AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:		CA18/2/3/10450	
Aircraft Registration	ZU-COB	**Date of Accident**		8 May 2024		**Time of Accident**	1445Z
Type of Aircraft	Orion Cub			**Type of Operation**		Private (Part 94)	
Pilot-in-command Licence Type	National Pilot Licence (NPL)			**Age**	65	Licence Valid	Yes
Pilot-in-command Flying Experience		**Total Flying Hours**			6 820	**Hours on Type**	200
Last Point of Departure	Krugersdorp Aerodrome (FAKR), Gauteng Province						
Next Point of Intended Landing	Krugersdorp Aerodrome (FAKR), Gauteng Province						
Damage to Aircraft	Substantial						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Approximately 2 kilometres (km) north of FAKR at Global Positioning System (GPS) co-ordinates determined to be 26°4'14.23" South 27°43'22.90" East, at 5 400 feet (ft) AMSL							
Meteorological Information	Wind direction: 180º; Wind speed: 03kts; Temperature: 21ºC; Dew Point: 16ºC; Cloud Cover: Nil; Cloud Base: Nil; Visibility: CAVOK; QNH: 1015hPa						
Number of People On-board	1+0	**Number of People Injured**	0	**Number of People Killed**	0	**Other (On Ground)**	0

Synopsis

On Wednesday afternoon, 8 May 2024, a pilot on-board the Orion Cub aircraft with registration ZU-COB was on a private flight from Krugersdorp Aerodrome (FAKR) in Gauteng province with the intention to land back at the same take-off aerodrome. Visual meteorological conditions (VMC) by day prevailed at the time of the flight which was conducted under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot stated that he took off from FAKR Runway 26 (RWY 26) to the general flying area (GFA). On his return to FAKR whilst on final approach, the engine stopped. He opted to perform a forced landing on a private farm, approximately 2 kilometres (km) north of the aerodrome. During landing, the main wheels impacted the ground hard which resulted in substantial damage to the main landing gear struts. The pilot was not injured. A post-accident examination of the engine did not reveal anything abnormal. The prevailing meteorological conditions at the time of the flight were conducive to moderate ice formation at both cruise and descent power settings. The engine stopped due to carburettor icing.

Probable Cause

Engine stoppage due to carburettor icing which resulted from the pilot's omission to use carburettor heat whilst operating in conditions that were conducive to the formation of carburettor ice. This, consequently, led to an unsuccessful forced landing.

SRP Date	8 October 2024	Publication Date	10 October 2024

Occurrence Details

Reference Number	**:** CA18/2/3/10450
Occurrence Category	**:** Category 2
Type of Operation	**:** Private (Part 94)
Name of Operator	**:** Avroy Shlain
Aircraft Make and Model	**:** Orion Aircraft
Nationality	**:** South African
Registration	**:** ZU-COB
Place	**:** Krugersdorp Aerodrome (FAKR), Gauteng Province
Date and Time	**:** 8 May 2024 at 1445Z
Injuries	**:** None
Damage	**:** Substantial

Purpose of the Investigation

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and not 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 8 May 2024. The occurrence was classified as an accident according to the CAR 2011 Part 12 and the International Civil Aviation Organisation (ICAO) STD Annex 13 definitions. Notifications were sent to the State of Registry, Operator, 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 did not dispatch to the accident site. .

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   Accident — this investigation accident
   Aircraft — the Orion Cub 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; enhancement of colour, brightness, and contrast; or addition of text boxes, arrows, or lines.*

