed of the aircraft in relation to its position on the runway.

When more braking pressure was applied, the aircraft pulled to the left. Due to this sudden change in direction, the pilot under supervision increased braking pressure further. The pilot under supervision reported trying to correct the pull to the left by applying right nose-wheel steering, however the aircraft continued to veer to the left. The aircraft came to a stop with the nose and left main wheels bogged off the left side of the runway, at an estimated angle of 50 degrees off runway heading.

[2] The ICUS pilot was occupying the left seat, with the training captain occupying the right seat.

Once stopped, the aircraft could not be moved under its own power. The aircraft was shut down and the passengers disembarked. After the passengers had been transported to the terminal, the aircraft was towed onto the runway, where the engines were started and the aircraft taxied to the terminal without further incident. There was no reported damage to the aircraft or injuries to passengers or crew as a result of the incident.

Weather information

Weather at the time of arrival was reported to be fine following a rain shower that had recently passed over the aerodrome. The runway was reported to be wet, but with no standing water.

Pilot information

The pilot under supervision (left seat) held an Air Transport Pilot (Aeroplane) Licence with a multi-engine command instrument rating. He had 3,280 hours total flying time, with 1,220 hours experience on the Saab 340 aircraft type, including 12 hours operating as pilot in command under supervision. He had received adequate sleep in the 48 hours preceding the incident.

The supervising pilot (right seat) held an Air Transport Pilot (Aeroplane) Licence with a multi-engine command instrument rating. He had 6,600 hours total flying time with 3,819 hours experience on the Saab 340 aircraft type. He had received adequate sleep in the 48 hours preceding the incident.

Aircraft information

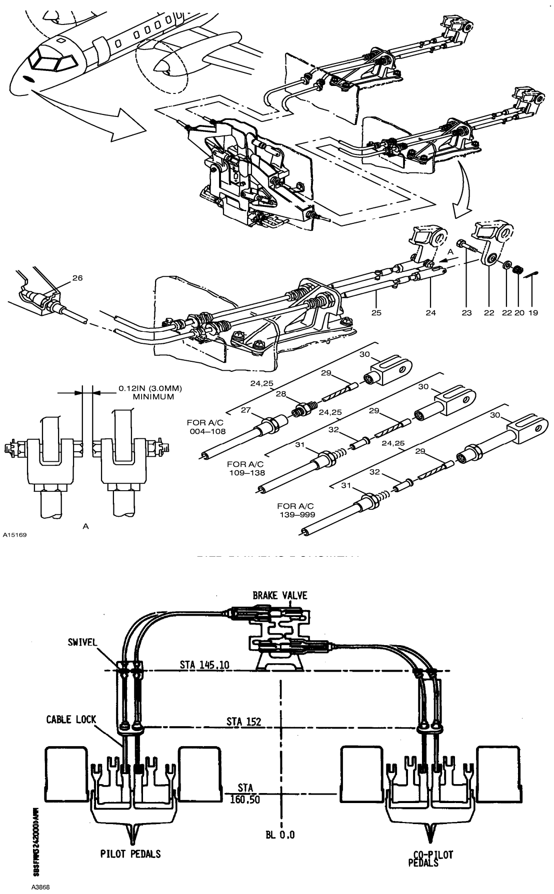
Saab 340B braking system

The handling pilot (left seat) and copilot (right seat) each had left and right foot-operated brake pedals (Figure 1). The pilot's pedals could be operated together to slow the aircraft in a straight line or independently to help turn the aircraft left or right during slow speed ground operations.

Normal braking was controlled through the handling pilot's pedals and was hydraulically powered by the main hydraulic system. Main hydraulic system pressure was accepted into the braking system through a mechanically operated power brake valve. When the pilot or copilot depressed a brake pedal, the motion was mechanically transferred to the brake valve via Teleflex[3] cables. The brake valve then ported proportionate hydraulic pressure to the selected wheel brake assembly.

An anti-skid system provided maximum braking with skid and locked wheel protection.

Figure 1: Brake control cables



Images - Saab 340 maintenance manual

Braking system fault finding

The operator's maintenance personnel determined that with 50 lb of force applied to each brake pedal, the output pressure from the pilot's right brake pedal was 150 psi compared to 300 psi from the other three pedals.

Following extensive fault finding, the pilot's right brake control cable conduit was inspected with a boroscope. A gouge was found on the inside radius and was taken to be evidence of cable movement restriction. The cable was replaced and the aircraft returned to service following successful system tests.

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3 Mechanical remote-control systems in which push/pull commands are transmitted by tube-mounted cable with complex coiled over layers.

FDR Information

Data from the aircraft's flight data recorder was consistent with the pilots' reported chain of events.

ATSB COMMENT

The following Aviation Research and Analysis Reports provide further reading on runway excursions.

- AR-2008018(1) Runway excursions: Part 1 - A worldwide review of commercial jet aircraft runway excursions
- AR-2008018(2) Runway excursions: Part 2 - Minimising the likelihood and consequences of runway excursions, An Australian perspective

For a full copy of these reports please visit the ATSB's website www.atsb.gov.au

AO-2010-039: VH-NGX, Weather related event

Date and time:	1 June 2010, 0900 WST	
Location:	Southern Cross (ALA), Western Australia	
Occurrence category:	Serious incident	
Occurrence type:	Weather related event	
Aircraft registration:	VH-NGX	
Aircraft manufacturer and model:	Fairchild Industries Inc. SA226-TC (Metro II)	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 2	Passengers – 12
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

SYNOPSIS

On 1 June 2010, a Fairchild Industries Inc. SA226-TC (Metro II) aircraft, registered VH-NGX, was being prepared for a charter passenger service from Perth to the Southern Cross aeroplane landing area (ALA), Western Australia (WA).

Prior to departing, the crew obtained the weather forecasts for the flight. The area forecast (ARFOR), which covered a large area, forecast fog, while the aerodrome forecast (TAF), which covered a particular location, forecast conditions as clear. The crew contacted the Bureau of Meteorology (BoM) to confirm the conditions. The crew received an amended forecast for Southern Cross indicating fog, and visibility reducing to 300 m until 0800 Western Standard Time[1]; after this time conditions were forecast to improve.

Due to the payload requirements of the flight, additional fuel for an alternate aerodrome could not be carried as required if the weather conditions at Southern Cross were unfavourable. Consequently, the crew elected to delay the departure from Perth until 0800.

While en route, the crew observed a band of cloud between Perth and Southern Cross. On arrival at Southern Cross, the conditions were not as expected by the crew, with overcast low cloud and fog present. The crew tracked to the north of the airstrip, where the fog had cleared, and commenced the approach. In order to remain clear of cloud and maintain visual sight with the runway, the aircraft was descended to 337 ft above ground level (AGL). From this point, the crew determined that a straight-in-approach could not be conducted and a low level circling approach to position the aircraft on final for runway 14 was performed. The aircraft landed at about 0915 without further incident.

The BoM conducted a review of this incident and made a number of recommendations, including making forecasters aware of the synoptic conditions behind this incident and its consequential effect on users; and as part of a national review, establishing the minimum observation requirements needed in order to issue and maintain a weather watch on a TAF.

FACTUAL INFORMATION

On 1 June 2010, the crew of a Fairchild Industries Inc. SA226-TC (Metro II) aircraft, registered VH-NGX (NGX), were preparing for a 'closed charter' passenger service from Perth to Southern Cross ALA, WA, operating under instrument flight rules. The purpose of the flight was to transport mining personnel to the St Barbara mine located about 30 km south of the Southern Cross Township. Two other aircraft from the operator were also scheduled to conduct the same flight.

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

In preparation for the flight, the crew obtained the weather forecasts for Southern Cross and the surrounding region; the TAF and ARFOR[2]. The crew reported that the Southern Cross TAF (issued at 0420 on 1 June 2010), forecast conditions as CAVOK[3], while the ARFOR forecast fog. The crew contacted the BoM to confirm the weather conditions. The crew reported that they had been advised that there was a high probability of fog at Southern Cross. The BoM amended the TAF (issued at 0503), forecasting fog between 0600 and 0800. After 0800, conditions were forecast to be CAVOK.

Due to the payload requirements for the flight (about 450 kg of fuel and 14 persons on board), additional fuel for a diversion to an alternate aerodrome could not be carried. The crew elected to carry as much fuel as allowable, resulting in a total of 475 kg on board[4]. The operator's other aircraft were able to carry sufficient fuel if a diversion was required.

The crew delayed the departure to 0800, so that the estimated arrival at Southern Cross was about 45 minutes after the fog was forecast to clear. The crew were also subsequently advised by personnel at St Barbara that fog was present at the mine site, but the airstrip was clear.

At about 0800, the aircraft departed Perth with two crew[5] and 12 passengers onboard. The aircraft was the last of the three company aircraft to depart.

After takeoff, the crew selected the best rate of climb speed and a higher cruising altitude of flight level (FL)[6] 190 to conserve fuel. A band of low cloud was observed in the area between Perth and Southern Cross, with the ground sighted intermittently. The exact height of the cloud could not be determined. The crew elected to continue the flight as they believed the cloud had lifted sufficiently for an instrument approach to be conducted at Southern Cross.

Throughout the flight, the crew monitored the fuel status of the aircraft and determined that sufficient fuel would be available on arrival at Southern Cross to conduct two approaches.

They continued to assess the situation and suitable alternate aerodromes if the weather conditions deteriorated. Cunderdin and Kalgoorlie were not considered appropriate, as there was insufficient fuel on board to divert; Merredin did not have an instrument approach, nor were the weather conditions observed as favourable. The most suitable alternative was Windarling (about 135 km north of Southern Cross). The crew determined that if a diversion was initiated at that time, the aircraft would arrive with less than 45 kg of fuel on board. The aircraft operator's company policy was for a 136 kg fixed fuel reserve[7].

The progress of the operator's other two aircraft was monitored by radio. They arrived overhead Southern Cross about 10 to 15 minutes ahead of NGX. The crew of NGX reported that at this point in time, they had passed the point of no return[8]. When about 37 km to the west of Southern Cross, the crew were advised by the crews of the operator's other aircraft

2 As the ARFOR forecasts conditions over a large area and the TAF relates to a specific location, there are many instances where the weather elements may appear on an ARFOR, but not in each TAF contained within the ARFOR boundary.

3 CAVOK indicates conditions that are observed, or forecast to occur simultaneously: visibility of 10 km or more; no cloud below 5,000 ft or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus or towering cumulus at any height; and nil significant weather such as thunderstorms, fog, hail, rain, and snow (Aeronautical Information Publication – GEN 3.5 paragraphs 12.13 and 13).

