PRELIMINARY ACCIDENT REPORT

Accident and Incident Investigations Division

Accident
- Preliminary Report -
AIID Ref No: CA18/2/3/10144

Figure 1: The Piper PA-32-112 Tomahawk similar to the ZS-AXE aircraft. (Source: www.Airliners.net)

Description:

On Friday, 8 April 2022 at approximately 1050Z, a flight instructor and a student pilot on-board a Piper PA-38-112 (Tomahawk) aircraft with registration ZS-AXE took off on a training flight from Cape Town International Airport (FACT) to Diemerskraal Aerodrome to conduct circuit exercises with the intention to return to FACT. Upon arrival at Diemerskraal Aerodrome, the flight instructor noticed the crosswind (the wind was very strong and was blowing across the runway). He deduced that the conditions were not conducive for flight training and opted that they return to FACT. During the initial climb at approximately 150 feet (ft) above ground level (AGL), the engine spluttered and later stopped. The flight instructor opted to execute a forced landing straight ahead. During landing, the aircraft touched down hard and bounced a few times, causing the nose gear strut to collapse. The aircraft came to rest in a nose-down attitude. The flight instructor injured his back during the accident whilst the student pilot was unscathed.

Occurrence Details

Reference Number	**:** CA18/2/3/10144
Occurrence Category	**:** Category 2
Type of Operation	**:** Training (Part 141)
Name of Operator	**:** Cape Town Flying Club
Aircraft Registration	**:** ZS-AXE
Aircraft Make and Model	**:** Piper PA-38-112
Nationality	**:** South African
Place	**:** Private farm near Diemerskraal Aerodrome
Date and Time	**:** 8 April 2022 at 1050Z
Injuries	**:** Flight instructor was seriously injured
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-38-112 Tomahawk, which occurred at a farm near Diemerskraal Aerodrome in the Western Cape province on 8 April 2022 at 1050Z. The occurrence was classified as an accident according to the CAR 2011 Part 12 and ICAO Standards Annex 13 definitions.

The AIID has appointed an investigator-in-charge who did not dispatch to the site but undertook a desktop investigation. Notifications were sent to the State of Registry/Operator/Design/Manufacturer in accordance with the CAR 2011 Part 12 and ICAO Annex 13 Chapter 4. The States did not appoint accredited representative/s or advisor/s. 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 statement or the 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 Piper PA-38-112 Tomahawk involved in this accident
   Investigation — the investigation into the circumstances of this accident
   Pilots — the pilots 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
'	Minutes
"	Seconds
°	Degree
°C	Degree Celsius
AGL	Above Ground Level
AIID	Accident and Incident Investigations Division
AMO	Aircraft Maintenance Organisation
ATO	Approved Training Organisation
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CTFC	Cape Town Flying Club
CRS	Certificate of Release to Service
FACT	Cape Town International Airport
ft	Feet
GPS	Global Positioning Satellite
hPa	Hectopascal
hrs	Hours
kt	Knots
km	Kilometre
Lt	Litre
m	Metres
METAR	Meteorological Aerodrome Report
PIC	Pilot-in-command
POH	Pilot's Operating Handbook
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
SB	Service Bulletin
SI	Service Instructions
SL	Service Letter
SOP	Standard Operating Procedures
USG	US Gallons
QNH	Altitude Above Mean Sea Level
Z	Zulu (Term for Universal Co-ordinated Time - Zero Hours Greenwich)

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1. On Friday, 8 April 2022 at approximately 1050Z, a flight instructor and a student pilot on-board a Piper PA-38-112 (Tomahawk) aircraft with registration ZS-AXE took off on a training flight from Cape Town International Airport (FACT) in the Western Cape province to Diemerskraal Aerodrome in the same province. The intention of the flight was to conduct circuit training and touch-and-go exercises. 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. According to the flight instructor and the student pilot, the start-up was conducted at FACT, however, they could not recall which tank they had selected at start-up. The aircraft was then taxied to the designated general aviation run-up area to conduct further checks prior to take-off. The aircraft departed FACT using Runway 19. The flight instructor and the student pilot reported that they commenced with after-take-off checks, which included switching off the electrical fuel pump, when they were approximately 600 feet (ft) above ground level (AGL). Upon switching off the electrical fuel pump, the flight instructor noticed a drop in fuel pressure. He then switched the electrical fuel pump on again. The flight instructor stated that he was “not comfortable” with the fuel pressure, therefore, he lowered the nose and reduced power. *Following these actions normalised the fuel flow pressure.* The flight instructor decided to continue with the flight and kept the electrical fuel pump on throughout the flight.

