SOUTH AFRICAN CIVIL AVIATION AUTHORITY



**PRELIMINARY ACCIDENT REPORT**

## Accident and Incident Investigations Division

Accident
- Preliminary Report -
AIID Ref No: CA18/2/3/10160


**Figure 1:** File picture of the accident aircraft. (Source: airliners.net)

Description:

On Wednesday, 18 May 2022, a pilot on-board a Piper 25-235 Pawnee aircraft with registration ZS-BTL took off on a private flight from Runway (RWY) 03 at Potchefstroom Aerodrome (FAPS), North West province, with the intention to land at Bospan airstrip, also in the North West province. The pilot stated that during the climb phase at approximately 300 feet (ft) above ground level (AGL), she noticed partial engine power loss to below 2400 revolutions per minute (RPM). At this time, the aircraft had already flown beyond the runway and the pilot could not land back on the runway. The pilot then sought out and identified an open field covered with grass ahead of the aircraft's path on which to conduct an emergency landing. After touchdown on the grass, the aircraft ran over a body of water which led to the main landing gear wheels sinking into the muddy soil and the aircraft nosed over coming to rest in an inverted position. The aircraft sustained substantial damage during the accident sequence; however, the pilot did not sustain injuries; he disembarked the aircraft without assistance.

## Occurrence Details

| | |
|---|---|
| **Reference Number** | **:** CA18/2/3/10160 |
| **Occurrence Category** | **:** CAT 2 |
| **Type of Operation** | **:** Private (Part 91) |
| **Name of Operator** | **:** To be determined |
| **Aircraft Registration** | **:** ZS-BTL |
| **Aircraft Make and Model** | **:** Piper Aircraft Corporation, PA-25-235 Pawnee |
| **Nationality** | **:** South African |
| **Place** | **:** ±900 metres from the threshold of Runway 21, Potchefstroom Aerodrome (FAPS) |
| **Date and Time** | **:** 18 May 2022, 1005Z |
| **Injuries** | **:** None |
| **Damage** | **:** Substantial |

## Purpose of the Investigation

*In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and not to apportion blame or liability.*

*All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.*

## Investigation Process

The Accident and Incident Investigations Division (AIID) of the South African Civil Aviation Authority (SACAA) was notified of the occurrence involving a Piper PA-25-235 Pawnee aircraft, which occurred outside Potchefstroom Aerodrome (FAPS), North West Province, on 18 May 2022 at 1005Z. The AIID classified the occurrence as an accident according to the CAR 2011 Part 12 and ICAO STD Annex 13 definitions.

The AIID has appointed an investigator-in-charge to investigate. The investigator did not dispatch to the accident site. The AIID will lead the investigation and issue the final report of this accident in accordance with CAR 2011 Part 12 and ICAO Annex 13.

The information contained in this preliminary report is derived from the information gathered during the on-going investigation into the occurrence. Later, an interim or final report may contain altered information in case new evidence is found during the on-going investigation that requires changes to the information depicted in this report.

*The AIID reports are made available to the public at:*
http://www.caa.co.za/Pages/Accidents%20and%20Incidents/Aircraft-accident-reports.aspx

*Notes:*

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   *Accident — this investigated accident*
   *Aircraft — the PA-25-235 Pawnee involved in this accident*
   *Investigation — the investigation into the circumstances of this accident*
   *Pilot — the pilot involved in this accident*
   *Report — this accident report*

2. *Photos and figures used in this report were taken from different sources and may have been adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report were limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows, or lines.*

## Disclaimer

## Table of Contents

| Abbreviations | Description |
|---|---|
| ° | Degrees |
| °C | Degrees Celsius |
| AIID | Accident and Incident Investigations Division |
| AGL | Above Ground Level |
| AMO | Aircraft maintenance organisation |
| CAR | Civil Aviation Regulations |
| C of R | Certificate of Registration |
| CRS | Certificate of Release to Service |
| FACR | Carletonville Airfield |
| FAPS | Potchefstroom Aerodrome |
| ft | Feet |
| hPa | Hectopascal |
| kt | Knots |
| m | Metres |
| METAR | Meteorological Routine Aerodrome Report |
| MPI | Mandatory Periodic Inspection |
| MTOW | Maximum take-off weight |
| NM | Nautical miles |
| PPL | Private Pilot Licence |
| RPM | Revolutions per minute |
| RWY | Runway |
| SACAA | South African Civil Aviation Authority |
| SAWS | South African Weather Service |
| QNH | Altitude Above Mean Sea Level |
| VFR | Visual flight rules |
| Z | Zulu (Term for Universal Co-ordinated Time - Zero Hours Greenwich) |

