SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Section/division **Accident and Incident Investigations Division** Form Number: CA 12-12a

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:		CA18/2/3/10167	
Aircraft Registration	ZS-WAP	**Date of Accident**		1 June 2022		**Time of Accident**	0935Z
Type of Aircraft	Piper PA-28R-200 Cherokee Arrow II			**Type of Operation**		Training (Part 141)	
Pilot-in-command Licence Type	Commercial Pilot Licence (CPL)			**Age**	25	**Licence Valid**	Yes
Pilot-in-command Flying Experience		**Total Flying Hours**		1486.3		**Hours on Type**	494
Last Point of Departure	Cape Town International Airport (FACT), Western Cape Province						
Next Point of Intended Landing	Stellenbosch Airport (FASH), Western Cape Province						
Damage to Aircraft	Destroyed						

Location of the accident site with reference to easily defined geographical points (GPS readings if possible)

R44 road in Firgrove, Stellenbosch, at Global Positioning System (GPS) co-ordinates determined to be 34°01'29.23" South 18°49'12.39" East at an elevation of 95 feet (ft)

Meteorological Information	Wind: 040° at 05kts, Temperature: 17°C, Clouds cover: Nil, Dew Point: 10°C, Cloud Base 3200ft, Visibility: 10km and QNH: 1030hPa						
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, 1 June 2022, a Grade II flight instructor and a student pilot on-board a PA-28R-200 Cherokee Arrow II aircraft with registration ZS-WAP took off on a training flight from Cape Town International Airport (FACT) in the Western Cape province, to Stellenbosch Airport (FASH) in the same province. The flight was conducted under visual flight rules (VFR) by day and under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pair intended to conduct a touch-and-go landing exercise at FASH before returning to FACT. The flight to FASH was uneventful. The aircraft touched down safely on Runway 19 and took off again. Whilst on the climb at approximately 300 feet (ft) above ground level (AGL), the engine spluttered and the manifold pressure (MP) decreased to 25 inches. The power was insufficient for the climb. The flight instructor then took control of the aircraft and attempted to troubleshoot the anomaly, but without success. The aircraft lost height and the flight instructor decided to perform a forced landing on the R44 road, about 2.65 nautical miles (nm) south of FASH.

The aircraft was destroyed during the accident sequence, and both occupants were injured.

Probable Cause

The flight instructor executed a forced landing on the R44 road following an engine failure in-flight, which resulted in damage to the aircraft. The cause of engine failure could not be determined due to lack of evidence.

SRP Date	11 April 2023	Publication Date	14 April 2023

Occurrence Details

Reference Number	**:** CA18/2/3/10167
Occurrence Category	**:** Category 1
Type of Operation	**:** Training (Part 141)
Name of Operator	**:** 4 Aviators
Aircraft Registration	**:** ZS-WAP
Aircraft Make and Model	**:** Piper PA-28R-200 Cherokee Arrow II
Nationality	**:** South African
Place	**:** R44 road in Firgrove in Stellenbosch, Western Cape Province
Date and Time	**:** 1 June 2022 at 0935Z
Injuries	**:** 1 minor, 1 serious
Damage	**:** Destroyed

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 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 on 1 June 2022 at 0945Z. The occurrence was classified as an accident according to the CAR 2011 Part 12 and ICAO STD Annex 13 definitions. Notifications were sent to the State of Design and Manufacturer in accordance with CAR 2011 Part 12 and ICAO Annex 13 Chapter 4. The State of Design and Manufacturer did not appoint an accredited representative and advisor. The investigator had dispatched to the accident site for this occurrence.

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   Accident — this investigation accident
   Aircraft — the Piper PA-28R-200 Cherokee Arrow II was 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 the 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

This report is produced without prejudice to the rights of the AIID, which are reserved.

