



Australian Government

Australian Transport Safety Bureau

Fuel starvation event involving a Cessna 210, VH-BKD

3 km east of Broome Airport, Western Australia, 3 May 2015.

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Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, Australian Capital Territory 2601
Telephone: 1800 020 616, from overseas +61 2 6257 4150 (24 hours)
Accident and incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117, from overseas +61 2 6247 3117
Email: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

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Addendum

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Fuel starvation event involving a Cessna 210, VH-BKD

What happened

On 3 May 2015, at about 0230 Central Standard Time (CST), a Cessna 210 aircraft, registered VH-BKD (BKD), departed from Alice Springs Airport, Northern Territory for a ferry flight to Broome, Western Australia. The pilot was the sole person on board.

At about 70 NM from Broome, the pilot obtained a weather report from the automated aerodrome weather information service (AWIS) located at Broome Airport. The AWIS indicated a dewpoint¹ of 22 °C and an ambient temperature of 22° C, which indicated conditions suitable for the development of fog.

The pilot reported that the AWIS information prompted them to start considering alternatives should fog prevent a landing. The pilot had planned and flown BKD at the optimum endurance profile of 45% power² and changed tanks³ on a regular time-based pattern. The pilot reviewed the fuel log and determined they had sufficient fuel for a 30-minute search for a suitable break in the fog. If unsuccessful, the pilot planned to turn back inland on a reciprocal to the inbound track and land on the highway.

At about 15 NM from Broome, the pilot observed the start of a thick layer of fog below the aircraft. Arriving overhead Broome Airport at about 0622 Western Standard Time (WST), with the right fuel tank selected, the pilot initially surveyed the area from about 1,000 ft above ground level. However, as there were no breaks in the fog, the pilot descended the aircraft to about 650 ft. The pilot kept the aircraft in visual conditions while circling the airport and Cable Beach areas (Figure 1) occasionally flying at a lower level to take a closer look for possible breaks. With the right fuel tank still selected, the pilot's search continued for about forty-five minutes.

Figure 1: Broome Airport and accident site



Source: Google earth annotated by the ATSB

¹ Dewpoint is the temperature at which water vapour in the air starts to condense as the air cools. It is used among other things to monitor the risk of aircraft carburettor icing or likelihood of fog at an aerodrome.

² Endurance power setting allows for the longest time in the air.

Deciding that landing was not possible until the fog lifted, the pilot sought assistance from the person waiting on the ground for the aircraft. As this person was local and understood the likely extent of the fog, they were able to offer the pilot two alternate airports, as options. The first option, Beagle Bay was about 62 NM to the north, and the second option Eco Beach, about 23 NM to the south. The pilot considered these options, but reasoned that with such widespread fog, these options may also be fog bound. With limited choices and now limited fuel, the pilot turned BKD for one last low-level check along runway 10. The pilot then initiated a climb with the intent of heading back to the highway to land.

Shortly after applying full power to initiate the climb, the aircraft's engine surged and spluttered. The pilot instantly realised that the right tank had been selected for over an hour, and quickly changed the fuel selector to the left tank. However, the engine did not respond. The pilot then attempted to restart the engine with the ignition key, but reported hearing a crunching noise as the starter motor engaged. The propeller was still windmilling.

With the aircraft only at about 500 ft and descending into the thick layer of fog, the pilot levelled the aircraft's wings and prepared for a forced landing. Electing to leave the undercarriage retracted, the pilot descended through the fog and noted the outline of a dirt track. The pilot attempted to land on the track, but the aircraft collided with the sandy terrain just prior to reaching it. The aircraft momentum allowed it to skid across the track, coming to rest in the mangroves a few metres on the other side (Figure 2 and 3). The accident site was located within the mangrove area of the Dampier Creek.

The pilot was not injured; however, the aircraft propeller and engine sustained substantial damage.

Figure 2: Initial contact point



Figure 3: VH-BKD in the mangroves



Source: WA Police (both figures)

Pilot experience and comments

The pilot had around 3,850 flying hours, with around 830 of those on Cessna 210 aircraft.

Pre-flight planning

The pilot elected to conduct the flight at night to increase their night command hours. The evening before the flight, the pilot checked the weather forecast and completed the flight plan. They noted

a 30% probability of fog on the terminal area forecast (TAF) for Broome during the planned arrival time. However, the pilot reported that, in their experience, 30% probability of fog would mean non-existent or minimal impact on operations, so they did not consider or plan for any alternates

The pilot pre-flighted the aircraft in the morning prior to the 0230 departure.

