LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10490								
Classification	Accident		**Date**	5 September 2024		**Time**	1350Z		
Type of Operation	Private (Part 91)								
Location									
Place of Departure	Postmasburg Aerodrome (FAPT), Northern Cape Province		Place of Intended Landing	Chief David Stuurman Aerodrome (FAPE), Eastern Cape Province					
Place of Occurrence	On a road in Algoa Park residential area								
GPS Co-ordinates	Latitude	33°53' 28.4" S	Longitude	025°33' 30.7" E		Elevation	100 ft		
Aircraft Information									
Registration	ZS-NSX								
Make; Model; S/N	Piper Aircraft Corporation; PA-32RT-300T (Serial number: 32R-7987-300T)								
Damage to Aircraft	Substantial			Total Aircraft Hours	3 718.8				
Pilot-in-command									
Licence Type	Commercial Pilot Licence (CPL)			Gender	Male		Age	74	
Licence Valid	Yes	Total Hours		9 628.9	Total Hours on Type			381.5	
Total Hours 30 Days	18.25			Total Flying on Type Past 90 Days				10.4	
People On-board	1 + 2	**Injuries**	0	**Fatalities**	0	**Other (on ground)**		0	

What Happened

On Thursday, 5 September 2024, a pilot and two passengers on-board a Piper PA-32RT-300T aircraft with registration ZS-NSX took off on a private flight from Postmasburg Aerodrome (FAPT) in the Northern Cape province to Chief David Stuurman Aerodrome (FAPE) (initially Port Elizabeth Aerodrome) in the Eastern Cape province. The flight was conducted under instrument flight rules (IFR) by day and under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot stated that on Wednesday, 4 September 2024, the aircraft was refuelled with 237 litres of Aviation Gasoline 100 Low-Lead (Avgas 100LL) which brought the total fuel on-board to 370 litres with an endurance of approximately 6.5 hours. The aircraft was parked overnight on the apron outside the hangar at FAPE in the general aviation side. The pilot could not open the doors to the hangar as they were jammed, hence, he parked outside the hangar. The next morning (5 September 2024) the pilot, accompanied by two passengers, contacted the tower via telephone to file a flight plan. Thereafter, the pilot conducted a pre-flight inspection but omitted to check the fuel levels in the fuel tanks as he was present when the aircraft was refuelled the previous day. The pilot and the passengers boarded the aircraft and took off to FAPT. The flight time was 2.7 hours. Approximately 200 litres of fuel was used for this flight. Later, the pilot and the two passengers embarked on a return flight. No fuel was uplifted at FAPT, and the pilot did not plan to land at any aerodrome on their return leg to FAPE. With approximately 200 litres of fuel used for the outbound flight, about 170 litres of fuel remained in the aircraft's tanks. The fuel endurance for this leg required approximately 2.0 hours or 2.2 hours with reserves.

As the aircraft entered the FAPE controlled airspace, the pilot contacted the air traffic control (ATC) and reported his position and intention to land at the aerodrome. The pilot received clearance to join the right circuit for landing Runway (RWY) 26. Approximately 6 nm north of FAPE and whilst on descent, the engine surged briefly. The pilot selected the electrical fuel pump to ON position and switched the fuel tank selector to the right

tank; the engine recovered but stopped a few minutes later. The pilot immediately contacted the ATC to advise them that he had lost engine power due to fuel-related challenges. He then scanned the area for a suitable place to perform a forced landing. He noticed that there was heavy traffic on the National Road (N2) and the Regional Road (R75) at the time and, therefore, opted to perform a forced landing on a public road in Algoa Park residential area. He communicated his intentions to the ATC and opted to perform a wheels-up landing due to space constraints. The identified area had uneven terrain and street light poles.