Disclaimer

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Abbreviation	Description
°	Degrees
°C	Degrees Celsius
A/C	Aircraft
AIID	Accident and Incident Investigations Division
AMO	Aircraft Maintenance Organisation
AMSL	Above Mean Sea Level
AP	Approved Person
ATF	Authority to Fly
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CAR	Civil Aviation Regulations
CAVOK	Ceiling and Visibility OK
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
FAKR	Krugersdorp Aerodrome
FDR	Flight Data Recorder
ft	Feet
GPS	Global Positioning System
hPa	Hectopascal
ICAO	International Civil Aviation Organisation
IIC	Investigator-in-Charge
Km	Kilometres
Kt/s	Knot/s
METAR	Meteorological Aerodrome Report
NPL	National Pilot Licence
QNH	Query: Nautical Height
RWY	Runway
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
UTC	Co-ordinated 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, 8 May 2024, a pilot on-board the Orion Cub aircraft with registration ZU-COB was on a private flight from Krugersdorp Aerodrome (FAKR) in Gauteng province with the intention to land back at the same take-off aerodrome. Visual meteorological conditions (VMC) by day prevailed at the time of the flight which was conducted under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.2. The pilot reported that a pre-flight inspection of the aircraft was conducted, and no anomalies were found. About 50 litres (l) of Aviation Gasoline 100 Low Lead (Avgas 100LL) was uplifted to make a total of 60l on-board. Around 1400Z, the aircraft commenced with the take-off run from Runway 26 (RWY 26) and rotated. It climbed and circled overhead the aerodrome for a few minutes before it headed to the general flying area (GFA). Upon its return to FAKR during final approach for landing, the engine stopped. The pilot tried to restart the engine, but without success. After deducing that a safe approach to the aerodrome was not feasible, the pilot opted to perform a forced landing on a farm, approximately 2 kilometres (km) north of the aerodrome. During landing, the aircraft's main wheels impacted the ground hard which caused substantial damage to the main landing gear struts. Moreover, the propeller blades contacted the ground during the accident sequence. The pilot was not injured.

1.1.3. The accident occurred during daylight approximately 2km north of FAKR at Global Positioning System (GPS) co-ordinates determined to be 26°4'14.23" South 27°43'22.90" East, at 5 400 feet (ft) above mean sea level (AMSL).

