AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:		CA18/2/3/10634	
Aircraft Registration	ZS-EXR	**Date of Accident**		4 February 2026		**Time of Accident**	0530Z
Type of Aircraft	Piper PA-28-140 Cherokee			**Type of Operation**		Training (Part 141)	
Pilot-in-command Licence Type	Commercial Pilot Licence (CPL)			**Age**	55	Licence Valid	Yes
Pilot-in-command Flying Experience		**Total Flying Hours**			1694.6	**Hours on Type**	154.4
Last Point of Departure	Grand Central Airport (FAGC), Midrand Gauteng Province						
Next Point of Intended Landing	Grand Central Airport (FAGC), Midrand Gauteng Province						
Damage to Aircraft	Substantial						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
On a private residential property in Austin View, Midrand, Gauteng province, at Global Positioning Co-ordinates 26°01'43.453"S 28°08'12.94"E							
Meteorological Information	Wind direction: 55°; Wind speed: 6kt; Air temperature: 18°C; Visibility: Clear						
Number of People On-board	2 + 0	**Number of People Injured**	2	**Number of People Killed**	0	**Other (On Ground)**	0

Synopsis

On Wednesday morning, 4 February 2026, a flight instructor (FI) and a student pilot (SP) on-board a Piper PA-28-140 Cherokee aircraft registered ZS-EXR were conducting a training flight from Grand Central Airport (FAGC) in Midrand, Gauteng province, with the intention to return to FAGC. The flight was conducted under visual meteorological conditions (VMC) and under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011, as amended.

According to the operator, the aircraft departed from FAGC at 0400Z to conduct a touch-and-go circuit training. The pair completed three circuits of touch-and-go exercises. However, during the fourth circuit after turning into downwind whilst flying overhead Ultimate Helipad at a height of approximately 1 000 feet (ft) above ground level (AGL), the engine stopped without warning. The FI attempted to restart the engine but was unsuccessful; she then made a MAYDAY call to FAGC tower on frequency 122.8-Megahertz (MHz) stating that the engine had stopped and that she would execute a forced landing on a field ahead of her flight path. The aircraft did not reach the identified field, and it crash-landed on a private property near Carstenhof Hospital in Austin View residential area.

The investigation determined that the aircraft likely experienced fuel starvation during the flight whilst the right fuel tank was selected. Based on fuel calculations, a small amount of usable fuel remained in the selected tank, increasing the risk of fuel interruption to the engine. Although the remaining fuel quantity in the right tank could not be verified because of impact damage, no evidence of fuel spillage was found at the accident site. Furthermore, the quantity of fuel confirmed to have been loaded into the right-wing tank was found in the left-wing tank after the accident, indicating non-availability of fuel from the selected tank during the flight.

Probable Cause

Unsuccessful forced landing after an engine stoppage in-flight caused by fuel starvation.

Contributory Factor

1. Fuel mismanagement.

SRP Date	11 August 2026	Publication Date	12 August 2026

Occurrence Details

Reference Number	**:** CA18/2/3/10634
Occurrence Category	**:** Part 141
Type of Operation	**:** Training
Name of Operator	**:** Skyhawk Aviation (Pty) Ltd
Aircraft Registration	**:** ZS-EXR
Aircraft Make and Model	**:** Piper PA-28-140 Cherokee
Nationality	**:** South African
Place	**:** On a private property in Austin View, Midrand, Gauteng Province
Date and Time	**:** 4 February 2026 at 0530Z
Injuries	**:** Serious
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) was notified of the occurrence on 4 February 2026 at 0530Z. The occurrence was classified as an accident according to the CAR 2011 Part 12 and the International Civil Aviation Organisation STD Annex 13 definitions. Notifications were sent to the State of Registry, Operator, and Design and Manufacturer in accordance with the CAR 2011 Part 12 and the ICAO Annex 13 Chapter 4. The States did not appoint an accredited representative and/or advisor. The investigator was dispatched to the accident site.

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   Accident — this investigated accident
   Aircraft — the Piper PA-28-140 Cherokee 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

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Abbreviation	Description
°	Degrees
°C	Degrees Celsius
AIID	Accident and Incident Investigations Division
AGL	Above Ground level
AMO	Approved Maintenance Organisation
ATF	Authority-to-Fly
ATO	Approved Training Organisation
AVGAS	Aviation Gasoline
CAR	Civil Aviation Regulations
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CPL	Commercial Pilot Licence
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
FAGC	Grand Central Airport
FDR	Flight Data Recorder
FI	Flight Instructor
ft	Feet
GFA	General Flying Area
GPS	Global Positioning System
hPa	Hectopascal
IMC	Instrument Meteorological Conditions
kt	Knots
m	Metres
METAR	Meteorological Aerodrome Report
MHz	Megahertz
nm	Nautical Miles
PHAK	Pilot's Handbook of Aeronautical Knowledge
POH	Pilot’s Operating Handbook
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
SP	Student Pilot
TBO	Time Between Overhaul
QNH	Altitude Above Mean Sea Level
UTC	Universal Time
VMC	Visual Meteorological Conditions
Z	Zulu (Term for Universal Co-ordinated Time - Zero Hours Greenwich)

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1. On Wednesday morning, 4 February 2026, a flight instructor (FI) and a student pilot (SP) on-board a Piper PA-28-140 Cherokee aircraft registered ZS-EXR were conducting a training flight from Grand Central Airport (FAGC) in Midrand, Gauteng province, with the intention to return to FAGC. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011, as amended.

