Australian Government

Australian Transport Safety Bureau

Fuel starvation and ditching involving Piper PA-28, VH-FEY

15 km north-west of Jandakot Airport, Western Australia on 20 April 2023

ATSB Transport Safety Report

Aviation Occurrence Investigation (Short)

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Addendum

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Executive summary

What happened

On 20 April 2023, a Piper PA-28-181 'Archer' aircraft, registered VH-FEY, departed Carnarvon, Western Australia for a private flight with the owner-pilot and 2 passengers on board. The aircraft initially proceeded to Geraldton to drop off one of the passengers before continuing to Jandakot (Perth). Based on the conduct of previous similar flights, and the aircraft departing Carnarvon with full fuel tanks, the pilot considered there was sufficient fuel remaining for the return journey to Jandakot and did not refuel at Geraldton.

The pilot departed Geraldton and tracked to Jandakot via the generally direct route aligned with the coast, which was essentially the reciprocal of the track flown the day before. After cruising at 5,500 ft, the pilot descended to 4,000 ft then 2,000 ft, because of airspace restrictions.

At about 10 km north of Fremantle, as the pilot was tracking coastal over water, engine power subsided to idle power over a couple of seconds then recovered to cruise power. In response, the pilot selected the mixture control to full RICH and carburettor heat to ON. (The electric fuel pump was already selected ON.)

Engine power then subsided and recovered a number of times over a period of about 2 minutes. There were no indications of a mechanical failure and the pilot looked at the instruments but was unable to recall any indications after the event.

The pilot was unable to maintain height and decided to turn into wind for a forced landing on the adjacent beach but there were a number of people on the beach. Instead, the pilot decided to ditch the aircraft in the ocean as close to shore as possible.

As they were approaching the water, the pilot tried to hold the nose up as far as possible. A main wheel contacted the water and the aircraft skipped along the surface for a few seconds. Then the right wing dropped rapidly, consistent with a stall, and dug into the water, quickly stopping the aircraft. Water gushed up over the front of the aircraft and windscreen.

The pilot and passenger exited the aircraft uninjured and swam to shore.

What the ATSB found

The pilot departed Carnarvon with sufficient fuel for the intended flight to Jandakot via Geraldton but did not carry out regular fuel quantity checks in accordance with regulatory guidance or keep a written log of the fuel consumed from each tank during the flight.

During cruise at 1,900 ft, engine power subsided to low power then returned to normal power. This occurred a number of times, probably because of a lack of usable fuel in the selected (right) tank.

The pilot responded to the engine power anomalies by carrying out some of the emergency procedures but did not select the other (left) tank, which contained usable fuel. Consequently, engine power was not restored and the pilot carried out a forced ditching into the ocean near a beach.

Prior to the first departure from Geraldton on the day of the occurrence, the pilot drained a significant amount of water from both fuel tanks (that had been refuelled to full the night before) and from the fuel strainer. The aircraft was subsequently operated for over 6.5 hrs with a refuelling at Carnarvon without any symptoms of fuel contamination and it is unlikely that there was a significant amount of water remaining in the fuel.

The engine had been in service for 28 years since overhaul and 13 years since a bulk strip, which was more than double the recommended time before overhaul of 12 years. However, given no engine defects were identified and the required maintenance was carried out, this was not identified as a factor in that occurrence.

Safety message

Fuel management

EFB and GPS technology have enhanced flight planning and navigation capability, but pilots are still required to carry out in-flight fuel quantity checks at regular intervals. These should include a cross check of all available data, including fuel quantity indications, and be recorded. For aircraft with separate tank selections, it is advisable to monitor the fuel consumed, and fuel remaining, for each tank.

Although the fuel gauges in older light aircraft can be unreliable and should not be the sole source of fuel quantity information, they are an essential component in fuel management processes. As such, they should be maintained in a serviceable condition with regular pre-flight and post-flight validation against known fuel quantities. If a fuel gauge indicates an unexpectedly low fuel quantity, the pilot should consider that to be a valid indication and act accordingly, until the anomaly is resolved.

Emergency procedures

Relative to a complete engine power loss, an intermittent or partial engine power loss is an ambiguous condition that can disrupt pilot implementation of emergency procedures. Unless there is an obvious solution, pilots should prepare for a complete engine power loss and follow the applicable procedures to optimise recovery of engine power.

If pilots might be required to ditch in case of an emergency, they should be familiar with the applicable procedures in the POH, as available, and/or generic guidance produced by national aviation authorities.

Engine time before overhaul

Although continued private operation is conditionally permitted for aeroplane engines that have exceeded the recommended calendar time before overhaul, operators should consider the length of the extension, modification status, and associated risk of failure.

The investigation

Decisions regarding the scope of an investigation are based on many factors, including the level of safety benefit likely to be obtained from an investigation and the associated resources required. 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

The owner-pilot of a Piper PA-28-181 'Archer' aircraft, registered VH-FEY, planned to conduct a flight from Jandakot to arrive in Carnarvon, Western Australia (WA) on 20 April 2023 to observe an eclipse of the sun at about 1130 local time, then return to Jandakot. This was a private operation under the visual flight rules.[1]

Previous flights

On the day before the eclipse, the pilot with one passenger on board, departed Jandakot Airport at 1416 and tracked to Geraldton Airport. The pilot landed at 1617 and parked in the general aviation area. Soon after arrival, the aircraft was attended by a refueller and Avgas tanker which replenished both fuel tanks (65 L added). The pilot and passenger then left the airport for their overnight accommodation.

At 0806 the next day, the pilot and 2 passengers arrived at the aircraft. The pilot advised that during the preflight inspection, water and a number of solid particles were visible in fuel samples drained from both tanks and the fuel strainer (gascolator). A number of fuel drains were carried out until the samples were free of water. The pilot estimated that the total amount of water drained from the aircraft fuel system was in the order of 500 ml.

Although the pilot was concerned about the amount of water that had been drained from the fuel system, they considered that the system was free of water and there should be no effect on the aircraft. The pilot conducted the usual engine run ups, did not identify any problems, and departed for Carnarvon at 0831.

The aircraft tracked direct towards Carnarvon and climbed to 6,500 ft. At about 90 NM (170 km) from Carnarvon, the pilot diverted to Shark Bay aerodrome, landing at 1020. The aircraft departed Shark Bay at 1031 and tracked to Carnarvon, landing at 1108. Engine operation during both sectors was reported as normal.

Both fuel tanks were replenished by a refueller and Avgas tanker (81 L added). The pilot and 2 passengers experienced the eclipse and obtained lunch near the airport. When the pilot carried out a fuel drain on return to the airport, there was no water found in the samples from the tanks but there was a small amount of water drained from the fuel strainer.

