



**Australian Government**

**Australian Transport Safety Bureau**

# Pilot incapacitation involving Cessna 208B, VH-DQP

53 km west-north-west of Sunshine Coast Airport, Queensland, on 2 July 2020

**ATSB Transport Safety Report**

Aviation Occurrence Investigation (Short)

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#### Addendum

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# Safety summary

## What happened

On the afternoon of 2 July 2020, the pilot of a Cessna 208B aircraft, registered VH-DQP, was conducting a ferry flight from Cairns to Redcliffe, Queensland. After encountering unforecast icing conditions and poor visibility due to cloud, the pilot climbed from 10,000 ft to 11,000 ft. When the aircraft was about 53 km west-north-west of Sunshine Coast Airport, air traffic control attempted to contact the pilot regarding the descent into Redcliffe. No response was received from the pilot at that time, or for the next 40 minutes. During this time, air traffic control, with the assistance of pilots from nearby aircraft, made further attempts to contact the pilot of VH-DQP.

When the aircraft was about 111 km south-south-east of the intended destination, the pilot woke and communications were re-established. The pilot was instructed by air traffic control to land at Gold Coast Airport. The pilot tracked to the Gold Coast and landed safely without further incident.

## What the ATSB found

The ATSB found that the pilot was likely experiencing a level of fatigue due to inadequate sleep the night before and leading up to the incident. Further, operating at 11,000 ft with intermittent use of supplemental oxygen likely resulted in the pilot experiencing mild hypoxia. This likely exacerbated the pilot's existing fatigue and contributed to the pilot falling asleep.

## Safety message

The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported by industry. One of the priorities is [Fatigue](#), which is a physical and psychological state typically caused by prolonged wakefulness and /or inadequate sleep. Most people generally underestimate their level of fatigue and tend to overestimate their abilities. The incident emphasises the importance of pilots monitoring their own health and wellbeing, to ensure that they are well-rested and adequately nourished, especially when conducting single pilot operations.

Further, it demonstrates that, although mild hypoxia is not known to impair complex cognition it has been found to increase fatigue and decrease vigour. Symptoms of hypoxia can begin very subtly at lower altitudes and can also begin to show below 10,000 ft for people who are smokers, unfit, or fighting off an illness.

Further information about assessing your fitness to fly and hypoxia can be found on the [ATSB](#) website and in the Flight Safety Australia article [Do not go gentle: the harsh facts of hypoxia](#).

# The investigation

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 investigation was conducted in order to produce a short investigation report, and allow for greater industry awareness of findings that affect safety and potential learning opportunities.

## The occurrence

On 2 July 2020, at about 1230 Eastern Standard Time,<sup>1</sup> the pilot of a Cessna Aircraft Company 208B aircraft, registered VH-DQP (DQP), departed Cairns on a ferry flight to Redcliffe, Queensland under instrument flight rules.<sup>2</sup> The pilot initially maintained 10,000 ft, however, during the flight they encountered unforecast icing conditions and poor visibility due to cloud. Consequently, at about 1541, the pilot climbed to flight level (FL)<sup>3</sup> 110.

At about 1634, the pilot made first contact with air traffic control's (ATC's) Burnett sector. About 20 minutes later, when the aircraft was about 29 NM (53 km) west-north-west of Sunshine Coast Airport, Queensland, ATC attempted to contact the pilot regarding the descent into Redcliffe. No response was received from the pilot. Air traffic control, with the assistance of pilots from nearby aircraft, continued attempts to contact the pilot of DQP. The aircraft was observed by ATC to overfly Redcliffe and continue tracking toward Brisbane. During this time, ATC declared an uncertainty phase<sup>4</sup> and contacted the Australian Maritime Safety Authority Joint Rescue Coordination Centre and the Australian Defence Force for support.

At about 1713, ATC asked the pilot of a Royal Flying Doctor Service Beechcraft B200 aircraft, which was departing Brisbane, to intercept DQP. The B200 pilot intercepted the aircraft, but was unable to establish communications with the pilot of DQP. The B200 pilot then attempted to attract the pilot's attention by dipping the aircraft's wings and approached DQP in an effort to activate its traffic alert and collision avoidance system.<sup>5</sup> The pilot did not respond to these attempts. At about 1725, ATC upgraded the uncertainty phase to a distress phase.<sup>6</sup>

At about 1735, after 40 minutes without contact and when about 60 NM (111 km) south-south-east of Redcliffe (Figure 1), communications with the pilot of DQP was re-established. Air traffic control instructed the pilot to conduct an immediate descent to 8,000 ft and to change to a discrete ATC frequency. After a minute of no change in the aircraft's altitude, ATC again instructed the pilot to change frequencies and to use oxygen as they were treating the situation as a hypoxic event. This was also reiterated to the pilot of DQP by the B200 pilot. Air traffic control reported that the pilot sounded 'groggy' and 'not really with it' upon first contact and took a few minutes before slowly commencing the descent to 8,000 ft.