During approach, the pilot pitched the aircraft's nose down due to space limitation. The aircraft initially impacted the grass-covered ground on the left side of the road; it then skidded on its belly for approximately 115 metres (m). It struck a tree with its left wing (middle part of the leading edge) about 29m after touchdown and struck a second tree 15m further down the road with its left-wing tip which caused the aircraft to rotate 90° to the left. It skidded over a speed hump and impacted a steel streetlight pole approximately 40m after the second tree, which severed the empennage. The streetlight was damaged (see Figure 4). The aircraft ground-looped 180° to the right and came to rest 15m from the street pole. The pilot and the passengers disembarked from the aircraft unassisted; they were not injured.

The accident occurred during daylight at Global Positioning System (GPS) coordinates determined to be 33°53' 28.4" South, 025°33' 30.7" East, at an elevation of 100 feet (ft).

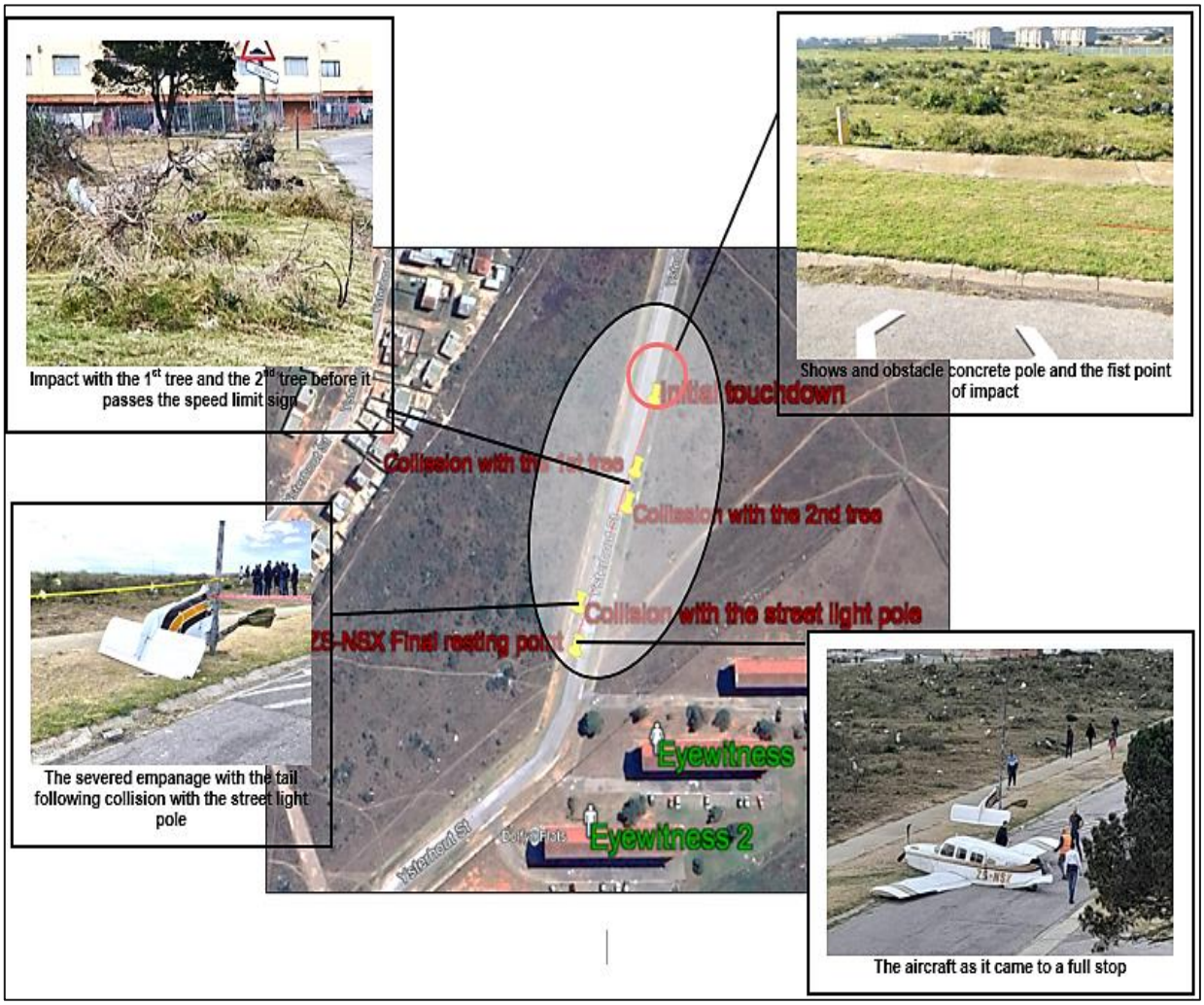

Figure 1: The accident site with plotted sequence of events.

