Australian Government
Australian Transport Safety Bureau

Fuel exhaustion involving a Piper PA-25, VH-SSO

Near Bacchus Marsh (ALA), Victoria, 18 May 2014

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Aviation Occurrence Investigation
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Addendum

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Fuel exhaustion involving a Piper PA-25, VH-SSO

What happened

At about 1525 Eastern Standard Time on 18 May 2014, the pilot of a Piper PA-25 (Pawnee) aircraft, registered VH-SSO, took off from Bacchus Marsh aeroplane landing area (ALA), with a glider in tow. This was the pilot's seventh glider tow of the afternoon, following six uneventful glider launches. The conditions were clear, but there was a gusty wind from the north-north-west generating considerable turbulence, particularly in the circuit area.

The climb out was normal up to about 1,500 ft above ground level (AGL) when the pilot noticed a momentary engine power loss. The pilot had his hand on the throttle at the time, and initially thought that the power loss may have resulted from an inadvertent reduction in throttle setting. In response to the momentary power loss, the pilot lowered the nose of the aircraft and applied more throttle. At about the same time, the glider pilot sensed a reduction in speed and noticed that the tow rope had gone slack. In response, the glider pilot released the tow rope and turned to the right, away from the Pawnee.

The Pawnee pilot turned left after the glider released and re-joined the circuit via a left downwind for runway 27. The pilot later commented that the engine responded normally to throttle inputs following the momentary power loss, but after the pilot turned onto the base leg of the circuit at about 800 ft AGL, the engine surged briefly then stopped. The pilot immediately commenced tracking directly toward the ALA, believing that he had sufficient altitude to make a glide approach, and transmitted a MAYDAY[1] call on the Bacchus Marsh ALA Common Traffic Advisory Frequency.

As the aircraft descended through about 300 ft AGL, the pilot noticed a substantially increased rate of descent and was concerned he may not be able to reach the ALA. He identified a cleared area short of the ALA in which to land, and transmitted another MAYDAY call. As he neared the selected area however, the pilot grew concerned about a possible collision with trees. He was able to clear the trees, but immediately beyond the trees the aircraft aerodynamically stalled[2] and landed heavily in a cleared area adjacent to the ALA (Figure 1).

As the aircraft impacted the ground, the right main landing gear collapsed and the aircraft slewed to the right, coming to rest facing towards the east-south-east. As the right landing gear collapsed it impacted the right wing, damaging the leading edge (Figure 2). One of the propeller blades was also damaged when it struck the ground during the accident. After the aircraft came to a stop, the pilot turned off the electrical system and exited the aircraft uninjured. Subsequent inspection found that the aircraft fuel supply was exhausted.

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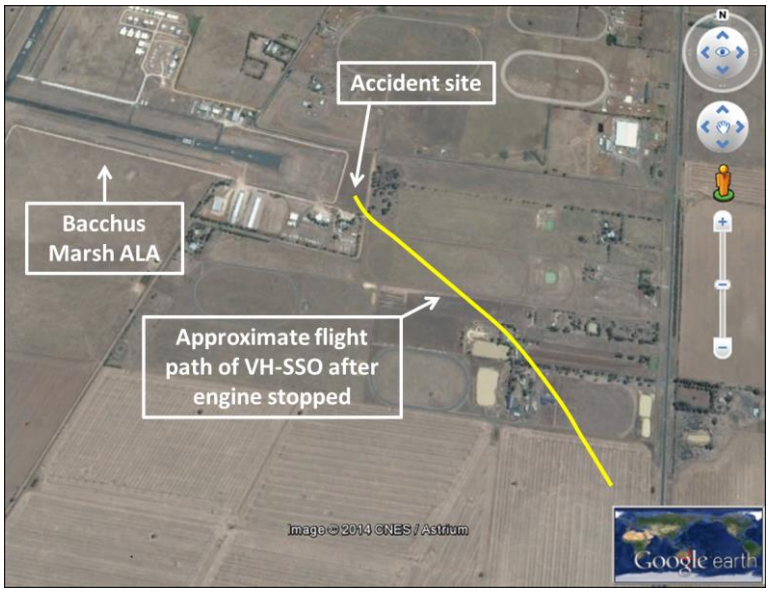
1 MAYDAY is an internationally recognised radio call for urgent assistance.

2 An aerodynamic stall is the term used to describe a condition whereby the wing is no longer producing sufficient lift to support the weight of the aircraft.

