



Australian Government

Australian Transport Safety Bureau

Low fuel event involving a Piper PA-28, VH-MHI

28 km SE of Adelaide, South Australia, on 10 July 2015

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Addendum

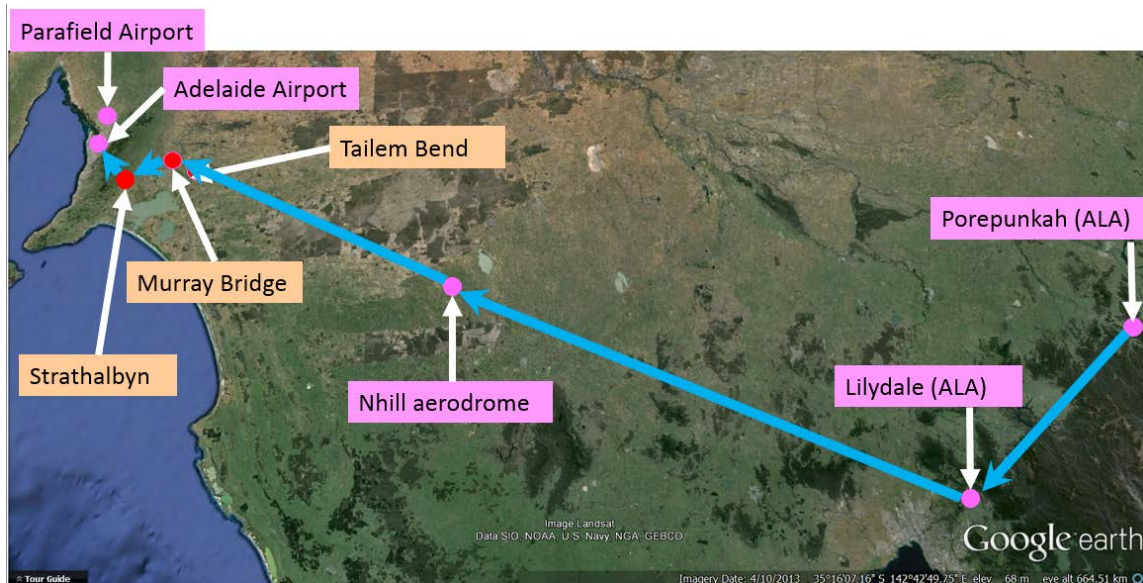
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Low fuel event involving a Piper PA-28, VH-MHI

What happened

On 10 July 2015, the pilot of a Piper PA-28 aircraft, registered VH-MHI (MHI), conducted a flight from Porepunkah to Lilydale, Victoria (Figure 1). In Lilydale, the pilot refuelled the aircraft, filling the tanks to full (189 L). Then the aircraft departed for Parafield, South Australia at about 1400 Eastern Standard Time (EST), with the pilot and two passengers on board.

Figure 1: Approximate aircraft track from Porepunkah to Lilydale and Adelaide



Source: Google earth annotated by the ATSB

As the aircraft passed overhead Nhill, Victoria, the pilot assessed the fuel status. The fuel gauges indicated about 100 L of fuel remaining, which the pilot reported was in agreement with the expected fuel consumption rate. The pilot calculated that based on 90 minutes flight time remaining, 60 L of fuel was required, plus 30 L fixed reserve. Therefore, the pilot assessed that sufficient fuel remained to complete the planned flight, and elected to continue towards Parafield.