Table of Contents

Abbreviation	Description
°	Degrees
°C	Degrees Celsius
AGL	Above Ground Level
AIID	Accident and Incident Investigations Division
AME	Aircraft Maintenance Engineer
AMO	Aircraft Maintenance Organisation
C of A	Certificate of Airworthiness
CAR	Civil Aviation Regulations
CRMA	Certificate Relating to Maintenance
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
FACT	Cape Town International Aerodrome
FASH	Stellenbosch Aerodrome
ft	Feet
GPS	Global Positioning System
IAW	In Accordance With
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
KIAS	Indicated Air Speed
Kts	Knots
METAR	Meteorological Aerodrome Report
MP	Manifold Pressure
NM	Nautical Mile
PF	Pilot Flying
PM	Pilot Monitoring
POH	Pilot's Operating Handbook
PPL	Private Pilot Licence
QNH	Barometric Pressure Adjusted to Sea level
RWY	Runway
S	South
SACAR	South African Civil Aviation Regulations
SAWS	South African Weather Service
UTC	Co-ordinated Universal Time
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, 1 June 2022, a Grade II flight instructor and a student pilot on-board a PA-28R-200 Cherokee Arrow II aircraft with registration ZS-WAP took off on a training flight from Cape Town International Airport (FACT) in the Western Cape province to Stellenbosch Airport (FASH) in the same province. The pair intended to conduct touch-and-go landings at FASH before flying back to FACT. The flight was conducted under visual flight rules (VFR) by day and under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.2 The flight instructor reported that before departure at FACT, a pre-flight inspection was conducted on the aircraft and no anomalies were found. Also, there were no defects noted or recorded in the aircraft flight folio. The aircraft was refuelled to full capacity of 189 litres (L) or 50 United States (US) gallons with Avgas 100LL. After the engine was started, the student pilot taxied the aircraft to the threshold of Runway 01 where he carried out engine run-up checks; all the engine indications were within limits. At 0805Z, the crew communicated their intention to FACT ground control on very high frequency (VHF) 120.9-Megahertz (MHz). The aircraft was cleared for take-off, and it climbed to 1500 feet (ft) above ground level (AGL) and routed to FASH, which is approximately 28 nautical miles (nm) from FACT.

1.1.3 Upon reaching FASH, the aircraft descended to 1300ft AGL to join the circuit pattern for Runway 19. The instructor reported that the first approach was unstable as the aircraft's speed was higher than the required speed, and that they were too close to the traffic that was ahead of them, which was on final approach for a full-stop landing on Runway 19. The instructor instructed the student pilot to carry out a go-around. The student pilot flew a wider circuit. Thereafter, the student pilot completed a successful touch-and-go landing on Runway 19. The instructor reported that the oil pressure indication was normal, and the engine was operating as expected. But after rotation during climb, the instructor felt severe vibration and diminishing engine power, although the throttle lever was fully in the open position. At approximately 300ft AGL, the engine began spluttering, this was followed by a decrease in revolutions per minute (rpm) and the manifold pressure (MP) decreased to 25 inches. The instructor checked the engine instrument indications and noticed a rise in fuel flow which was abnormal. The power available was insufficient for the aircraft to climb.

1.1.4 The instructor then took over the control of the aircraft and commenced with the fault-finding procedure by recycling power and mixture levers, switching on the electric fuel pump, changing tanks, and checking the magnetos. There was no change in the aircraft's engine performance, except when full power was applied, which caused the engine to splutter.

1.1.5 The instructor decided to perform a forced landing but could not identify a suitable area as the aircraft was flying very low. He then assessed the R44 road ahead of him and committed to land on it as that was the only available area to land the aircraft. The traffic on the road made way for the aircraft except for one motor vehicle that had stopped in the left lane. Whilst the instructor was manoeuvring to avoid colliding with the stationary vehicle, the left wing of the aircraft hit the road traffic sign pole and the aircraft yawed to the left and immediately pitched down. This led to the aircraft landing with the nose gear first, which subsequently failed. The aircraft skidded for approximately 30 metres (m) before it came to a stop facing the opposite direction from which it had approached.

1.1.6 The aircraft was destroyed during the accident sequence; the instructor suffered minor injuries whilst the student pilot sustained serious injuries.

1.1.7 The accident occurred during daylight on the R44 road in Firgrove in Stellenbosch at Global Positioning System (GPS) co-ordinates determined to be 34°01'29.23" South 18°49'12.39" East at an elevation of 95 feet (ft).