At 1239, the aircraft departed Carnarvon with the pilot and 2 passengers for Jandakot via Geraldton to drop off a passenger. The aircraft track was generally direct to Geraldton and the average cruise altitude was 7,500 ft. The pilot joined the circuit at 1452 and landed at 1455. Engine operation during the flight was reported as normal.

The occurrence flight

After a quick stop without refuelling, the pilot and 1 passenger boarded for the flight to Jandakot. The pilot recalled that as they advanced the throttle at the start of the take-off roll, there was an unusual 'cough' from the engine. Given it was a long runway and the engine reached full power,

[1] Visual flight rules (VFR): a set of regulations that permit a pilot to operate an aircraft only in weather conditions generally clear enough to allow the pilot to see where the aircraft is going.

the pilot continued the take-off roll while monitoring the engine. It sounded normal and the temperatures and pressures were in the green operating ranges, so the pilot continued the take-off.

The pilot departed Geraldton at 1513 to track to Jandakot via the generally direct route aligned with the coast, similar to the reciprocal track flown the day before. To take advantage of a forecast tailwind, the pilot climbed to cruise at 5,500 ft.

At 1559, the pilot began descent to about 4,000 ft to avoid restricted airspace near Lancelin. A further descent to 2,000 ft was initiated at 1612.

By 1632, the aircraft had reached 2,000 ft and was crossing the coast near Ledge Point (120 km north-north-west of Jandakot Airport) to track coastal over water. For the next 30 minutes the aircraft proceeded down the coast at about 2,000 ft.

The pilot advised the ATSB that they were just about to make a routine radio transmission about 10 km north of Fremantle for any traffic in the area, when engine power subsided to idle power over a couple of seconds then recovered to cruise power. (A descent, heading change, and groundspeed reduction were recorded at 1705.)

In response, the pilot selected the mixture control to full RICH and carburettor heat to ON. The electric fuel pump was already selected ON.

Engine power then subsided and recovered several times over a period of about 2 minutes. The pilot recalled there was no roughness or indications of a mechanical failure and it seemed like the engine was responding to the throttle being moved (without any throttle movement).

The pilot tried different throttle settings for 20–30 seconds without any reported effect. The pilot recalled looking at the engine instruments and thinking of the need to look at the fuel quantity indicators but after the occurrence could not recall any indications.

At this stage, the aircraft had descended to about 1,200 ft and the pilot assessed that the aircraft would not be able to reach Jandakot Airport, which was about 18 km to the south-east. The pilot also decided against trying to reach the Swan River, which was about 4 km to the south-south-east and on the other side of a built-up area.

Now at about 1,000 ft, the pilot observed that they were not far from Leighton Beach. Considering that the surface wind was coming from the north-east, the pilot decided to turn into wind and land on the beach (Figure 1). During the turn however, the pilot noticed there were people all over the beach and that the plan was unworkable.

Instead, they decided to ditch the aircraft in the ocean as close to shore as possible to minimise their swimming distance. The pilot recalled trying to line up with the crest of the waves in accordance with generic ditching guidance.

At 500 ft, the pilot realised that no one had been advised of the emergency and made a MAYDAY call to Melbourne Centre. Shortly afterwards, the passenger asked if the door should be unlatched, and this was carried out.

By the time the turn had been completed, at about 300 ft, the engine had completely lost power and the propeller stopped turning shortly afterwards. The last data point was recorded at 1709.

Figure 1: Aircraft track from engine fluctuations to ditching

Source: Google Earth (Annotated by the ATSB)

The pilot recalled that as they were approaching the water, they tried to hold the nose up as far as possible to prevent the nosewheel contacting first and flipping the aircraft forward. When about 20–30 ft above the water the stall warning activated. To the pilot that meant the airspeed was probably about 50 kt or less but they were watching the water and did not look at the air speed indicator.

With the stall warning still going, a main wheel contacted the water and the aircraft skipped along the surface for a few seconds. Then the right wing dropped rapidly consistent with a stall and dug into the water, quickly stopping the aircraft. Water gushed up over the front of the aircraft and windscreen.

Figure 2: VH-FEY ditching touchdown

Source: Image extracted from Channel 9 News footage

The pilot and passenger were not injured and got out of the aircraft to stand on the wing. Some people swam out from shore to check if they were okay. When the aircraft began to sink after a couple of minutes, they swam to shore.

Context

Pilot information

The pilot began flight training in August 2020 and was issued with a private pilot licence (aeroplane) in November 2021 and a commercial pilot licence (aeroplane) (CPL(A)) in September 2022. To gain the flying experience required for a CPL(A), the pilot acquired VH-FEY in March 2022 and operated the aircraft on several long flights within WA. At the time of the occurrence, the pilot's total flying experience was 360 hours.

The pilot held a Class 1 Medical certificate that was due to expire on 2 May 2023. This specified a requirement for the pilot to wear distance vision correction.

Meteorology

The ATSB obtained aviation meteorological information from the Bureau of Meteorology.

From the initial graphical area forecast (GAF) for southern Western Australia on the day of the occurrence (valid 1300 to 1900 local time), visibility was forecast to be greater than 10 km, except where it was 4,000 m due to isolated smoke south of Kalbarri. In a later issue of the GAF, the area of isolated smoke had contracted to potentially affect the flight south of Ledge Point, 65 NM (120 km) north of Jandakot.

The low-level grid point wind and temperature (GPWT) forecast issued at 0837 on 20 April 2023, indicated that at 1500, the following winds were expected at 5,000 ft and 7,000 ft respectively:

- Carnarvon to Geraldton from the north-east at 12 kt and 16 kt
- Geraldton to Jandakot from the north and north-west at 6 kt and 10 kt.

On 20 April 2023, at 1700 (5 minutes before the engine power loss), the automatic weather station at Swanbourne (5 km east of the engine power loss position) recorded the surface wind from the east at 5 to 8 kt. The recorded temperature was 23.8° and dewpoint 6.6°. When plotted on the Carburettor icing probability chart produced by CASA, the result was serious icing – descent power.

To ascertain the risk of water contamination due to rainfall, the ATSB accessed records of daily weather observations for Jandakot and Geraldton. At Jandakot, in the 4 weeks prior to the occurrence, a total of 67.6 mm of rain was recorded over 12 days. At Geraldton, there was no rain recorded on 19 and 20 April 2023.

Aircraft and systems

The Piper Aircraft Corporation manufactured the PA-28-181 aircraft in the United States in 1975. It was first registered in Australia in 1977.