4 A total of about 596 kg of fuel would have been required for a diversion to Kalgoorlie, WA.

5 The crew consisted of a training captain (the pilot in command (PIC)) and a pilot in command under supervision (ICUS), that is, performing the duties and functions of the PIC, while under the supervision of the actual PIC.

6 Flight level is a level of constant atmospheric pressure related to a datum of 1013.25 hectopascals, expressed in hundreds of feet. Therefore, flight level 190 indicates 19,000 ft.

7 Fixed fuel reserve refers to an amount of fuel, expressed as a period of time holding at 1,500 ft above an aerodrome at standard atmospheric conditions, that may be used for unplanned manoeuvring in the vicinity of the aerodrome at which it is proposed to land, and that would normally be retained in the aircraft until the final landing (Civil Aviation Advisory Publication CAAP 234-1(1) – Guidelines for Aircraft Fuel Requirements).

8 Point of no return refers to the point at which the remaining fuel on board is insufficient for the aircraft to return to the last departure point.

that a diversion to an alternate aerodrome would be more suitable. The crew determined that there was insufficient fuel on board to divert.

The crew had initially planned to track direct to the airstrip and conduct a global positioning system (GPS) arrival procedure, followed by a low-level circuit as the cloud appeared to be at, or above the minima's specified for the approach. However, soon after commencing the GPS arrival, the crew elected to discontinue the approach, as visual reference to the ground could not be achieved when at the approach minimas. The crew continued towards the aerodrome with reference to the GPS and Southern Cross non-directional beacon. At this point, there was about 230 to 270 kg of fuel on board.

The crew reported that when they arrived overhead Southern Cross, they were confronted with overcast low cloud. They observed that the fog had cleared about 13 km north of the airstrip and elected to track to the north, where a descent was commenced in order to remain clear of the cloud, keeping both the ground and airstrip in sight. The crew advised air traffic control that they were holding due to weather. By this time, one of the operator's aircraft had elected to divert to Kalgoorlie.

The aircraft was initially maintained at a height of 537 ft AGL so that visual navigation to the airstrip could be maintained. When about 7 km north, inbound, the cloud base lowered and a further descent to 337 ft AGL was made. The aircraft remained clear of cloud and forward visibility was reportedly greater than 5 km, allowing the crew to sight the runway when about 4 km to the north of the airstrip. After this, visibility reduced and the crew determined that a straight-in-approach could not be conducted.

When overhead the airstrip, the pilot flying (the ICUS pilot) initiated a low-level circling approach to position the aircraft on short final for runway 14, remaining clear of cloud and keeping the airstrip in sight at all times. Low cloud was observed to the south of the airstrip, with fog infringing the final approach path.

When on short final, the weather conditions deteriorated further and the training captain assumed control of the aircraft and conducted the landing. The aircraft landed without further incident at about 0915. The crew advised the other company aircraft positioned overhead of the weather conditions, who subsequently elected to divert to Kalgoorlie.

After landing, the crew reported that 180 kg of fuel was on board the aircraft. The crew reported that they would have had insufficient fuel for a diversion to Kalgoorlie or Windarling.

A third TAF for Southern Cross was issued at 0903, indicating broken[9] cloud at 800 ft AGL until 1000; thereafter conditions were forecast as CAVOK. On departing Southern Cross after 1000, the crew observed cloud at 400 ft AGL and advised air traffic control. The operator's two other aircraft later departed Kalgoorlie and arrived at Southern Cross after 1200. They reportedly noted cloud at the same height as the circling minima for the GPS arrival procedure, 927 ft AGL, with lower patches of cloud also present.

Meteorological information

Area forecast (ARFOR)

In order to facilitate the provision of aviation weather forecasts by the BoM, Australia is divided into a number of forecast areas. The Southern Cross (ALA) is located within Area 61. The Area 61 ARFOR that was issued by the BoM, valid from 0400 on 1 June 2010 to 1800 on 1 June 2010 included:

- fog to the south of a line Bencubbin to Kalgoorlie until 1000
- broken stratus cloud from 2,000 ft to 3,000 ft[10] south of a line Bencubbin to Kalgoorlie until 1000
- visibility 300 m in fog.

Aerodrome forecast (TAF)

The TAF for Southern Cross, issued by the BoM at 0420 on 1 June 2010, forecast conditions as CAVOK between 0600 and 1900. An amended TAF was issued at 0503, indicating a 30% probability of fog and visibility reducing to 300 m between 0600 and 0800. After 0800, conditions were forecast as CAVOK. A third TAF was issued by the BoM at 0903, valid from 0900 to 1900, indicating broken cloud at 800 ft AGL and visibility greater than 10 km

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

10 Cloud levels provided in an ARFOR are Above Mean Sea Level (AMSL).

between 0900 and 1000. After 1000, conditions were forecast as CAVOK.

Alternate requirements

The Aeronautical Information Package (AIP) ENR 58 paragraphs 58.2.1 and 58.2.3 specifies that an alternate aerodrome is not required if sufficient fuel is carried to allow the aircraft to hold until the specified time plus 30 minutes, when the weather conditions at the destination are forecast as detailed below, but are expected to improve at a specific time:

- more than scattered[11] cloud below the alternate minima; or
- visibility less than the alternate minimum; or
- if visibility is greater than the alternate minimum, but the forecast states a percentage probability of fog, mist, dust or any other phenomenon that restricts visibility below the alternate minimum; or
- a crosswind or downwind component more than the maximum for the aircraft.

Prior to departing, the crew received an amended TAF indicating a 30% probability of fog at Southern Cross between 0600 and 0800, and visibility reducing to 300m; thereafter conditions were forecast as CAVOK. The payload requirements of the flight precluded additional fuel being carried for an alternate aerodrome. Consequently, the crew delayed the departure until 0800. This allowed for an arrival time at Southern Cross about 45 minutes after the fog was forecast to clear, thus removing the requirement for the nomination of an alternate aerodrome.

Low flying

When approaching the Southern Cross airstrip, the crew were required to descend to a height of 337 ft AGL in order to remain clear of cloud.

Civil Aviation Regulation 157 states that the pilot in command of an aircraft must not fly over any city, town or populous area at a height lower than 1,000 ft, or any other area at a height lower than 500 ft. However, if it is necessary for a lower height to be maintained due to stress of weather, then the above requirement does not apply.

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

Operator weather evaluation

The operator advised the ATSB that fog has traditionally been a problem for morning flights operating into Southern Cross and that it has been a long term requirement for crews to examine the Kalgoorlie TAF and synoptic chart the night before a flight to gain an appreciation of the likely weather conditions for the following morning.

The operator conducts specific training regarding the fog issues experienced when operating into Southern Cross as a result of numerous fog delays over a number of years.

Bureau of Meteorology

The BoM conducted a review of this incident and provided the following:

- The forecast presence of fog is not included on a TAF unless the probability of fog is greater than 30%. This same limitation is not reflected in the ARFOR. Consequently, it is common for fog to be forecast on the ARFOR and not on the TAF.
- The TAF for Southern Cross is produced using a range of information, including surface observations from an automatic weather station (AWS). The AWS is currently not equipped with aviation sensors to measure cloud height and visibility. Furthermore, manual visual observations are not available. This makes it difficult to both forecast and then weather watch a TAF, particularly with respect to cloud and visibility, including the presence of fog. Unless the BoM receives an updated observation of the weather from pilots or other persons located at an aerodrome, they would not be aware of the difference in 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 incident.

Bureau of Meteorology

The BoM advised the ATSB that the following preventative actions were recommended as a result of their review of this incident.

Documenting weather reports

A system be implemented in the regional forecasting centre to document weather reports received by telephone from the aviation industry.

Forecaster awareness

Weather forecasters are made aware of the synoptic situation leading to this incident and the resultant effect on its users.

A new reference publication for BoM forecasters, the Aeronautical Forecasters Handbook, is currently being written. Included in this document is a complete chapter dedicated to forecasting low cloud.

Industry awareness

The BoM visit the operator to discuss their services and to encourage users to advise the Bureau when weather conditions differ from that forecast.

National review

The BoM is currently in the process of conducting a national review into the provision of aerodrome forecasts. In part, the purpose of this is to establish the minimum requirements relating to observations in order to issue and maintain a TAF service.

AO-2010-046: VH-KDQ, Crew incapacitation

Date and time:	22 June 2010, 06:30 CST	
Location:	204 km north of Adelaide, South Australia	
Occurrence category:	Serious incident	
Occurrence type:	Crew incapacitation	
Aircraft registration:	VH-KDQ	
Aircraft manufacturer and model:	Saab Aircraft Company 340B	
Type of operation:	Charter - passenger	
Persons on board:	Crew – 3	Passengers – 30
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

SYNOPSIS

On 22 June 2010, a Saab 340B aircraft, registered VH-KDQ, was conducting a passenger charter flight from Adelaide to Ceduna, South Australia (SA). After departure, the copilot notified the pilot in command (PIC) that he was feeling unwell. The copilot's condition deteriorated to the point where he was unable to continue the flight to Ceduna. Shortly after reaching the top of climb, the pilot in command (PIC) decided to return the aircraft to Adelaide due to the copilot's deteriorating condition.

During the event, air traffic control (ATC) was not made aware of the reasons for the aircraft returning to Adelaide. Had the wellbeing of the copilot deteriorated further during the return to Adelaide, there may have been unnecessary delays in medical help being available.

FACTUAL INFORMATION

On 22 June 2010, a Saab 340B aircraft (Figure 1), registered VH-KDQ, departed from Adelaide on a passenger charter flight to Ceduna, SA. On board the aircraft were three crew and 30 passengers.

Prior to departure, the copilot gave no indication of being unwell. However, about 15 minutes after departure, the copilot notified the PIC that he was starting to feel unwell. A few minutes later the copilot again mentioned that he was unwell. When the aircraft reached its cruising altitude, approximately 180 km to the north of Adelaide aerodrome, the copilot began using his oxygen mask.

Figure 1: Saab Aircraft Company 340B

Photograph courtesy – Saab Aircraft Leasing

The PIC asked the copilot how he was feeling and he replied that he was feeling dizzy and unwell. The PIC turned the cockpit light on and observed that the copilot was looking very pale. The copilot informed the PIC that he was feeling very sick and was uncertain if he could continue with the flight. A short time later, he informed the PIC that he could not continue and wanted to return to Adelaide.

At approx 0630 Central Standard Time[1] the PIC decided to return to Adelaide due to the condition of the copilot. He directed the copilot to inform ATC that they were returning to Adelaide.