1.1.3. According to the student pilot, he was familiar with the flight checks which he repeated every 15 to 20 minutes during the flight, although the flight instructor was the pilot flying at that stage. The flight instructor and the student pilot stated that during the flight, they omitted to conduct the FREDA checks (fuel pressure, radio frequency, engine parameters, altimeter setting and suction/safety) as required in the Standard Operating Procedures (SOP) as they were having a discussion in the cockpit about the prevailing weather conditions at Diemerskraal Aerodrome, which had a significant crosswind from both sides of the runway that was orientated 04 and 22. The flight instructor and the student pilot had attempted to contact the aerodrome owner to acquire a detailed weather update, but this was in vain. The flight instructor and the student pilot confirmed that during the flight to Diemerskraal, no fuel tank change was made; not even during the joining phase at the aerodrome.

1.1.4. According to the flight instructor, when they arrived at the aerodrome there was a strong crosswind, however, he decided to demonstrate the crosswind technique to the student pilot. After the initial circuit, the flight instructor decided that they should return to FACT as he felt that the wind was too strong and not conducive for training. During the initial climb at a height of approximately 150ft AGL, the engine started to lose power and surged, whereafter it stopped. The flight instructor and the student pilot stated that they had little time to react, and, thus, the flight instructor opted to land straight ahead on an open field.

1.1.5. During the forced landing on an uneven ground, the aircraft landed with its right main landing gear first, whereafter it bounced. Upon second contact with the ground, both main wheels made contact with the ground first, causing a second bounce; this was

followed by the nose gear contacting the ground first, whereupon it collapsed. The aircraft skidded for several metres before it came to rest in a nose-down attitude.

1.1.6. The student pilot disembarked the aircraft unassisted and, thereafter, helped the flight instructor out of the aircraft to a safe distance where he lay down; he had a severe back pain. The student pilot then contacted the operator who, in turn, informed the relevant authorities. The flight instructor was attended to by emergency medical personnel at the scene. He was later transported to a hospital by ambulance. The student pilot was not injured during the accident. The aircraft sustained damages to the nose section and nose landing gear, as well as the propeller hub.

1.1.7. The accident occurred on a private farm at Global Positioning System (GPS) determined to be 33°35'0.10" South 018°54'47.45" East at an elevation of 300ft.

1.2. Injuries to Persons

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

Note: Other means people on ground.

1.3. Damage to Aircraft

1.3.1. The aircraft sustained substantial damages to the nose landing gear and nose section, as well as the propeller hub.

Figure 2: The aircraft as it came to rest. (Source: ATO)

1.4. Other Damage

1.4.1. There was fuel spillage which was limited to the area where the aircraft had come to rest following the accident sequence.

1.5. Personnel Information

1.5.1. Pilot-in-command (PIC)

Nationality	South African	Gender	Male	Age	27
Licence Type	Commercial Pilot Licence				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument, Flight Instructor Grade 3				
Medical Expiry Date	28 February 2023				
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	316.7
Total Past 24 Hours	2.4
Total Past 7 Days	5.6
Total Past 90 Days	37.1
Total on Type Past 90 Days	33.5
Total on Type	137.0

1.5.2. The flight instructor was initially issued a Commercial Pilot Licence (CPL) by the Regulator (SACAA) on 11 February 2021. The licence revalidation was issued by the Regulator on 18 January 2022 with an expiry date of 31 January 2023.

1.5.3. The flight instructor's Class 1 medical certificate was valid and issued on 24 February 2022 with an expiry date of 28 February 2023. He had accumulated a total of 316 flying hours of which 137 hours were on the aircraft type.

1.5.4. The student pilot was issued a Student Pilot Licence (SPL) by the Regulator on 21 February 2022 with an expiry date of 20 February 2023.

1.5.5. The student pilot's Class 2 medical certificate was issued on 15 December 2021 with an expiry date of 15 December 2026. The student pilot had accumulated a total of 15.7 hours on the aircraft type.

1.6. Aircraft Information

1.6.1. The information below is an extract from the Pilot's Operating Handbook (POH), PA-38-112 Tomahawk:

The Piper Tomahawk is a two-seat single engine and tricycle fixed gear aircraft with low cantilever wing configuration and a T-tail. In alignment with the initial premise of building the ultimate flight trainer based on the market consensus, the differentiating design features of the Tomahawk are exactly what the surveyed flight instructors requested. The aircraft is fitted with a Lycoming O-235-L2-C engine and a Sensenich 72CK-0-56 two-bladed propeller.