The aircraft was powered by a Lycoming O-360-A4M piston engine and fixed pitch propeller.

A metal tank in each wing contained 24 US Gals (90 L) of usable fuel. Fuel was piped from the single outlet of each tank to a 3-position fuel selector (OFF/LEFT/RIGHT) located on the left side-panel (forward of the pilot's seat), then to the fuel strainer, fuel pumps, and carburettor.

Normal operating procedures

The PA-28-181 Pilot's Operating Handbook, issued in 1975 and last updated in 2019, advised that the fuel system should be drained daily prior to first flight and after refuelling to avoid accumulation of water or sediment. To drain the lines from the tanks, the tank selector is switched from each tank in turn, and the fuel strainer drain valve open.

In normal operation, the electric fuel pump was to be selected ON before take-off and deselected on reaching the desired altitude. Then, for approach and landing, the electric fuel pump was to be selected ON. It was also recommended that the electric fuel pump be selected ON while changing fuel tank selection. Otherwise, the electric fuel pump should normally be OFF so that any malfunction of the engine-driven fuel pump was immediately apparent.

The POH advised that, to keep best lateral trim for the flight, fuel should be used alternately from each tank at 1-hour intervals. It further recommended that one tank be used for 1 hour after take-off, then the other tank used for 2 hours before returning to the first tank. At that point, the first tank will contain approximately 1.5 hrs of fuel and the second tank approximately 0.5 hr. There was a caution to not run tanks completely dry in flight.

To reduce fuel consumption in cruise, the POH recommended that the mixture should be leaned above 5,000 ft and at pilot discretion at lower altitudes when 75% or less power was being used. Leaning was carried out by pulling the mixture control back until the engine operation became rough then advancing it until smooth running was restored.

If an exhaust gas temperature gauge was fitted, as it was to VH-FEY, the Lycoming Operator's Manual recommended leaning to 150°F on the rich side of peak EGT for maximum power cruise or to peak EGT for best economy cruise.

Operational practices

The pilot confirmed that their usual practice was to change fuel tank selection every hour and that this was prompted by the fuel gauge indicating 10 US Gals had been consumed. In practice, when starting with full tanks, the first and second tank changes would be when each tank indication was 20 US Gals in turn and the third and fourth at 10 US Gals.

Although the fuel gauges were calibrated a few months before the occurrence and were not reported as defective, the pilot did not rely on the gauges and considered them to only be a guide. To establish fuel on board, the pilot used a dipstick before or after flight. The pilot did not verify the accuracy of the fuel gauges by cross referencing the quantities with dipstick or refuelling figures.

The pilot advised that the mixture was left in RICH until top of climb then leaned to a setting that was slightly rich of peak EGT and was producing smooth engine operation. For descent, the pilot's practice was to keep the mixture leaned and adjust as required to keep the engine smooth.

When the pilot operated the aircraft at higher altitudes and leaned the mixture as much as possible, the average fuel consumption rate calculated post-flight was consistently 30 L/hr. If operating at lower altitudes without leaning, the aircraft used more fuel.

The pilot reported that, based on the advice of an experienced instructor, their practice was to select the electric fuel pump ON for the entire flight to avoid any power interruptions if the engine-driven pump failed.

Management of the flight

The pilot advised that a few days before a flight they usually used an EFB application to calculate estimates of flight times. Prior to departure from Jandakot, a flight plan was compiled manually as per their usual practice.

During the flight to Carnarvon via Geraldton and Shark Bay, the pilot did not consistently use the flight plan/navigation log or look at the map. The pilot advised that this was unnecessary because they were familiar with the route, having conducted the flight multiple times.

For the return flight to Jandakot, the pilot advised that they did not compile a flight plan or maintain a fuel log. After each of the previous flights from Carnarvon, the pilot had dipped the tanks and measured about 50–60 L remaining so expected that to be the outcome unless there was a strong headwind. As the flights from Jandakot to Carnarvon had consumed a total of 146 L, and there was no extensive ground running or stopover at Shark Bay on the return journey, the pilot expected that the fuel consumed on the return would be less than that figure. In that case, the fuel remaining on arrival at Jandakot was expected to be more than 34 L.

The pilot was monitoring progress of the flight using the EFB application.

Fuel quantity analysis

The ATSB obtained flight data that was transmitted at regular intervals from the on-board EFB application to the associated server via the mobile phone network. That data allowed for calculation of flight times[2] and in combination with refuelling records, the average[3] fuel consumption rate for the previous sectors.

On the first sector from Jandakot to Geraldton, the approximate fuel consumption rate was calculated as 32 L/hr (based on a flight time of 123 minutes and fuel add of 65 L). This flight was preceded by extended ground running so the consumption rate based on the flight time might have been marginally lower.

On the second flight from Geraldton to Carnarvon via Shark Bay, the average fuel consumption rate was calculated as 33 L/hr (based on a combined flight time of 147 minutes and fuel add of 81 L). This fuel consumption rate was applied to the return flight from Carnarvon because it was conducted in similar conditions.

The combined flight time from Carnarvon to Geraldton then to the engine power loss was 4 hrs and 15 minutes. At 33 L/hr, the estimated fuel burn was 140 L. Therefore, when the engine lost power, the estimated fuel on board was 40 L (Full fuel at Carnarvon: 180 L).

To establish the approximate distribution of fuel as the flight progressed from Carnarvon, the ATSB compiled a fuel log based on the pilot's recollection of the fuel tank selections. From the flight data, the ATSB identified the time that the aircraft was at the pilot-nominated locations to identify an approximate time for each tank change. That data was inserted into the fuel log to retrospectively track the fuel burn and fuel on board as the flight progressed (Table 1).

Table 1: Retrospective fuel log for Carnarvon – Geraldton – Engine power loss

FUEL LOG							
Left Tank				Right Tank			
Time on	Time off	Burn 33 L/hr	FOB 90 L	Time on	Time off	Burn 33 L/hr	FOB 90 L
				1236[1]	1334	32	58
1334[2]	1415	23	67				
				1415[3]	1455[4]	22	36
1510[5]	1610	33	34				
				1610[6]	1705[7]	30	6[8]

[1] Take-off at Carnarvon on right tank

[2] At about bottom end of Shark Bay switched to left tank

2 The flight times referenced in this section are derived from the take-off and landing times recorded in the flight data. If flight times were derived from other data such as engine start to engine stop, the calculated fuel consumption rate may be different, but the results would be the same.

3 This is sometimes referred to as block fuel consumption rate and does not identify climb or other phases of flight for calculations at different rates. In the context of the operation type and imprecision of the available data, this was considered suitable for purposes of the investigation.