1.1.2. The SP did not find any anomalies with the aircraft during a pre-flight inspection. The aircraft had a total of 36 US gallons (136 litres) of Aviation Gasoline 100 Low Lead (AVGAS 100LL) in the fuel tanks. After boarding the aircraft, the crew contacted the air traffic control (ATC) tower at FAGC to request permission for start-up and taxi. The permission was granted and they were informed to taxi to Runway (RWY) 35 for take-off, which was uneventful. The FI and the SP completed three touch-and-go circuits. Thereafter, they conducted the after-take-off checks during which they ensured that the brakes were off, mixture and throttle were in positions, flaps were configured up, and fuel pump was in OFF position. During the fourth circuit after turning into downwind whilst flying overhead Ultimate Helipad at a height of approximately 1 000 feet (ft) above ground level (AGL), the engine stopped without warning. At this time, the FI took over command of the aircraft and attempted to restart the engine whilst also checking the magnetos, electric fuel pump, fuel air mixture control throttle and changing the fuel tanks. However, the engine would not restart.

1.1.3. After the failed attempt to restart the engine, the FI broadcasted a MAYDAY to FAGC tower on frequency 122.8-Megahertz (MHz), indicating that the engine had stopped and that she would execute a forced landing on a field ahead of her flight path. At this stage, the aircraft was losing height rapidly and the FI instructed the SP to switch off the fuel pump, close the fuel selector valve and turned off the master switch. The FI surveyed the surrounding area for a suitable landing spot on which to conduct a forced landing. She identified a field in Austin View residential area in Midrand. However, the aircraft could not reach the identified field; it impacted a tree with its right wing before it stopped in a tail-high attitude. The crash occurred on a residential property near Carstenhof Hospital in Austin View.

1.1.4. The aircraft was substantially damaged, and the FI and SP were seriously injured. They were both airlifted to Milpark Hospital in Johannesburg, Gauteng province.

1.1.5. The accident occurred in Austin View under visual meteorological conditions (VMC) and at

Global Positioning System (GPS) co-ordinates determined to be 26°01'43.453"South 28°08'12.94"East, at an elevation of 4 943 feet (ft).

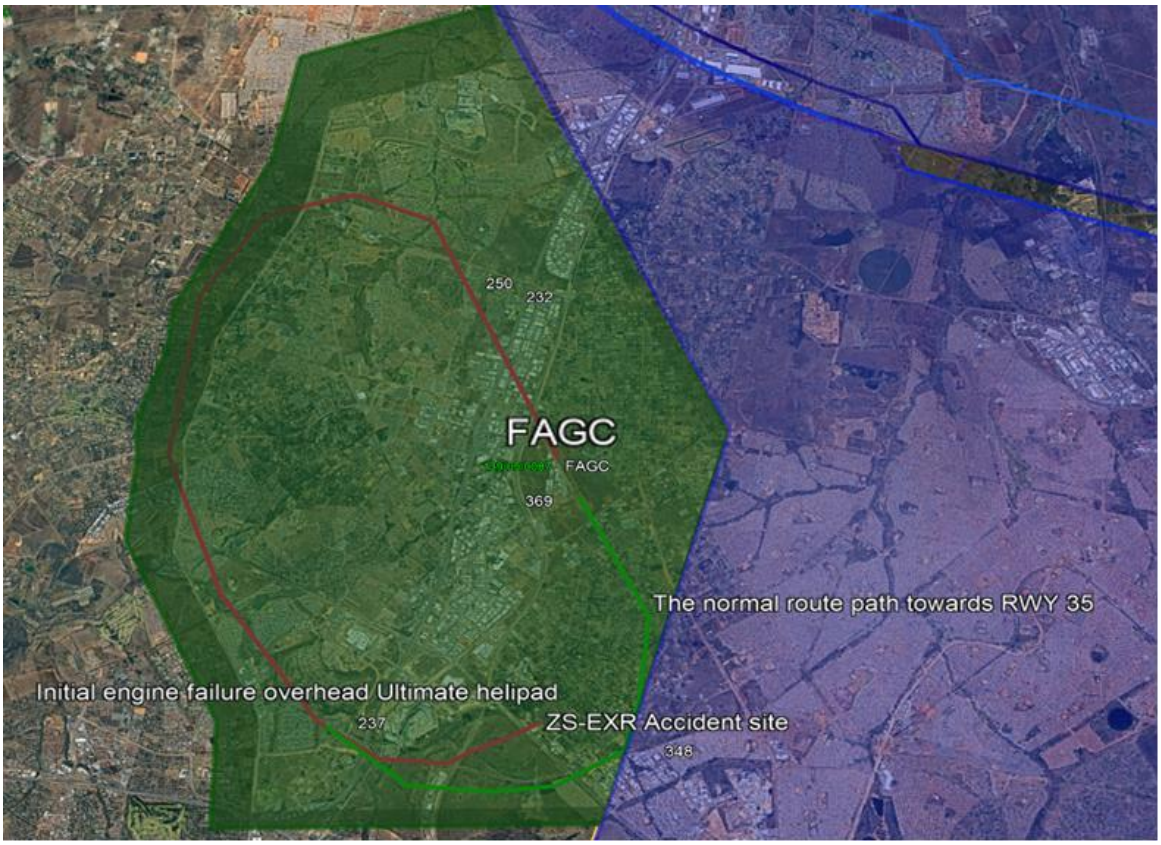

Figure 1: FAGC circuit border line in green. (Source: Google Map)

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	-	-	-	-	-
Serious	2	-	-	-	-
Minor	-	-	-	-	-
None	-	-	-	-	-
Total	**2**	**-**	**-**	**2**	**-**

Note: Other means people on the ground.