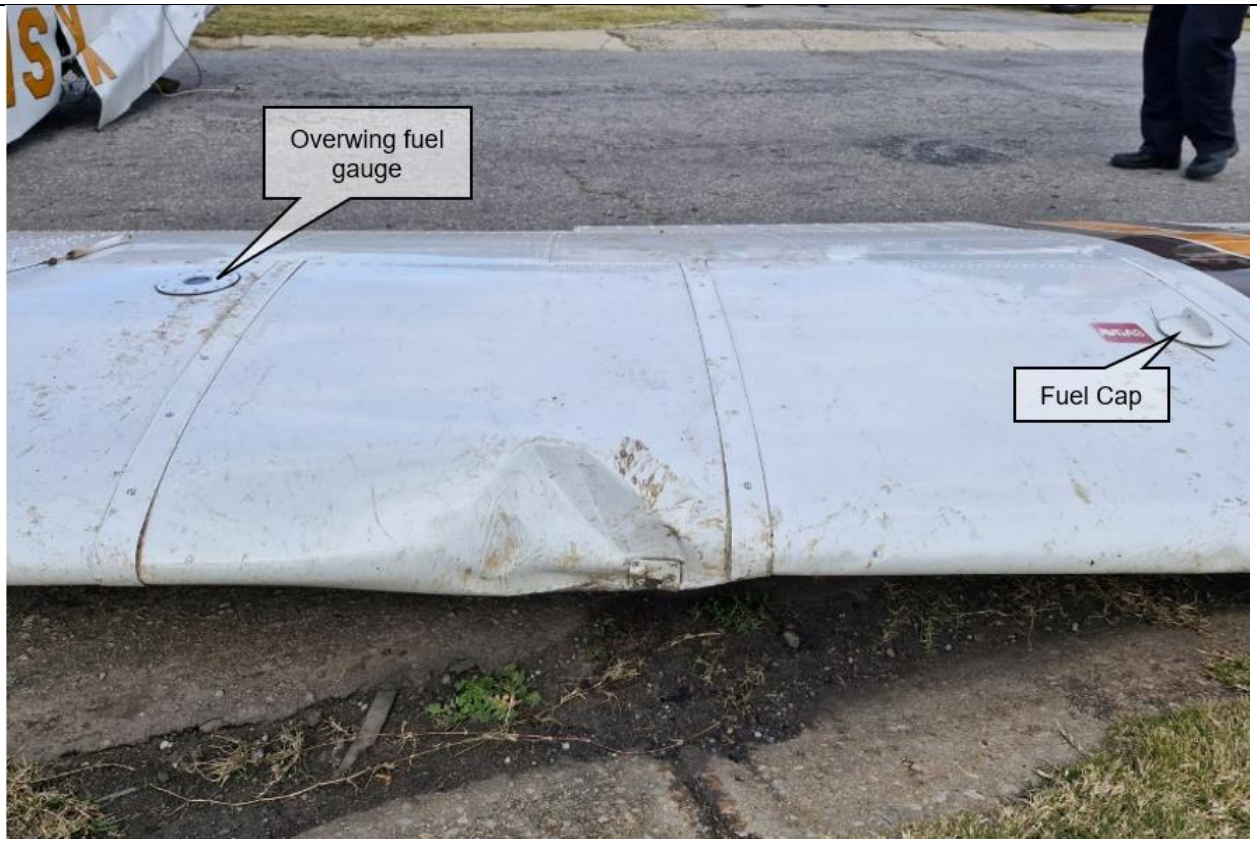

Figure 2: Damage from the initial impact with the first tree.