[3] At about Kalbarri switched back to right tank

[4] Landed at Geraldton on right tank

[5] Start, taxi, and take-off at Geraldton on left tank

[6] At about Cervantes switched to right tank

[7] Engine power loss (right tank)

[8] Estimated usable fuel remaining in right tank

The ATSB notes that the retrospective fuel log is based on an average fuel consumption rate and approximate timing of tank changes. As such, it is only indicative of the fuel on board in each tank at each change and at the time of the engine power loss. (If the left tank had been selected for 11 minutes more over the 2 periods of use, the left/right fuel balance would be 40/0 L.)

The pilot believed that the right fuel gauge was showing just under 10 US Gals remaining when it was selected before the occurrence (at 1610), but was not certain of this after the occurrence. Based on the retrospective fuel log and fuel calibration figures (Table 2), the right fuel gauge would have indicated between the 5 and 10 US Gals markings.

After the occurrence, the pilot estimated that when the engine loss occurred there was about 40 L (or 10 US Gals) in the left tank and 15–20 L in the right tank.

If the flight had continued without the engine power loss, operation for the additional flight time of approximately 15 minutes would have consumed a further 8 L (at 33 L/hr). In that case the total fuel on board after landing would have been about 32 L, which equated to an hour of flight time.

Fuel management guidance

CASA provided guidelines for aircraft fuel requirements in Advisory Circular AC 91-15 v1.1. The following information is adapted from the AC and selected for applicability to Day VFR operation of a light aircraft, such as a Piper PA-28-181.

Pilots were advised to operate in accordance with known or estimated fuel consumption data. This could be sourced from the aircraft/engine manufacturer or taken from recent historical consumption records.

The usable fuel required at the commencement of a Day VFR flight consisted of the taxi and trip fuel expected to be consumed, and final reserve fuel (30 minutes operation at 1,500 ft above aerodrome elevation) to be protected until landing. It was expected that additional fuel would be carried for contingencies.

According to the AC, the pilot must determine the amount of usable fuel on board before commencing a flight. Unless fuel quantity can be assured and verified (for example, full tanks), pilots should use the best available cross-check process. Those checks applicable to aircraft without ‘fuel consumed indicators’ were:

- after refuelling and having regard to any recorded post-flight fuel quantities, a check of the cockpit fuel quantity indications or visual readings against the refuelling uplift readings
- when a series of flights is undertaken by the same pilot and refuelling is not carried out at intermediate stops, checking of the cockpit fuel quantity indications against computed fuel on board.

The AC cautioned that fuel gauges, particularly on smaller aircraft, may be unreliable. Therefore, placing sole reliance on a fuel quantity gauge to assess fuel quantity and not cross-checking fuel quantity from a second source, increases the risk of being unable to determine actual fuel remaining should the fuel quantity indication system become faulty.

In-flight fuel management was described as continual validation of planning assumptions that influence fuel usage and required fuel reserves. As part of in-fight fuel management, the pilot must ensure that fuel quantity checks are carried out at regular intervals to:

- compare planned fuel consumption and actual fuel consumption
- determine the amount of usable fuel remaining
- determine whether the usable fuel remaining is sufficient
- determine the amount of usable fuel expected to be remaining when the aircraft lands at the destination aerodrome.

In-flight fuel quantity checks must include a reconciliation of the fuel remaining indicated from available aircraft fuel quantity indication systems and these should also be checked to confirm fuel balance and fuel tank quantity.

It was implied that the in-flight fuel checks would be recorded in some way such as flight plan or fuel log written entry, to allow a time-based reference to previous in-flight fuel checks for trend identification.

In all instances, it was highly recommended that the post-flight fuel quantity be determined and recorded.

Aircraft maintenance

The last periodic maintenance inspection was carried out in October 2022. At that time the aircraft total time in service was 7,421.3 hours.

Recent maintenance certified on 10 February 2023 included calibration of the fuel quantity indication system. The results were recorded in the aircraft logbook and on a placard above the fuel gauges (Table 2). For each increment marked on the gauges as US gallons, there is a corresponding figure for usable fuel in litres. In the brackets are the figures from the previous calibration carried out on 28 December 2018.

Table 2: Fuel calibration record VH-FEY

Gauge (US Gals)	E	5	10	15	20	Full
Left (L)	0	35 (35)	60 (55)	73 (60)	83 (75)	93 (86)
Right (L)	0	26 (30)	53 (50)	69 (60)	78 (70)	89 (86)

The ATSB notes that when each fuel gauge indicated 5 US Gals during the calibration process, the right tank contained 26 L and left tank contained 35 L. At the average fuel consumption rate of 33 L/hr (utilised in the retrospective fuel log), this equated to 47 minutes and 63 minutes flying time respectively. So, for the same fuel gauge indication of 5 US Gals, the right tank would yield 16 minutes less flying time than the left.

A review of the aircraft logbooks found 2 entries for removal and reinstallation of the right fuel tank in 1989 and 1993. These were the only records that could be associated with installation of a non-conforming outlet fitting to the right fuel tank (see the section titled *Wreckage recovery and examination*).

The engine was last overhauled and installed in 1995 when the aircraft total time in service was 5,972.9 hours. As of the last periodic inspection, the engine had been operated for 1,449 hours and 28 years since overhaul.

In 2010, the engine was removed, bulk stripped, and reinstalled. Since then, and up to the last periodic inspection, the aircraft had been operated for 426 hours and 13 years.

Since the bulk strip in 2010, the carburettor had been repaired, and various components such as the engine driven fuel pump and magnetos had been replaced or overhauled.

The engine manufacturer issued a service instruction that specified time between overhaul (TBO) schedules. It included:

- All engine models were to be overhauled within 12 calendar years of the date they first entered service or of last overhaul.
- For the Lycoming O-360 type fitted to VH-FEY, the operating-hour TBO was 2,000 hours.

Although the engine had exceeded the calendar time TBO period, the registered operator (owner-pilot) of VH-FEY continued to operate the aircraft. This was permissible for private category operations when the engine was maintained in accordance with the Civil Aviation Safety Authority (CASA) 'on-condition' maintenance requirements. At the last annual inspection in October 2022, the maintenance organisation had fulfilled those requirements by completing a piston engine condition report that verified engine serviceability.