1.2.1. The occupants were both seriously injured.

1.3. Damage to Aircraft

1.3.1. The damage was substantial, including the right-side wing, engine and its mountings, landing gears and the cockpit section.

Figure 2: The ZS-EXR at the accident site after it impacted a tree.

1.4. Other Damage

1.4.1. None.

1.5. Personnel Information

Flight Instructor (FI)

Nationality	South African	Gender	Female	Age	55
Licence Type	Commercial Pilot Licence (CPL)				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instructor Grade 2A, Night rating, Instrument rating				
Medical Expiry Date	31 August 2026				
Restrictions	Correction for defective near vision				
Previous Accidents	None				

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

Flying Experience:

Total Hours	1694.6
Total Past 24 Hours	1
Total Past 7 Days	5.2
Total Past 90 Days	59.5
Total on Type Past 90 Days	18.5
Total on Type	154.4

1.5.1. The FI had a Commercial Pilot Licence (CPL) that was initially issued by the Regulator on 13 July 2021. The licence was reissued on 25 July 2025 with an expiry date of 31 July 2026. The FI's Class 1 aviation medical certificate was issued on 18 August 2025 with an expiry date of 31 August 2026 and with a restriction to wear corrective lenses for a defective near vision.

1.5.2. The FI had a total of 1 694.6 flying hours of which 154.4 hours were acquired on the aircraft type. She also had a Grade 2A instructor rating.

Student Pilot (SP)

Nationality	Egyptian	Gender	Male	Age	25
Licence Type	Student Pilot Licence (SPL)				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	19 June 2030				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	30.6
Total Past 24 Hours	1
Total Past 7 Days	1
Total Past 90 Days	1
Total on Type Past 90 Days	1
Total on Type	30.6

1.5.3. The SP had a Student Pilot Licence (SPL) that was initially issued on 1 July 2025 with an expiry date of 30 June 2026. The SP's Class 2 medical certificate was issued on 19 June 2025 with an expiry date of 19 June 2030 with no restrictions.

1.5.4. The SP had a total of 30.6 hours on type. His progress briefing report reflected that he had a good understanding of flight principles.

1.6. Aircraft Information

1.6.1. Piper PA-28-140 (Source: Pilot's Operating Handbook [POH])

The Piper PA-28 Cherokee is a family of light aircraft built by Piper Aircraft and designed for flight training, air taxi and personal use. The PA-28 family of aircraft has all-metal,

unpressurised, single-engine, piston-powered with low-mounted wings and tricycle landing gear. They have a single door on the co-pilot side, and entry is gained by stepping on the wing.

Figure 3: The file picture of the ZS-EXR aircraft. (Source: www.surfacezero.com)

Airframe:

Manufacturer/Model	Piper Aircraft / PA-28-140	
Serial Number	28-22542	
Year of Manufacture	1967	
Total Airframe Hours (At Time of Accident)	10175.8	
Last Inspection (Date & Hours)	20 January 2026	10168.7
Airframe Hours Since Last Inspection	7.1	
CRS Issue Date	21 January 2026	
C of A (Issue Date & Expiry Date)	4 September 2025	17 October 2026
C of R (Issue Date) (Present Owner)	15 November 2024	
Operating Category	Training (Part 141)	
Type of Fuel Used	AVGAS 100LL	
Previous Accidents	None	

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

Engine:

Manufacturer/Model	Textron Lycoming/ O-320-L2A
Serial Number	L-2191-27A
Hours Since New	7425.9
Hours Since Overhaul	1471.8

Propeller:

Manufacturer/Model	Sensenich Propellers/ 74DM6-0-60
Serial Number	A58970
Hours Since New	3721.8
Hours Since Overhaul	1774.9

1.6.2. The last annual inspection of the aircraft was conducted and certified on 20 January 2026 at 10 168.7 airframe hours after which a Certificate of Release to Service (CRS) was issued with an expiry date of 20 January 2027 or at 10 286.7 hours, whichever comes first.

1.6.3. The aircraft had a valid Certificate of Airworthiness (C of A) that was initially issued by the Regulator (SACAA) on 17 October 2017. The C of A was renewed on 4 September 2025 with an expiry date of 17 October 2026. The aircraft was airworthy when it was dispatched for the flight.

1.6.4. The Certificate of Registration (C of R) was issued to the present owner on 15 November 2024.

1.6.5. Fuel System (Source: PA-28-140 POH)

Fuel is stored in two 25-gallon tanks, which are secured to the leading-edge structure of each wing by screws and a nut plate to allow easy removal for service or inspection.

The fuel selector control is located on the left-side panel, forward of the pilot's seat. The button on the selector cover must be depressed and held while the handle is moved to the OFF position. The button releases automatically when the handle is moved back to the ON position.