Figure 3: The damaged wing tip after the second impact with the tree.

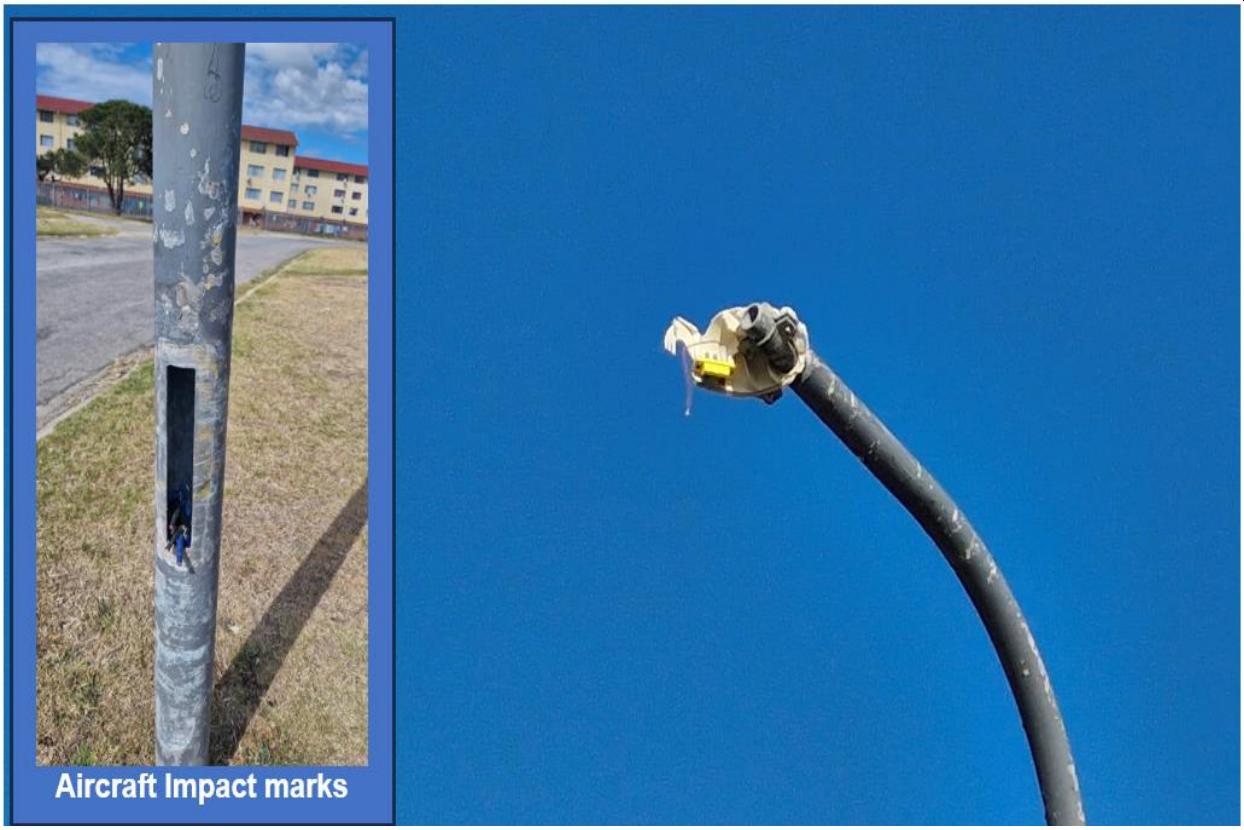

Figure 4: The damaged streetlamp.

Post Accident Inspection:

After the accident, the aircraft maintenance engineer (AME) inspected the aircraft on site. The inspection revealed that both fuel tanks were empty (see Figure 5). No fuel spillage was observed at the accident site.