<sup>1</sup> Eastern Standard Time (EST): Coordinated Universal Time (UTC) + 10 hours.

<sup>2</sup> Instrument flight rules (IFR): a set of regulations that permit the pilot to operate an aircraft in instrument meteorological conditions (IMC), which have much lower weather minimums than visual flight rules (VFR).

<sup>3</sup> Flight level: at altitudes above 10,000 ft in Australia, an aircraft's height above mean sea level is referred to as a flight level (FL). FL 110 equates to 11,000 ft.

<sup>4</sup> An emergency phase declared by the ATC when e uncertainty exists as to the safety of an aircraft and its occupants.

<sup>5</sup> Traffic alert and collision avoidance system (TCAS): a type of airborne collision avoidance system (ACAS).

<sup>6</sup> An emergency phase declared by the ATC when there is reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger or require immediate assistance.

**Figure 1: VH-DQP flight path and distance from Redcliffe Airport**



Source: Google Earth, annotated by the ATSB

Upon changing frequencies, ATC instructed the pilot to land at Gold Coast Airport. The pilot accepted the instruction at first, but then later advised that they would prefer to continue to Redcliffe instead. Air traffic control reiterated that, given the situation it would be better for the pilot to land at the Gold Coast as there was runway lighting and emergency services available.

The pilot accepted the instruction and tracked to the Gold Coast, while the B200 pilot continued to follow and monitor the aircraft. Air traffic control reported that the pilot continued to sound ‘groggy’, but gradually improved on approach to land.

The aircraft was landed safely at 1801 and the pilot was attended by the Gold Coast aircraft rescue and firefighting officers and the aerodrome safety officer. The officers conducted a visual observation of the pilot. The pilot, who reported falling asleep, declined first aid and an ambulance.

## Context

### **Pilot information**

The pilot previously held an Air Transport Pilot Licence (Aeroplane), but at the time of the incident was exercising the privileges of a Private Pilot Licence, with a valid Class 2 Aviation Medical Certificate. The pilot had a total flying experience of about 20,000 hours and had accrued 500 hours on the Cessna 208. They had been retired from full-time flying for about 10 years and had been ferrying aircraft for about 12 years. The pilot reported that, on the day of the incident, they:

- Boarded a flight from Brisbane at 0730 and arrived at Cairns at 1000.
- Had a light breakfast and a cup of tea between 0500-0530, and a small bottle of water on the flight up to Cairns. After departing Cairns in DQP and established in the cruise, the pilot had a sandwich and a milk coffee.

- Had the heater on while in the cruise at FL 110. The heater was on for about 20 minutes and it was reasonably warm in the cockpit. The pilot believed that this contributed to falling asleep.
- Had a low workload prior to falling asleep and had no memory of commencing the descent. Upon waking up, the pilot was confused and had not realised how far off course the aircraft had flown.
- Did not recall ATC advising that they had been out of communication for a significant time.
- They were a non-smoker.
- They did not take any medication or have any pre-existing medical conditions that would have contributed to the incident.
- Had a chest infection for several months, which had cleared up in the weeks prior to the incident.

### ***Sleep history***

The pilot recalled having disturbed sleep the night before the flight, which had been a regular occurrence, on and off for the last 1-2 years. They could not estimate the amount of time asleep the night before the incident. However, a typical night would consist of going to bed at around 2230 and waking up at around 0030. They would then tend to lie awake for 1-2 hours before drifting off into a mildly disturbed sleep. The night before the incident, the pilot went to bed at 2230 and woke up between 0500 and 0530. The pilot reported feeling a little tired on the day of the incident, but was okay to fly.

### ***Hypoxia***

Hypoxia is the result of a lack of oxygen to the body tissues. The most common type of hypoxia in aviation is altitude (hypobaric) hypoxia and is associated with breathing air at low barometric pressure. Hypoxia can be prevented by pressurising the aircraft or by breathing supplemental oxygen. VH-DQP was not pressurised.

The onset of hypoxia can be insidious and may not necessarily be noticed by a pilot. Symptoms of altitude hypoxia relevant to this incident, include sleepiness, drowsiness, slurred speech, confusion, impaired cognition and decision making. Loss of consciousness is also a symptom of hypoxia, however, a person would not typically regain consciousness without additional oxygen.