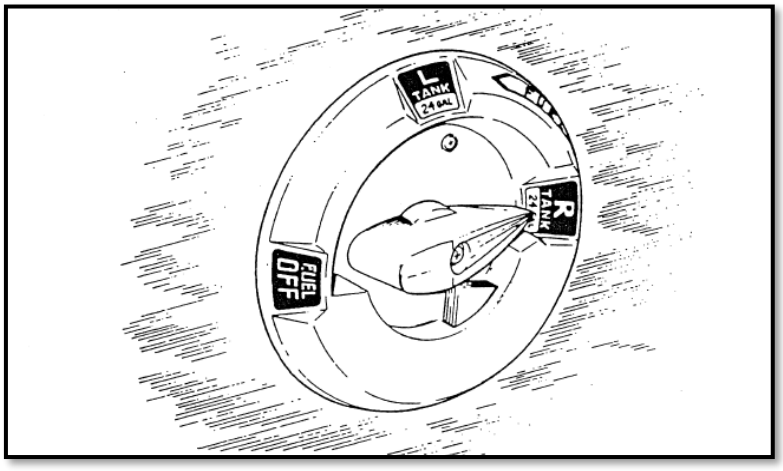

Illustration 1: A fuel selector.

To obtain the standard fuel quantity of 36 gallons, fill the tanks to the bottom of the filler neck indicator. To obtain the standard plus the reserve quantity, a total of 50 U.S gallons, fill the tanks to the top of the filler neck.

An auxiliary electrical fuel pump is provided for use in case of failure of the engine-driven pump. The electric pump should be on for all take-offs and landings and when switching tanks.

The fuel strainer is equipped with a quick drain and is located on the front lower left corner of the firewall. This strainer should be drained during pre-flight to check for water or sediments and proper fuel (a special bottle is furnished for this operation). To drain the lines from the tank, the tank selector valve must be switched to each fuel tank in turns with the electric pump ON, and the gascolator drain valve opened. Each tank has an individual quick drain located at the bottom inboard rear corner.

Fuel quantity and pressure are indicated on gauges located in the engine gauge cluster on the left side of the instrument panel.

The engine priming system is installed to facilitate starting. The primer pump is located on the immediate left of the throttle quadrant.

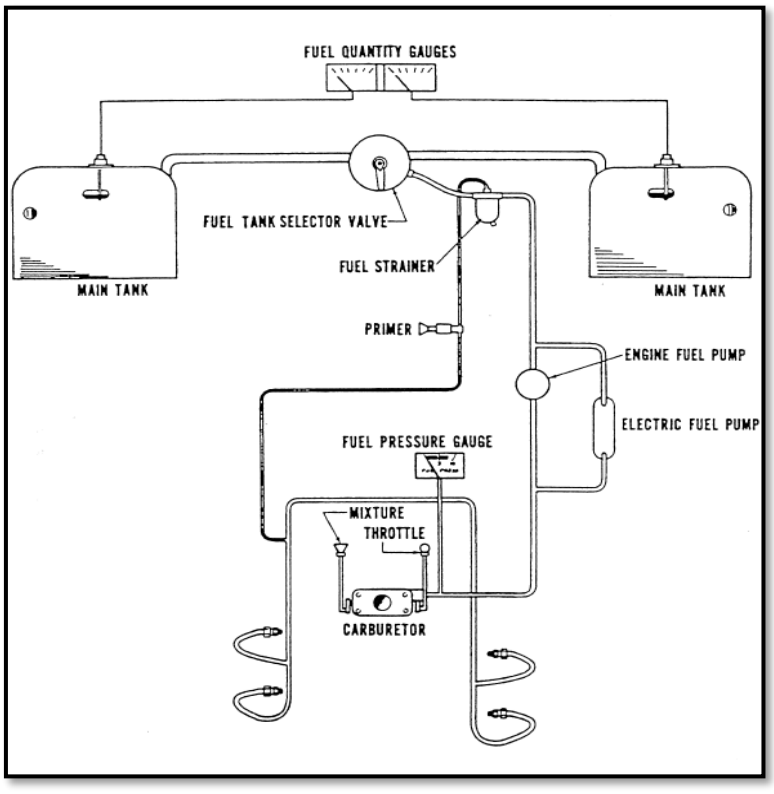

Diagram 1: Fuel system schematic.

Fuel Consumption, 75% power (gal per hr)	8.4
Fuel Consumption, 50% power (gal per hr)	5.6
Stalling Speed, flaps down (mph)	55
Landing Roll, flaps down (ft)	535

Fuel consumption data. (Source: PA-28 POH)

1.6.6. The on-site investigation found fuel in the fuel filter. No other defects were found that could relate to fuel transfer in the fuel system.

1.6.7. According to the on-site investigation, approximately 18 US gallons of fuel was drained from the left-wing tank. The right-wing fuel tank was damaged during the accident sequence, and there was neither a sign of fuel leakage nor extensive fuel smell at the accident site; there was also no fuel spillage on the right-side wing. According to the crew, they had 36 US gallons of fuel on-board which meant that they had a total of 18 US gallons in each wing tank. The aircraft had a total of 2 gallons unusable fuel (1 gallon per tank). According to the aircraft's fuel consumption specifications, fuel consumption is 8.4 gallons per hour. The crew flew for a duration of 1.5 hours, which equated to an approximate usage of 12.6 gallons. Therefore, 5.4 gallons of fuel remained in the right tank, including the 1 gallon of unusable fuel. The engine stopped after a turn to the left onto downwind leg during a circuit flight after a touch-and-go landing. The remaining amount of fuel was too little, and this created a significant imbalance during the flight.