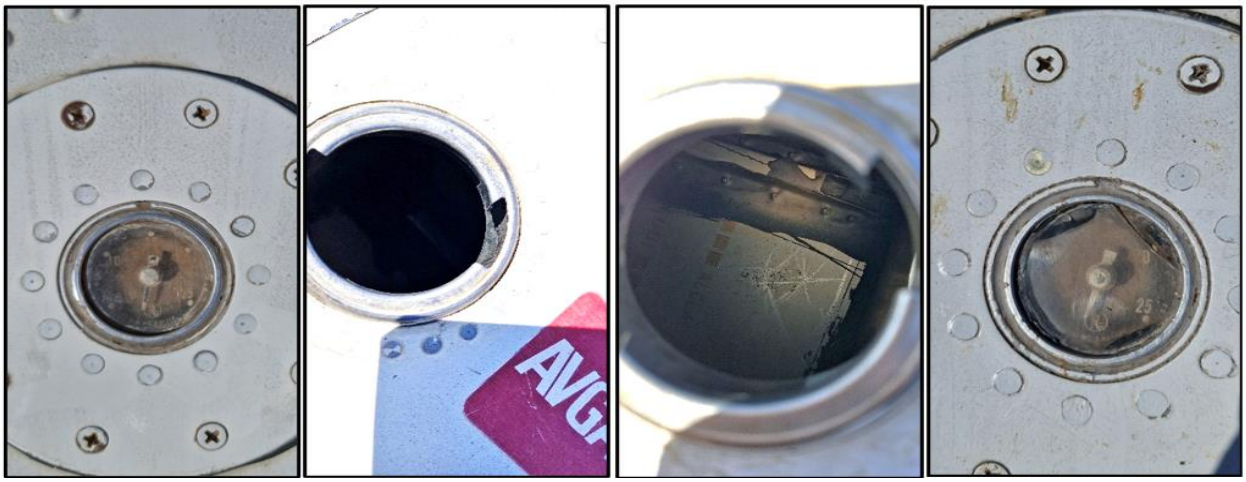

Figure 5: The left and right fuel tanks were empty, and the gauges indicated zero.

The pilot stated that he was suspicious of fuel theft in the aerodrome as he had parked the aircraft outside the hangar. The aircraft was refuelled to capacity with an endurance of approximately 6.5 hours. A closed-circuit television (CCTV) camera that was positioned on the opposite hangar from where the aircraft was parked had stopped recording about 30 minutes before ZS-NSX was parked. Therefore, no CCTV camera footage was available to confirm the pilot's suspicion that fuel was stolen from the aircraft overnight. A fuel slip record obtained from the pilot confirmed fuel upliftment of 237 litres of Avgas100LL from the fuel station in FAPE.

Flight Operations Requirements *(Source: CAR 2011)*

Fuel and oil requirements
91.07.12 *(1) A pilot-in-command of an aircraft shall not commence a flight unless he or she is satisfied that the aircraft is carrying sufficient amount of usable fuel and sufficient oil to complete the planned flight safely and to allow for deviations from the planned operation.*
(2) The pilot-in-command shall ensure that the amount of useable fuel to be carried shall, as a minimum, be based on—

(a) the following data—
(i) current aircraft-specific data derived from a fuel consumption monitoring system, if available; or
(ii) if current aircraft-specific data is not available, data provided by the aeroplane manufacturer;

(3) The pre-flight calculation of usable fuel required shall include
(a) Taxi fuel, which shall be the amount of fuel expected to be consumed before take-off; taking into account local conditions at the departure aerodrome and auxiliary power unit (APU) fuel consumption;
(b) Trip fuel, Which shall be the amount of fuel required to enable the aeroplane to fly from take-off or the point of in-flight re-planning until landing at the destination aerodrome taking into account the operating conditions of paragraph (b) of sub-regulation 91.07.12 (2);
(c) Contingency fuel, which shall be the amount of fuel required to compensate for unforeseen factors. It shall be 5 per cent of the planned trip fuel or of the fuel required from the point of in-flight re-planning based on the consumption rate used to plan the trip fuel but, in any case, shall, in the case of aeroplanes, shall not be lower than the amount required to fly for 5 minutes at holding speed at 1 500 ft above the destination aerodrome in standard conditions;
Note: Unforeseen factors are those factors that could have an influence on the fuel consumption to the destination aerodrome, such as deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions, and extended delays.