The PIC then informed the passengers over the public address system that the aircraft was

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

returning to Adelaide due to a crew member being unwell. The crew confirmed with ATC that operations were normal and the aircraft was cleared for a return to Adelaide. The copilot reported that he was able to perform his flying duties during the return. The flight continued to Adelaide without further incident and landed approximately 20 minutes later.

The PIC reported that during the decent and approach, the copilot continued to look very pale and was intermittently using his oxygen mask. While taxiing after landing, the PIC contacted operations and requested transport be provided for the copilot from the aircraft to the hanger as it was considered too far for him to walk in his condition.

The PIC spoke to the passengers as they disembarked, informing them again of the reason for the return to Adelaide and directing them to the terminal, where they would be provided with further information. After the passengers disembarked, the PIC went back into the aircraft cockpit and observed the copilot's condition had deteriorated further.

A ground crew member assisted the copilot to the company hangar by car. After completion of arrival tasks, the PIC met the copilot at the hangar and observed that his condition was improving. The copilot then left the airport to seek medical attention. The copilot was subsequently diagnosed with food poisoning and returned to duty once he had fully recovered.

PAN[2] call

The operator reported that this occurrence had raised issues in relation to following standard operating procedures, specifically, the appropriate times to make a PAN call. The operator's procedures state that flight crew will make a PAN call if a crew member is incapacitated. During the event, ATC were not made aware of the reasons why the aircraft was returning to Adelaide.

ATSB COMMENT

The decision by the crew not to continue with the flight was appropriate and served to minimise risk associated with a longer duration flight through to the destination. Communications with ATC provide an important mechanism for notifying emergency responders that their services may be required and/or for ensuring the aircraft is given appropriate priority. In this instance, had the wellbeing of the copilot deteriorated further during the return to Adelaide, there may have been unnecessary delays in medical help being available.

Research published by the Australian Transport Safety Bureau (ATSB) indicated that between 1975 and 2006, there were 98 reported crew incapacitation occurrences for medical or physiological reasons. Of these occurrences, 21 were due to gastrointestinal illness. Flight crew should be aware of any potential medical or physiological conditions that may affect their fitness for flight and consider seeking professional medical advice before commencing duty where such a condition exists. The following publication (available at www.atsb.gov.au) provides some useful information on pilot incapacitation occurrences:

- Newnam, D.G. (2007), Pilot incapacitation: Analysis of medical conditions affecting pilots involved in accidents and incidents 1 January 1975 to 31 March 2006. (B2006/0170)

2 International signal indicating that an urgent message will follow.

AO-2008-052: VH-ZMK, Partial power loss

Date and time:	25 July 2008, 1033 CST
Location:	Darwin aerodrome, Northern Territory
Occurrence category:	Serious incident
Occurrence type:	Partial power loss
Aircraft registration:	VH-ZMK
Aircraft manufacturer and model:	Piper Aircraft Corporation PA-31-350
Type of operation:	Air transport – low capacity
Persons on board:	Crew – 1 Passengers – 6
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Minor

SYNOPSIS

On 25 July 2008 at 1033 Central Standard Time[1] a Piper PA-31-350 (Chieftain) aircraft, registered VH-ZMK was being operated on a scheduled passenger flight from Darwin to Bathurst Island, Northern Territory (NT). Moments after takeoff, the right engine began to surge and shortly afterwards, the left engine also began to surge. The pilot declared an emergency and returned to the airfield, landing short of the runway.

The investigation was unable to reconcile the pilot's report that he had selected the inboard tanks before takeoff on the incident flight with the evidence of the fuel remaining in the inboard tanks afterwards. The engine surging and power loss could be explained by fuel starvation resulting from selection of the outboard tanks that contained minimal fuel.

FACTUAL INFORMATION

On 25 July 2008, a Piper Aircraft Corporation PA-31-350 (Chieftain) aircraft, registered VH-ZMK, was being operated on a scheduled passenger flight under the instrument flight rules from Darwin to Bathurst Island, NT. The aircraft, carrying the pilot and six passengers, took off from Darwin at about 1033. A few seconds after takeoff, the right engine began to surge. Approximately 75 seconds after takeoff, the pilot notified the Darwin tower that he was experiencing engine problems and requested a return to the airfield. In response, the aerodrome controller assigned the pilot a heading of 070 degrees. Sometime after this, the left engine began surging and, about 2 minutes after takeoff, the pilot declared an emergency (he subsequently clarified to the tower that his intention had been to declare a PAN[2]). The aerodrome controller instructed the pilot to track for a left base for runway 18. The surging became more pronounced and the pilot broadcast a Mayday[3] about 3.5 minutes after takeoff. One minute later, the pilot declared he would not be able to land on the runway itself. In the final seconds of the flight, both engines momentarily lost all power.

The aircraft landed on a flat area of gravel and grass north of runway 18. During the touchdown and landing roll, the left main landing gear torque link and the right main landing gear door were damaged. After the landing, the engines were idling normally. The pilot taxied the aircraft under power to taxiway Y and then along the taxiway towards the waiting emergency services fire tenders. Once the engines had been shut down and electrical power had been switched off, the pilot instructed the passengers to evacuate through the rear exit. There were no injuries.

1 The 24-hour clock is used in this report. Central Standard Time (CST) was Coordinated Universal Time (UTC) + 9.5 hours

2 'PAN' is an internationally recognised call for assistance.

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

Ground testing after the incident flight

After the incident flight, the aircraft was towed to the hangar and inspected by the operator's chief engineer. The fuel selectors were both in the inboard tank position and the aircraft appeared to have been shut down in the normal way.

The engines started without difficulty and were run for about 2 minutes to a maximum of 1,700 rpm. The magnetos, fuel selectors, firewall fuel shutoffs, fuel pumps, and fuel vents were tested and functioned normally. The fuel filters and associated screens were found to be clean. One induction tube showed signs of weeping. Fuel pressures were normal.

A fuel sample of 1.6 L was taken from each inboard tank (for a total of 3.2 L), after which it took a total of 14 L to refill the inboard tanks. The outboard tanks were found to contain a total of about 0.5 L of fuel (about 0.25 L could be drained from each outboard tank).

An extended ground run lasting 21 minutes was then conducted, during which full power was used three times and the function of the fuel system components was tested again. The engines ran normally throughout the power range and no defect was found.

Prior to the incident there had been reports of surging on the right engine on 2 July 2008 and right engine rough running on 15 July 2008. Following rectification there had been no further reoccurrence before the incident.

Fuel system and fuel management procedures

The PA-31-350 fuel system included four flexible fuel tanks (two in each wing). Each tank had a single outlet (on its lower inboard edge) to a fuel line that led to the fuel selector valve and to the engine on that side of the aircraft. The inboard tanks held 212 L each and the outboard tanks held 151.4 L each, for a total of 726.8 L, of which 688.9 L was useable. The outboard tanks were only to be used during the cruise: the operator's Standard Operating Procedures stated they must not be used during takeoff, climb, descent, or landing.

The fuel management controls were located in a central fuel control panel at the base of the pedestal (Figure 1). They comprised the fuel tank selectors (one for each side), fuel shutoffs, and crossfeed controls. During normal operation, each engine was supplied with fuel from its own respective fuel system: the fuel controls on the right control the fuel from the right cells to the right engine and the controls on the left control the fuel from the left fuel cells to the left engine. The crossfeed system was not used for normal operation. For emergencies, fuel from one system can supply the opposite engine through the crossfeed system.

Figure 1: Central fuel control panel and fuel selectors in VH-ZMK

Simulation of the incident flight

On 2 December 2009, the incident flight was simulated in VH-ZMK at Mackay, Queensland. The objective was to ascertain how much fuel VH-ZMK would have burned on the incident flight in Darwin.

The ground operation, engine run-ups, flight time, and take-off weight on the incident flight were approximated as closely as possible on the simulation, with one exception. In the interest of obtaining a conservative estimate of the incident flight fuel burn, post-incident flight engine runs and fuel system testing (conducted by the chief engineer at Darwin after the incident flight) were not replicated at Mackay.

The incident pilot reported that he had requested the refueller to fill the inboard tanks prior to the incident flight. To avoid any difference in the quantity of fuel the inboard tanks could accept on the simulation flight (which might have resulted from tilting of the aircraft due to unevenness of the ground), care was taken to position VH-ZMK in the same place at the fuel bowser when the inboard tanks were filled both before and after the simulation flight. [4]

After the simulation, it took 29.36 L to refill the inboard tanks, or 2.72 times (or 18 L) more than on the incident flight.

Engine surging and power loss

Typically, during takeoff and subsequent manoeuvring in the early part of the climb, the acceleration and attitude of an aircraft change quickly. The forces resulting from this motion will tend to cause fuel to move around within the aircraft's fuel tanks.

Engine surging and power loss can occur in a mechanically sound aircraft if the flow of fuel to the engines is intermittent. Intermittent fuel flow can result from fuel alternately covering and uncovering the port through which it drains from a fuel tank into the fuel line to an engine. In such a situation, air will be sucked into the fuel line whenever the port is not covered by fuel, which will lead to the engine temporarily losing power. When the air has passed through the engine and fuel reaches it again, the engine will develop power once more, giving the impression it is 'surging'. The process is more likely to occur when a fuel tank contains relatively little fuel, because this increases the likelihood any gross movement of the fuel within the tank will leave the port uncovered.

ATSB COMMENT

The investigation was unable to reconcile the pilot’s report that he had selected the inboard tanks before takeoff on the incident flight, with the evidence of the fuel remaining in the inboard tanks afterwards. The engine surging and power loss could be explained by fuel starvation[5] resulting from selection of the outboard tanks that contained minimal fuel.

Fuel exhaustion[6] and starvation accidents accounted for over 6 per cent of all accidents between 1991 and 2000. In December 2002 the ATSB published a research paper titled `Australian Aviation Accidents Involving Fuel Exhaustion and Starvation'.

There have been two similar accidents, investigated by the ATSB, involving Piper Chieftain aircraft in which similar factors may have been implicated:

- Piper Aircraft Corp PA-31-350, VH-MZV, 4 km NW Darwin , NT, 10 August 2004 (200402947)
- Piper Aircraft Corp PA-31-350, VH-UBC, 2 km W Mullengandra, NSW, 12 August 2003 (200303599)

These investigation reports can be found at www.atsb.gov.au.