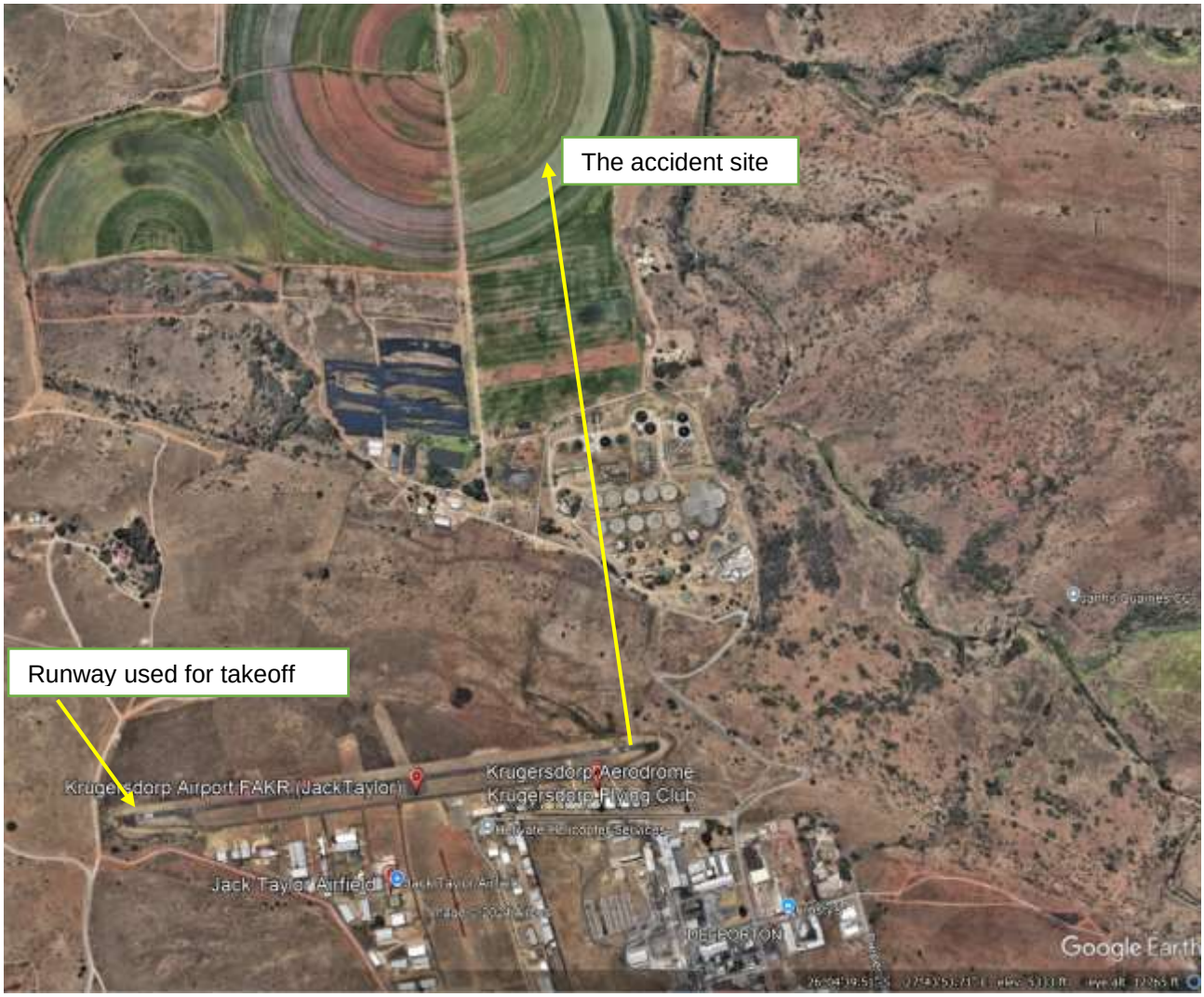

Figure 1: View of the aerodrome and the approximate location of the accident scene. (Source: Google Earth)

1.2. Injuries to Persons

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

Note: Other means people on the ground.

1.3. Damage to Aircraft

1.3.1. The aircraft was substantially damaged.

Figure 2: The aircraft at the accident site. (Source: Pilot)

1.4. Other Damage

1.4.1. None.

1.5. Personnel Information:

Nationality	South African	Gender	Male	Age	65
Licence Type	National Pilot Licence (NPL)				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instruments Rating				
Medical Expiry Date	31 August 2026				
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	6 820
Total Past 24 Hours	1.0
Total Past 7 Days	3.6
Total Past 90 Days	60.5
Total on Type Past 90 Days	41.7
Total on Type	200

1.5.1. The pilot was initially issued a National Pilot Licence (NPL) by the Regulator (SACAA) on 5 March 2019. His licence was reissued on 6 March 2023 with an expiry date of 26 February 2025. The aircraft type was endorsed on the pilot's licence.

1.5.2. The pilot was issued a Class 4 aviation medical certificate on 4 August 2023 with an expiry date of 31 August 2026.

1.6. Aircraft Information (Source: Orion Cub Pilot's Operating Handbook [POH])

1.6.1. *The Orion Cub is a high-wing tailwheel aircraft. It features seating for two in tandem configuration. Powered by a single Rotax 912ULS turbo engine, the aircraft boasts a fuel capacity of 126 litres (l). Equipped with large, slotted flaps, it offers enhanced short take-off and landing (STOL) performance.*

Airframe:

Manufacturer/Model	Orian Aircraft / Orion Cub	
Serial Number	22-02	
Year of Manufacture	2024	
Total Airframe Hours (At Time of Accident)	3.6	
Last Inspection (Date & Hours)	17 February 2024	0.0
Airframe Hours Since New	3.6	
CRS Issue Date	17 February 2024	
ATF (Issue Date & Expiry Date)	7 May 2024	6 May 2025
C of R (Issue Date) (Present Owner)	15 February 2024	
Operating Category	Private (Part 94)	
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 the maintenance records, the construction of the aircraft was approved by the Regulator on 15 March 2023 with approval number CAAD493E. The construction of the aircraft was conducted and certified by an approved person (AP) on 17 February 2024. The AP was issued an Approved Person Certificate on 31 January 2024 with an expiry date of 31 January 2025.