(d) Destination alternate fuel, which shall be:
(i) Where a destination alternate aerodrome is required, the amount of fuel required to enable the aeroplane to:
(aa) perform a missed approach at the destination aerodrome;
(bb) climb to the expected cruising altitude;
(cc) fly the expected routing;
(dd) descend to the point where the expected approach is initiated; and
(ee) conduct the approach and landing at the destination alternate aerodrome; or

Meteorological Information

The following meteorological weather report (METAR) was issued by the South African Weather Service (SAWS) for FAPE on 5 September 2024 at 1400Z.

051400Z 24018G28KT CAVOK 16/10 Q1020 NOSIG=

Wind Direction	240º	Wind Speed	18 gusting 28 knots	Visibility	9999 m
Temperature	16ºC	Cloud Cover	CAVOK	Cloud Base	Nil
Dew Point	10ºC	QNH	1020hPa		

The Aircraft and System Description (Sources: Pilot's Operating Handbook)

The Piper PA-32RT-300T is a single-engine, low-wing retractable landing gear, all-metal airplane featuring the tail surfaces in a "T" configuration. It has seating for up to seven occupants and two separate one-hundred-pound luggage compartments. The airframe is constructed with the exception of a steel engine mount, the landing gear, miscellaneous steel parts, the cowling, and the lightweight plastic extremities (tips of wings, tail fin, and stabilator), the basic airframe is of aluminum alloy. Aerobatics are prohibited in this airplane since the structure is not designed for aerobatic loads.

The Lycoming TIO-540-S1AD engine installed in the PA-32RT-300T is rated at 300 horsepower at 2700rpm. This engine has a compression ratio of 8.7 to 1 and requires 100/130 minimum octane fuel. The engine is equipped with a geared starter, a 60-ampere alternator, dual magnetos, a vacuum pump drive, a diaphragm-type fuel pump, and fuel injection. The average fuel consumption is at approximately 19 U.S. gallons (72 litres) per hour. A constant-speed propeller is a Hartzell HC-E2YR-1BF propeller with a diameter of 80 inches. The propeller is controlled by a governor mounted at the left forward side crankcase. The governor is operated by cable from the power control quadrant.

Fuel System

The fuel system consists of two interconnected aluminum tanks in each wing, having a combined capacity of 49 U.S. gallons for a total capacity of 98 U.S. gallons (370 liters) with only 94 U.S. gallons (355.8 liters) of the total fuel usable. These tanks form an integral part of the wing surface when installed. Fuel flow is indicated on the gauge located in the instrument panel. A fuel quantity gauge for each wing system is also located in the instrument panel and indicates the amount of fuel remaining as transmitted by the electric fuel quantity sending units located in the wing tanks. An exterior sight gauge is installed in the inboard tank of each wing so fuel quantities can be checked on the ground during the preflight of the airplane.