Wreckage recovery and examination

Prior to initiation of ATSB investigation

The aircraft was recovered from the ocean to the nearby beach by a salvage company. Disassembly of the aircraft for transport was supervised by a licensed aircraft maintenance engineer (LAME) with the support of the salvage company. They related the following details:

- both fuel tanks were full of fluid
- the fuel tank drains were not leaking
- there was a distinctive smell of Avgas when the right fuel cap was removed
- the contents of both fuel tanks were drained from each standard drain point into an empty semi-transparent intermediate bulk container (IBC)
- on completion of draining tank contents into the container there was a demarcation between the upper 25–35 mm of fluid and the remainder below
- the fluid in the upper layer was consistent with Avgas and the lower level was sea water.

Based on the estimated depth of the upper layer of fluid in the IBC, the quantity of Avgas drained from the fuel tanks was in the order of 30–42 L. It was not possible to differentiate between the amount of fuel drained from the left and right tanks. The container was subsequently used for recovery of other fluids by the salvage operator so no further information about fuel tank contents was available.

The wings and stabilator were removed and the aircraft was then transported along the beach to storage at the salvage operator's yard.

ATSB examination

The ATSB initiated an investigation on 2 May 2023 and carried out examinations of the engine and aircraft fuel system at the storage facility. Forward of the firewall, this included:

- basic engine condition and mechanical continuity
- fuel strainer, engine driven fuel pump and carburettor
- air filter, airbox and carburettor heat mechanism
- magneto-engine timing and spark plugs
- exhaust and muffler
- oil filter

No engine defects were identified. The fuel strainer contained primarily sea water with a small amount of Avgas. The gauze filter was about 10–15% occluded by an unidentified white paste. The carburettor bowl was drained and was all sea water.

The carburettor, engine driven fuel pump, magnetos, and oil filter were removed for further examination. This was carried out and, other than saltwater residue, there were no defects or anomalies, and the components were probably serviceable at the time of the occurrence.

Examination of the aircraft fuel system was focussed on the right fuel tank assembly and fuel line to the selector. The right tank outlet fitting did not incorporate a 'finger' strainer, which was a non-conformance with the fuel system data in the PA-28 parts catalogue. This outlet fitting was a different type to the conforming left tank outlet. No foreign object or evidence of contamination was found in the right tank.

Figure 3: VH-FEY Fuel tank outlet fittings - left with finger strainer and right without finger strainer

Source: ATSB

The ATSB considered the absence of a finger strainer in the only outlet from the right tank increased the risk of foreign object obstruction to fuel flow from the tank. This scenario would require an object of about the size of the internal diameter of the outlet fitting, which was stepped from 10 mm to 7 mm. Given there were no foreign objects found in the tank and no openings in the tank that would allow migration of any objects post-ditching, this scenario was considered highly unlikely. In addition, the aircraft manufacturer advised that there were no service difficulty reports or occurrences associated with the finger strainer (72091-000).

The fuel line from the right tank through the fuel selector to the fuel strainer was unobstructed. No defects were identified in the fuel selector, which was in the right tank position consistent with the pilot account.

The fuel sender unit was removed from the right tank and was in good condition. Given the immersion in sea water and removal of the wings it was not feasible to functionally test the fuel quantity indication system.

Although the wing flaps had been removed as part of the recovery operation, fuselage damage indicated the flaps were retracted during the ditching. This was consistent with the LAME's recollection and the pilot's account.

Geraldton Airport related

In response to the pilot account of significant water drained from the aircraft fuel system at Geraldton Airport on the morning of 20 April 2023, the ATSB sought information about possible sources of contamination at the airport.

The airport refueller advised that the usual quality checks were carried out to the tanker on the morning of 19 April 2023 and this was supported by their records. There was no report of water and the refueller advised that there was no history of this occurring.

The ATSB contacted the operator of an aircraft refuelled before VH-FEY who advised that no water had been detected from the post-refuelling fuel drains and normal operation was experienced on the subsequent flight.

Geraldton Airport is a security-controlled airport that required authorised access to airside areas. One of the CCTV cameras at the terminal was directed towards the aircraft parking area utilised by the pilot of VH-FEY.

The ATSB requested CCTV data for the period from aircraft arrival on the 19 April 2023 to departure on 20 April 2023. Due to the timing of the data recovery, data for 19 April 2023 was unavailable. The CCTV available from 0804 on 20 April 2023 showed the pilot and passengers arriving at the aircraft, some pre-flight activity, and the aircraft being taxied for take-off. Although the resolution was not high, there was evident movement that was consistent with the pilot making multiple fuel drains.

Emergency procedures – Engine power loss and forced landing

The pilot’s operating handbook (POH) for VH-FEY included emergency procedures for in-flight engine power loss and landing without engine power. There was no specific procedure or guidance in the POH for partial power loss or ditching. The text of the emergency procedures for engine power loss in flight is reproduced with revised formatting for readability in a report context:

> **ENGINE POWER LOSS IN FLIGHT**
>
> Fuel selector - switch to tank containing fuel
>
> Electric fuel pump – ON
>
> Mixture – RICH
>
> Carburettor heat – ON
>
> Engine gauges – check for indication of cause of power loss
>
> Primer – check locked
>
> If no fuel pressure indicated, check tank selector position to be sure it is on a tank containing fuel
>
> If power is not restored prepare for power off landing.
>
> Trim for 87 MPH IAS (76 KTS IAS)

When the pilot responded to the engine fluctuations, the first item was overlooked and the fuel selector remained on the right tank throughout the engine power loss sequence. The pilot explained that during initial flight training in a Cessna 172 they had memorised a ‘flow’ for practice forced landings that started at the centre of the aircraft (including fuel selector) then moved left. However, the pilot had not considered the implication of that method for the PA-28-181. So, in this case, the pilot had started in the middle but did not reach the left-mounted fuel selector because attention was diverted to preparing for the forced landing.

The text of the emergency procedures for a power off landing is reproduced below with revised formatting for readability in a report context:

> **POWER OFF LANDING**
>
> Locate suitable field
>
> Establish spiral pattern 1000 ft. above field at downwind position for normal landing approach
>
> When field can be easily reached slow to 76 MPH IAS (66 KTS IAS) for shortest landing
>
> Touchdowns should normally be made at lowest possible airspeed with full flaps
>
> When committed to landing:
>
> Ignition – OFF
>
> Master switch – OFF
>
> Fuel selector – OFF
>
> Mixture - idle cut-off
>
> Seat belt and harness - tight

In the safety tips section of the POH, pilots were advised:

> In an effort to avoid accidents, pilots should obtain and study the safety-related information made available in FAA publications such as regulations, advisory circulars, Aviation News, AIM, and safety aids.

The AIM reference in the POH safety tips was to the *Aeronautical Information Manual* published by the Federal Aviation Administration (FAA) in the United States. This addressed ditching procedures and is referenced in the next section.