1.6.3. The aircraft was first registered to the present owner on 15 February 2024.

1.6.4. The aircraft had the Authority to Fly (ATF) that was initially issued on 7 May 2024 with an expiry date of 6 May 2025.

1.6.5. According to the aircraft maintenance records, the first inspection of the aircraft was certified on 17 February 2024 at 0.0 airframe hours (after construction). The Certificate of Release to Service (CRS) was issued by the AP on 17 February 2024 at 0.0 airframe hours with an expiry date of 16 February 2025 or at 100 airframe hours, whichever occurs first. The aircraft had accrued 3.6 airframe hours since the last inspection.

1.6.6. The last weight and balance calculation was conducted on 17 February 2024. Records showed that the aircraft's certified maximum take-off weight (MTOW) is 800 kilograms (kg).

Engine:

Manufacturer/Model	Rotax / 912ULS
Serial Number	10000617
Hours Since New	3.6
Hours Since Overhaul	Not reached

Propeller:

Manufacturer/Model	Ax Sport /Variable Speed
Serial Number	0016
Hours Since New	3.6
Hours Since Overhaul	Not reached

1.7. Meteorological Information

1.7.1. The weather information below was obtained from the Meteorological Aerodrome Report (METAR) that was issued for FAKR by the South African Weather Service (SAWS) on 8 May 2024 at 1445Z. FAKR is located 2km from the accident site.

Wind Direction	180°	Wind Speed	03kt	Visibility	999m
Temperature	21°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	16°C	QNH	1015hPa		

1.7.2 Carburettor Icing

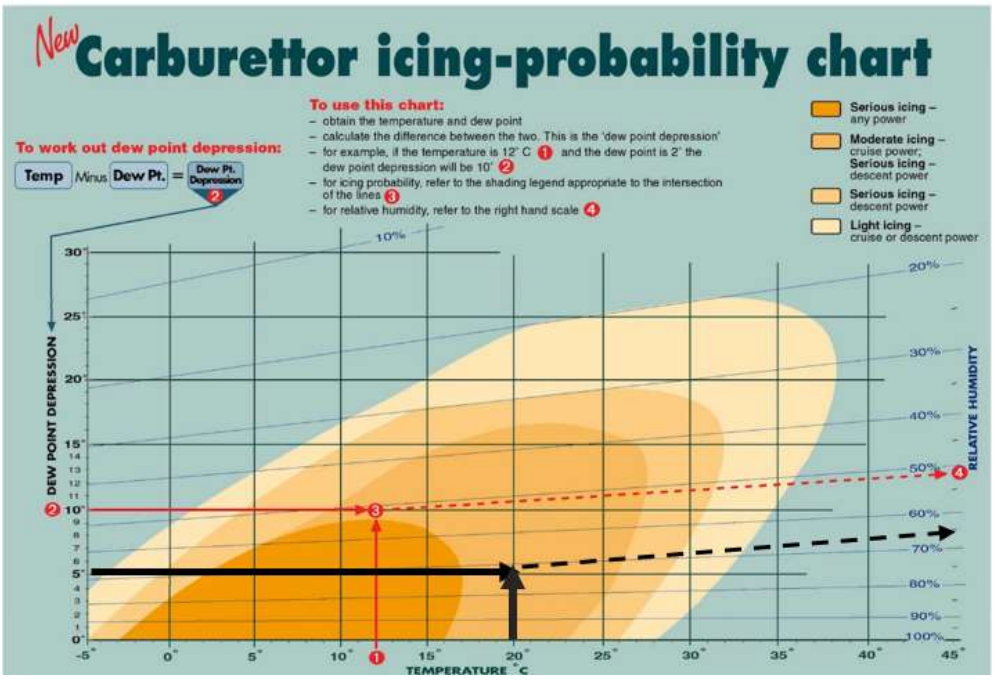

Chart 1: Carburettor icing chart.