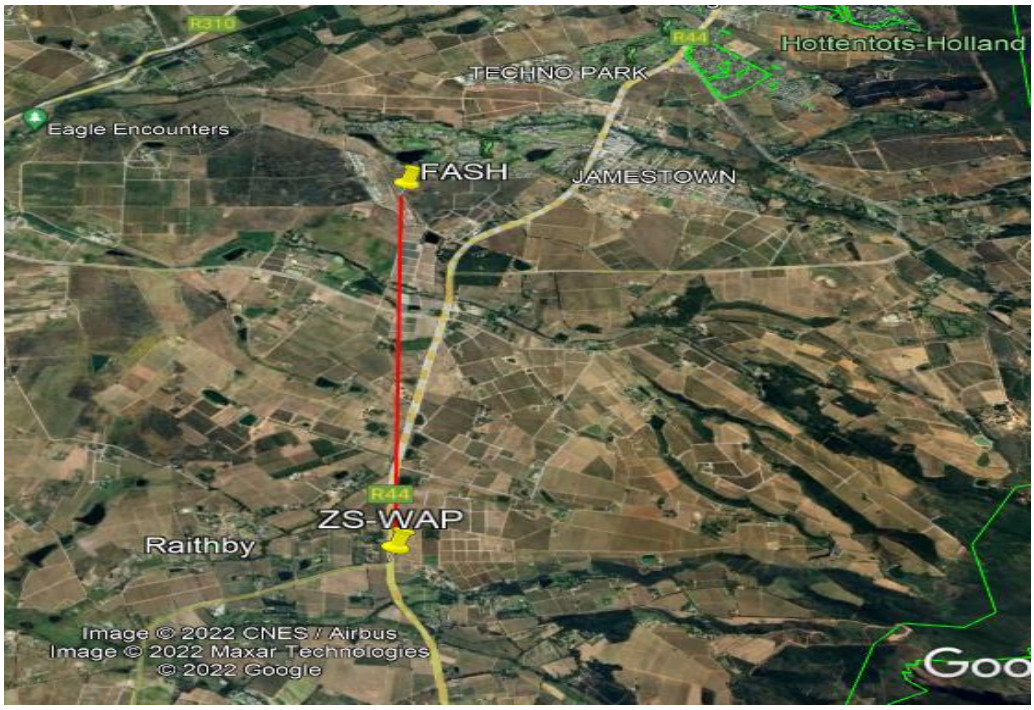

Figure 1: The approximate flight path of the ZS-WAP aircraft. (Source: Google Earth)

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	-	-	-	-	-
Serious	1	-		1	-
Minor	1	-	-	1	-
None	-	-	-	-	-
Total	**2**	**-**	**-**	**2**	**-**

Note: Other means people on the ground.

1.3. Damage to Aircraft

1.3.1 The aircraft was destroyed during the accident sequence.

Figure 2: The aircraft at the accident site.

1.4. Other Damage

1.4.1 The aircraft impacted the road traffic sign pole with its left wing.

Figure 3: The severed road traffic sign pole.

1.5. Personnel Information

Grade II Flight Instructor Pilot (FI)

Nationality	South African	Gender	Male	Age	25
Licence Type	Commercial Pilot Licence				
Licence Valid	Yes	Type Endorsed		Yes	
Ratings	Grade II Instructor and Instruments				
Medical Expiry Date	31 December 2022				
Restrictions	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	1486.3
Total Past 24 Hours	3.1
Total Past 7 Days	10.0
Total Past 90 Days	153.9
Total on Type Past 90 Days	40.0
Total on Type	494

1.5.1. The instructor was initially issued a Commercial Pilot Licence (CPL) on 11 October 2016. His last validation was completed on 26 January 2021 with an expiry date of 3 January 2023. His Class 1 medical certificate was issued on 2 December 2022 with an expiry date of 31 December 2023 with a restriction to wear suitable corrective lenses.

Student Pilot (SP) (Pilot Flying)

Nationality	South African	Gender	Male	Age	21
Licence Type	Student Pilot Licence (SPL)				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	31 July 2022				
Restrictions	None				
Previous Accidents	None				

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

Flying Experience:

Total Hours	123.8
Total Past 24 Hours	1.5
Total Past 7 Days	3.7
Total Past 90 Days	41.2
Total on Type Past 90 Days	15.0
Total on Type	15.0

1.5.2. The student pilot was issued a Student Pilot Licence (SPL) on 22 February 2022 with an expiry date of 28 February 2023. His Class 1 medical certificate was issued on 17 July 2021 with an expiry date of 31 July 2022 with no restrictions.