1.7. Meteorological Information

1.7.1. The weather information below was obtained from the Meteorological Aerodrome Report (METAR) that was issued by the South African Weather Service (SAWS), recorded at FAGC on 4 February 2026 at 0500Z.

METAR FAGC 040500Z 05506KT CAVOK 18/15 Q1025=

Wind Direction	55°	Wind Speed	6kt	Visibility	CAVOK
Temperature	18°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	15°C	QNH	1025hPa		

1.7.2. According to the icing probability chart, the given weather conditions were conducive for the formation of carburettor icing.

Temp – Dew Pt = Dew Pt Depression

18°C -15°C = 3°C

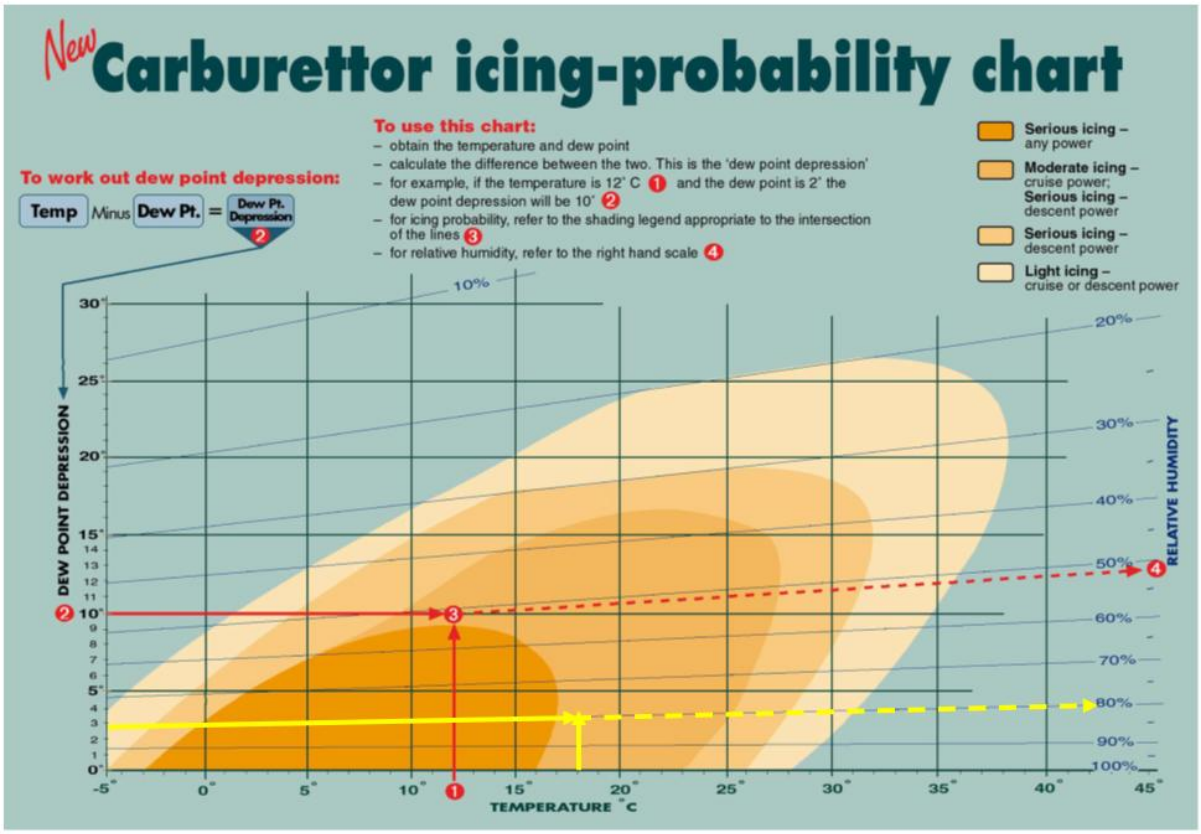

Figure 4: Carburettor icing probability chart calculations.

The weather conditions at the time of flight were conducive to an ice probability formation, indicated by the plotted yellow lines (Figure 4). The above icing probability chart indicates a relative 80% humidity, which is highly significant to cause serious icing during descending power settings in the carburettor.

1.8. Aids to Navigation

1.8.1. The aircraft was equipped with standard navigational equipment as approved by the Regulator. There were no records indicating that the navigational equipment was unserviceable prior to the flight.

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 flight.

1.10. Aerodrome Information

1.10.1. The accident did not occur near an aerodrome but on a private property in Midrand, Gauteng province.

1.11. Flight Recorders

1.11.1. The aircraft was neither 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 aircraft lost height above a residential property in Austin View and crashed near a field behind Carstenhof Hospital. The property had tall trees.

Figure 5: Overview of the accident site. (Source: Google Earth)

1.12.2. After the engine failed during the downwind leg, the FI opted to conduct a forced landing on an open field. However, the aircraft, which was descending, was unable to clear the residential property next to the field and it clipped the treetops in its path. This was evidenced by a trail of broken branches along its projected flight path as it continued in a downward trajectory.

Figure 6: Trail of tree branches clipped by the aircraft.

Figure 7: The aircraft in its final resting position after crash landing.

1.12.3. The aircraft impacted a larger tree close to the boundary fence. The point of impact was relatively low, indicating a significant loss of altitude at that stage. The aircraft's nose was also slightly pitched downward, consistent with a descending profile under reduced power.