1.7.3. According to the carburettor icing chart calculations, the temperature was 21°C and the dew point was 16°C; the dew point depression was 5°C. When plotting these numbers on the carburettor icing chart, the relative humidity was calculated at approximately 65%, which indicated moderate icing conditions at cruise and serious icing conditions at descent. The aircraft was on descent to land and the engine experienced serious icing conditions.

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 occurred approximately 2km from FAKR.

Aerodrome Name	Krugersdorp Aerodrome
Aerodrome Location	Krugersdorp, Gauteng Province
Aerodrome Status	Licensed
Aerodrome GPS coordinates	26°4’52” South, 27°43’32” East
Aerodrome Elevation	5 400ft
Runway Headings	8/26
Dimensions of Runway Used	9m x 818m
Heading of Runway Used	26
Surface of Runway Used	Asphalt
Approach Facilities	None
Radio Frequency	122.0 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. The aircraft landed hard with the main landing gear wheels which caused the right gear strut to bend outward. The left gear strut also bent, and the axle broke. Thus, the aircraft's nose pitched down, which resulted in the propeller striking the ground.

Figure 3: The right main landing gear strut that bent outward. (Source: Pilot).

Figure 4: The bent left main gear strut, and the broken axle. (Source: Pilot)

Figure 5: The propeller blade that broke off. (Source: Pilot).

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 there was no damage to the cockpit and cabin areas that would have caused serious injuries to the occupant.

1.16. Tests and Research

1.16.1. The aircraft was recovered to the AP facility for further investigation. These are the findings:

The Rotax 912ULS engine with serial number 10000617 was started and ground ran. Throughout the test, the engine performed reliably and remained within all the operational parameters specified in the operator's manual. The performance and functionality of the engine were in accordance with the manufacturer's guidelines, ensuring that all technical and safety standards were met. This comprehensive testing confirmed that the engine was operating optimally and in line with the prescribed specifications for safe and efficient operation.

1.17. Organisational and Management Information

1.17.1. The flight was conducted under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.17.2. The first inspection of the aircraft was certified on 17 February 2024 at 0.0 airframe hours (after construction). The Certificate of Release to Service (CRS) was issued by the AP on 17 February 2024 at 0.0 airframe hours with an expiry date of 16 February 2025 or at 100 airframe hours, whichever occurs first. The aircraft had accrued 3.6 airframe hours since the last inspection.

1.18. Additional Information

1.18.1 Carburettor Icing (Source: https://www.faa.gov/sites/faa.gov/files/09_phak_ch7.pdf).

One disadvantage of the float-type carburettor is its icing tendency. Carburettor ice occurs due to the effects of fuel vaporisation and the decrease in air pressure in the venturi, which causes a sharp temperature drop in the carburettor. If water vapour in the air condenses when the carburettor temperature is at or below freezing, ice may form on the internal surfaces of the carburettor, including the throttle valve. The reduced air pressure, as well as the vaporisation of fuel contributes to the temperature decrease in the carburettor. Ice generally forms in the vicinity of the throttle valve and the venturi throat. This restricts the flow of the fuel-air mixture and reduces power. If enough ice builds up, the engine may cease to operate. Carburettor ice is most likely to occur when temperatures are below 70 degrees Fahrenheit (°F) or 21 degrees Celsius (°C) and the relative humidity is above 80 percent. Due to the sudden cooling that takes place in the carburettor, icing can occur even in outside air temperatures as high as 100 °F (38 °C) and humidity as low as 50 percent. This temperature drop can be as much as 60 to 70 absolute (versus relative) Fahrenheit degrees (70 x 100/180 = 38.89