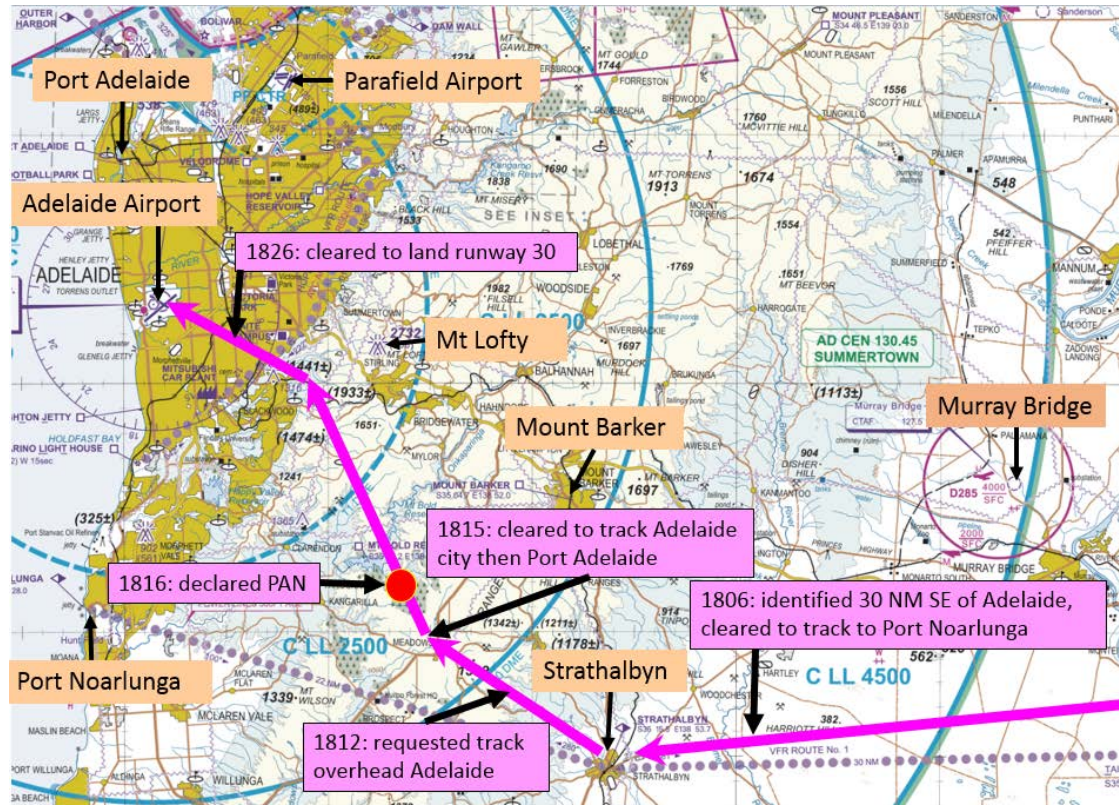
The pilot reported that the forecast cloud base was 4,500 ft in the area around Taillem Bend, South Australia. However, when approaching Taillem Bend at 4,500 ft above mean sea level (AMSL), the pilot was required to deviate and descend around cloud to remain in visual meteorological conditions (VMC). This deviation increased the track miles flown.

At about 1750 Central Standard Time (CST), the pilot contacted Adelaide Centre air traffic control (ATC), and advised that they were overhead Taillem Bend, and requested a clearance into the Adelaide control zone. The controller assigned the pilot a unique transponder code, and the aircraft tracked towards Murray Bridge, South Australia. At about 1755, when abeam Murray Bridge, the pilot advised ATC of the aircraft's current position. The controller confirmed the pilot had the correct transponder code and advised that the aircraft was not visible on the ATC radar display and they were therefore to remain outside Class C airspace. About 2 minutes later, the pilot recycled the transponder, then advised ATC of the code they had selected on the transponder. The controller responded that the aircraft was still not visible on the radar display. In addition, they advised the pilot that if they were unable to identify the aircraft on radar, the pilot would not be given a clearance to enter Class C airspace. The pilot repeated the transmission about 3 minutes later, when about 30 NM south-east of Adelaide at 4,500 ft. Again, the controller

advised that the aircraft was still not visible on the radar display, and would therefore not be able to obtain a clearance into controlled airspace.