## 1. FACTUAL INFORMATION

### 1.1. History of Flight

1.1.1. On Wednesday, 18 May 2022, a pilot on-board a Piper 25-235 Pawnee aircraft with registration ZS-BTL took off on a private flight from Runway (RWY) 03 at Potchefstroom Aerodrome (FAPS) in the North West province, with the intention to land at Bospan airstrip, also in the North West province. The flight was conducted under visual flight rules (VFR) by day.

1.1.2. The pilot stated that during the climb phase at approximately 300 feet (ft) above ground level (AGL), she noted partial loss of engine power to below 2400 revolutions per minute (RPM). At this time, the aircraft was already beyond the runway and the pilot could not land back (on the runway). The pilot continued with the flight but with no improvement in engine power.

1.1.3. According to the pilot, whilst conducting the emergency checks, the aircraft lost significant height. He then sought out and identified an open field of grass, about 30 degrees (°) left of the aircraft's flight path, on which to conduct an emergency landing.


**Figure 2:** Aerial view of the accident site's proximity to FAPS RWY 21. (Source: Google Earth)

1.1.4. After touchdown on the grass area, the aircraft ran over a body of water, which caused the main wheels to sink into the mud, decelerating the aircraft as a result, the tail tilted forward and caused the aircraft to nose over and the aircraft came to rest in an inverted position.

1.1.5. The aircraft sustained substantial damage during the accident sequence; however, the pilot was not injured, and he disembarked the aircraft without assistance.

1.1.6. The accident occurred during daylight at Global Positioning System (GPS) co-ordinates determined to be 26°39'45.65" South 027°05'01.94" East, at 4 459ft above mean sea level (AMSL).

## 1.2. Injuries to Persons

| Injuries | Pilot | Crew | Pass. | Total On-board | Other |
|---|---|---|---|---|---|
| Fatal | - | - | - | - | - |
| Serious | - | - | - | - | - |
| Minor | - | - | - | - | - |
| None | 1 | - | - | 1 | - |
| **Total** | **1** | **-** | **-** | **1** | **-** |

Note: Other means people on the ground.

## 1.3. Damage to Aircraft

1.3.1. The aircraft sustained substantial damage.


**Figure 3:** The aircraft post-accident. (Source: AMO)

## 1.4. Other Damage

1.4.1. None.

## 1.5. Personnel Information

| | | | | | |
|---|---|---|---|---|---|
| Nationality | South African | Gender | Female | Age | 52 |
| Licence Type | Private Pilot Licence | | | | |
| Licence Issue Date | 6 February 2019 | Licence Expiry Date | 30 June 2022 | | |
| Licence Valid | Yes | Type Endorsed | Yes | | |
| Ratings | Night | | | | |
| Medical Class | Class 2 | | | | |
| Medical Issue Date | 30 August 2021 | Medical Expiry Date | 30 September 2022 | | |
| Limitations | Suitable corrective lenses | | | | |
| Previous Accidents | None | | | | |

Note: Previous accidents refer to past accidents the pilot was involved in, when relevant to this accident.

**Flying Experience:**

| | |
|---|---|
| Total Hours | 1060.1 |
| Total Past 24 Hours | 0 |
| Total Past 7 Days | 0 |
| Total Past 90 Days | 29 |
| Total on Type Past 90 Days | 27 |
| Total on Type | 17.6 |

1.5.1. According to the pilot's logbook endorsement section, the PA-25 Pawnee aircraft type conversion training was completed and endorsed on the pilot's licence on 21 November 2021.

1.5.2. The pilot completed a Private Pilot Licence (PPL) skills test on 27 February 2022, which was endorsed by an instructor in the pilot's logbook.