Airframe:

Manufacturer/Model	Piper Aircraft Corporation/ PA-38-112	
Serial Number	38-79A0265	
Year of Manufacture	1979	
Total Airframe Hours (At Time of Accident)	7873.21	
Last Inspection (Date & Hours)	1 March 2022	7785.31
Hours Since Last Inspection	87.9	
CRS Issue Date	1 March 2022	
C of A (Issue Date & Expiry Date)	1 March 2021	30 April 2022
C of R (Issue Date) (Present Owner)	26 May 2021	
Type of Fuel Used	Avgas LL100	
Operating Category	Part 141	
Previous Accidents	None	

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

Engine:

Manufacturer/Model	Lycoming
Serial Number	L19483-1S
Part Number	O-235-L2-C

Hours Since New	2708.85
Hours Since Overhaul	1051.86

Propeller:

Manufacturer/Model	Sensenich
Serial Number	KV518
Part Number	72CK-0-56
Hours Since New	2257.7
Hours Since Overhaul	377.23

1.6.2 The aircraft maintenance documents, such as the mandatory periodic inspection (MPI) document, logbooks and all engine and airframe manufacturer-published Service Bulletins (SB), Service Instructions (SI) and Service Letters (SL) were reviewed. The aircraft was issued a Certificate of Airworthiness on 1 March 2021 with an expiry date of 30 April 2022. The aircraft maintenance was conducted by an aircraft maintenance organisation (AMO) with a valid AMO approval certificate, issued by the Regulator on 4 September 2021 with an expiry date of 30 November 2022. The AMO issued the aircraft a Certificate of Release to Service (CRS) on 1 March 2021 following a MPI.

1.6.3 The information below is an extract from the Pilot's Operating Handbook (POH), PA-38-112 Tomahawk:

The fuel system

The fuel system should be simple, self-explanatory, and easy to access. Fuel is stored in two, sixteen-US gallon (1 US gallon usable) fuel tanks, giving the aircraft a total of thirty-two US gallons (30 US gallons usable). The tanks are secured to the leading edge of each wing with rivets. When installed, a filler neck indicator aids in determining fuel remaining when the tanks are not full. The fuel tank selector control is located in the centre of the engine control quadrant. 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. A fuel quantity gauge for each tank is located on either side of the fuel tank sector, each gauge on the same side as the corresponding fuel tank.

An auxiliary electrical fuel pump is provided in case the engine-driven pump fails. The electrical pump should be ON for take-offs and landings and when switching tanks. The fuel pump switch is located in the switch paned to the left of the throttle quadrant. The fuel drains should be opened daily prior to the first flight to check for water or sediments. Each tank has an individual drain at the bottom, inboard rear corner. A fuel strainer, located on the lower left front of the fire wall, has a drain which is accessible from outside the left nose section. The strainer should also be drained before the first flight of the day. The fuel pressure gauge is mounted in a gauge cluster located to the right of the control quadrant. An engine priming system is installed to facilitate starting.

- The accident aircraft had sufficient fuel on-board which was approximately 20 US gallons (USG); that is – a fuel upliftment of 20 litres, bringing each tank to 10 USG.

Loss of fuel pressure

If loss of fuel pressure occurs, turn ON the electrical fuel pump and check that the fuel selector is on a tank containing fuel. If the problem is not an empty tank, land as soon as practical and have the engine-driven fuel pump and fuel system checked.

1.6.4. ***Engine power loss during take-off (if airborne)***

If the engine failure occurs after the aircraft has lifted off, and if there is insufficient landing area remaining for a touchdown and stop, maintain a safe airspeed to avoid a stall. Close the throttle, pull the mixture control to idle cut-off, and turn OFF the fuel selector, the master switch, and the magnetos. Use of flaps depends upon the circumstances, however, normally full flaps allow the slowest and softest touchdown. Maintain directional control and land straight ahead. All low altitude turns should be avoided except for slight and gentle deviations to avoid obstacles. A preferred crash landing straight ahead is preferable to risking a stall which could result in an uncontrolled roll and crash out of a turn.

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) for FACT on 8 April 2022 at 1000Z.