4 The refuellers ensured the attitude of the aircraft was consistent at both refuels.

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

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

AO-2010-004: VH-MTC, Precautionary landing

Date and time:	22 January 2010, 1222 EDT	
Location:	Miles Beach, North Bruny Island, Tasmania	
Occurrence category:	Incident	
Occurrence type:	Pilot incapacitation	
Aircraft registration:	VH-MTC	
Aircraft manufacturer and model:	Victa Airtourer 115/A1	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – nil
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

SYNOPSIS

On 22 January 2010, a Victa Airtourer 115/A1, registered VH-MTC, was landed safely on Miles Beach, Bruny Island, Tasmania. The pilot, being the sole occupant, shut down, exited and secured the aircraft before leaving it on the beach and walking away. The pilot was found deceased approximately 300 m from the aircraft. A post-mortem revealed the pilot had died as the result of a heart attack.

FACTUAL INFORMATION

On 22 January 2010, at about 1145 Eastern Daylight-saving Time[1], a Victa Airtourer 115/A1, registered VH-MTC, took off from Cambridge aerodrome on a private flight heading towards North Bruny Island, Tasmania.

At about 1205, the pilot was heard on the Multicom radio frequency reporting that he was entering the Bruny Island aerodrome circuit area and the aircraft was seen shortly after performing a 'touch-and-go'[2] manoeuvre from Runway 32. The aircraft was last seen airborne, just before 1213, flying a very large arc on downwind for Runway 32.

At about 1600, VH-MTC was reported as missing and a search and rescue operation was initiated. The aircraft was subsequently sighted on Miles Beach, North Bruny Island (Figure 1). The pilot was found deceased about 300 m from the aircraft.

Based on information from the aircraft's instrumentation[3], the aircraft was shut down on the beach at about 1222. It was later reported that the aircraft had been sighted on the beach at about 1230 by a pilot in another aircraft. The pilot made a low pass over the aircraft and noted that the canopy was closed, and the pilot was nowhere to be seen. The pilot did not report the aircraft sighting.

Aircraft information

The aircraft, serial number 112, was manufactured in Australia in 1965 and had accumulated 7,131 hours in service.

After the incident, the aircraft was airlifted from the beach to the Bruny Island airstrip, where it was inspected by the Australian Transport Safety Bureau (ATSB). The inspection included checks of the engine ignition system, exhaust, fuel systems (including fuel quantity and visual inspection of a fuel sample), engine controls, induction system and airframe. An engine performance run was then conducted for 15 minutes at various power

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 Time was Coordinated Universal Time (UTC) + 11 hours.

2 A 'touch-and-go' is a practice landing whereby the aircraft is permitted to touch the runway briefly before taking off again.

3 The aircraft's RPM gauge timer operates via oil pressure and read that the aircraft had been operating for 0.7 hours.

settings and two high-speed taxi runs were completed.

At the conclusion of the inspection and engine checks, the ATSB could not identify any problems with the aircraft that may have necessitated the pilot making a forced landing on the beach.

The aircraft operator subsequently flew the aircraft back to Cambridge aerodrome without any indications of mechanical issues.

Medical information

The pilot held a current class 1 aviation medical certificate with restrictions, valid until 31 January 2010. The medical restrictions in place at the time of this incident were not related to a heart condition. The pilot's Designated Aviation Medical Examiner (DAME) stated that the on 16 January 2010, the pilot had informed him of a recent cardiologist's examination, which had resulted in the scheduling of further testing. The DAME stated that he had advised the pilot that he not fly until a suitable intervention had been identified and enacted. The DAME reported that the pilot's cardiologist had also advised that he not fly.

Following the incident, the pilot's post-mortem examination indicated that he had died as a result of an acute heart attack.

ATSB COMMENT

While in this occurrence the pilot made a successful landing prior to becoming incapacitated, events such as these are a reminder that pilots should remain cognisant of their responsibilities in determining whether they are fit to fly and should always heed the advice of qualified medical practitioners. Incapacitation in single pilot operations is particularly serious and can impose a significant risk to other parties, in addition to the obvious risks it represents to the pilot. It is fortunate in many respects in this occurrence that the pilot was able to land the aircraft away from any built up or populated areas.

The following ATSB publication (available at http://www.atsb.gov.au/publications/2007/b20060170.aspx) provides some useful information on pilot incapacitation occurrences:

- Pilot incapacitation: analysis of medical conditions affecting pilots involved in accidents and incidents 1 January 1975 to 31 March 2006 (2007)

Figure 1: VH-MTC on Miles Beach following incident flight, 22 January 2010

Photograph used with permission

AO-2010-041: VH-YHM and VH-RQZ, Aircraft proximity event

Date and time:	4 June 2010, 1345 EST	
Location:	4 km S of Dayboro, Queensland	
Occurrence category:	Serious incident	
Occurrence type:	Airprox	
Aircraft registration:	VH-YHM and VH-RQZ	
Aircraft manufacturer and model:	VH-YHM: Diamond Aircraft Industries DA40-D VH-RQZ: Cessna Aircraft Company 172	
Type of operation:	VH-YHM: Flying training - dual VH-RQZ: Flying training - solo	
Persons on board:	VH-YHM: Crew – 2 VH-RQZ: Crew – 1	Passengers – Nil Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

SYNOPSIS

On 4 June 2010, at about 1345 Eastern Standard Time[1], a Diamond Aircraft Industries DA40-D (DA40), registered VH-YHM, was travelling in a westerly direction towards Esk, Queensland (Qld), maintaining 2,500 ft. When passing Dayboro, Qld, the DA40 came into close proximity with a Cessna Aircraft Company 172R (C172), registered VH-RQZ, which was descending through 2,500 ft, heading to the south.

The lateral separation between the aircraft was estimated at 10 m, with the DA40 in front of, and slightly below the C172. While the pilots of both aircraft had sighted each other, there was insufficient time to respond and take any action.

The pilots both reported maintaining a visual lookout, but having been temporarily distracted just prior to the incident.

Flights conducted outside controlled airspace (Class G) are not provided with a traffic separation service from air traffic control (ATC). Consequently, maintaining separation is the pilot's responsibility. It is crucial that pilots employ a number of defences to ensure that separation between aircraft is suitably achieved. Applying unalerted and alerted see-and-avoid principles by maintaining a vigilant lookout, and providing and interpreting radio communications will assist in enhancing situational awareness.

FACTUAL INFORMATION

Sequence of events

Diamond DA40, VH-YHM

On 4 June 2010, at about 1200, a flight instructor and student pilot in a Diamond Aircraft Industries DA40-D (DA40), registered VH-YHM, departed Gold Coast aerodrome, Qld on a navigation training flight under visual flight rules (VFR). The flight was in preparation for the student's Commercial Pilot's Licence test.

After departure, the aircraft tracked to Redcliffe aerodrome, Qld, where the student conducted a number of 'touch and go'[2] manoeuvres. The aircraft departed Redcliffe and the student reported broadcasting a departure call on the Redcliffe Common Traffic Advisory Frequency (CTAF). The aircraft was then flown west towards Esk, Qld. The pilots elected to maintain an altitude of 2,500 ft to

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 A 'touch-and-go' is a practice landing whereby the aircraft is permitted to touch the runway briefly before taking off again.

remain outside controlled airspace and to avoid scattered[3] cloud cover at about 3,500 ft.

The pilots were monitoring both the Redcliffe CTAF and the Brisbane Radar frequency.

Cessna 172, VH-RQZ

At about 1130, a Cessna Aircraft Company 172R (C172), registered VH-RQZ, departed Archerfield, Qld operating under VFR. On board was a student pilot, conducting his first solo navigation exercise. After departing Archerfield, the pilot overflew Petrie, en route to Wondai. On departing Wondai, the pilot reported making a departure call on the Wondai CTAF.

The pilot then tracked back towards Archerfield, overflying Kumbia and the Dayboro VFR waypoint (Figure 1). When passing Mount Brisbane, the pilot changed frequencies to Brisbane Radar. To stay outside controlled airspace[4], the pilot descended to 2,500 ft.

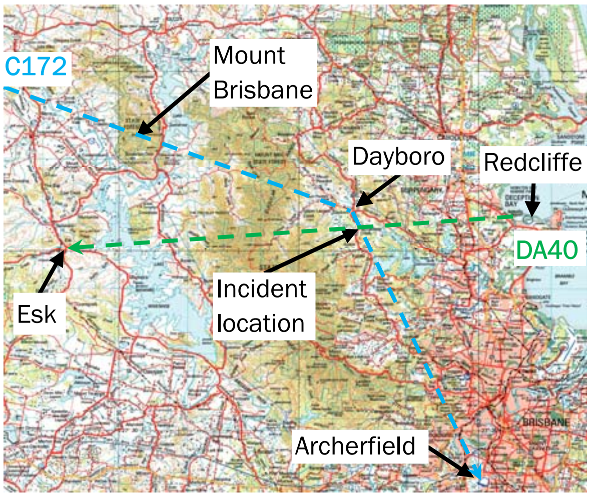
When the aircraft crossed Dayboro, the pilot reported looking down to write the time in his navigation log. After this, the pilot turned the aircraft towards Archerfield.

The incident

About 10 seconds after commencing the turn towards Archerfield, the pilot of the C172 reported seeing the DA40 aircraft fly from the 9 o'clock position in front of his aircraft. The C172 passed slightly behind the DA40. Based on the size of the DA40, the pilot of the C172 estimated that the DA40 was 10 m away and slightly below. The pilot believed the DA40 was obscured by the wing strut of the C172, at the time he commenced the turn.

The instructor in the DA40 stated that he was temporarily distracted at the time of the incident, as he and the student were discussing possible forced landing areas. He reported seeing the C172 in his 2 o'clock position and then pass behind. The instructor estimated that the C172 was about 5-10 m horizontally from the DA40 and a 'few' metres vertically.

Figure 1: Incident location



© Commonwealth of Australia (Geoscience Australia) 2008.

The pilots of both aircraft stated that they saw the other aircraft too late to respond and take any action. After the incident, the pilots of both aircraft reported checking that they had the Brisbane Radar frequency selected and that they had their transponders correctly set.

Both aircraft continued their flights, with the C172 landing at Archerfield and the DA40 landing at the Gold Coast, without further incident.

Air traffic control requirements in uncontrolled airspace

In Class G, uncontrolled airspace, air traffic control (ATC) is required to provide traffic information to instrument flight rules (IFR) and military low jet (MLJ) aircraft about conflicting IFR and MLJ aircraft. Where the area is covered by radar and workload permitting, ATC may provide traffic alerts to other aircraft; however, pilots should not expect this service.