## 1.6. Aircraft Information

1.6.1. *The Piper PA-25 Pawnee was manufactured by Piper Aircraft as an agricultural aircraft and introduced in August 1959. The Pawnee was produced from 1959 to 1981 and continues to serve its purpose in agricultural spraying. It was also utilised as a tow plane, or tug, used for launching gliders or for towing banners.*

*In the same year, two pre-production models were built and in May 1959, aircraft production began. In 1962, the PA-25-235 Pawnee B was built. It was powered by a Lycoming O-540-B2B5 engine rated at 235 brake horsepower and showcased a larger hopper, enhanced dispersal gear, and increased payload of 540 kg. In 1967, the PA-25-235 and PA-25-260 Pawnee C were introduced. It was an enhanced variant of the previous Pawnee B fitted with a 235 horsepower or 260 horsepower high-compression type of the Lycoming O-540 engine. It also featured a fixed-pitch or a constant-speed propeller. The PA-25-235 and PA-25-260 Pawnee D with fuel tanks located in the outer wings were also built.*
(Source: Piper Aircraft Corp)

**Airframe:**

| | | |
|---|---|---|
| Manufacturer/Model | Piper Aircraft Corp., PA-25-235-D (Pawnee) | |
| Serial Number | 25-7656016 | |
| Year of Manufacture | 1976 | |
| Total Airframe Hours (At Time of Accident) | 7963.30 | |
| Last MPI (Date & Hours) | 17 March 2022 | 7937.00 |
| Hours Since Last Inspection | 26.30 | |
| CRS Issue Date | 17 March 2022 | |
| C of A (Original Date of Issue & Expiry Date) | 5 November 2004 | 30 November 2022 |
| C of R (Issue Date) (Present Owner) | 25 July 2014 | |
| Type of Fuel Used | AVGAS | |
| Operating Category | Private (Part 91) | |
| Previous Accidents | None | |

Note: Previous accidents refer to past accidents the aircraft was involved in, when relevant to this accident.

**Engine:**

| | |
|---|---|
| Manufacturer/Model | Lycoming, O-540-B2B5 |
| Serial Number | L-13409-40 |
| Hours Since New | 27.6 |
| Hours Since Overhaul | Not yet reached |

**Propeller:**

| | |
|---|---|
| Manufacturer/Model | McCauley, 1A200FA8452 |
| Serial Number | 104523 |
| Hours Since New | 152.3 |
| Hours Since Overhaul | Not yet reached |

1.6.2. There were no technical defects recorded in the aircraft's logbooks and flight folio.

1.6.3. According to the pilot, the fuel on-board at take-off was 137 litres (L).

1.6.4. **Mass and Balance**

1.6.4.1. The Mass and Balance Report submitted by the pilot was as follows:

| **Item** | **Mass (kg)** |
|---|---|
| Aircraft Empty Mass | 763,4 |
| Pilot | 70 |
| Fuel | 106 |
| Hopper | 0 |
| **Take-off Weight** | **939.4** |

1.6.4.2. According to the Mass and Balance Report, the aircraft was reweighed on 26 September 2018 and the recorded empty mass was 763.4 kilograms (kg) (1683 pounds [lb]). According to the aircraft's Pilot Operating Handbook (POH), the certified maximum take-off mass (MTOM) is 1315.4kg (2900 lb). Therefore, the take-off mass of the aircraft on the day of the accident was 376kg below the certified MTOM.

## 1.7. Meteorological Information

1.7.1. The weather information below was obtained from the Meteorological Routine Aerodrome Report (METAR) that was issued by the South African Weather Service (SAWS) and recorded on 18 May 2022 at 1005Z at the Potchefstroom Automatic Weather Station (AWS), located approximately 2 nautical miles (nm) from the accident site.

| | | | | | |
|---|---|---|---|---|---|
| Wind Direction | 340 ° | Wind Speed | 06-10 kt | Visibility | 9999 m |
| Temperature | 19.7 °C | Cloud Cover | CAVOK | Cloud Base | None |
| Dew Point | 9.3 °C | QNH | 872.1 hPa | | |

1.7.2. According to the SAWS reported weather conditions, the wind components that would have been prevalent at the time of the accident would have been a headwind of 6.43 knots (kt) with a crosswind of 7.66kt. According to the aircraft's POH, the maximum crosswind component allowable for the aircraft is 15kt.