FACT 080930Z 15012KT 9999 FEW035 22/07 Q1025 NOSIG=

FACT 081000Z 13011KT 9999 FEW035 22/06 Q1025 NOSIG=

Wind Direction	130°	Wind Speed	11kt	Visibility	9999m
Temperature	22°C	Cloud Cover	FEW	Cloud Base	35000ft
Dew Point	7°C	QNH	1025		

1.7.2 The prevailing weather conditions at the time indicated a strong crosswind from the left of Runway 22, which was used.

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 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

1.10.1 The accident occurred on a private farm, approximately 540m from the threshold of Runway 04 at Diemerskraal Aerodrome.

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, about 540m from the threshold of Runway 04 at Diemerskraal Aerodrome.

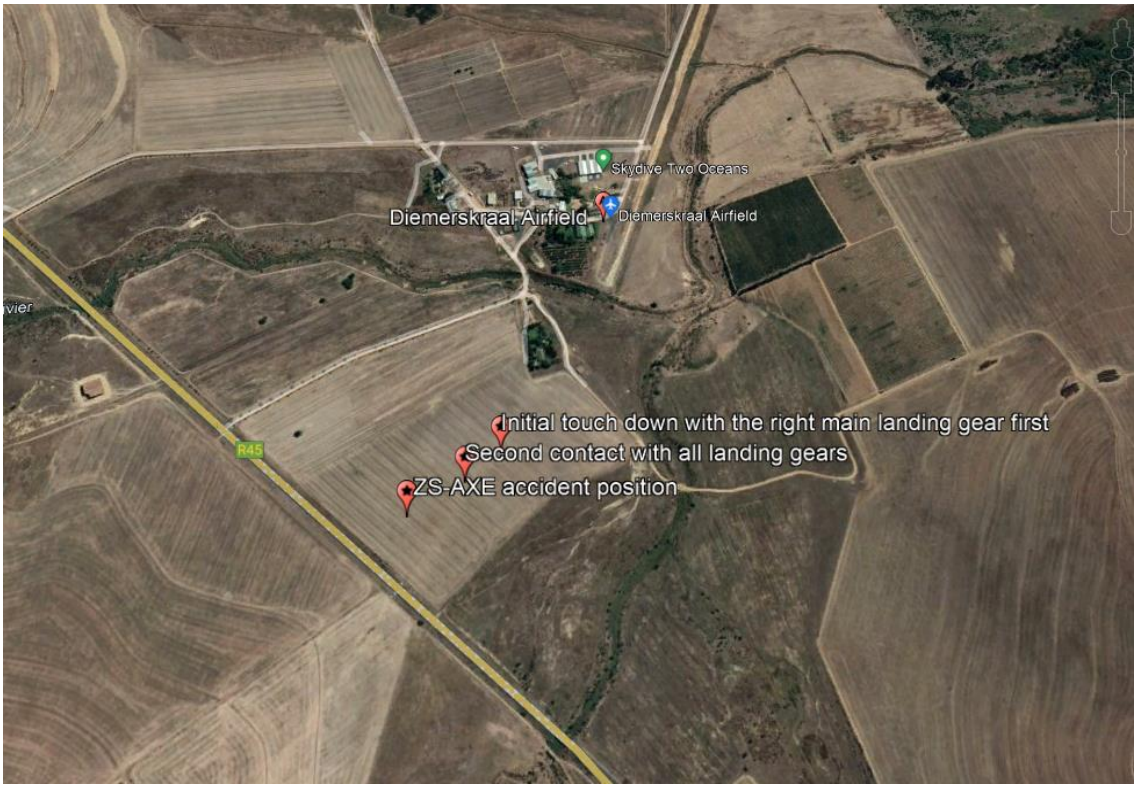

Figure 3: Aerial view of the accident site. (Source: Google)

1.12.2. Observation of the aircraft wreckage:

- Initially, the aircraft touched down on its right main landing gear first and rolled for approximately 17 metres, followed by the left main landing gear, and then the nose landing gear; all three gears remained in contact with the ground for approximately 7m. Thereafter, the aircraft subsequently bounced and contacted the ground, then bounced again, but this time, touching the ground with the nose gear first.