Figure 1: Approximate flight path of VH-SSO after the engine stopped



Source: Google Earth – modified by the ATSB using information supplied by the Gliding Federation of Australia

Figure 2: Damage to VH-SSO

Source: Gliding Federation of Australia

Fuel management

The gliding club that operated the Pawnee used aircraft flight time (air-switch time) as a basis for determining when a refuel was required. This method of fuel management was established in part because pilots found the aircraft fuel gauges difficult to read with accuracy. Each time the aircraft was refuelled (to full tanks), 90 minutes was added to the existing flight time, and that figure was noted on a card that was retained in the aircraft for ongoing reference. Although normally over 2 hours of glider towing was available with full tanks, the gliding club used 90 minutes flight time as a reference time for refuelling purposes, to provide some operational flexibility and to provide a safety margin to guard against fuel exhaustion. The Gliding Federation of Australia (GFA) report dealing with the accident indicated that at the time of the accident, the card indicated that a refuel was required at 1284.1 hours flight time. The flight time reading following the accident was almost 1284.9 hours.

The aircraft was fitted with a warning light to alert pilots to a low fuel level condition (initially flashes then becomes steady). The pilot stated that the light did not flash or illuminate during flight on this occasion, but he noticed that it was illuminated after the accident, before he exited the aircraft. The light again illuminated when electrical power was subsequently re-established after the accident. The reasons for which the light did not flash or illuminate during flight are unclear.

Pilot comments

The pilot attended the gliding club on the day of the accident to visit colleagues. He was not intending to fly and only offered his assistance when made aware that there was no other pilot available to fly the Pawnee that afternoon. Because it was a relatively short-notice opportunity, the pilot overlooked his usual pre-flight routine, which normally included a physical check of the aircraft fuel quantity. Additionally, there was no hand-over discussion with the pilot who had flown the Pawnee earlier during the day. Such a discussion may have heightened the pilot's awareness of the existing aircraft fuel state before he commenced flying that afternoon.

The pilot indicated that he was familiar with gliding club procedures regarding the 90 minute flight time refuel requirement and annotation of the time on the card stored in the cockpit. He recalled looking at the card prior to commencing flying that afternoon, but was unsure why the noted figure did not effectively draw his attention to the requirement to refuel during the subsequent glider launches. The pilot also indicated that had the low fuel level warning light alerted him to the low fuel state, it would have provided a trigger to refuel the aircraft. He had seen the low fuel level warning light illuminate during another flight about a year or more prior to this accident, and on that occasion, it provided sufficient warning to allow at least completion of a normal circuit.

The pilot commented that he may have been suffering from an elevated level of fatigue after having very little sleep during the evening prior to the accident. He believed that fatigue may have affected his alertness, and played a role in the accident.

Safety action

Gliding Federation of Australia

As a result of this occurrence, the GFA indicated that they intended to remind all glider towing pilots of the importance of fuel management and fatigue awareness.

Safety message

This accident highlights the following key safety messages:

Pre-flight preparation. Pilots should be particularly cautious when their usual pre-flight preparation is interrupted or abnormal. Under such circumstances, normal checks and practices can easily be overlooked.

Fatigue. The International Civil Aviation Organisation defines fatigue as:

> A physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity) that can impair a crew member's alertness and ability to safely operate an aircraft or perform safety-related duties.

Fatigue affects people in different ways, but commonly affects such things as judgement, concentration and the ability to perceive and interpret information. Pilots are encouraged to carefully consider the possible effects of fatigue that may result from limited or disrupted sleep, before engaging in flying operations or any other safety-critical activity.

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.

A copy of the ATSB Research report AR-2011-112 is available on the ATSB website at http://www.atsb.gov.au/publications/2012/avoidable-5-ar-2011-112.aspx.

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 (http://www.atsb.gov.au/safetywatch/ga-pilots.aspx).

General details

Occurrence details

Date and time:	18 May 2014 – 1535 EST	
Occurrence category:	Accident	
Primary occurrence type:	Fuel exhaustion	
Location:	Near Bacchus Marsh ALA	
	Latitude: 37° 44.0' S	Longitude: 144° 26.2' E

Aircraft details

Manufacturer and model:	Piper PA-25	
Registration:	VH-SSO	
Serial number:	25-7405602	
Type of operation:	Aerial work	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
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.