## 1.8. Aids to Navigation

1.8.1. The aircraft was equipped with standard navigational equipment as approved by the Regulator (SACAA). There were no records indicating that the navigation system was unserviceable prior to the accident.

## 1.9. Communication

1.9.1. The aircraft was equipped with a standard communication system as approved by the Regulator. There were no recorded defects with the communication system prior to the accident.

## 1.10. Aerodrome Information

| | |
|---|---|
| Aerodrome Location | Potchefstroom Aerodrome, North West province |
| Aerodrome Status | Unregistered |
| Aerodrome GPS coordinates | 26°40’13.16” South, 27°04’44.66” East |
| Aerodrome Elevation | 4520 feet |
| Runway Numbers | 03/21 |
| Dimensions of Runway Used | 5791ft x 98ft / 1765m x 30m |
| Heading of Runway Used | 032° |
| Surface of Runway Used | Asphalt |
| Approach Facilities | None |
| Radio Frequency | 115.50 MHz |

## 1.11. Flight Recorders

1.11.1. The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR), nor was it required by regulation to be fitted to the aircraft type.

## 1.12. Wreckage and Impact Information

1.12.1. The accident occurred on a private farm, approximately 910 metres (m) north-west of the threshold of Runway 21 at FAPS on a grass field.

1.12.2. Due to the type of terrain the aircraft landed on, after touchdown, the aircraft ran over a body of water which led to the main wheels sinking into the muddy soil, bringing the aircraft to an abrupt stop. The aircraft nosed over and came to rest in an inverted position.

**Figure 4:** Wreckage location picture taken by another pilot on an aircraft. (Source: Pilot)

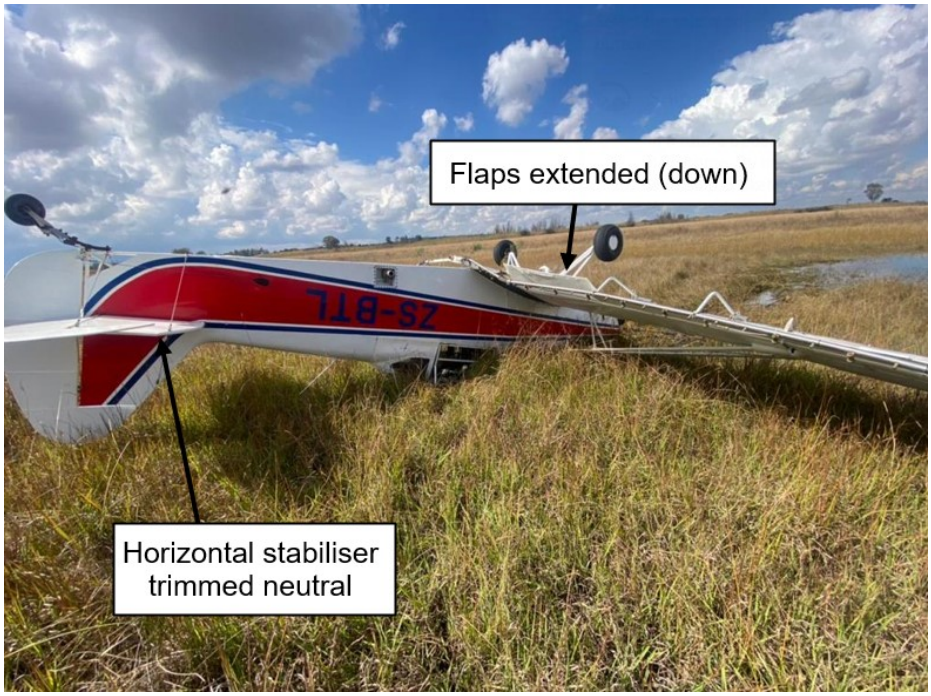


**Figure 5:** The aircraft as it came to rest in the grass field. (Source: Pilot)

1.12.3. The aircraft's wings and vertical stabiliser were damaged.

## 1.13. Medical and Pathological Information

1.13.1. Not applicable to this occurrence.

## 1.14. Fire

1.14.1. There was no evidence of a pre- or post-impact fire.

## 1.15. Survival Aspects

1.15.1. The accident was considered survivable as the cockpit and cabin structure remained intact. The pilot had made use of the aircraft's equipped safety harnesses during the flight.