According to the International Civil Aviation Organization (2012), the threshold of hypoxia is generally considered to be about 3,300 ft as no obvious physiological reaction to decreased atmospheric pressure has been reported below this altitude. As altitude increases above this level, the first detectable symptoms of hypoxia begin to appear and a more realistic threshold would be around 5,000 ft. However, symptoms become more pronounced above 10,000 ft.

Studies have found that hypoxia between 8,000-12,000 ft does not impair complex cognition, but at FL 120, can increase fatigue and reduce vigour. These effects can be subtle and can depend on the individual (Legg et al., 2015, Bouak et al., 2018). Factors that can increase an individual's susceptibility and severity of the symptoms can include illness, fatigue, physical fitness and activity, mental health and the use of certain medications and drugs (Campbell & Bagshaw, 2002, Nethus et al., 1997), cabin temperature, altitude, rate of ascent and duration at altitude (Skybrary, 2019).

### ***Supplemental oxygen***

Civil Aviation Safety Authority Civil Aviation Order 20.4 – *Provision and use of oxygen and protective breathing equipment* stated that:

A flight crew member who is on flight deck duty in an unpressurised aircraft must be provided with, and continuously use, supplemental oxygen at all times during which an aircraft flies above 10 000 feet altitude.

Civil Aviation Order 20.4.4 – *Duties of crew members in relation to oxygen and protective breathing equipment* also stated that a crew member must check the serviceability of the oxygen system of the aircraft prior to take-off.

The pilot reported checking the oxygen system pressure, but did not complete a full oxygen system check prior to the flight, as they were not expecting to use the system. No oxygen masks were supplied on the aircraft, however, the pilot kept a personal mask in their flight bag. A post-incident inspection was conducted by the Civil Aviation Safety Authority on the aircraft, in particular, the oxygen system, with no defects found.

The pilot reported that they started using oxygen about 5-10 minutes after receiving the ATC clearance to climb to FL 110. After this, the pilot was taking a ‘sniff’ of oxygen on and off for a total of about 15-20 minutes while maintaining FL 110.

### ***Speech analysis***

The ATSB conducted a speech analysis on the pilot’s radio transmissions to determine if the pilot was experiencing hypoxia. The pilot’s response times, delay between mic-keying and speaking, their average speech rate, their voice pitch, their mic un-keying delay, and the duration to announce the aircraft’s call-sign were analysed.

The speech analysis found that these aspects were all affected above 10,000 ft. However, the ATSB was unable to confirm if the pilot was hypoxic as the speech characteristics may have been influenced by other factors.

### ***Dehydration***

The pilot reported possibly being dehydrated after drinking minimal amounts of water throughout the day, having only consumed about 500 ml, and not having the need to go to the toilet from the time they first arrived at Cairns to later that night after 2000. Dehydration is caused by excessive water loss and can result from not drinking enough water (Flight Safety Foundation, 2001). A symptom of dehydration includes fatigue.

### ***Medical advice***

The ATSB engaged an aviation medical specialist to determine if the pilot was suffering from hypoxia. The specialist concluded that the intermittent use of supplemental oxygen would not have been sufficient to offset the cumulative effects of hypoxia. Despite this, while a degree of hypoxia was likely, this would not have resulted in a loss of consciousness when operating at FL 110. It was more plausible that the pilot fell asleep. This was likely to be due to acute and chronic fatigue from the sleep issues described by the pilot, and inadequate fluid intake and diet.

### ***Similar occurrences***

#### ***ATSB investigation ([AO-2018-075](#))***

On 8 November 2018, a Piper PA-31-350 was being used for a freight flight from Devonport to King Island, Tasmania. During the flight, the pilot fell asleep and overflew their destination with the autopilot engaged. About 78 km past the intended destination of King Island Airport, the pilot awoke and manoeuvred the aircraft back to King Island. The investigation concluded that the pilot was very likely acutely fatigued to a level affecting performance, predominately due to the lack of recent sleep and hours awake. Although there was opportunity, the pilot did not plan or obtain sleep prior to commencing the night shift.

#### ***ATSB investigation ([AO-2013-155](#))***

On 1 September 2013, the pilot of a Cessna 210 aircraft was conducting a private flight from Port Macquarie to Bankstown, New South Wales. Prior to the flight, the pilot reported feeling a little tired and unwell. During cruise, the aircraft entered controlled airspace above Williamtown without a clearance. Air traffic control tried to contact the pilot, but no response was received. At that time, an uncertainty phase was declared and ATC again attempted to contact the pilot. About 20

minutes later, the pilot recalled waking up. Believing they may have fallen asleep, the pilot checked the aircraft's instruments to determine their location. The pilot then realised they had entered controlled airspace without a clearance twice. In a state of shock, the pilot decided to descend the aircraft to 2,500 ft to regain the original flight plan track. They continued the flight to Bankstown without further incident.