Pilots flying under VFR may request either a flight following service or traffic information. This will be provided by ATC workload permitting. However, the provision of traffic information does not absolve pilots of their responsibility to see-and-avoid other aircraft.[5]

3 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; scattered = 3 to 4 oktas.

4 Overhead Dayboro controlled airspace was above 3,500 ft; closer to Archerfield, controlled airspace was above 1,500 ft.

5 Aeronautical Information Package – General 3.3 Air Traffic Services – 2.13.1 Traffic Information.

SAFETY ACTION

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

Operator of VH-YHM

The operator is in the process of drafting procedures to emphasise to pilots the need to make additional position reports.

Operator of VH-RQZ

The operator's flight instructors have been advised of the incident. They have also been asked to raise awareness of this incident with all of their students and ensure that they are adequately briefed, both on the ground and in flight, when operating in areas such as Dayboro.

ATSB COMMENT

When operating outside controlled airspace, it is the pilot's responsibility to maintain separation with other aircraft. For this, it is imperative that pilots utilise a number of mechanisms such as unalerted see-and-avoid and alerted see-and-avoid to enhance situational awareness. This involves not only maintaining an effective lookout, but also appreciating and interpreting what is being seen; and providing and interpreting radio communications.

The following publications provide some useful information on see-and-avoid principles:

- Limitations of the See-and-Avoid Principle (1991), available from the ATSB's website at www.atsb.gov.au
- Pilot's responsibility for collision avoidance in the vicinity of non-towered (non-controlled) aerodromes using 'see-and-avoid' (Civil Aviation Advisory Publication CAAP 166-2(0)), available from the Civil Aviation Safety Authority's website at www.casa.gov.au

AO-2010-040: VH-IVT and VH-IMV, Loss of separation assurance

Date and time:	2 June 2010, 1132 EST	
Location:	Moorabbin aerodrome, Victoria	
Occurrence category:	Incident	
Occurrence type:	Loss of separation assurance	
Aircraft registration:	VH-IVT and VH-IMV	
Aircraft manufacturer and model:	VH-IVT: Cessna Aircraft Company 152	
	VH-IMV: Cessna Aircraft Company 172R	
Type of operation:	VH-IVT: Flying training	
	VH-IMV: Flying training	
Persons on board:	VH-IVT: Crew – 1	Passengers – Nil
	VH-IMV: Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage to aircraft:	Nil	

SYNOPSIS

On 2 June 2010, a Cessna Aircraft Company 172R aircraft (C172), registered VH-IMV, was cleared to line up and hold on runway 17R at Moorabbin aerodrome, Victoria. On board the aircraft were an instructor and student, with the intention of conducting a training flight to Essendon aerodrome.

After processing a number of other aircraft, the controller cleared a Cessna Aircraft Company 152 aircraft (C152), registered VH-IVT, for a touch and go[1] on runway 17R. The C172 continued to line up and hold at the end of the runway without making any further transmissions.

A Beech Aircraft Corporation 58 then reported ready for runway 17R at taxiway Alpha 1. The controller noticed the C172 lined up and instructed the C152 on final to go around. When the C152 was upwind, the C172 was cleared for takeoff.

Although Moorabbin was a General Aviation Aerodrome Procedures (GAAP)[2] aerodrome at the time of the occurrence, runway separation standards were required to be applied. There was a loss of separation assurance[3].

Airservices advised that they would introduce the use of flight progress strips for Moorabbin control tower during the second half of 2010. They also advised that they planned to conduct an ergonomic study of the Moorabbin control tower layout.

FACTUAL INFORMATION

On 2 June 2010, at about 1129 Eastern Standard Time[4], a Cessna Aircraft Company 172R aircraft

1 A ‘touch and go’ is a practice landing in which an aircraft is permitted to touch the runway briefly.

2 Prior to 3 June 2010, GAAP was a class of airspace that was defined as ‘CTRs [control zones] of defined dimensions where special procedures (GAAP) apply for high density general aviation aircraft operations’. GAAP procedures were replaced by Class D airspace procedures on 3 June 2010.

3 A separation standard existed, however planned separation was not provided or separation was inappropriately or inadequately planned.

4 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.

(C172), registered as VH-IMV, was cleared to line up and hold on runway 17R at Moorabbin aerodrome, Victoria. On board the aircraft were an instructor and student, with the intention of conducting a training flight to Essendon aerodrome.

A Cessna Aircraft Company 152 aircraft (C152), registered VH-IVT was operating in the circuit with a student pilot on board. The C152 was on the downwind leg of the circuit.

The aerodrome controller West (ADCW) then processed two other aircraft by issuing them with their rejoin instructions, before clearing the C152 for a touch and go on runway 17R at 1132. The C172 continued to line up and hold at the end of the runway, but did not make any transmission that may have alerted the controller that the C172 was on the runway.

Ten seconds later, the pilot of a Beech Aircraft Corporation 58 (BE58) reported ready for runway 17R at taxiway Alpha 1. The controller then noticed the C172 lined up at the end of the runway and instructed the C152 on final to go around. When the C152 was safely upwind, the controller transmitted '…confirming clear for takeoff' to the pilot of the C172. The pilot read back the take-off clearance and became airborne.

The controller later reported that they thought that they had cleared the C172 for takeoff, before clearing the C152 for the touch and go, and had expected the landing area to be unoccupied when conducting their secondary visual check of the runway.

Although Moorabbin was a General Aviation Aerodrome Procedures (GAAP) aerodrome at the time of the occurrence, runway separation standards were required to be applied. There was a loss of separation assurance.

Air Traffic Control

Controller responsibilities in a GAAP control zone

The Manual of Air Traffic Services (MATS) paragraph 13-10-410 stated that at a GAAP Control Zone (CTR), controllers were required to apply a runway separation standard. In this instance, a breach of the standard did not occur as an alternate clearance for the C152 to go around was issued prior to the aircraft crossing the runway threshold.

MATS paragraph 12-30-430 required that the aerodrome controller visually check the landing path again, immediately before the aircraft crosses the runway threshold to land, to ensure no obstructions existed. The controller performed this check when the pilot of the BE58 reported ready. They observed that the runway was occupied and issued a go around instruction to the pilot of the C152. The go around instruction was in accordance with MATS requirements when a landing area is obstructed.

MATS paragraph 12-30-460 stated that the controller must issue a landing clearance to an aircraft, before it descended to a height of 200 ft above ground level (AGL). Prior to 200 ft AGL, the aircraft may have been sent around due to a number of circumstances, including any landing area obstructions indentified during the final visual runway check by the controller, which must therefore have been completed before the aircraft reached the cut-off height. The ATSB was unable to determine the height of the C152 when it was issued the go around instruction by the controller.

When the controller cleared the C152 for the touch and go, a runway separation standard still existed, as the C152 had not crossed the runway threshold. However, a loss of separation assurance resulted between the C152 and the C172, and the controller had to issue a go around instruction to ensure that the runway separation standard was not infringed.

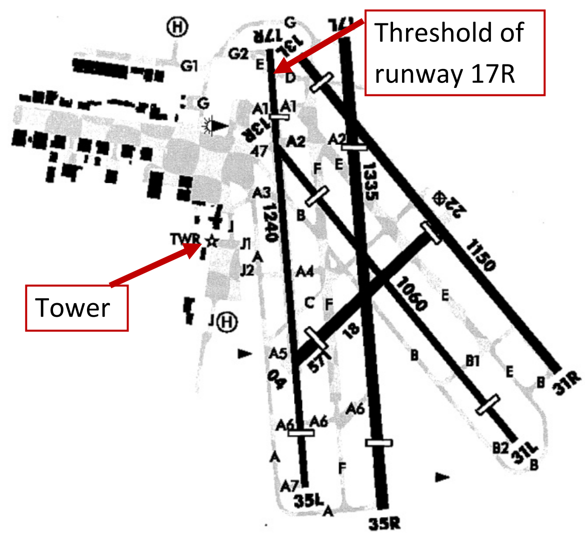
Aerodrome controller West

The controller had met the recency, familiarisation and endorsement requirements of Airservices Australia (Airservices). The controller held a current Civil Aviation Medical Certificate (Class 3) issued by the Civil Aviation Safety Authority and was reported to be well rested prior to the commencement of the shift.

Moorabbin control tower

The Moorabbin control tower was commissioned in 1977. The control tower was located on the western side of the aerodrome, overlooking a complex system of multiple parallel and crossing runways and taxiways (Figure 1).

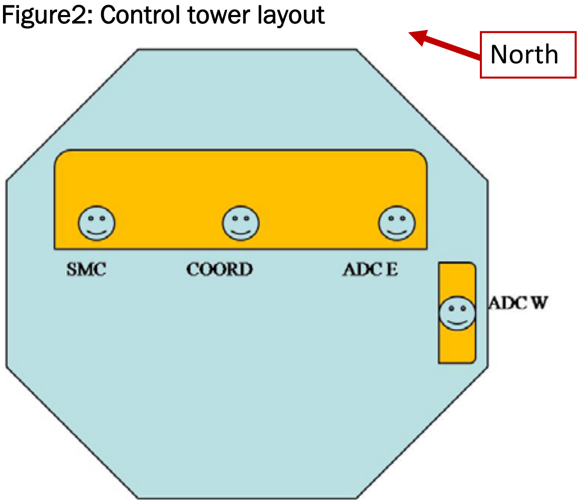
Figure 1: Moorabbin aerodrome



© Airservices Australia

The control tower was manned by four control positions; surface movement controller (SMC), coordinator (Coord), aerodrome controller east (ADCE), and aerodrome controller west (ADCW) (Figure 2). The position from where the ADCW worked was not a part of the original design of the tower and was introduced in 1982.

Figure2: Control tower layout



As a consequence of the tower layout, the ADCW was required to look over the main tower console and past other controllers to see the threshold of 17R (Figure 3).

Figure 3: View from the ADCW position

Situation awareness

To maintain a mental model of the location of air traffic and develop overall situation awareness[5], there were two traffic management techniques used by GAAP aerodrome controllers for documenting and managing GAAP control zone traffic flows. One method used reusable 'flight progress strips' and the other method utilised paper 'traffic running sheets'.

The flight progress strip method used by some control towers utilised a plastic holder with a removable paper insert for each aircraft, recording flight details, airways clearances and instructions. The strip was then moved around bays on the tower console to depict the various stages of the flight within the controller's area of responsibility. The flight progress strip was both a record of the flight progress and a memory prompt.

As a memory prompt, an aircraft occupying an active runway would be depicted by the relevant flight progress strip being placed in the 'active runway bay' on the tower console until such time as the aircraft had departed the runway. When the aircraft was clear of the runway, the strip would then be moved to another bay.