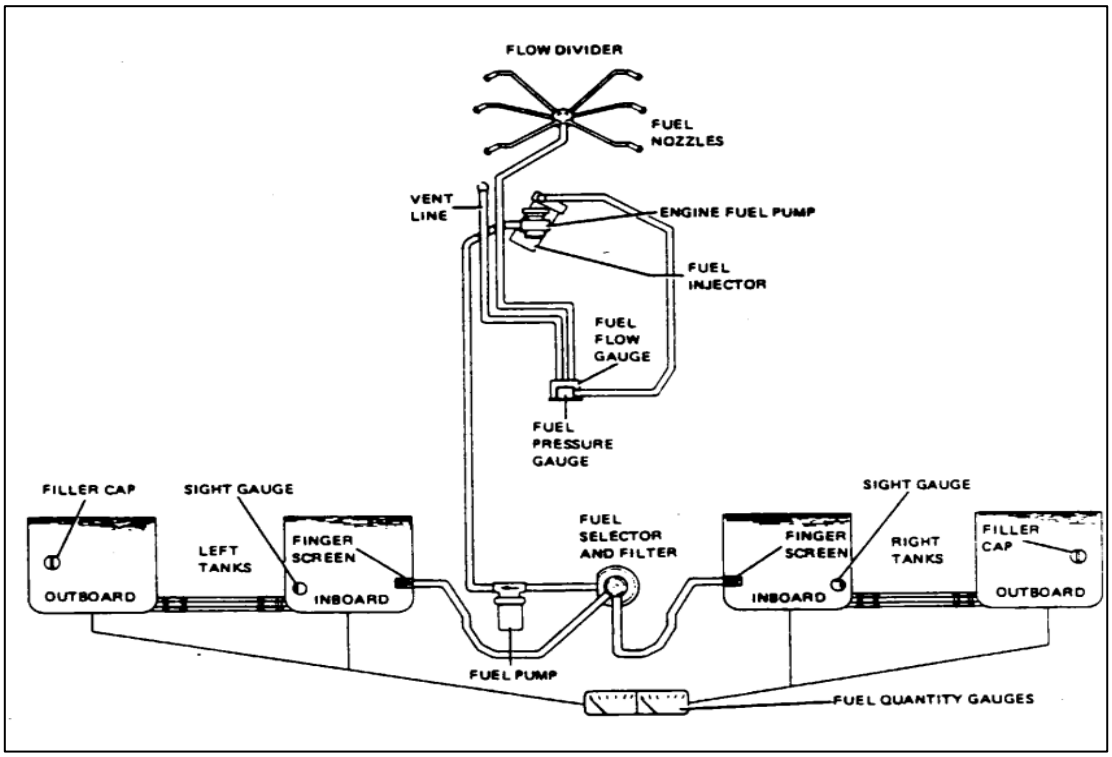

Illustration 1: Schematic diagram of the aircraft fuel system.

Fuel is drawn through a finger screen located in the inboard fuel tank and routed to a three-position fuel selector valve and filter unit which is located aft of the main spar. The valve has "OFF" and "LEFT" and "RIGHT" positions which are remotely selected using a torque tube operated by a handle located in the pedestal. The handle has a spring-loaded detent to prevent accidental selection to the "OFF" position. From the selector

valve, the fuel goes to the electric fuel pump, which is also mounted aft of the main spar, and then goes forward to the engine-driven fuel pump which forces the fuel through the injector unit into the engine.

Fuel Calculations (Source: Aircraft Folio Records)

Date	Fuel Uplift (lt)	Hours Flown (hr.)	Capacity (lt)	Fuel Consumption (L).
3/9/ 2021	320	0.5hrs		36 L
7/9 /2021	150	1.5	370	108 L
13/6/2022	200	2.5	370	180 L
25/8/2022	160	3.0	370	216 L
8/5/2024	260	5.0	370	360 L
28/5/2024	280	3.5	370	252 L
6/8/2024	200	3.7	370	266.4 L
8/8/2024	50	2.6	370	187 L
4/9/ 2024	237	4.7	370	338 L

Engine Performance (Source: Lycoming Operator's Manual for O-540, IO-540 Series**)**

According to the engine manufacturer's manual, all O-540 models have a fuel requirement of 100/100LL Octane (AVGAS), Minimum with a 55-psi maximum fuel pump inlet and the fuel injector in the idle cut-off. The average fuel consumption of the engine type is approximately 19 US gallons per hour (72 litres/hour).

The information in the table above indicates that on 8 May 2024, a 5-hour flight was flown with a fuel consumption of 360 litres. At full capacity, the aircraft had usable fuel of 355.8 litres. The standard average fuel consumption is 72 litres per hour. Therefore, the fuel calculations above reveal that the aircraft was flown for 4.9 hours.