Figure 8: Damage to the engine compartment, engine mountings and the right wing.

The aircraft struck the tree on the right side of the engine cowling, scraping against it until the right-wing leading edge made a more forceful impact. This impact caused the right wing to deform and separate from the airframe, with parts of it remaining wrapped around the tree. Marks on the right side of the engine cowling showed areas of shrivelled skin, consistent with frictional contact against the tree during the crash. In contrast, the left wing remained largely intact. Furthermore, the right-wing fuel tank was damaged with no evidence of fuel spillage or smell at the accident site. The left fuel tank still contained approximately 70 gallons of fuel.

After the impact, most of the wreckage was found concentrated near the main fuselage; the aircraft came to rest in a tail-high position. The engine compartment was heavily damaged, leading to the failure of the engine mountings. The engine compartment cowlings were removed by the first responders during the rescue operation. Despite this, both the engine and the propeller remained largely intact. The condition of the propeller indicated that it was not rotating at the time of impact; the blunt damage was consistent with contact against the tree or the ground during the crash (Figure 8).

Figure 9: The wreckage.

The fuel selector valve was found stuck in OFF position. This was consistent with the SP's statement that it was switched off during descent in preparation for the forced landing.

Figure 10: The fuel selector valve in OFF position (left).

Figure 11: Fuel selector valve positions, taken from a different aircraft of a similar type (right).

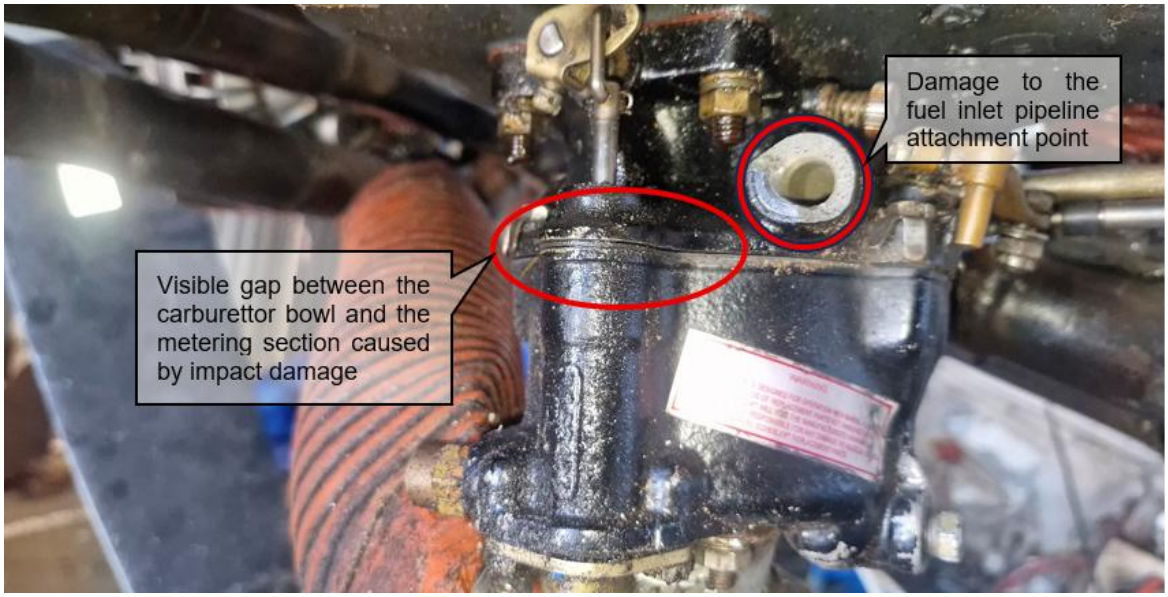

Figure 12: The damage to the carburettor's left side and the fuel inlet attachment points.

1.12.4. The carburettor exhibited impact damage. The fuel inlet pipeline attachment point was damaged and severed with further damage to the bottom attachment of the carburettor bowl and the metering section, resulting in a gap that could possibly leak fuel contained in the bowl. There was no fuel found in the engine carburettor fuel bowl (see Figure 12).

Figure 13: Cockpit instrument panel and the damaged control column.

1.12.5. The first responders reported that although the engine cowlings were already damaged, they were removed during efforts to rescue the occupants. The right-side door was jammed and had to be taken off to gain access and extract the FI. The cockpit area was disturbed during the rescue of the SP. Whilst the instrument panel appeared largely intact, the left-side control yoke had to be cut because it trapped the SP after impact. Airport Rescue and Firefighting

(ARFF) personnel at FAGC confirmed that removing the yoke was necessary to free the SP from the left seat.

Figure 14: The aircraft seats after impact.

1.12.6. Both seats showed signs of deformation, consistent with the forces experienced during impact. The left-side wall of the cockpit had already sustained damage in the crash, but it was further torn and pushed downward during the rescue operation, resulting in additional damage.

1.13. Medical and Pathological Information

1.13.1. The FI and the SI were seriously injured; they were airlifted to Milpark Hospital.

1.14. Fire

1.14.1. There was no fire after impact.

1.15. Survival Aspects

1.15.1. The accident was survivable as the occupants had their seat belts on during the crash.

1.16. Tests and Research

1.16.1. No test and research was conducted during this investigation. The engine could turn freely, and fuel was found in the left tank, but no fuel was in the right tank.