## 1.16. Tests and Research

### Engine Compression Test

1.16.1. According to the owner of the ZS-BTL aircraft, during post-accident inspection, the engine compression test was carried out by turning the propeller by hand in the direction of rotation, and it rotated freely without obstruction.

### Possible fuel contamination

1.16.2. According to the pilot, it is likely that the power loss experienced on the day of the accident could have been due to fuel contamination, with high water sediments found even after adequate draining. This was also reported by several other pilots who experienced engine power loss after take-off at FAPS in the month of May 2022.

The owner of the aircraft has taken a fuel sample for contamination testing; more information will be provided based on the fuel contamination test results.

## 1.17. Organisational and Management Information

1.17.1. This was a private flight conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.17.2. The aircraft maintenance organisation (AMO) which carried out the last mandatory periodic inspection (MPI) was issued an AMO approval certificate by the SACAA on 12 July 2021 with an expiry date of 31 July 2022.

## 1.18. Additional Information

### 1.18.1. CAA of New Zealand – Good Aviation Practice (GAP) – Fuel Management

*Fuel contamination is where there's a foreign substance such as water, dirt, or fungi – Cladosporium resinae, for instance – in the fuel. The contaminant may cause the engine to stop because it has inhibited combustion or blocked the fuel lines or damaged the fuel system components.*
*The reasons for these occurrences often relate to:*

- *the pilot's poor knowledge of the fuel system of the aircraft they fly*
- *pre-flight planning was inadequate*
- *pre-flight checks were inadequate*
- *the pilot has failed to accurately monitor inflight fuel consumption*
- *when faced with a low-fuel state, the pilot is unable to take decisive action quickly.*

## 1.19. Useful or Effective Investigation Techniques

1.19.1. To be discussed in the final report.

# 2. FINDINGS

## 2.1. General

From the available evidence, the following preliminary findings were made with respect to this Accident. These shall not be read as apportioning blame or liability to any organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusions heading:

- **Findings —** are statements of all significant conditions, events, or circumstances in this accident. The findings are significant steps in this accident sequence, but they are not always causal or indicate deficiencies.

2.2. **Findings**

The Pilot

2.2.1. The pilot had a Private Pilot Licence (PPL) that was issued on 6 February 2019 with an expiry date of 30 June 2022. According to the pilot's questionnaire, the pilot had flown a total of 1060.1 hours, of which 17.6 were on the aircraft type.

2.2.2. The pilot was issued a Class 2 aviation medical certificate on 30 August 2021 with an expiry date of 30 September 2022, with restrictions to wear suitable corrective lenses.

Weather

2.2.3. The wind conditions at the time of take-off were within limits, detailed in the aircraft's POH. According to the SAWS weather report, the crosswind component was within the maximum allowable crosswind component.

The aircraft

2.2.4. The present owner was issued the aircraft's Certificate of Registration (C of R) on 25 July 2014.

2.2.5. The aircraft was originally issued a Certificate of Airworthiness (C of A) on 5 November 2004 with an expiry date of 30 November 2022.

2.2.6. The aircraft was issued a Certificate of Release to Service (CRS) following its last mandatory periodic inspection (MPI) carried out on 17 March 2022 at 7937.00 airframe hours. The aircraft had accumulated a further 26.30 airframe hours since the inspection.

2.2.7. The AMO which carried out the last MPI was issued an AMO approval certificate by the SACAA on 12 July 2021 with an expiry date of 31 July 2022.

2.2.8. After experiencing a partial power loss during take-off, the pilot executed an emergency landing on a grass field with a body of water, during which the aircraft flipped over.

2.2.9. The take-off mass of the aircraft was within the prescribed limits.

2.2.10. During post-accident inspection, the engine compression test was conducted by turning the propeller by hand in the direction of rotation, and it rotated freely without obstruction.

## 3. ON-GOING INVESTIGATION

3.1. The AIID investigation is on-going, and the investigator will be looking into other aspects of this occurrence which may or may not have safety implications.

**This report is issued by:**

**Accident and Incident Investigations Division**
**South African Civil Aviation Authority**
**Republic of South Africa**

**Compiled by:** Tebogo Mathebula

_____ Date: _____
For: Executive – AIID

_____ Date: _____
Investigator-in-charge Tebogo Mathebula