In other Airservices control towers, the traffic running sheet method utilised a pre-formatted A4 paper sheet retained on a clipboard. The controller

5 A cognitive state or process associated with the assessment of cues both past and present in a dynamic situation. Isaac, A.R, & Ruitenberg, B. (1999), *Air Traffic Control: Human Performance Factors*, Aldershot, UK, Ashgate.

used specific annotations on the running sheet to record a flight's progress for every aircraft within the controller's area of responsibility.

The running sheet method was used by Moorabbin controllers for maintaining situation awareness of the traffic in their area of responsibility.

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

Situational awareness

Airservices advised the ATSB that it would introduce the use of flight progress strips for Moorabbin control tower during the second half of 2010.

Control tower layout

Airservices advised the ATSB that it planned to conduct an ergonomic study of the Moorabbin control tower layout.

AO-2010-049: VH-JXY and VH-BDP, Aircraft proximity event

Date and time:	30 June 2010, 1400 WST
Location:	4 km WNW of Mandurah, Western Australia
Occurrence category:	Serious incident
Occurrence type:	Airprox
Aircraft registration:	VH-JXY and VH-BDP
Aircraft manufacturer and model:	VH-JXY: Avions Pierre Robin R-2160 VH-BDP: Grob – Burkhaart Flugzeugbau G-115C2
Type of operation:	VH-JXY: Flying training VH-BDP: Flying training
Persons on board:	VH-JXY: Crew – 2 Passengers – Nil VH-BDP: Crew – 2 Passengers – Nil
Injuries:	Crew – Nil Passengers – Nil
Damage to aircraft:	Nil

SYNOPSIS

On 30 June 2010, a Grob – Burkhaart Flugzeugbau G-115C2 (Grob) aircraft, registered VH-BDP, and an Avions Pierre Robin R-2160 (Robin) aircraft, registered VH-JXY, were conducting flying training north-west of Mandurah, Western Australia (WA). On board both aircraft were a flight instructor and student.

At about 1400 Western Standard Time[1], the Robin was travelling to the south-west, maintaining about 3,500 ft. The instructor in the Robin reported that he had just cleared the area in preparation for conducting a manoeuvre when he saw the Grob on a reciprocal heading, at about the same altitude. The aircraft was sighted too late to take any action. The instructor in the Grob also sighted the Robin, slightly to the left, and immediately initiated a steep turn to the right. It was estimated that the distance between the aircraft was about 50 m horizontally and 150 ft vertically, with the Grob positioned above the Robin.

As a result of this incident, the operator of the Grob has modified their operating procedures so that flying training will only be conducted in the designated training area. The operator of the Robin has implemented a procedure requiring pilots to request traffic information or flight following from air traffic control prior to commencing aerial work.

FACTUAL INFORMATION

On 30 June 2010, at about 1300, the flight instructor and student of a Grob – Burkhaart Flugzeugbau G-115C2 (Grob) aircraft (Figure 1), registered VH-BDP, departed Jandakot, WA to conduct stalling exercises.

This exercise would normally be conducted in the designated training area located to the south of Jandakot; however, due to the height of cloud cover, the instructor decided to operate off the coast abeam Mandurah.

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

Figure 1: A similar Grob G-115C2 aircraft

Photograph courtesy of Lachlan Brendan

The instructor reported monitoring both the Perth Radar frequency and the Murray Field/Serpentine Common Traffic Advisory Frequency (CTAF). When east of Rockingham, tracking towards Mandurah, he heard an aircraft request traffic information[2] from air traffic control (ATC) for the area the Grob was currently operating in. He reported that ATC responded stating that there was no traffic in the area. The instructor advised ATC of his position, which they acknowledged.

When maintaining 3,500 ft, the instructor and student began the stalling exercises. The manoeuvres were conducted in a northerly and southerly direction, with a 180 degree clearing turn between each exercise.

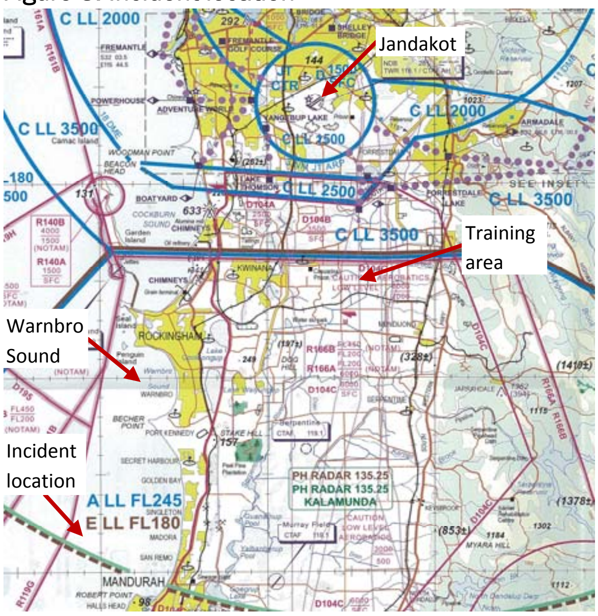
At about 1330, an Avions Pierre Robin R-2160 (Robin) aircraft, registered VH-JXY (Figure 2), departed Jandakot on a flying training exercise for the purposes of conducting spinning and other advanced handling manoeuvres. On board were the flight instructor and student.

Figure 2: VH-JXY

Photograph courtesy of Brian Conway

The instructor in the Robin normally conducted these manoeuvres in the Warnbro Sound area, south of Rockingham. However, due to the low cloud, the instructor elected to operate in an area clear of cloud, to the north-west of Mandurah (Figure 3).

Figure 3: Incident location



It was the Robin instructor's normal practice to request traffic information from ATC prior to conducting aerial work, in particular, spin training. However, because the weather was moving, the instructor thought that he may not have been able to complete the entire exercise in that location. He stated he therefore did not want to request traffic information and state he was going to do aerial work

2 In Class G, uncontrolled airspace, a pilot flying under visual flight rules (VFR) may request either a flight following service or traffic information. This will be provided by ATC workload permitting. However, the provision of traffic information does not absolve pilots of their responsibility to see-and-avoid other aircraft.

for one area and then have to move to another area to conduct the spin training. As a result, the instructor decided to conduct the advanced handling manoeuvres and then request traffic information from ATC prior to the spin exercises.

At about 1400, the instructor in the Robin reported that he was at about 3,500 ft and travelling on a heading of 240 degrees. He had just conducted a visual scan of the area for traffic, prior to commencing a manoeuvre, when he saw the Grob heading towards the aircraft. The instructor reported that there was insufficient time to take any evasive action. The Grob passed above the Robin and the instructor reported the aircraft were about 15 m apart horizontally.

The instructor in the Grob reported that they were half way through the stalling exercise, at an altitude of about 3,600 ft, tracking north in between manoeuvres. The instructor was operating the controls and reported sighting another aircraft coming towards them, slightly to the left. The instructor immediately initiated a steep turn to the right. He estimated that the distance between the aircraft was about 50 m horizontally and about 150 ft vertically, with the Grob positioned above the Robin.

After the incident, the instructors commenced communications with one another on the Perth Radar frequency. The pilots continued their flights and subsequently returned to Jandakot without further incident.

SAFETY ACTION

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

Operator of VH-BDP (Grob)

As a result of this incident, the operator of the Grob has changed their operating procedures so that flying training will only be conducted in the designated training area.

Operator of VH-JXY (Robin)

The operator of the Robin advised the ATSB that they have implemented a procedure requiring pilots to request traffic information or flight following from ATC prior to commencing aerial work.

ATSB COMMENT

This incident highlights the importance and challenges in conducting thorough visual scans and clearing exercises. The Federal Aviation Administration (FAA) Advisory Circular AC 90-48C *Pilots' role in collision avoidance*, recommends scanning the entire visual field outside the cockpit with eye movements of 10 degrees or less, with 1 second required for each fixation, to ensure detection of conflicting traffic.

The following publications provide some useful information on see-and-avoid principles:

- Pilots' role in collision avoidance (Federal Aviation Administration Advisory Circular AC 90-48C), available at www.faa.gov
- Limitations of the See-and-Avoid Principle (1991), available at www.atsb.gov.au

When operating outside controlled airspace, the use of position reports, or requesting flight following or traffic information from ATC (subject to workload) can enhance pilot situational awareness. An Airservices Australia article titled 'Get your radar sense tingling with RIS – our free of charge flight information service', published in the January-February 2009 edition of the Flight Safety Australia magazine explains the flight following service, what it provides and the benefits. This article is available at www.casa.gov.au/fsa/index.htm.

AO-2010-053: VH-TIJ, Controlled flight into terrain

Date and time:	13 July 2010, 1600 WST	
Location:	59 km NE Norseman, Western Australia	
Occurrence category:	Accident	
Occurrence type:	Controlled flight into terrain	
Aircraft registration:	VH-TIJ	
Aircraft manufacturer and model:	Cessna Aircraft Company C210L	
Type of operation:	Charter – Survey	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – 2 (Serious)	Passengers – Nil
Damage to aircraft:	Serious	

SYNOPSIS

On 13 July 2010, a Cessna Aircraft Company 201L aircraft, registered VH-TIJ, with two people on board was engaged in geophysical survey operations about 100 km south of Kalgoorlie, Western Australia (WA). Shortly after commencing a grid survey at low level, the aircraft collided with terrain in a shallow descent at around 140 to 150 kts in a wings level attitude. The pilot and survey equipment operator received serious injuries and the aircraft sustained serious damage.

The equipment operator raised the alarm and maintained contact with the rescue coordinators throughout the operation. He may have reduced the extent of his injuries had he been wearing his upper body seatbelt restraint. The emergency locator beacon fitted to the aircraft failed to activate.

As a result of this accident and a previous industry accident in December 2009 involving a different operator and owner, the geophysical survey company have been investigating the fitment of a 4-point harness into the operator's seat, and movement of the equipment such that the operator could still complete his/her work.

They further advised that they have already placed 4-point harnesses in the pilot's seat in their other aircraft and expect engineering work to be completed to allow modification of the operator position soon.

The aircraft operator advised that they were undertaking work on the radio altimeters fitted to survey aircraft to add an aural warning function to the existing warning light to enhance pilot awareness of when the selected aircraft operating height has been acquired.

The aircraft was fitted with a ME406 emergency locator beacon that was designed to be activated by impact forces. No activation was recorded probably because a necessary jumper link had not been installed. The Civil Aviation Safety Authority (CASA) has undertaken to raise industry awareness of the circumstances of this beacon non-activation through publication of an article in the next Flight Safety Australia Magazine. This article will highlight correct emergency locator transmitter (ELT) installations and possible pitfalls of not following approved methods and designs.