1.17. Organisational and Management Information

1.17.1. This was a training flight operated under the provisions of Part 141 of the CAR 2011, as amended.

1.17.2. The training school had a valid Approved Training Organisation (ATO) Certificate that was issued by the Regulator on 19 March 2025 with an expiry date of 31 March 2030.

1.17.3. The aircraft maintenance organisation (AMO) which conducted the last maintenance of the aircraft had an AMO Certificate that was issued by the Regulator on 23 July 2025 with an expiry date of 31 July 2027.

1.18. Additional Information

1.18.1. Engine Power Loss In-flight (Source: PA-28-POH)

Complete engine power loss is usually caused by fuel flow interruption, and power will be restored shortly after fuel flow is restored. If power loss occurs at low altitude, the first step is to prepare for an emergency landing (see POWER OFF LANDING). Maintain an airspeed of at least 80 MPH IAS, and if altitude permits, proceed as follows:

1. *Fuel Selector - Switch to another tank containing fuel.*
2. *Electric Fuel pump - On*
3. *Mixture-Rich*
4. *Carburettor heat - On*
5. *Engine gauges - Check for indication of the cause of power loss.*
6. *Primer- Check locked*
7. *If no fuel pressure is indicated, check tank selector position to be sure it is on a tank containing fuel.*

   When Power is restored
8. *Carburettor heat - Off*
9. *Electric Fuel Pump - Off*

   If the above steps do not restore power, prepare for an emergency landing.

If time permits:

1. *Ignition Switch - "L" then "R" then back to" BOTH".*
2. *Throttle and Mixture - Different settings. (This may restore power if the problem is too rich or lean a mixture, or if there is partial fuel system restriction)*
3. *Try other fuel tanks. (Water in the fuel could take some time to be used up, and allowing the engine to windmill may restore power. If power loss is due to water, fuel pressure indications will be normal.)*

Note

If engine failure was caused by fuel exhaustion, power will not be restored after tanks are switched until empty fuel lines are filled, which may require up to ten seconds. If power is not restored, proceed with POWER OFF LANDING PROCEDURE

Engine Failure After Take-Off (Single-Engine) (Source: FAA-H-8083-3A Airplane Flying Handbook)

The altitude available is, in many ways, the controlling factor in the successful accomplishment of an emergency landing. If an actual engine failure should occur immediately after take-off and before a safe manoeuvring altitude is attained, it is usually inadvisable to attempt to turn back to the field from where the take-off was made. Instead, it is safer to immediately establish the proper glide attitude and select a field directly ahead or slightly to either side of the take-off path. The decision to continue straight ahead is often difficult to make unless the problems involved in attempting to turn back are seriously considered. In the first place, the take-off was in all probability made into the wind. To get back to the take-off field, a downwind turn must be made. This increases the groundspeed and rushes the pilot even more in the performance of procedures and in planning the landing approach. Secondly, the airplane will be losing considerable altitude during the turn and might still be in a bank when the ground is contacted, resulting in the airplane cartwheeling (which would be a catastrophe for the occupants, as well as the airplane). After turning downwind, the apparent increase in groundspeed could mislead the pilot into attempting to prematurely slow down the airplane and cause it to stall. On the other hand, continuing straight ahead or making a slight turn allows the pilot more time to establish a safe landing attitude, and the landing can be made as slowly as possible, but more importantly, the airplane can be landed while under control.

Concerning the subject of turning back to the runway following an engine failure on take-off, the pilot should determine the minimum altitude an attempt of such a manoeuvre should be made in a particular airplane. Experimentation at a safe altitude should give the pilot an approximation of height lost in a descending 180° turn at idle power. By adding a safety factor of about 25 percent, the pilot should arrive at a practical decision height. The ability to make

a 180° turn does not necessarily mean that the departure runway can be reached in a power-off glide; this depends on the wind, the distance travelled during the climb, the height reached, and the glide distance of the airplane without power. The pilot should also remember that a turn back to the departure runway may in fact require more than a 180° change in direction. Consider the following example of an airplane which has taken off and climbed to an altitude of 300 feet AGL when the engine fails. After a typical 4-second reaction time, the pilot elects to turn back to the runway. Using a standard rate (3° change in direction per second) turn, it will take 1 minute to turn 180°. At a glide speed of 65 knots, the radius of the turn is 2,100 feet, so at the completion of the turn, the airplane will be 4,200 feet to one side of the runway. The pilot must turn another 45° to head the airplane toward the runway. By this time the total change in direction is 225° equating to 75 seconds plus the 4 second reaction time. If the airplane in a power off glide descends at approximately 1,000 f.p.m., it will have descended 1,316, feet placing it 1,016 feet below the runway.

1.19. Useful or Effective Investigation Techniques

1.19.1. None.

2. ANALYSIS

2.1. General

From the available evidence, the following analysis was made with respect to this accident. This shall not be read as apportioning blame or liability to any organisation or individual.

2.2. Analysis

Crew

2.2.1. The crew was licensed, medically fit and qualified for the flight. The flight instructor (FI) had sufficient experience as a Grade 2 instructor, and the aircraft type was endorsed in her licence. The student pilot's (SP's) progress report reflected a good understanding of flight principles.

Aircraft

2.2.2. The aircraft was airworthy, properly maintained and operated in accordance with the applicable regulatory requirements at the time of the flight. There were no recorded defects

in the maintenance record relating to any of the aircraft's systems or components. There was sufficient fuel on-board the aircraft at the time of the flight.