On the day of the accident flight, the outbound flight lasted 2.7 hours with a fuel consumption of 200 litres. The remaining fuel for the return flight was 175 litres. According to the flight folio record, a total of 4.7 hours was flown with fuel consumption of 338 litres. The aircraft should have had 0.2 hours (12 minutes) of fuel remaining. The pilot conducted a forced landing following fuel exhaustion.

The pilot drained approximately 5 litres of fuel from the left tank into a 20-litre container; the amount of fuel remaining was less than the recommended unusable fuel of 15 litres.

Figure 6: Approximately 5 litres of fuel was drained from the left tank.

Findings

1. Personnel Information

1.1 The pilot had a Commercial Pilot Licence (CPL) that was initially issued by the Regulator (SACAA) on 30 May 1984. The latest licence renewal was on 3 August 2024 with an expiry date of 31 July 2025. The pilot had a Class 2 test pilot, instrument, and aircraft type ratings.

1.2 The pilot was issued a Class 2 aviation medical certificate on 15 August 2024 with an expiry date of 28 February 2025 with no restrictions.

1.3 The pilot conducted an inadequate pre-flight inspection by omitting to check the fuel levels on each tank before take-off. There was inadequate fuel management practice and non-adherence to the regulatory flight operation requirements of the pre-flight inspection, including the reliance on estimated fuel endurance.

1.4 The pilot may have felt rushed or under pressure to depart without verifying fuel levels as the flight was conducted early in the morning. He also uplifted fuel a day before the flight and parked the aircraft outside the hangar, subjecting it to the risk of fuel theft.

1.5 The decision to not refuel at FAPT before the return flight (2.7 hours) led to fuel exhaustion.

1.6 The pilot's reaction to the engine surge indicated a reliance on emergency protocols; however, it also highlights a potential gap in training for managing fuel-related emergencies.

2. Aircraft Information

2.1 The aircraft had a valid Certificate of Airworthiness (C of A) that was issued by the Regulator on 29 August 2024 with an expiry date of 30 September 2025.

2.2 The Certificate of Registration (C of R) was issued to the present owner on 30 August 2017.

2.3 The aircraft was issued a Certificate of Release to Service (CRS) on 7 February 2024 at 3 702.5 airframe hours with an expiry date of 6 February 2025 or at 3 802.5 hours, whichever comes first.

2.4 The last maintenance inspection of the aircraft was certified on 7 February 2024 at 3 702.5 airframe hours.

2.5 The aircraft was airworthy at the time it was dispatched for the flight. Maintenance and certifications regulatory procedures were adhered to.

3. Metrological Information

3.1 The weather conditions on the day of the flight did not contribute to the accident, however, the weather likely influenced the aircraft's performance, especially fuel consumption.

Probable Cause(s)

Fuel exhaustion caused the engine to stop in-flight, and the pilot executed an unsuccessful forced landing on a suburban road in a residential area.

Contributing Factor(s)

1. Improper flight planning.
2. Failure to adhere to Regulatory stipulations regarding fuel requirements and fuel reserves.
3. Failure to uplift fuel at FAPT.
4. Failure to adhere to standard operating procedures.

Safety Action(s)

None.

Safety Message and/or Safety Recommendation/s

None.

About this Report

The decision to conduct a limited investigation is based on factors including whether the cause is known and the evidence supporting the cause is clear, the level of safety benefit likely to be obtained from an investigation, and that will determine the scope of an investigation. For this occurrence, a limited investigation has been conducted, and the Accident and Incident Investigations Division (AIID) has relied on the information submitted by the affected person/s and organisation/s to compile this limited report. The report has been compiled using information supplied in the initial notification, as well as from follow-up desktop inquiries to bring awareness of potential safety issues to the industry in respect of this occurrence, as well as possible safety action/s that the industry might want to consider in preventing a recurrence of a similar occurrence.

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.

Purpose

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011 and ICAO Annex 13, 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.

Disclaimer

This report is issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa