Australian Government
Australian Transport Safety Bureau

Low fuel event involving a Piper PA-31P, VH-OGW

at Bankstown Airport, New South Wales, on 18 December 2015

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2015-146
Final – 13 April 2016

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

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

Addendum

Page	Change	Date

Low fuel event involving a Piper PA-31P, VH-OGW

What happened

On 18 December 2015, the pilot of a Piper PA-31P aircraft, registered VH-OGW (OGW), operated patient transfer flights from Bankstown to Merimbula, Wagga Wagga, Griffith and return to Bankstown, New South Wales.

At the start of the day, the aircraft was fuelled to a total of 440 L, which the pilot entered into the on-board fuel computer. After landing at Merimbula, the pilot added fuel to a total of 650 L on board. However, the pilot inadvertently entered a figure equating to about 710 L into the fuel computer at that time, which was 60 L more than the actual fuel on board.

Prior to departing on the final sector from Griffith to Bankstown, the pilot reviewed the fuel requirements for the flight. Based on figures from the fuel computer, there was sufficient fuel on board for the aircraft to land at Bankstown with 140 L remaining; which was in excess of the minimum reserves required. Also on board for the flight were a nurse and a patient.

After departure from Griffith, the aircraft climbed to flight level (FL) 110.[1] However, at FL 110, the aircraft encountered a headwind of about 20 kt. In order to conserve fuel, the pilot elected to descend to 10,000 ft, where the headwind decreased to about 10 to 15 kt.

At about 2300 Eastern Daylight-saving Time (EDT), the aircraft landed at Bankstown Airport. The following morning, prior to the first flight of the day, another company pilot dipped the aircraft's fuel tanks, and assessed that only about 60 L of fuel remained after the previous flight. A minimum of 45 minutes of fixed fuel reserves, equating to 120 L, was required for the flight, hence the aircraft had landed the previous night with half the required fuel reserves remaining.

Wind

The forecast was for variable winds at 10 kt increasing to 20 kt above 10,000 ft. Based on the wind encountered on the previous sectors, the pilot expected a tailwind for the return flight.

Fuel calculations

The fuel computer provided the fuel flow and fuel consumed for each sector flown. The computer held two units: total fuel on board in US gallons (USG) as entered by the pilot; and fuel flow, which was calculated by fuel flow sensors in the fuel inlet lines. The fuel flow was displayed in USG per hour, and tallied the amount of fuel consumed in USG. The pilot could select to display the quantity of fuel remaining, which the computer calculated by subtracting the fuel consumed from the fuel on board figure entered by the pilot.

Before entering the fuel figures, the pilot converted the amount of fuel on board in L to USG as required for the computer. The incorrect figure entered at Merimbula may have resulted from a conversion error and/or a data entry error.

The pilot planned to land at Bankstown with 140 L of fuel remaining; and reported that the fuel computer indicated that 130-135 L remained after landing. The aircraft fuel gauges indicated that about 40 USG remained (150 L). Those figures corresponded with the pilot's assessment of the planned fuel consumption and the headwind encountered during the flight.

[1] 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.

Pilot comments

The pilot calculated that there was adequate fuel on board to meet the minimum fuel required for the flight plus a small excess; which would ensure the aircraft was below the maximum landing weight for the arrival to Bankstown, with fixed reserves intact.

The pilot had a total of 17.3 hours on the PA-31P aircraft type, although significantly more in the PA-31. The pilot had completed a company check flight in the aircraft that morning, and then operated three sectors prior to the incident flight.

The pilot had previously used the same type of on-board fuel computer in different aircraft, and assumed it was a reliable source for establishing the actual amount of fuel on board. However, the only reliable source approved by the operator, was to fill the fuel tanks to full, or to a known quantity and use a dipstick to crosscheck the fuel on board with the computer figure. The pilot stated that in aging aircraft, the fuel gauges were unreliable.

The pilot also commented that the dipstick provided a reliable indication of the fuel on board for the first flight of the day, but may provide an inaccurate reading if the aircraft was not parked on level ground.

Operator comments

The aircraft operator's report into the incident stated that the pilot had not followed the fuel crosscheck requirements of the company operations manual.

Company flight crew subsequently verified that the fuel computer in that aircraft was accurate.

Safety action

Aircraft operator

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

Notice to air crew

The aircraft operator issued a notice to air crew (NOTAC) immediately following the incident. The notice reminded company flight crew of the importance of adhering to the company's fuel cross check requirements. The notice also advised of an impending amendment to the Operations Manual to clarify the specific fuel cross check requirements of the PA-31P.

The amendment stated:

> PA31P aircraft have a calibrated dipstick provided and an on-board Shadin fuel computer installed. The dipstick must be utilised for visual confirmation of a known fuel amount to be entered into the Shadin. In the event the dipstick is lost and/or the Shadin is un-serviceable then check if fuel quantity can be visually seen at the bottom of the tank, if fuel is lapping at the entry point the aircraft has 300 litres on-board. A pilot shall not depart on any mission without a visual confirmation of this minimum 300 litres.
>
> Visual fuel crosscheck using the dipstick must be completed to verify the accuracy of the Shadin and the accuracy of pilot input into the Shadin on each subsequent sector where fuel is *not* added.

Safety message

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 states that 'accurate fuel management starts with knowing exactly how much fuel is being carried at the commencement of a flight. This is easy to know if the aircraft tanks are full, or filled to tabs'.

This incident highlights the need for pilots to use a known fuel quantity to obtain accurate fuel figures, and not rely on planned fuel consumption or a fuel calculator. Many factors can affect planned fuel consumption, including power and fuel mixture settings, variance in wind direction and strength, and holding or delays due to air traffic control. Furthermore, on-board fuel computers that rely on manual data entry may also be subject to error.

General details

Occurrence details

Date and time:	18 December 2015 – 2300 EDT	
Occurrence category:	Serious incident	
Primary occurrence type:	Low fuel	
Location:	Bankstown Airport, New South Wales	
	Latitude: 33° 55.47' S	Longitude: 150° 59.30' E

Aircraft details

Manufacturer and model:	Piper Aircraft Corporation, PA-31P-350
Registration:	VH-OGW
Serial number:	31P-8414044
Type of operation:	Aerial work

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 operations involving the travelling public.

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.