The pilot had personal commitments in Broome that morning and back in Alice Springs the next day. Hence, they needed to deliver the aircraft in time to catch the lunchtime jet flight back from Broome to Darwin and eventually be back in Alice Springs the next morning.

The flight

The pilot made the following comments about the flight:

- the cruise level was 8,500 ft
- there was smooth conditions enroute but with a stronger headwind than forecast
- the flight time between Alice Springs and Broome was about 5 hours.

Fuel management

The pilot maintained a fuel log during the flight. They initially used fuel from the left tank for 30 minutes, then 60 minutes on the right, back to the left. The pilot continued using this pattern until they arrived overhead Broome.

Although the pilot had calculated there was sufficient fuel to search for a break in the fog for 30 minutes, once pressured and distracted looking for an expected opening to be able to land, the pilot reported flying in excess of 60 minutes with the right fuel tank selected.

The aircraft fuel tanks were dipped post- accident. The right tank had no fuel remaining while there was 45 L remaining in the left tank.

Aviation weather forecasts and alternate aerodrome requirements

The Aeronautical Information Publication Australia (AIP) ENR 1.1 87 details the following requirements concerning planning for alternate aerodromes:

A pilot in command must make provision for flight to an alternate aerodrome, when required, in accordance with the following paragraphs:

...Except when operating an aircraft under the VFR by Day within 50NM of the point of departure, the pilot in command must provide for a suitable alternate aerodrome, when arrival at the destination will be during the currency of, or up to 30 minutes prior to the forecast commencement of, the following weather conditions:

Cloud – more than SCT below the alternate minimum

Visibility – less than the alternate minimum

Visibility – greater than the alternate minimum, but the forecast is endorsed with a percentage probability of fog, mist, dust or any other phenomenon restricting visibility below the alternate minimum....

Note: When weather conditions at the destination are forecast to be as above, but are expected to improve at a specific time, provision for an alternate aerodrome need not be made if sufficient fuel is carried to allow the aircraft to hold until that specified time plus 30 minutes.

AIP GEN 3.5-7 explains that:

PROB% is used in terminal area forecasts (TAF) to indicate an expected 30 or 40% probability of occurrence. If greater than or equal to 50% probability is forecast, reference is made to the phenomenon in the forecast itself not by the addition of a PROB statement

Safety message

The pilot had planned the flight using maximum endurance performance figures and kept a fuel log. The pilot's fuel management used a time-based system up until arriving overhead the destination. Due to the unexpected distraction and increased workload of arriving at the destination airport covered in thick fog, with no planned alternates, the pilot lost situational awareness of the aircraft's fuel state.

Issue number 5 in the ATSB's Avoidable Accident Series – [Starved and exhausted: Fuel management aviation accidents](#) looks in more detail at such scenarios. The report notes that fuel exhaustion is more likely to occur on flights when there is little flight fuel margin.

The *Avoidable Accidents* series is available on the ATSB website under the *Safety Awareness* tab at www.atsb.gov.au

The ATSB published a research report titled [Dangerous Distraction, an examination of aviation accidents and incidents involving pilot distraction in Australia between 1997 and 2004](#), covers in detail the role of pilot distraction in a number of aircraft accidents.

The research looked closely at 325 occurrences involving some measure of pilot distraction. The researchers were able to develop a taxonomy of three major causes of distraction. They were 'flight management tasks', 'external objects', and 'people on board the aircraft'. The report concludes with a number of tentative suggestions for minimising the risk of pilot distraction. Further reading is available on the ATSB website.

Information regarding alternate aerodrome requirements is available in the Air Information Publication (AIP), ENR 1.1-87. This is available on the Airservices Australia website at www.airservicesaustralia.gov.au.

The Civil Aviation Safety Authority flight planning kit covers issues such as planning for alternates, obtaining local knowledge when flying to an unfamiliar destination and the importance of considering all aspects of the weather forecast.

This *Flight Planning Kit* is available from the online shop on the CASA website at www.casa.gov.au.

General details

Occurrence details

Date and time:	3 May 2015 – 0725 WST	
Occurrence category:	Accident	
Primary occurrence type:	Fuel starvation	
Location:	3 km east of Broome Airport, Western Australia	
	Latitude: 17° 56.80' S	Longitude: 122° 15.55' E

Aircraft details

Manufacturer and model:	Cessna Aircraft Company	
Registration:	VH-BKD	
Serial number:	21063127	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – N/A
Damage:	Substantial	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB 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 report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.