The pilot then switched the transponder off for about one minute, before switching it back on. At about 1803, the Adelaide Centre controller told the pilot that the Tower controller at Parafield Airport had advised that they were unable to see Mt Lofty from Parafield due to cloud. The pilot advised the controller that the aircraft was then approaching Strathalbyn and the weather appeared to be clear towards Adelaide (Figure 2). The controller then stated that the aircraft was now visible on the radar display.

Figure 2: Approximate aircraft track from Strathalbyn to Adelaide



Source: Airservices Australia annotated by the ATSB

At about 1805, the pilot again reported to ATC that they were approaching Strathalbyn at 4,500 ft and the controller advised the pilot to standby for a clearance. About 1 minute later, the controller identified the aircraft on the radar display, about 30 NM south-east of Adelaide and cleared the pilot to track to Port Noarlunga, then expect to track up the coast to Port Adelaide and on to Parafield.

At about 1812, the pilot was becoming increasingly concerned about the aircraft's fuel status, with both fuel gauges indicating close to empty. Therefore, the pilot requested a clearance to track overhead Adelaide to shorten the distance remaining to Parafield. About 2 minutes later, the controller cleared the aircraft to track direct overhead Adelaide city then to Port Adelaide.

When about 15 NM southeast of Adelaide, the engine ran roughly. The pilot changed the selected fuel tank from the left to the right, and assessed that the left tank was empty. The left fuel gauge was indicating empty and the right gauge was indicating just above empty.

At about 1816, the pilot declared a PAN¹ due to low fuel and requested a clearance to track direct to Adelaide Airport for a landing there. The controller advised the pilot to expect a clearance to

¹ An internationally recognised radio call announcing an urgency condition which concerns the safety of an aircraft or its occupants but where the flight crew does not require immediate assistance.

land on runway 30 at Adelaide. About 5 minutes later, the pilot was cleared to conduct a visual approach to runway 30 and the controller suggested to the pilot to ‘remain as high as you can for as long as you can’.

At about 1824, the pilot contacted the Adelaide Tower controller and switched on the aircraft landing lights. Two minutes later, the tower controller cleared MHI to land, and the aircraft subsequently landed at Adelaide on runway 30.

After the flight, the pilot dipped the fuel tanks. The dipstick indicated no fuel in either tank. The calibration for the dipstick in that aircraft stated that zero fuel would indicate on the stick when 20 L or less remained in either tank. As the left tank had run dry, the pilot assessed there had been less than 20 L of fuel remaining after shutting down the aircraft.

Weather

The weather forecast for Parafield aerodrome (TAF) valid from 1730 CST included wind from 320° at 15 kt, showers of light rain, and broken² cloud at 4,500 ft above ground level (AGL). The weather forecast for Adelaide aerodrome (TAF) included wind from 320° at 15 kt, showers of light rain, and broken cloud at 4,500 ft AGL.

The area forecast for Area 50 valid for the flight included wind at 5,000 ft AMSL from 280° at 30 kt, and broken cloud with base from 3,000-8,000 ft AMSL and scattered showers of rain.

Pilot comments

The aircraft was filled with fuel and close to maximum weight when departing Lilydale. The aircraft departed about 90 minutes later than planned from Porepunkah for Lilydale and was then further delayed waiting for fuel in Lilydale. Prior to those delays, the pilot had anticipated arriving in Parafield before last light. The pilot had planned to refuel (during daylight hours) at Murray Bridge if it was assessed as necessary during the flight. However, there was no aerodrome lighting available at Murray Bridge. There were also numerous airfields between Nhill and Parafield suitable for landing during daylight hours, if additional fuel was required. After dark, Nhill was the last airport with pilot activated lighting (PAL) before Adelaide, but fuel was only available at Nhill by prior arrangement.

The pilot had planned to conduct the cruise at 4,500 ft, but had to descend close to the lowest safe altitude of 3,800 ft to stay clear of cloud. The delay with radar identification meant they had to divert from the direct track to remain outside controlled airspace. These factors contributed to the low fuel state.