## Safety analysis

### ***Use of supplemental oxygen***

After departing Cairns for Redcliffe, the pilot was initially intending to operate at 10,000 ft, but climbed to FL 110 due to weather. In which case, the pilot was always required to use supplemental oxygen. However, the pilot reported only using oxygen intermittently during the flight. According to the ATSB's medical specialist, the occasional use would not have been sufficient to offset any cumulative effects of hypoxia.

### ***Fatigue and mild hypoxia***

While en route, the pilot became unresponsive for about 40 minutes and flew past their destination. The pilot reported falling asleep, although they only felt slightly tired, and suspected the warm cockpit environment might have been contributed this. However, a sleep history review indicated that it was likely that the pilot was experiencing chronic fatigue due to their reported inadequate sleep the night before and disturbed sleep over an extended period leading up to the incident. Most people generally require 7-8 hours of sleep to achieve a maximum amount of alertness and performance. Inadequate sleep can result in sleep debt, which is the difference between the amount of sleep you should be getting and the amount acquired below that. Sleep debt can be cumulative and can result in degraded performance and uncontrolled sleep episodes (Orlady & Orlady, 1999, Hawkins, 1993).

It was also reported that the pilot sounded 'groggy' and did not seem to comprehend ATC instructions when communications were restored. While they did gradually improve with time, this suggested that the pilot may have been experiencing sleep inertia. When awakening from a deep sleep, an individual will typically feel the effects of sleep inertia including sleepiness, disorientation and impaired cognitive performance. These effects can last for 5 minutes or up to 30 minutes, with impaired performance for over an hour if an individual is abruptly awoken. It has been found that the effects of sleep inertia can be greater with sleep deprivation and restriction (Groeger et al., 2011, Hilditch & McHill, 2019).

In addition, the influence of operating at FL 110 while only intermittently using supplementary oxygen was also considered. Research has shown that hypoxia at FL 120 can increase fatigue and reduce vigour. Further, although a common symptom of hypoxia is loss of consciousness, it is not typical for someone experiencing hypoxia to regain conscious, while still operating at the same altitude and without additional oxygen. Therefore, from the information obtained by the medical specialist and from studies conducted on mild hypoxia at moderate altitudes, the ATSB determined that it was unlikely that the pilot had lost consciousness solely due to mild hypoxia. Rather, the pilot had fallen asleep likely due to a combination of fatigue and mild hypoxia, possibly exacerbated by dehydration and diet.

## Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include 'contributing factors' and 'other factors that increased risk' (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition, 'other findings' may be included to provide important information about topics other than safety factors.

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

From the evidence available, the following findings are made with respect to the pilot incapacitation involving a Cessna 208B, registered VH-DQP that occurred 56 km west-north-west of Sunshine Coast Airport, Queensland, on 2 July 2020.

### **Contributing factors**

- The pilot did not appropriately use the supplemental oxygen system while operating at flight level 110, likely resulting in mild hypoxia.
- During the flight, the pilot's ability to remain awake was likely reduced by a combination of fatigue and mild hypoxia.

## **Sources and submissions**

### **Sources of information**

The sources of information during the investigation included the:

- the pilot
- Airservices Australia
- Royal Australian Air Force Institute of Aviation Medicine
- the Civil Aviation Safety Authority.

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### ***Submissions***

Under section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. That section allows a person receiving a draft report to make submissions to the ATSB about the draft report.

Submissions were received from the pilot. The submissions were reviewed and, where considered appropriate, the text of the report was amended accordingly.

# General details

## Occurrence details

Date and time:	2 July 2020 – 1644 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Flight crew incapacitation	
Location:	56 km west-north-west of Sunshine Coast, Queensland	
	Latitude: 26° 30.4020' S	Longitude: 152° 32.6280' E

## Aircraft details

Manufacturer and model:	Cessna Aircraft Company 208	
Registration:	VH-DQP	
Serial number:	208B2069	
Type of operation:	Private	
Activity:	Test and ferry	
Departure:	Cairns, Queensland	
Destination:	Redcliffe, Queensland	
Actual destination:	Gold Coast, Queensland	
Persons on board:	Crew – 1	Passengers – N/A
Injuries:	Crew – 0	Passengers – N/A
Aircraft damage:	None	