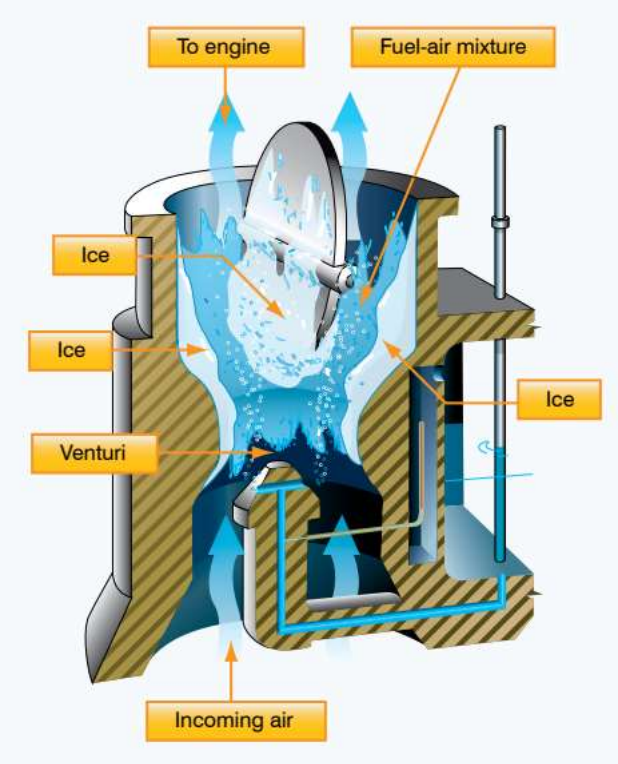

Illustration 1. Carburettor icing in an engine. (Source: https://www.bing.com/images/search?q=illustration+of+carburetor+icing)

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

2.2.1. Man

The pilot's licence and medical certificate were valid. The pilot met regulatory requirements for the operation of the aircraft, including type endorsement and medical fitness.

Machine

2.2.2. The aircraft was first registered to the present owner on 15 February 2024. The aircraft's construction was authorised by the SACAA and the aircraft was certified by the approved person (AP). The construction process followed regulatory standards. The AP certificate was valid. The construction and certification of the aircraft were completed correctly. The

inspection and CRS were recent and in compliance with the regulations. The aircraft had accumulated 3.6 of flight hours since new, this suggests that the aircraft was in good operational condition.

Mission

2.2.3. This was a private flight conducted under the provisions of Part 94 of the CAR 2011 as amended.

Medium (Weather Conditions)

2.2.4. Weather conditions at the time of the flight were conducive to moderate carburettor icing at cruise power setting and serious icing at descent power setting. The aircraft was on final approach for landing at FAKR.

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, that 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 pilot was initially issued a National Pilot Licence (NPL) on 5 March 2019. His licence validation was conducted on 6 March 2023 with an expiry date of 26 February 2025. The aircraft type was endorsed on the pilot's licence. The pilot was issued a Class 4 aviation medical certificate on 4 August 2023 with an expiry date of 31 August 2026.

3.2.2. The flight was conducted under the provisions of Part 94 of the CAR 2011 as amended.

3.2.3. The construction of the aircraft was approved by the SACAA on 15 March 2023 with approval number CAAD493E. The construction of the aircraft was certified by the AP on 17 February 2024. The AP was issued an Approved Person Certificate on 31 January 2024 with an expiry date of 31 January 2025.

3.2.4. The aircraft was first registered to the present owner on 15 February 2024.

3.2.5. The aircraft had a valid proving flight Authority to Fly (ATF) that was initially issued by the Regulator on 7 May 2024 with an expiry date of 6 May 2025.

3.2.6. The last inspection of the aircraft after construction was certified on 17 February 2024 at 0.0 airframe hours. The aircraft had accrued 3.6 airframe hours since new. The Certificate of Release to Service (CRS) was issued by the AP on 17 February 2024 at 0.0 airframe hours with an expiry date of 16 February 2025 or at 100 airframe hours, whichever occurs first.

3.2.7 The engine was ground-run post-accident. Throughout the test, the engine performed reliably and remained within all the operational parameters specified in the operator's manual.

3.2.8. Around the time of the accident flight, the temperature and dew point conditions were conducive to moderate carburettor icing at cruise power setting and serious icing at descent power setting.

3.3 Probable Cause

3.3.1. Engine stoppage due to carburettor icing which resulted from the pilot's omission to use carburettor heat whilst operating in conditions conducive to carburettor ice formation. This, consequently, led to an unsuccessful forced landing.

3.4 Contributory Factor

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. None.

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