FACTUAL INFORMATION

At about 0812 Western Standard Time[1], on 13 July 2010, the crew of a Cessna Aircraft Company 210L aircraft registered, VH-TIJ, departed Kalgoorlie, WA, to conduct geophysical survey tasks. The crew comprised one pilot and one survey equipment

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

operator. They completed the first geophysical survey task during the morning, returning to Kalgoorlie at about 1030.

At about 1400, they departed Kalgoorlie to conduct a survey task in an area about 100 km to the south. They completed a job safety analysis by flying the aircraft at 500 ft over the area to be surveyed prior to commencing work. This analysis included looking for obstructions and terrain hazards along the planned flight path and projected survey grid.

After completing the site safety analysis, the crew commenced the survey task. The crew completed approximately eight or ten parallel survey lines of 3 to 4 minute duration that were oriented in an east-west direction across the survey grid. The flight duration at the commencement of the survey lines was about 1 to 1.5 hours.

The equipment operator recalled the pilot turning at the end of a survey line to prepare for the next line in the opposite direction. They were about wings level after the turn and approaching the start of the next survey line at around 140 to 150 kts when the pilot advised him they had about 200 m of distance to run, which meant that the pilot would start easing down from this point to capture the required survey altitude of 165 ft above ground level (AGL). The operator had already commenced recording the data at around 1.5 km, advising the pilot his equipment was “ONLINE”. He then looked down at his screen to monitor the data stream.

His next recollection was waking up and realising the aircraft had collided with terrain. The aircraft sustained serious damage (Figure 1).

Figure 1: VH-TIJ resting inverted on salt lake

Photograph courtesy of RAC Rescue helicopter.

The equipment operator recalled pressing the red panic button[2], although he did not believe it would operate due to the aircraft damage. He then located the satellite phone and advised his operations manager of their approximate location and requested assistance; this occurred just after 1600. After this, he located and activated his emergency position indicating radio beacon (EPIRB), which was picked up by the Australian Maritime Safety Authority monitored satellite at 1617. He then maintained contact with the rescue coordinators on the satellite phone every 10 minutes until assistance arrived by helicopter. The rescue helicopter arrived at 1930 and departed at 2043 to transport the seriously injured crew to Kalgoorlie.

In an interview, the pilot could not recall much detail of the event, other than an unremarkable flight, followed by regaining consciousness in the aircraft after the accident.

Survey flight requirements

The survey required that the aircraft be flown precisely at 165 ft (50 m) AGL and fly a pattern comprising parallel survey lines spaced 50 m apart. To fly this pattern accurately, the pilot employed a combination of:

- visual flight - looking outside referencing landmarks
- global positioning satellite (GPS)
- radio altimeter[3] information within the cockpit

to allow him to adjust any track error and accurately execute the flight profile.

Typically, the pilot manoeuvred the aircraft between survey lines which progressed, for example, to his right by:

- continuing the run out from a completed line about 1.5 km after the operator had called OFFLINE

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[2] The aircraft was fitted with a “Skynet” tracking system which typically relayed information every two minutes back to the company. Pressing the red button would alert ground based personnel that this aircraft had a problem.

[3] A light illuminated on the radio altimeter when the selected height was acquired.

- climbing slightly, then commencing a 30° left bank, tracking 60° to the left of the line just surveyed for about 1.2 km
- then reversing the turn and entering a Rate 1[4] turn to the right to bring the aircraft back around.

He would coordinate the rate of closure in degrees of turn and distance to run to arrive at the start point to commence the next run on the next reciprocal line heading. The pilot would also make any required adjustments for tail winds and gusts in order not to overshoot the starting point.

Weather

The crew reported that the weather was as forecast, with some cloud at 3,000 ft, which they remained clear of at all times. The pilot remarked that it was quite windy and he did experience some problems with the position of sun, but not to the extent that it was a major concern. The equipment operator reported a similar assessment of CAVOK[5] in the morning and building to 6 oktas[6] of cloud in the afternoon. The pilot also commented that he had to be mindful when discerning the horizon as the task required flight over calm water.

Crew restraint during survey operations

The equipment operator remarked that he was in the habit of not wearing his upper body restraint in order to enable him to reach and manipulate all of his equipment. He realised that this was a risk, but he nevertheless only wore the lap portion of the belt while on task and dispensed with the sash or upper body portion of the restraint. Neither aircraft occupant was wearing a helmet, nor were they required to do so.

4 A turn that describes a 360° circle in 2 minutes or 3° of heading change per second.

5 Weather information caveat relating to ceiling and visibility being OK (for visual flight rules flight)

6 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.

Emergency locator transmitter

The aircraft was fitted with an Artex ME406 fixed emergency locator transmitter (ELT), P/N 4563-6603, that was designed to be activated by impact forces. No activation was recorded. The unit was sent to the Australian Transport Safety Bureau's (ATSB's) technical facilities for further testing to ascertain the reason for its non-activation.

The testing revealed that a circuit for the impact activation ('G') switch[7] was required to be enabled by the installation of a bridging or jumper link, which then provided a circuit in the canon plug external to the locator beacon. This circuit then allowed the 'G' switch within the beacon to function. Automatic activation of the beacon is effectively disabled without this jumper link installed and the unit will not activate under any impact loads when in the ARM position. When the jumper link was enabled and the beacon subjected to a simulated impact force, automatic activation by the 'G' switch was normal.

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.

Geophysical survey company

Crew restraint systems

The geophysical survey company advised that as part of a finding from a previous industry accident in December 2009, involving a different owner and operator, and in conjunction with the International Airborne Geophysics Safety Association (IAGSA) recommendations, they have been investigating the fitment of a 4-point harness into the operator's seat, and movement of the equipment, so that the operator could still conduct his/her duties.

7 A switch that is activated by the sudden application of an acceleration force.

They further advised that they have already installed a 4-point harness in the pilot's seat of the operator's other aircraft and expected engineering work to be completed on the modifications to the equipment operator position soon.

Aircraft operator

Radio altimeter warnings

The aircraft operator advised that they were undertaking work on the radio altimeters fitted to survey aircraft to add an aural warning function to the existing warning light to enhance pilot awareness of when the selected aircraft operating height has been acquired.

Civil Aviation Safety Authority

Artex 406 ELT beacon installation

The Civil Aviation Safety Authority (CASA) has undertaken to raise industry awareness of the circumstances of this ME406 beacon non-activation through publication of an article in the next Flight Safety Magazine. This article will highlight correct ELT installations and possible pitfalls of not following approved methods and designs.

ATSB COMMENT

For an accident or incident (occurrence) to be classified as controlled flight into terrain (CFIT), it must satisfy the following criteria:

- the aircraft is under the control of the pilot(s);
- there is no defect or unserviceability that would prevent normal operation of the aircraft,
- there was an in-flight collision with terrain, water, or obstacles; and
- the pilot(s) had little or no awareness of the impending collision.

The combination of possible cloud reflections on the lake, and low flying conspired to impair the pilot's ability to clearly identify the horizon and made the successful execution of this geophysical task very demanding. The absence of a radio altimeter aural warning queue when the task altitude was acquired also probably increased the difficulty, by requiring the pilot to continuously alternate his scan between the radio altimeter for the selected altitude acquisition light to illuminate and the view outside the cockpit. Under these conditions, the risk of a CFIT event was significant.

The Flight Safety Foundation (FSF) notes that CFIT persisted as the world's second leading cause of commercial aviation fatalities as of 2008.

The FSF provide a number of products aimed at reducing CFIT accidents, which can be accessed at the following link:

- http://flightsafety.org/current-safety-initiatives/controlled-flight-into-terrain-cfit/cfit-reduction-products

Emergency locator beacon activation

It was probable that the jumper link which was external to the beacon unit was not established at installation, or was broken, thus disabling the 'G' switch function of the ELT in this accident.

To ensure correct operation, the beacon manufacturer's installation and wiring instructions should be strictly adhered to.

AO-2010-054: VH-WRD, Wheels up landing

Date and time:	16 July 2010, 1600 CST	
Location:	Mount Borradaile Station, Northern Territory	
Occurrence category:	Serious incident	
Occurrence type:	Wheels up landing	
Aircraft registration:	VH-WRD	
Aircraft manufacturer and model:	Cessna Aircraft company 210M	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – Nil	Passengers –Nil
Damage to aircraft:	Minor	

SYNOPSIS

On 16 July 2010, the pilot of a Cessna Aircraft Company 210M on a passenger charter flight was preparing to land at Mount Borradaile Station, Northern Territory (NT). The pilot reported that it was quite windy during the approach, with the aircraft being blown off course. At about 300 ft above the airstrip, a small bird struck the windshield and briefly distracted the pilot. The pilot continued the approach. Just prior to touch-down the aircraft was picked up by a gust of wind. After the pilot corrected this, the aircraft touched down, but bounced three times.

The pilot assessed that there was not enough landing strip left to recover and initiated a go-around. The pilot pushed the throttle forward and raised the flaps to 15 degrees. As the aircraft took-off from the strip, the pilot retracted the undercarriage. The aircraft failed to climb and settled back onto the strip, skidding for about 30 m on its belly, before coming to rest prior to the end of the strip. The pilot and passengers were uninjured; however, the aircraft sustained minor damage.

On exiting the aircraft, the pilot realised that the pitch and mixture controls had not been placed in the full forward position resulting in insufficient power for the go-around.

This occurrence highlighted the potential impacts of distractions on the safety of operations. The following report (available at www.atsb.gov.au) provides further information:

- Dangerous distraction: An examination of accidents and incidents involving pilot distraction in Australia between 1997 and 2004 (2006)

FACTUAL INFORMATION

On 16 July 2010, a Cessna Aircraft Company 210M, registered VH-WRD, departed Swim Creek, NT on a passenger charter flight to Mount Borradaile Station, NT. On board the aircraft were the pilot and two passengers.

The pilot reported that it was 'quite windy' on descent into the Mount Borradaile Station aircraft landing area (ALA)[1] (Figure 1), with the wind coming from a south-easterly direction. Due to the wind, the aircraft was being blown off course, which was corrected by the pilot. The pilot also noted the approach speed was slightly higher than usual; between 85 and 90 kts.

At about 1600 Central Standard Time[2], when the aircraft was 300 ft above the airstrip, a small bird

[1] The Mount Borradaile Station ALA was a 1,200 m dirt airstrip, aligned 11/23, which was surrounded by tall trees.