2.2.3. The aircraft departed with a total fuel quantity of 36 US gallons, with each wing tank containing 18 US gallons. After approximately 1.5 hours of flight time, 18 US gallons were recovered from the left tank. This indicates that no fuel was used from the left tank during the flight. Based on the aircraft fuel consumption rate of 8.4 US gallons per hour, it would have used about 12.6 US gallons during the flight. If the aircraft was flown predominantly using the right fuel tank, about 5.4 US gallons, including unusable fuel, would have remained in the tank at the time of the accident.

2.2.4. This reduced fuel quantity in the selected tank increased the likelihood of fuel moving away from the fuel pick-up point during manoeuvring. The risk was greater during the left turn onto the downwind leg, which is when the crew reported a sudden engine stopped.

2.2.5. No fuel was found in the carburettor bowl, which supports a disruption in the fuel supply to the engine. Although the exact quantity of fuel in the damaged right tank could not be confirmed, there was insufficient evidence of fuel spillage at the accident site. The available evidence indicated that the aircraft was likely operated predominantly using the right tank.

2.2.6. It is, therefore, probable that during the turn on to downwind, fuel in the right tank was either insufficient or not available at the pick-up point. This likely resulted in fuel starvation and the subsequent engine stoppage. The continued use of the right tank whilst the left tank still contained a substantial amount of fuel also introduced a lateral fuel imbalance during the flight.

2.2.7. The meteorological conditions at the time of the flight, including a relative humidity of approximately 80%, were favourable for carburettor icing. The probability charts indicated that serious icing was possible, particularly with reduced-power operation during descent. Carburettor icing was unlikely to have existed during the phase of the flight as the aircraft had just turn onto downwind following take-off. This is, therefore, a possible unproven factor whilst the available evidence strongly supports fuel starvation as the cause of engine stoppage.

2.2.8. When the engine stopped at about 1 000ft above ground level (AGL), the crew had little time to assess the problem, attempt a restart and choose a landing area. At that height, their priority had to be keeping the aircraft under control, maintaining airspeed and committing to a forced landing. A field to the left of the flight path appeared to offer the best option as the area ahead was uneven and unsuitable. However, the turn towards the field reduced the remaining glide distance, and the aircraft lost height too quickly to reach it. The aircraft came down short and struck a tree on the residential property.

2.2.9. The Piper PA-28-140 Flight Manual and the Airplane Flying Handbook state that after a low-altitude engine failure, the crew's priority is to maintain glide speed, keep the aircraft under control and prepare to land as close as possible to the flight path ahead whilst avoiding obstacles. It also warns that trying to turn back to the departure airfield at low level can increase the risk of losing control. In this case, the crew's decision to turn left towards an open area likely resulted in a rapid loss of height, preventing the aircraft from clearing the residential area to the intended forced landing site.

3. CONCLUSION

3.1. General

From the available evidence, the following findings, causes and contributing factors 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 conclusion 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.
- **Causes —** are actions, omissions, events, conditions, or a combination thereof, which led to this accident.
- **Contributing factors —** are actions, omissions, events, conditions or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident occurring, or would have mitigated the severity of the consequences of the accident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil, or criminal liability.

3.2. Findings

3.2.1. The crew was licensed, medically fit and qualified to conduct the flight. The flight instructor (FI) had sufficient experience as a Grade 2 instructor and the aircraft type was endorsed in her licence.

3.2.2. The student pilot's (SP's) progress report reflected a good understanding of flight principles.

3.2.3. The aircraft was airworthy, properly maintained and operated in accordance with the applicable regulatory requirements at the time of the flight. There were no recorded defects in the maintenance record relating to any of the aircraft systems or components.

3.2.4. There was sufficient fuel on-board the aircraft in the left tank, although the right-wing fuel tank showed evidence of no fuel.

3.2.5. The aircraft experienced a sudden engine stoppage during a downwind turn before the crew could conduct the after-take-off checks due to fuel starvation, which resulted from low-level fuel available in the selected tank.

3.2.6. The aircraft was likely operated mainly using the right fuel tank. After 1.5 hours, the remaining usable fuel in the selected tank was low and may have migrated from the fuel pick-up during circuit manoeuvring, causing a fuel supply interruption that led to fuel starvation. It is also probable that more fuel would have been consumed due to take-off and landing circuits.

3.2.7. Meteorological conditions at the time of the flight included a relative humidity of approximately 80% which was conducive to carburettor icing during prolonged operation at reduced power settings. However, as the engine was not operating under such conditions at the time, evidence indicate that the sudden loss of engine power was more likely due to fuel supply interruption.

3.2.8. After the engine stoppage at low height, the crew had little time to respond to engine fault finding; maintaining control of the aircraft and selecting a field to conduct a forced landing was the priority. However, the turn towards the field reduced the aircraft's glide range and the aircraft descended short of the intended landing area.

3.3. Probable Cause/s

3.3.1. Unsuccessful forced landing after an engine stoppage in-flight which was caused by fuel starvation.

3.4. Contributory Factor/s

3.4.1. Fuel mismanagement.

4. SAFETY RECOMMENDATIONS

4.1. General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report. The AIID expects that all safety issues identified by the investigation are addressed by the receiving States and organisations.

4.2. Safety Recommendation/s

4.2.1. None.

5. APPENDICES

5.1. None.

This report is issued by:

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