The aircraft manufacturer advised the ATSB that they were not aware of any significant risks if pilots applied the Power Off Landing procedure in the POH to a ditching. Given the wide range of forced landing scenarios in different environments, the aircraft manufacturer considered that it was not feasible to define an emergency procedure for each one. In addition, the general information about emergency procedures in the POH indicated that emergency procedures were not intended to replace pilot training or provide information that is the same for all aircraft.

Under the certification standards[4] applicable to light aircraft such as the Piper PA-28-181, there was a requirement for information concerning normal, abnormal, emergency procedures, and other pertinent information necessary for safe operation, to be provided. In the case of single-engine aircraft, this included the procedures, speeds, and configuration for a glide following engine failure and subsequent forced landing. There was no specific requirement for a ditching procedure.

The General Aviation Manufacturer's Association (GAMA) issued specification No. 1 for pilot's operating handbook released in February 1975 (the PA-28-181 POH was released in August 1975) and revised it in 1996. This document specified that procedures should be provided for forced landings under various conditions, including 'ditching, for aircraft with extended overwater flight capability'.

[4] The Piper PA-28 type was originally certified to CAR 3 in 1956. When the PA-28-181 was certified in 1975, the CAR 3 requirements were supplemented by certain provisions of Part 23 of the Federal Aviation Regulations. So, the current version of FAR 23 was referenced.

Ditching guidance and training

FAA

In the emergency procedures chapter of the FAA AIM, there were various diagrams showing best heading in relation to primary swell, secondary swell, and wind. The manual specified a successful aircraft ditching was dependent on 3 primary factors in the following order of importance:

1. Sea conditions and wind
2. Type of aircraft
3. Skill and technique of the pilot

In addition to detailed guidance about evaluation of sea conditions and selection of relative heading, the manual advised that:

> Touchdown should be at the lowest speed and rate of descent which permit safe handling and optimum nose up attitude on impact. Once first impact has been made, there is often little the pilot can do to control a landplane.

CASA

In the Australian context, CASA provided advice to operators of issues relevant to ditching an aeroplane through Advisory Circular 91-09 Ditching. This addressed preparation, selection of ditching area and direction of approach, and conduct of the actual ditching. The information provided was consistent with that in the FAA AIM.

If no type-specific guidance was available, the AC recommended that:

> … the gear remain up, the flaps full, and speed at a minimum. In all cases, the desired configuration should be adopted at a safe height and the aeroplane trimmed to allow concentration on selection of the touchdown point.

For selection of touchdown point, the AC included the following points:

- if there is no manufacturer guidance, select an attitude for minimum sink rate
- wings level with the water surface on top of or on the back of a swell, not on the face of a swell
- no yaw if possible; straighten nose if crosswind exists, but avoid lowering a wing.

Other aircraft POH

For comparison, the ATSB reviewed the POHs for 2 light single-engine aircraft that included ditching procedures: Cessna 172 and Gippsland Aeronautics GA8. The POHs specified power (if available) to achieve 300 ft/min rate of descent, and approach direction relative to wind and sea state. Touchdown was at descent attitude, without flare and/or at slowest practical speed.

Pilot training

Pilot training in Australia was carried out in accordance with the Part 61 manual of standards (MOS). The competency standards for the ‘Manage abnormal situations – single-engine aeroplanes’ unit included elements and performance criteria for ‘Perform forced landing (simulated)’ in response to a simulated complete engine failure, and simulated partial engine failure.

For both scenarios, pilots were expected to identify the engine power loss condition, perform immediate or recall actions, and optimise aircraft performance. A landing area was to be selected, taking into account that a partially failed engine might fail completely, with an appropriate flight path. Pilots were to perform emergency procedures, as time permitted, and advise air traffic services or other agencies. If engine power was not restored, the pilot was to land the aircraft ensuring the safest outcome.

Ditching was not referenced in the elements and performance criteria, but it was listed as one of the underpinning knowledge requirements.

The pilot advised that information about ditching had been gained from flight training and reading books.

Other occurrences – Australia

Fuel starvation and forced landing

Fuel starvation and forced landing is a common occurrence type. The following occurrence was selected for the similarity of the engine power loss symptoms to the same type of aircraft.

ATSB AO-2017-094 Fuel starvation and forced landing involving Piper PA-28-181, VH-BDB, near Bankstown, New South Wales on 19 September 2017.

The pilot believed that the aircraft fuel tanks were full and intended to conduct a 30–40 minute flight on the left tank. However, the aircraft had not been refuelled since the previous flight and contained about 25 L (35 minutes flying time) in the left tank and about 55 L (78 minutes flying time) in the right tank.

After about 30 minutes flight time, engine power started to fluctuate, and became progressively worse. The pilot conducted engine failure checks but did not change the fuel tank selection. Then the engine sustained a total loss of power and the pilot conducted a forced landing. There was no fuel found in the left tank.

Ditching

The ATSB carried out a search of its database for occurrences that were categorised as a ditching. The ATSB identified 78 occurrences in the previous 50 years, including 11 fatal accidents that resulted in 21 fatalities.[5]

Of the fatal accidents, 2 involved twin-engine aircraft (including Piper Chieftain, VH-MZK near Whyalla on 31 May 2000) and 2 involved loss of control of single-engine aircraft. The remaining 7 fatal accidents involved single-engine aircraft in controlled ditchings.

Apart from this occurrence involving VH-FEY, there were 5 other ditchings involving the PA-28 aircraft type, including 1 fatal ditching in a river near Bankstown in 1977. There were insufficient details to establish the method of ditching, however, the aircraft overturned on landing and sank immediately.

Extended time between overhauls (TBO)

ATSB AO-2020-060 Engine failure and collision with terrain involving S.E.D.E. Morane-Saulnier MS.893A, VH-UQI, on 6 November 2020.

During cruise, the engine began running rough then failed. The pilot conducted a forced landing in an open area but the aircraft impacted trees and caught fire. The pilot was seriously injured.

The ATSB found that the engine had sustained a catastrophic mechanical failure due to separation of a piston connecting rod. The engine had not been overhauled since 1997 and the aircraft had not been operated for an extended period, which was identified as a contributing factor.

Safety message: This investigation is a timely reminder for aircraft owners and maintainers to be cognisant of the manufacturer’s service information which ensures that the serviceability of engine and airframe systems are maintained to the highest standards. This includes strict monitoring of

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5 The ATSB notes that the database search was for indicative purposes only and data quality may vary over the search period.

on-condition items, and that replacement of some parts may be warranted to ensure continued and safe operation. Consideration should also be given to preservation of the engine and its systems, should an aircraft be infrequently utilised.