[2] The 24-hour clock is used in this report to describe the local time of day, Central Standard Time, as particular

struck the bottom right hand side of the windshield. The pilot reported being briefly distracted due to the impact.

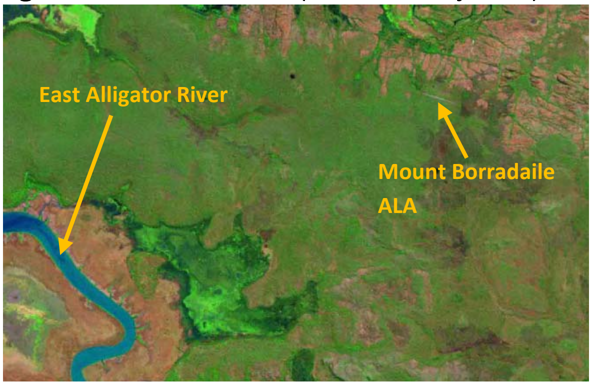
The pilot continued the approach and noted that the wind died back a little as the aircraft descended below the line of tall trees that surrounded the strip. Just prior to touchdown, the pilot stated that the aircraft was picked up by a gust of wind. The pilot applied a 'smidge' of power to correct and then reduced power as the aircraft touched down.

The aircraft then bounced three times. The pilot reported that each time the aircraft lifted slightly higher off the strip and the aircraft diverged to the left of the centreline. The pilot assessed that there was insufficient landing strip left to recover and initiated a go-around. The pilot pushed the throttle control forward, retracted the flaps to 15 degrees, and as the aircraft took off from the strip, retracted the undercarriage. During the go-around procedure, one of the passengers spoke to the pilot, which may have temporarily distracted the pilot.

The aircraft failed to climb and settled back onto the strip, skidding for about 30 m on its belly, before coming to rest prior to the end of the strip. The pilot and passengers were uninjured; however the aircraft sustained minor damage.

On exiting the aircraft, the pilot realised that the pitch and mixture controls had not been placed in the full forward position during the go-around procedure, resulting in insufficient power for the go-around.

Figure 1: Incident location (surrounded by trees)



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

Meteorological information

In order to facilitate the provision of aviation weather forecasts by the Bureau of Meteorology (BoM), Australia is divided into a number of forecast areas. The Mount Borradaile (ALA) is located within Area 80. The amended Area 80 forecast was issued at 1305 by the BoM, valid from 1310 on 16 July 2010 until 0230 on 17 July 2010. The forecast included:

- moderate turbulence with thermals or dust devils below 8,000 ft
- forecast winds at 3,000 ft from 100 degrees at 20 kts, and winds at 1,000 ft from 110 degrees at 25 kts.

ATSB COMMENT

When on final approach, the pilot is required to complete a number of actions to prepare the aircraft for landing or any need to go-around. These include, ensuring that the landing gear is down, the wing flaps are appropriately set, the mixture is rich and the propeller pitch is fully forward. If the pilot is distracted at this point, key actions could be overlooked or omitted.

A report published by the ATSB in 2006 stated that no pilot is immune from distractions, as they can occur unexpectedly, during periods of high or low workload, or during any phase of flight. This report demonstrates how distractions can impact aircraft operations, whether due to external influences, such as birdstrikes, or internal influences, such as passenger communications.

Strategies such as returning to the beginning of a checklist or adopting a 'sterile cockpit rule', commonly used in larger passenger transport operations, can assist in reducing the impact of pilot distractions. The following report (available at www.atsb.gov.au) provides further information:

- Dangerous distraction: An examination of accidents and incidents involving pilot distraction in Australia between 1997 and 2004 (2006)

AO-2010-057: VH-HVT, Controlled flight into terrain

Date and time:	30 July 2010, 1110 EST	
Location:	Near Healesville, Victoria	
Occurrence category:	Serious incident	
Occurrence type:	Controlled flight into terrain	
Aircraft registration:	VH-HVT	
Aircraft manufacturer and model:	Aerospatiale Industries AS.350BA	
Type of operation:	Aerial work - Photography	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – Nil	Passengers –Nil
Damage to aircraft:	Minor	

SYNOPSIS

On 30 July 2010, an Aerospatiale Industries AS.350BA (Squirrel) helicopter, registered VH-HVT, was being flown up a valley between Healesville and Narbethong, Victoria (Vic.). There was low cloud in the area, which was sitting on a ridgeline the helicopter needed to cross. The pilot reported that he hovered the helicopter near the ridgeline, about 10 ft (3 m) above the tree canopy and on the edge of the cloud base for about 2 to 3 minutes, hoping for a break in the cloud sufficient to allow passage.

The pilot reported that he decided it was not possible to cross the ridgeline and commenced a right turn to return via the same route. About two thirds of the way through the turn, when the helicopter was travelling at between 10 and 15 kts, it struck a branch that was protruding above the tree canopy. The branch broke the helicopter's right side chin bubble and brushed against the side of the helicopter. The pilot assessed the damage and decided to continue the flight back to Essendon, Vic. The helicopter landed at Essendon without further incident.

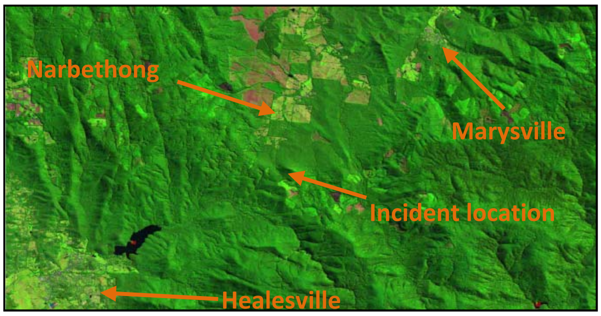
An inspection of the helicopter found that the branch had scraped against the flat side of one of the tail rotor blade. A closer examination of the blade found a small void in the composite core of the blade. The blade was subsequently repaired and returned to service.

FACTUAL INFORMATION

On 30 July 2010, the pilot of an Aerospatiale Industries AS.350BA (Squirrel) helicopter, registered VH-HVT, departed Essendon to conduct aerial photography in the Marysville area, under visual flight rules. On board the helicopter were the pilot and two passengers.

Due to low cloud, sitting on the ridgeline along the helicopter's intended track, the helicopter was flown through a valley from Healesville towards Narbethong (Figure 1). However, in order to fly from the valley to Narbethong, the pilot was required to cross a ridgeline that was covered in cloud.

Figure 1: Incident location



The pilot approached the ridgeline and hovered for about 2 to 3 minutes waiting for a break in the cloud sufficient to allow for passage across the ridgeline. At that point, the helicopter was about 10 ft (3 m) above the tree canopy and on the edge of the cloud base. The pilot determined that it was not possible to cross the ridgeline and so elected to return to Essendon.

At about 1110 Eastern Standard Time[84], the pilot stated that he commenced a right turn with the intention of returning via the same route. The pilot reported that during the turn, the helicopter was travelling between 10 and 15 kts and descending slightly to maintain the height above the canopy. About two thirds of the way through the turn, the pilot observed a tree branch protruding about 1 m above the average height of the surrounding canopy and about 2 m away from the front of the helicopter. The pilot recollected trying to climb the helicopter, but the branch impacted the front lower right side about 2 seconds later. The branch contacted and broke the helicopter's chin bubble and slid down the right hand the side of the helicopter (Figure 2).

Figure 2: VH-HVT

Photograph courtesy of Phil Vabre

The pilot reported that he considered conducting an emergency landing to assess the damage to the helicopter; however, he decided to return to Essendon. As part of his decision he stated that:

- the damage to the helicopter was minimal apart from the chin bubble
- after conducting a control check, there was no adverse control feedback
- the nearest cleared area suitable for a landing was 10 minutes away, while Essendon aerodrome was 20 minutes away.

The helicopter returned and landed at Essendon without further incident.

The helicopter was inspected on the ground at Essendon. It was found that the branch had scraped against the flat side of one of the tail rotor blades. A closer examination of the blade found a small void in the composite core of the blade. The blade was subsequently repaired and returned to service.

Pilot information

The pilot held a current Air Transport (Aeroplane and Helicopter) Pilot License. The pilot had a total of over 15,000 hours experience, with 1,300 hours on the Squirrel and had regularly operated in the region. The pilot was adequately rested prior to the occurrence.

The pilot noted that due to his level of experience, at the time he felt that he could operate safely with the margins, but in hindsight could have assessed the conditions and elected not to proceed earlier.

Meteorological information

For the purpose of issuing flight and other forecasts, the Bureau of Meteorology (BoM) divides Australia into a number of forecast areas. The flight from Essendon to Marysville was conducted in Area 30. The amended Area 30 forecast was issued at 0746 and was valid from 0900 until 2100 on 30 July 2010 and included:

- areas of drizzle on the north slopes of the divide and east of Melbourne until 1200
- scattered showers, isolated over the south-east land lee of the ranges and in the far north-west
- widespread low cloud north of the divide till 1200
- low cloud with precipitation and on the windward slopes
- fog and mist areas mostly clearing by 1100, but redeveloping after 1900 in the east
- broken[85] stratus between 500 and 3,000 ft[86], with broken cumulus and stratocumulus between 3,000 and 12,000 ft.

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84 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.

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

86 Above mean sea level.

ATSB COMMENT

For an accident or incident (occurrence) to be classified as controlled flight into terrain (CFIT), it must satisfy the following criteria:

- the aircraft is under the control of the pilot(s);
- there is no defect or unserviceability that would prevent normal operation of the aircraft,
- there was an in-flight collision with terrain, water, or obstacles; and
- the pilot(s) had little or no awareness of the impending collision.

With experience, comes a greater exposure to different operational environments and activities. This can assist pilots to develop the necessary skills, proficiency and judgement to operate safely. However, it is important not to let experience get in the way of appropriately assessing the risks associated with a flight. This incident highlights how task familiarity and experience can result in over-confidence and ultimately affect pilot decision making.

The Flight Safety Foundation (FSF) notes that CFIT persisted as the world's second leading cause of commercial aviation fatalities as of 2008. While this occurrence resulted in only minor contact between the helicopter and the tree branch, the margins between a seemingly 'minor' event and a potentially more serious occurrence can be very fine.

The FSF provide a number of products aimed at reducing CFIT accidents, which can be accessed at the following link:

- http://flightsafety.org/current-safety-initiatives/controlled-flight-into-terrain-cfit/cfit-reduction-products

Level 5 Factual Investigations:
July 2010 to September 2010
Issue 3