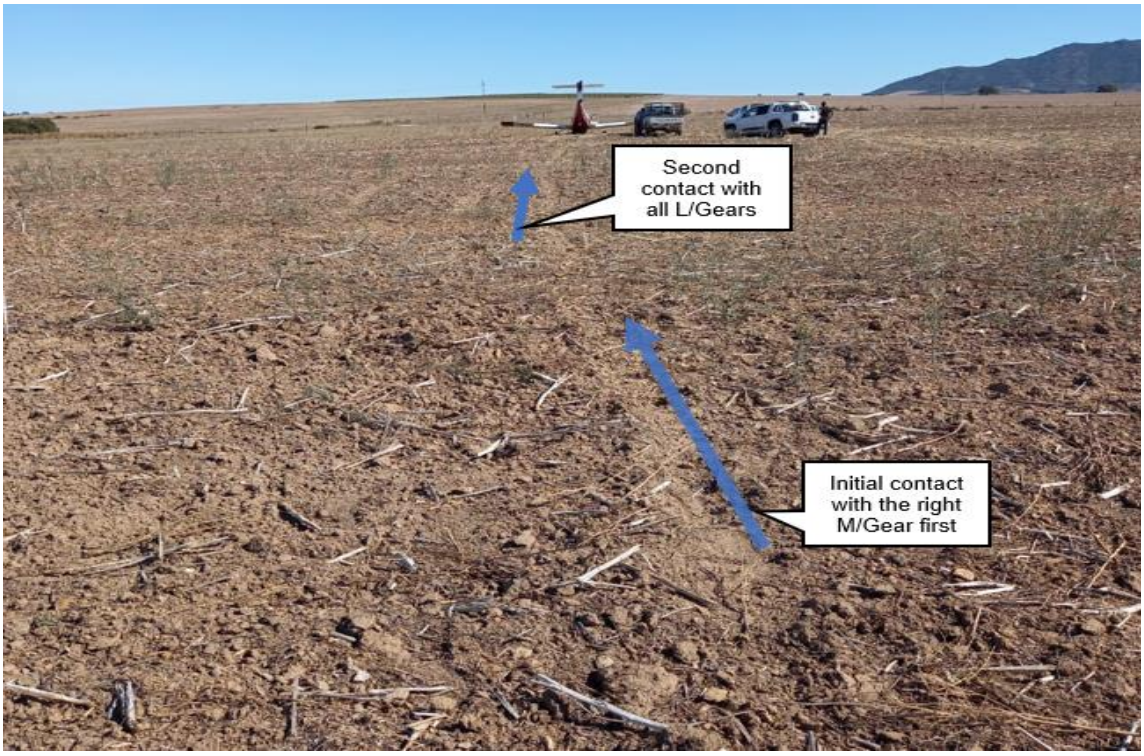

Figure 4: The aircraft's ground markings during the accident. (Source: Operator)

- The nose landing gear bent backwards, causing the aircraft's nose to drop. This led to the propeller hub and the propeller contacting the ground, followed by the nose section.

Figure 5: The damaged propeller hub and propeller blades.

- The propeller hub was destroyed during the accident sequence, and one of the propeller blades was damaged. The damage on the propeller blade was consistent with the propeller that was not turning or either wind-milling at the time of impact with the ground.

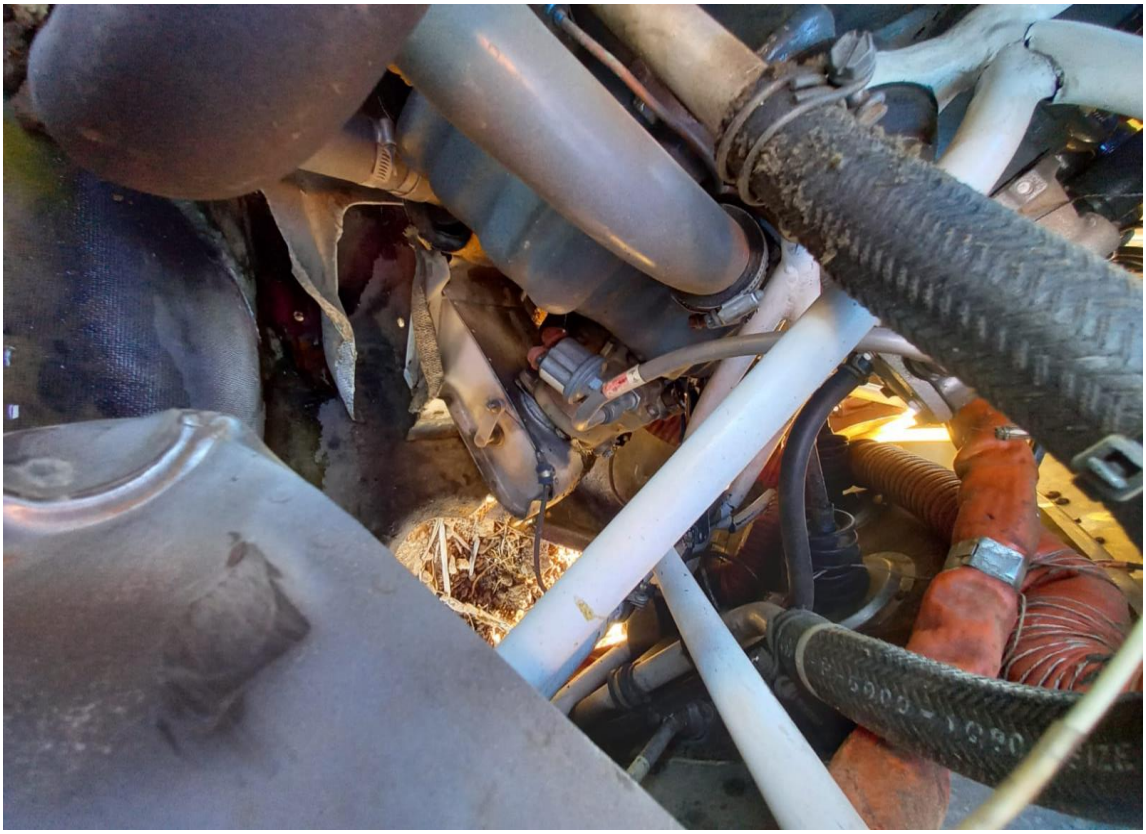

Figure 6: Damages sustained in the engine compartment and bent engine mountings.

- The engine compartment and engine mountings sustained impact damages. The nose landing gear caused damages to the bottom engine compartment.

- There was evidence of fuel leak from the bottom of the fuselage. The damage around the part where fuel was leaking could be associated with damage caused during the accident sequence.

1.13. Medical and Pathological Information

1.13.1. None.

1.14. Fire

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

1.15. Survival Aspects

1.15.1. The accident was considered survivable. The cockpit area remained intact during the accident sequence. Both the flight instructor and the student pilot had made use of the aircraft equipped safety harnesses during the flight. The flight instructor sustained a back injury and was hospitalised for seven days.

1.16. Tests and Research

1.16.1 To be discussed in the final report.

1.17. Organisational and Management Information

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

1.17.2. The aircraft was operated as a training aircraft by an approved training organisation (ATO) which was issued an ATO certificate on 11 November 2021 with an expiry date of 31 August 2024. The aircraft was endorsed on the ATO's operation specifications under Class 4 of Category A ratings.

1.17.3. The aircraft maintenance organisation (AMO) which maintained the aircraft had a valid AMO approved certificate that was issued by the Regulator on 4 September 2021 with an expiry date of 30 September 2022.

1.18. Additional Information

1.18.1 To be included in the final report.

1.19. Useful or Effective Investigation Techniques

1.19.1 To be included 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

2.2.1. The flight instructor was issued a Commercial Pilot Licence and a Grade 3 instructor rating. His licence was issued on 11 February 2021. The licence revalidation was issued on 18 January 2022 with an expiry date of 31 January 2023.

2.2.2. The flight instructor's Class 1 medical certificate was issued on 24 February 2022 with an expiry date of 28 February 2023. The flight instructor had flown a total of 316 hours of which 137 hours were on the aircraft type.

2.2.3. The student pilot was issued a Student Pilot Licence on 21 February 2022 with an expiry date of 20 February 2023.

2.2.4. The student pilot's Class 2 medical certificate was issued on 15 December 2021 with an expiry date of 15 December 2026. The student pilot had flown a total of 15.7 hours on the aircraft type.

2.2.5. The aircraft was issued a Certificate of Airworthiness by the Regulator on 1 March 2021 with an expiry date of 30 April 2022. The AMO issued the aircraft a Certificate of Release to Service on 1 March 2021 following a MPI.

2.2.6. The AMO that maintained the aircraft had a valid AMO approved certificate that was issued on 4 September 2021 with an expiry date of 30 September 2022.

2.2.7. The engine stopped during a climb from Diemerskraal Aerodrome to FACT, resulting in a forced landing.

2.2.8. The forced landing was performed on an open field at a private farm.

2.2.9. The instructor sustained a back injury whilst the student pilot was unscathed.

2.2.10. The aircraft was operated as a training aircraft by an approved ATO with a certificate which was issued on 11 November 2021 with an expiry date of 31 August 2024. The aircraft was endorsed on the ATO's operation specifications under Class 4 of Category A ratings.

2.2.11. Strong crosswind conditions prevailed in the area around Diemerskraal Aerodrome at the time of the accident.

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