Airservices Australia comments

Airservices Australia provided the following comments:

- If the aircraft’s transponder had been operating normally, the controller should have been able to identify the aircraft at the altitude and location where the pilot first contacted Adelaide Centre.
- At the pilot’s planned altitude of 4,500 ft, the aircraft was not required to divert to remain outside controlled airspace until within 20 NM of Adelaide Airport.
- The controller would have facilitated a clearance without radar identification, if the pilot had declared a PAN when initially requesting a clearance.

Fuel endurance

The following table provides a summary of the pilot’s fuel planning figures.

² Cloud cover is normally reported using expressions that denote the extent of the cover. The expression few indicates that up to a quarter of the sky was covered, scattered indicates that cloud was covering between a quarter and a half of the sky. Broken indicates that more than half to almost all the sky was covered, while overcast means all the sky was covered.

Table 1: Fuel calculation

Fuel	Pilot plan
Taxi and climb allowance	10 L
Planned fuel required	4 hours x 40 L = 160 L
Reserve fuel	30 L
Total fuel required	200 L

The pilot operating handbook (POH) for the Piper PA-28-181, Cherokee Archer II, stated that the fuel capacity was 189 L, with 182 L usable fuel. The handbook provided graphs to estimate fuel range, dependent on pressure altitude, power setting from 55% to 75%, and with mixture leaned to 100 °F rich of peak exhaust gas temperature (EGT) for 'best power mixture range', and with mixture leaned to peak EGT for 'best economy range'. The pilot reported an airspeed of about 120 kt, indicating power setting between 75% power and full throttle at 4,500 ft AMSL, based on the 'Speed power – performance cruise' graph in the POH. At 75% power at 4,500 ft the graph indicated a range of about 500 NM with 45 minutes reserve fuel, in zero wind conditions.

The pilot planned on fuel consumption of 40 L/hr and reported that the aircraft usually consumed about 37 L/hr when cruising above 5,000 ft. The pilot had set the fuel mixture control slightly rich of peak EGT. The planned total distance was about 400 NM and total time about 4 hours. The pilot reported that the airspeed was indicating 120-150 kt.

Lilydale to Parafield is about 370 NM in a straight line, and it is about 173 NM from Nhill to Parafield. The direct track from Lilydale to Parafield is 296°. Based on the forecast wind for the area at 5,000 ft, the aircraft would have encountered a headwind of about 25-30 kt. The pilot estimated that the aircraft had a headwind of about 10 kt.

After passing Nhill, the pilot selected the cabin heat on and thought this may have increased the fuel consumption. According to the aircraft's POH, the cabin heat is routed from air from around the manifold exhaust and does not increase fuel consumption. They did not have carburettor heat on at any stage of the flight.

Safety message

The pilot commented that at night, it is important to be more prudent with fuel planning. At night, greater consideration should be given to planning to track via aerodromes with fuel and aerodrome lighting available.

The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry. One of the safety concerns relates to [aircraft fuel management](#).



Pilots are reminded of the importance of careful attention to aircraft fuel state. ATSB Research report AR-2011-112 Avoidable accidents No. 5 [Starved and exhausted: Fuel management aviation accidents](#), discusses issues surrounding fuel management and provides some insight into fuel related aviation accidents. The report includes the following comment:

Incidences of fuel exhaustion often happen close to a flight's destination and, if it occurs when the aircraft is close to landing, it may offer the pilot less time and opportunity to successfully manage the situation.

General details

Occurrence details

Date and time:	10 July 2015 – 1822 CST	
Occurrence category:	Serious incident	
Primary occurrence type:	Low fuel	
Location:	15 NM SE of Adelaide Airport, South Australia	
	Latitude: 35° 04.20' S	Longitude: 138° 47.65' E

Aircraft details

Manufacturer and model:	Piper Aircraft Corporation PA-28-181	
Registration:	VH-MHI	
Serial number:	28-7790350	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

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.