1.6. Aircraft Information (Source: PA28R-200 Pilot Operating Handbook)

1.6.1. *A Piper PA-28R-200 is a four-seat, all-metal, low-wing aircraft that was manufactured in 1971. The aircraft is powered by a Lycoming IO-360-C1C piston engine, four-cylinder, direct drive, horizontally opposed fuel-injected engine rated at 200 horsepower (HP). It has a starter, 60 Amperes 12-volt alternator, shielded ignition, vacuum pump drive, fuel pump and a dry automotive type of injector air filter, driving a three-bladed Hartzell variable-pitch propeller. The design is conventional with mechanical controls, retractable tricycle landing gear and a wingspan of 9.81 metres. It has a fuel capacity of 189 litres (50 US gallons).*

Airframe:

Manufacturer/Model	Piper Aircraft Corporation, PA-28R-200	
Serial Number	28R-7135090	
Year of Manufacture	1971	
Total Airframe Hours (At Time of Accident)	6112.57	
Last Inspection (Date & Hours)	19 May 2022	6107.92
Airframe Hours Since Last Inspection	4.6	
CRS Issue Date	19 May 2022	
C of A (Issue Date & Expiry Date)	15 March 2011	31 March 2023
C of R (Issue Date) (Present Owner)	9 February 2019	
Operating Category	Training (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.

1.6.2. According to available information, the aircraft was first registered to the current owner on 9 February 2019. The aircraft was reissued a Certificate of Release to Service (CRS) on 19 May 2022 with an expiry date of 19 May 2023 or at 6207.92 airframe cycles, whichever occurs first.

1.6.3. Maintenance records indicated that the recent mandatory periodic inspection (MPI) was certified on 19 May 2022 at 6107.92 airframe hours. The MPI included a magneto timing check and an inspection of the spark plugs, which were all recorded as serviceable and within limits. Following the maintenance inspection, a flight test was conducted and the test pilot reported that the aircraft operated satisfactorily with no defects recorded.

Engine:

Manufacturer/Model	Textron Lycoming I0-360-C1C
Serial Number	L853-51A
Part Number	10-360-C1C
Hours Since New	6112.57
Hours Since Overhaul	575.95

1.6.4. The engine was last overhauled on 20 October 2017 at 5536.62 hours. It accrued a total of 575.95 hours since it was overhauled. The next overhaul was due at 7 536.62 hours. According to the POH, the engine time between overhaul (TBO) is 2000 hours.

1.6.5. Examination of the aircraft systems or components revealed no evidence of any pre-impact mechanical failures or malfunctions that would have precluded normal operation.

Propeller:

Manufacturer/Model	Hartzell Propellers HC-C2YK-1BF/F7666A
Serial Number	CH-9504
Part Number	F7666A
Hours Since New	6066,22
Hours Since Overhaul	1266.22

1.6.6 Description and Operation of the Fuel System (Source: PA28 Pilot Operating Handbook)

The fuel system is stored in two twenty-five-gallon tanks which are secured to the leading-edge structure of each wing by screws and nut plates. This allows easy removal for service or inspection. An auxiliary electric fuel pump is provided in case of failure of driven pump. The electric pump must be switched on for all take-offs and landings, and when switching tanks. The pump switch is in the switch panel above the throttle quadrant. Each tank has an individual quick drain located at the bottom, and inboard, rear corner, and should be drained to check for water before each flight. (A special bottle is furnished for this project.) The fuel strainer, which is also equipped with a quick drain is located on the front lower left firewall. This strainer should be drained regularly to check for water or sediment accumulation.

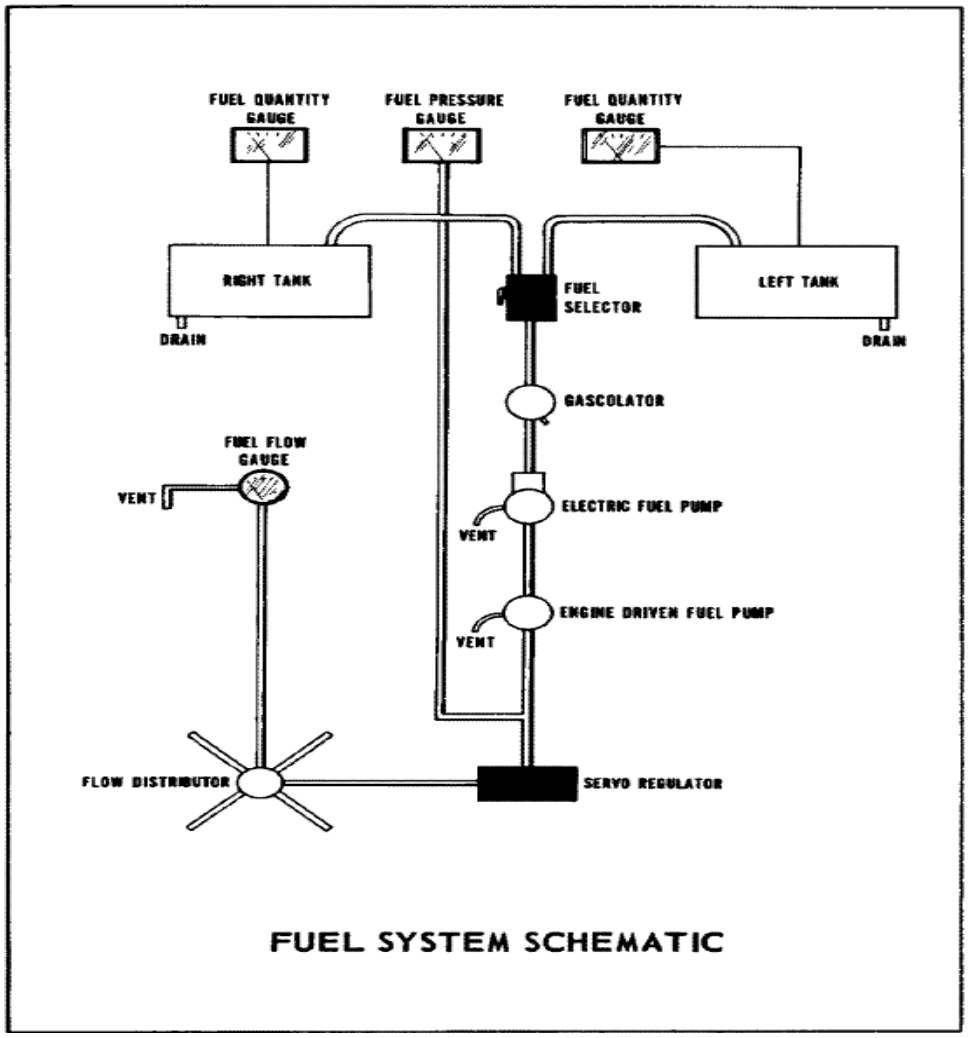

Diagram 1: Schematics of the fuel system. (Source: POH)

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) on 1 June 2022 at 0930Z, recorded at FACT which is located 28nm from the accident site.

Wind Direction	040°	Wind Speed	05kt	Visibility	9999m
Temperature	17°C	Cloud Cover	ft	Cloud Base	3200ft
Dew Point	10°C	QNH	1030hPa		

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 recorded defects with the navigational equipment before the accident 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 accident flight.

1.10. Aerodrome Information

1.10.1. The accident occurred approximately 2.65nm from Stellenbosch Airport.

Aerodrome Location	Stellenbosch, Western Cape Province
Aerodrome Status	Licensed
Aerodrome GPS coordinates	34°1'15" South, 18°49'30" East
Aerodrome Elevation	321 feet
Runway Headings	010°, 190°
Dimensions of Runway Used	820.8 x 30.5m
Heading of Runway Used	190°
The surface of Runway Used	Asphalt
Approach Facilities	N/A
Radio Frequency	119.3 MHz

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. Examination of the accident scene revealed that upon touchdown, the aircraft skidded for approximately 30m (see Figure 5) before it came to rest in an upright position in the middle (centre island) of four lanes of the tarred R44 road, facing the opposite direction from which it had approached.

1.12.2. Examination of the aircraft revealed substantial damage on both wings and fuselage, the engine and the nose section were displaced upward and aft of the aircraft. The wing tip of the left wing got ripped off, which caused the fuel to leak. The propeller sustained scratches on the leading edges of both blades, and the blade tips curled backwards. The landing gear was damaged. The wreckage was recovered by the aircraft maintenance organisation (AMO) to allow for the speedy re-opening of the road. The witness marks on the road indicated that the aircraft skidded from the initial point of impact to its final resting position. Figures 4 and 5 show the aircraft at the accident site and the skid marks on the road.

Figure 4: The aircraft at the accident site. (Source: Operator)

Figure 5: Skid marks on the R44 road and on the dirt centre island.

1.12.3. The gascolator did not contain fuel as it was damaged during impact.

Figure 6: The damaged gascolator.

1.12.4. Examination of the fuel tanks revealed that fuel was present in the tanks. The fuel lines to the injectors were still intact. During fuel drainage, the AMO used a portable fuel filter that removes (separates) water, dirt and debris from fuel (see Figure 7). The 120L (32 gallons) of fuel that was drained from the aircraft was clear and free of water or visible contamination (see Figure 8). The engine oil on the dipstick showed the correct level and appeared clean (see Figure 9).

Figure 7: The Portable Fuel Filter that was used by the AMO.

Figure 8: The 25-litre canisters containing 120L of fuel that was drained from the fuel tanks.

1.13. Medical and Pathological Information

1.13.1 None.

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 no damage was caused to the cockpit and cabin structure of the aircraft.

Figure 9: Cabin structure of the accident aircraft.

1.16. Tests and Research

1.16.1. Post-accident examination of the engine at the AMO's facility in the presence of the investigator showed no visible damage in the engine compartment. The engine drive train was rotated by turning the propeller by hand; compression was evident on all four cylinders and all rockers/valves moved normally. Both magnetos remained secured to the engine. Examination showed that the magneto-to-engine timing was set according to the manufacturer's specification and was tested for functionality. The propeller and its governing system were examined and did not exhibit any pre-impact damage. The propeller was rotating when the aircraft struck the ground. Approximately 7 quarts of oil was found in the oil tank (see Figure 10), and the minimum safe quantity is 2 quarts, according to the POH. Examination of the aircraft revealed that fuel was present in the tanks and the fuel lines leading to the injectors.

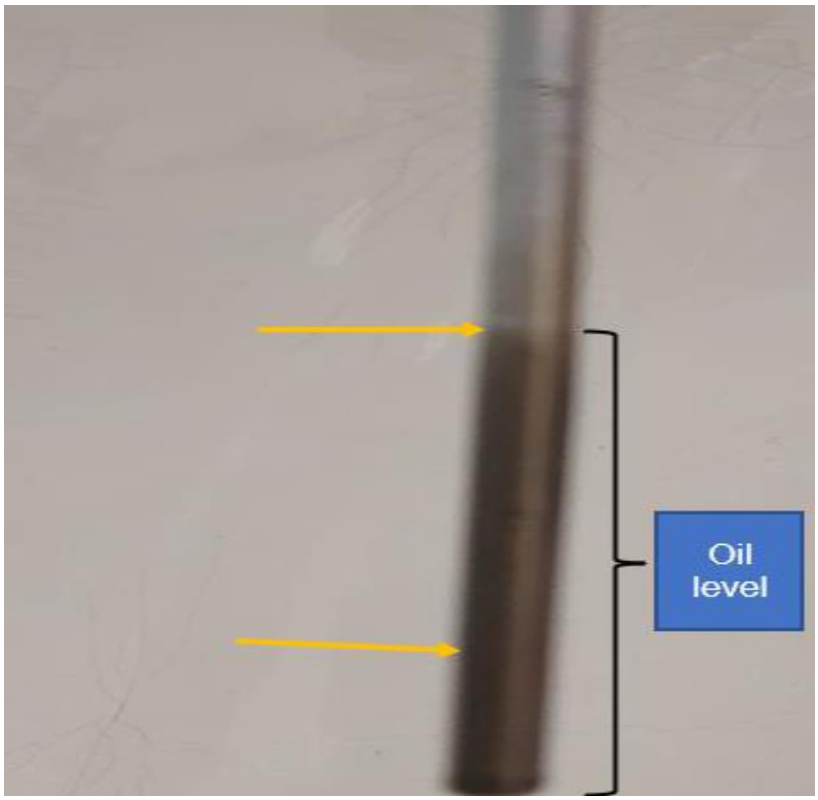

Figure 10: The dipstick shows sufficient oil level in the tanks. The top arrow shows 7 quarts, and the bottom arrow indicates 2 quarts.

1.16.2. The engine, a Textron Lycoming 10-360-C1C serial number L853-51A was removed and transported to another approved AMO for further testing. The engine could not be test-run as the propeller flange had bent. The external part of the engine was examined before it was stripped down in the presence of the investigator. (See the attached technical report as Appendix A and B.)

The following were tested:
<u>Fuel system</u>

- The fuel system injector servo was bench-tested, and no fault was found.
- The flow divider, fuel nozzles and fuel pipes were bench-tested, and no faults were found.

Ignition system

- The magnetos were bench-tested, and no faults were found.
- The spark plugs high-tension (HT) leads were bench-tested, and one lead was arcing but did not affect engine power loss as no faults were found with the spark plugs.

1.16.3. The crankcase, crankshaft, connecting rods, camshaft and assessor gears were all inspected and showed no mechanical anomalies.

1.17. Organisational and Management Information

1.17.1. The flight was conducted in accordance with the provisions of Part 141 (Training) of the CAR 2011 as amended.

1.17.2. The AMO which certified the last MPI prior to the accident flight was in possession of an AMO-approved certificate that was issued by the Regulator on 29 October 2021 with an expiry date of 31 October 2022.

1.17.3. The operator had an Approved Training Organisation (ATO) certificate which was issued by the Regulator on 1 April 2019 with an expiry date of 31 March 2024.

1.18. Additional Information

1.18.1. The information below is an extract from the PA-28R-200 Pilot's Operating Handbook (POH) Section IV, Emergency Procedures:

TAKE – OFF

ENGINE POWER LOSS DTAKE-OFFE -OFF

The proper action to be taken if a loss of power occurs during take-off will depend on circumstances.

1. *If sufficient runway remains for a normal landing, leave the gear down and land straight ahead.*
2. *If the area ahead is rough, or if it is necessary to clear obstructions, put the gear selector switch in the "UP" position, and hold the gear lever in the override position.*
3. *If you have gained sufficient altitude to attempt a restart, proceed as follows:*
   a. *Maintain safe airspeed.*
   b. *Fuel selector – switch to another tank containing fuel.*
   c. *Electric fuel pump – check on.*
   d. *Mixture – check rich.*
   e. *Alternate –air-on*
   f. *Emergency gear lever – as required.*

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

Man

2.2.1. The instructor had the valid Commercial Pilot Licence (CPL) issued on 26 January 2021 with an expiry date of 3 January 2022. The aircraft type rating was endorsed on his licence. The instructor had a valid Class 1 aviation medical certificate that was issued on 2 December 2021 with an expiry date of 31 December 2022, and with a restriction to wear suitable corrective lenses. The pilot had a total of 1 486.3 flying hours of which 494 were on the aircraft type (PA-28). Therefore, the pilot had adequate experience.

2.2.2. The student pilot was issued a Student Pilot Licence (SPL) on 22 February 2022 with an expiry date of 28 February 2023. His Class 1 medical certificate was issued on 17 July 2021 with an expiry date of 31 July 2022 with no restrictions. The student pilot had 123.8 total flying hours of which 15.0 were on the aircraft type (PA-28).

Machine

2.2.3. The aircraft had a valid Certificate of Airworthiness (C of A) and had been maintained in accordance with an approved maintenance programme. The aircraft mandatory periodic inspection was certified on 19 May 2022 with an expiry date of 19 May 2023. The ignition and the fuel system were tested for functionality, and they were ruled out as possible causes. The crankcase, crankshaft, connecting rods, camshaft and assessor gears were all inspected and showed no mechanical anomalies; therefore, they were ruled out as possible causes of loss of engine power.

2.2.4. The propeller and its governing system were examined and considered not to exhibit any pre-impact damage. Therefore, the governing system was ruled out as a possible cause of loss of engine power.

Mission

2.2.5. This was a training flight conducted in accordance with the provisions of Part 141 of the South African CAR 2011 as amended.

Weather

2.2.6. It was a clear sunny day with no cloud or rain at the time of the accident. The prevailing weather conditions at the time had no bearing to this accident.

Management

2.2.7. The AMO that performed the maintenance on the aircraft had a valid AMO certificate.

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 instructor was initially issued a Commercial Pilot Licence (CPL) on 11 October 2016. His last validation was conducted on 26 January 2021 and the licence was reissued on the same day with an expiry date of 3 January 2022. A PA-28R-200 rating was endorsed on his licence. The instructor's Class 1 medical certificate was issued on 2 December 2021 with an expiry date of 31 December 2022 with a restriction to wear corrective lenses.

3.2.2. The student pilot was issued a Student Pilot Licence (SPL) on 22 February 2022 with an expiry date of 28 February 2023. His Class 1 medical certificate was issued on 17 July 2021 with an expiry date of 31 July 2022 with no waivers.

3.2.3. The flight was conducted in accordance with the provisions of Part 141 of the South African CAR 2011 as amended.

3.2.4. The aircraft was first registered to the current owner on 9 February 2019. The aircraft was issued the Certificate of Airworthiness (C of A) on 15 March 2011 with an expiry date of 31 March 2023. The aircraft was reissued a Certificate of Release to Service (CRS) on 19 May 2022 with an expiry date of 19 May 2023 or at 6207.92 airframe cycles, whichever occurs first.

3.2.5. The last MPI on the aircraft was carried out on 19 May 2022 at 6107.92 airframe hours. The aircraft had accumulated an additional 4.6 airframe hours since the last MPI.

3.2.6. The engine had accrued a total of 6107.92 hours at the last MPI.

3.2.7. The engine was last overhauled on 20 October 2017 at 5536.62 hours and had accrued a total of 575.95 since the last overhaul.

3.2.8. The engine was removed from the aircraft and transported to another approved AMO for further inspection, teardown and tests.

3.2.9. The AMO that performed the maintenance on the aircraft had a valid AMO certificate that was issued by the Regulator on 29 October 2021 with an expiry date of 31 October 2022.

3.2.10. The weather was not a contributing factor to this accident. The weather conditions at the time of the flight were as follows: wind 040° at 05 knots; temperature at 17°C; dew point at 10°C; and ceiling and visibility OK.

3.2.11. During the climb phase, the aircraft lost engine power and the instructor took control of the aircraft and carried out the fault-finding procedure in accordance with the POH, but with no success. He executed a forced landing on a tarred R44 road.

3.3. Probable Cause/s

3.3.1. The flight instructor executed a forced landing on the R44 road following an engine failure in-flight, which resulted in damage to the aircraft. The cause of engine failure could not be determined due to lack of evidence.

3.4. Contributory Factor/s

3.4.1. None.

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. Appendix A and B Technical reports.

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

Appendix A

Regarding the engine of ZS-WAP

Lycoming IO-360-C1C serial number : L-7853-61A

The fuel system injector servo was bench tested by Breytech and no fault was found .

On the flow divider , nozzles, and pipes no fault was found – (function tested) 30-06-2022

The Ignition system , magnetos was bench tested and no fault was found .

Spark plugs HT leads tested one lead shorting out to body , and on the spark plugs no faults was found .

Appendix B

DEPARTMENT: AMO

Subject: Status Report on ZS-WAP fuel hoses

Please see attached fuel flow calculations and videos

Engine fuel hose removed and tested on ZS-KPW as the control sample.

Engine is Lycoming IO360 200Hp, and found The following:-

- 1Lt in 20 seconds.
- This translates to 180 Lts per hour or 47.3 Gal/Hr

The test hose was then fitted to control and the following results achieved

- 1 litre in 20 seconds
- This translates to 180 Lts per hour or 47.3 Gal/Hr

This is equal to the test sample, therefore the hose is found to be satisfactory and capable of delivering the required maximum flow