Other occurrences – Outside Australia

The ATSB identified the following occurrences involving ditching of a Piper PA-28-181 aircraft:

NTSB ERA16LA109 Fuel exhaustion involving Piper PA-28-181, N29099, near Port Jefferson, New York on 20 February 2016

During a night flight with a flight instructor, student pilot, and 2 passengers on board, the engine lost power. The flight instructor diverted to land along a shoreline but, unable to see it in the darkness, decided to ditch close to where he judged the shoreline to be from house lights. The instructor held the aircraft off the water as long as possible to avoid a touchdown with excessive speed and the risk of nosing over. All of the occupants evacuated the aircraft and there were no reports of any impact-related injuries. Three of the occupants were rescued but one of the passengers did not survive.

BEA 2020-0243 Piper PA-28-181 Archer II, N5352F, off the coast of the isle of Guadeloupe on 4 July 2020.

During a ferry flight the engine lost power. Although the in-flight power loss procedures was carried out, engine power could not be restored. The pilot approached without wing flaps and trimmed the aircraft slightly nose up to ditch parallel to the swell. The pilot and passenger were uninjured and were rescued by helicopter.

Safety analysis

Fuel management

Effective fuel management is a key factor in safe completion of a flight. Pilots are required to plan, uplift, then manage fuel, to ensure that an aircraft is landed with not less than the required reserve fuel on board.

For the return journey from Carnarvon to Jandakot, the pilot did not compile a flight or fuel plan. The pilot explained that the route was familiar and from experience estimated there would be about 50–60 L usable fuel (more than 1.5 hrs flying time) remaining at Jandakot. Also, the pilot expected that the fuel consumed on the return journey would be less than the total of 146 L consumed between Jandakot and Carnarvon. Based on full fuel of 180 L at Carnarvon, this equated to more than 34 L (about 1 hr flying time) remaining on arrival at Jandakot.

Although the pilot departed Carnarvon and subsequently Geraldton with sufficient fuel on board for the intended flight, the pilot did not keep a fuel log during the flight. Without progressive recording in a fuel log (or equivalent), calculation of the fuel remaining in each tank would have been based on recollection of the timing of tank changes and retrospectively calculating fuel consumed and fuel remaining in each tank.

The pilot's practice was to change tanks using the fuel gauge indications as a prompt, which equated to 1-hour time intervals. These intervals were consistent with the POH and were generally effective at maintaining lateral balance and simplifying fuel management. However, the ATSB fuel calculations for the journey from Carnarvon show that some of the intervals were less than 1 hour and the requirement to land and take-off on the fullest tank could disrupt simple rule-based fuel management.

In summary, EFB and GPS technology have enhanced flight planning and navigation capability, but pilots are still required to carry out in-flight fuel quantity checks at regular intervals. These should include a cross check of all available data, including fuel quantity indications, and be recorded. For aircraft with separate tank selections, it is advisable to monitor the fuel consumed, and fuel remaining, for each tank.

Engine power loss

About 15 minutes before arriving at Jandakot, engine power subsided to low power then returned to normal power. This type of fluctuation continued for about 2 minutes with insufficient power to maintain level flight. Shortly before the ditching the engine stopped completely.

The ATSB considered all of the potential reasons for the engine power loss, which can be broadly categorised as:

- engine and associated systems defect
- carburettor ice
- fuel contamination
- fuel starvation.

Although the aircraft had sustained impact damage and been submerged, the engine and associated systems were not significantly affected. The ATSB confirmed mechanical continuity of the engine and found that key engine components such as carburettor, magnetos, engine-driven fuel pump and electric fuel pump were not defective.

According to the CASA carburettor icing probability chart, the conditions were conducive to carburettor ice at descent power. Given the engine was at cruise power, carburettor icing produces a continuous engine power loss until cleared, and the pilot applied carburettor heat early in the sequence, the symptoms are not consistent with carburettor icing.

The pilot identified an unusual amount of water in the fuel during the pre-flight inspection at Geraldton on the morning of the occurrence. There was no evidence that the fuel tanker had introduced the water during refuelling the previous afternoon and there was no rain recorded at Geraldton while the aircraft was parked overnight. The ATSB was unable to resolve this anomaly.

Given the pilot had continued the fuel drains until water was no longer present in the samples and the pilot had operated for a further 6.7 hours, including another refuelling, it is unlikely that a significant amount of water was present in the tanks when the engine power loss occurred.

Submersion of the aircraft and infiltration of the fuel system by sea water prevented an accurate assessment of fuel quantity in each tank, although observations of the fluid drained from the tanks indicated there had been sufficient fuel on board for completion of the flight.

At the time of the engine power loss, the right tank was selected and the ATSB estimated that the fuel remaining in the right tank was 6 L. Due to imprecise information this was indicative and does not preclude a lower amount. In addition, there were no engine or aircraft fuel system defects, and the symptoms were consistent with other occurrences where fuel starvation was verified. Although water contamination could not be ruled out, the ATSB found that the engine power loss was probably because of a lack of usable fuel in the selected (right) tank.

This condition, categorised as fuel starvation, could have been rectified by changing the fuel tank selector from the right tank to the left tank that contained sufficient fuel to continue the flight to Jandakot.

Emergency procedures

If fuel starvation is recognised, the pilot can remedy the situation without recourse to emergency procedures. Otherwise, the pilot is required to apply the emergency procedures from memory and/or with reference to the written procedures.

The pilot responded to the engine power anomalies by selecting the mixture to RICH and carburettor heat to ON. The electric fuel pump was already selected ON because of the pilot's method of usage and that selection was not changed. Although continuous use of the electric fuel pump was contrary to the POH, this was not a factor in the occurrence.

Those immediate actions, conducted from memory, were in accordance with the engine power loss in flight procedure in the POH. However, the pilot did not action the first item, which was:

> Fuel selector - switch to tank containing fuel

The pilot attributed this to the 'flow' or sequence that had been learned for a different aircraft type and not adapted to the configuration of the PA-28-181, combined with limited time to complete the sequence. For pilots who fly different aircraft types, use of a checklist mnemonic that can safely be applied across those types will reduce vulnerability to negative transfer of type-specific flows or sequences. Ready access to the written procedure is an option but is often not practicable in a single-pilot time-critical context.

Compared to a complete engine power loss, an intermittent or partial engine power loss is an ambiguous condition that does not conform to standard training scenarios and can disrupt pilot implementation of emergency procedures. Unless there is an obvious solution, pilots should prepare for an imminent complete engine power loss and follow the applicable procedures to optimise recovery of engine power.

Engine power was not restored, and the pilot was required to conduct a forced landing. The pilot made a sound decision to carry out a ditching adjacent to the beach rather than landing on the populated beach with the high risk of injury.

By applying the POH guidance for a power off landing and generic ditching guidance, the pilot conducted a controlled ditching with minimal damage and no injuries. This outcome was assisted by favourable sea conditions.

The ATSB noted that the POH did not contain any procedures for ditching and considered whether this was a factor that increased risk.

For light aircraft such as the Piper PA-28-181, there was no requirement for the aircraft manufacturer to provide a ditching procedure and they advised that they were not aware of any significant risks if the Power Off Landing procedure was applied to a ditching. By contrast, some aircraft manufacturers did include ditching procedures.

As referenced in the PA-28-181 POH, the *Aeronautical Information Manual* published by the Federal Aviation Administration (FAA) addressed ditching procedures in some detail. And in the Australian context, CASA provided guidance in *Advisory Circular AC 91-09 Ditching*.

Training for ditching has obvious limitations and it was not referenced in the elements and performance criteria of the 'Perform forced landing (simulated)' competency standard. As one of the underpinning knowledge requirements, it is expected that on completion of pre-licence training, pilots would have an awareness of aircraft-specific and/or generic ditching procedures.

As indicated by the other occurrence information, the impact forces associated with a ditching are generally survivable, provided the pilot does not lose control of the aircraft before entering the water. As demonstrated in this occurrence, it is assumed that where there are no aircraft-specific ditching procedures, pilots conducting a ditching will apply power off landing procedures and generic training/guidance. Although aircraft-specific ditching procedures are an advantage there is no evidence that the absence of such procedures for the Piper PA-28 type significantly increases the risk of ditching.

In summary, if pilots might be required to ditch in case of an emergency, they should be familiar with the applicable procedures in the POH, as available, and/or generic guidance produced by national aviation authorities.

Extended TBO

The ATSB noted that since the last overhaul, the engine had been in service for 28 years, which was more than double the recommended time before overhaul of 12 years. This was mitigated to some extent by a bulk strip 13 years before the occurrence and various component changes.

Given there were no engine defects, and the required maintenance was carried out, the extended TBO was not identified as a factor in this occurrence.

Nevertheless, the ATSB recently found that in November 2020, a Lycoming 0-360 engine sustained a catastrophic mechanical failure due to separation of a piston connecting rod. The engine had not been overhauled since 1997 and the aircraft had not been operated for an extended period, which was identified as a contributing factor.

Although continued private operation is conditionally permitted for aeroplane engines that have exceeded the recommended calendar time before overhaul, operators should consider the length of the extension, modification status, and associated risk of failure.

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 fuel starvation and ditching involving Piper PA-28-181, registered VH-FEY, on 20 April 2023.

Contributing factors

- The pilot departed Carnarvon with sufficient fuel for the intended flight to Jandakot via Geraldton but did not carry out regular fuel quantity checks in accordance with regulatory guidance or keep a written log of the fuel consumed from each tank during the flight.
- During cruise at 1,900 ft, engine power subsided to low power then returned to normal power. This occurred a number of times, probably because of a lack of usable fuel in the selected (right) tank.
- The pilot responded to the engine power anomalies by carrying out some of the emergency procedures but did not select the other (left) tank that contained usable fuel. Consequently, engine power was not restored and the pilot carried out a forced landing/ditching into the ocean near a beach.

Other findings

- Prior to the first departure from Geraldton on the day of the occurrence, the pilot drained a significant amount of water from both fuel tanks (that had been refuelled to full the night before) and from the fuel strainer. The aircraft was subsequently operated for over 6.5 hrs with a refuelling at Carnarvon without any symptoms of fuel contamination and it is unlikely that there was a significant amount of water remaining in the fuel.
- The engine had been in service for 28 years, which was more than double the recommended time before overhaul (TBO) of 12 years. Given there were no engine defects, and the required maintenance was carried out, the extended TBO was not identified as a factor in the occurrence.

General details

Occurrence details

Date and time:	20 April 2023 – 1709 Western Standard Time	
Occurrence class:	Accident	
Occurrence categories:	Fuel starvation, Ditching	
Location:	15 km north-west of Jandakot Airport, Western Australia	
	Latitude: 32.0189° S	Longitude: 115.7502° E

Aircraft details

Manufacturer and model:	Piper Aircraft Corporation PA-28-181	
Registration:	VH-FEY	
Operator:	Private	
Serial number:	28-7690006	
Type of operation:	Part 91 General operating and flight rules-Other	
Activity:	General aviation / Recreational-Sport and pleasure flying-Pleasure and personal transport	
Departure:	Geraldton Airport, Western Australia	
Destination:	Jandakot Airport, Western Australia	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Substantial	

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- owner-pilot of the accident flight
- maintenance organisation for VH-FEY
- aircraft manufacturer
- video footage of the accident flight and other photographs and videos taken on the day of the accident
- recorded data transmitted from the EFB application on the aircraft.

References

Advisory Circular AC 91-09 v1.0 Ditching, Civil Aviation Safety Authority, November 2021.

Advisory Circular AC 91-15 v1.1 Guidelines for aircraft fuel requirements, Civil Aviation Safety Authority, September 2021.

Pilot's Operating Handbook Piper Cherokee Archer II PA-28-181 REPORT VB-760 Issued 15 August 1975, Revised 1 April 2019.

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.

A draft of this report was provided to the following directly involved parties:

- owner-pilot of the accident flight
- maintenance organisation for VH-FEY
- aircraft manufacturer
- Civil Aviation Safety Authority

A submission was received from the:

- owner-pilot of the accident flight

The submission was reviewed and, where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

About the ATSB

The ATSB is an independent Commonwealth Government statutory agency. It is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers.

The ATSB's purpose is to improve the safety of, and public confidence in, aviation, rail and marine transport through:

- independent investigation of transport accidents and other safety occurrences
- safety data recording, analysis and research
- 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, as well as participating in overseas investigations involving Australian-registered aircraft and ships. It prioritises investigations that have the potential to deliver the greatest public benefit through improvements to transport safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, international agreements.

Purpose of safety investigations

The objective of a safety investigation is to enhance transport safety. This is done through:

- identifying safety issues and facilitating safety action to address those issues
- providing information about occurrences and their associated safety factors to facilitate learning within the transport industry.

It is not a function of the ATSB to apportion blame or provide a means for determining 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. The ATSB does not investigate for the purpose of taking administrative, regulatory or criminal action.

Terminology

An explanation of terminology used in ATSB investigation reports is available on the ATSB website. This includes terms such as occurrence, contributing factor, other factor that increased risk, and safety issue.