PRELIMINARY ACCIDENT REPORT

Accident and Incident Investigations Division

Accident
- Preliminary Report -
AIID Ref No: CA18/2/3/10564

Figure 1: The file picture of the aircraft type. (Source: Operator)

Description:

On Wednesday, 19 March 2025 at 1500Z, a pilot and five passengers on-board an Aerostar PA-60-600 aircraft with registration ZS-NJD took off from Bethlehem Aerodrome (FABM) in Free State province with the intention to land at Wonderboom Aerodrome (FAWB) in Gauteng province.

According to the pilot, the aircraft departed from FAWB in the morning with sufficient fuel for a round trip to FABM. On the return leg prior to take-off, a pre-flight inspection was conducted and no faults were found. Thereafter, the aircraft taxied to FABM Runway 11. After a normal engine run-up and rotation at 90 knots (kts), the aircraft got airborne but failed to achieve the expected rate of climb; the airspeed decreased and the aircraft lost altitude. A belly forced landing was conducted approximately 500 metres beyond Runway 11. The pilot and the passengers were not injured; the aircraft sustained damage to the belly, propellers and wings leading edges.

Occurrence Details

Reference Number	**:** CA18/2/3/10564
Occurrence Category	**:** Category 2
Type of Operation	**:** Private (Part 91)
Name of Operator	**:** Twin City Development
Aircraft Registration	**:** ZS-NJD
Aircraft Make and Model	**:** Piper Aircraft PA-60-600, Aerostar
Nationality	**:** South African
Place	**:** Bethlehem Aerodrome, Free State province
Date and Time	**:** 19 March at 1500Z
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 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-60-600 Aerostar which occurred at Bethlehem Aerodrome, Free State province, on 19 March 2025 at 1500Z. 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.

The AIID has appointed an investigator-in-charge to conduct a full investigation. The investigator dispatched to the accident site. 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 had appointed an accredited representative. The AIID will lead the investigation and issue the final report of this accident in accordance with the CAR 2011 Part 12 and the 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 or 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:
https://www.caa.co.za/industry-information/accidents-and-incidents/

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   Accident — this investigated accident
   Piper — the PA-60-600 Aerostar 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

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Abbreviation	Description
°	Degrees
°C	Degrees Celsius
AIID	Accident and Incident Investigations Division
ATPL	Airline Transport Pilot Licence
AVGAS 100LL	Aviation Gasoline 100 Low Lead
CAR	Civil Aviation Regulations
COA	Certificate of Airworthiness
C of R	Certificate of Registration
CRS	Certificate of Release to Service
FABM	Bethlehem Aerodrome
FAWB	Wonderboom Aerodrome
ft	Feet
GPS	Global Positioning System
hPa	Hectopascal
kt	Knots
m	Metres
METAR	Meteorological Aerodrome Report
RWY	Runway
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
QNH	Altitude Above Mean Sea Level
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, 19 March 2025 at 1500Z, a pilot and five passengers on-board the Aerostar PA-60-600 with registration ZS-NJD took off from Bethlehem Aerodrome (FABM) in Free State province with the intention to land at Wonderboom Aerodrome (FAWB) in Gauteng province. The flight was conducted under visual meteorological conditions (VMC) and under the provisions of Pat 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.2. According to the pilot's report, the aircraft departed from FAWB in the morning with adequate fuel on-board for the planned flight to Bethlehem Airport (FABM) and back to FAWB. The round trip was scheduled for the same day. The outbound flight to FABM was uneventful. Later that day prior to the return leg to FAWB, the pilot conducted a pre-flight inspection of the aircraft and no defects (abnormalities) were identified. After boarding the aircraft, the pilot and the passengers taxied to Runway 11 (RWY 11) and held short for departure.

1.1.3. The pilot completed the standard engine run-up checks before departure, and all the engine parameters were within the normal operating limits (green range). Take-off was commenced and the aircraft rotated at 90 knots (kts). Shortly after becoming airborne, the pilot noticed that the aircraft was not achieving the expected rate of climb, although it cleared the aerodrome's perimeter fence; the airspeed was decaying and the aircraft was losing altitude. In response, the pilot retracted the landing gears.

1.1.4. After realising that the aircraft was unable to maintain altitude, he scanned the area and identified a line of tall trees ahead of the flight path which posed an imminent collision threat. To avoid the direct impact, the pilot initiated a slight turn to the left to align the aircraft to a gap between the trees.

1.1.5. The aircraft landed on its belly approximately 500 metres (m) beyond RWY 11. It continued to slide on the ground for about 250m before it stopped between the tall trees after it had impacted a small tree on its path. The aircraft rested facing south.

1.1.6. An eyewitness who was photographing the departure and positioned near the hangars adjacent to RWY 11 stated that the aircraft struggled to gain altitude after rotation. He also noted that the landing gear was retracted just as the aircraft began to descend and, subsequently, impacted the ground.

1.1.7. The pilot and the passengers disembarked from the aircraft unassisted; they were not injured. The aircraft sustained substantial damage to the underside fuselage (belly), both propellers and both left and right wings leading-edge.

1.1.8. The accident occurred during daylight on a private farm about 750m from RWY 11 at Global Positioning System (GPS) co-ordinate determined to be S 28° 14' 53.69", E 028° 20' 42.75".

Figure 2: A view of the accident site with inset pictures showing the aircraft after take-off. (Source: Google Map)

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	1	-	5	6	-
Total	**1**	**-**	**5**	**6**	**-**

Note: Other means people on the ground.

1.2.1. No person was injured.

1.3. Damage to Aircraft

1.3.1. The aircraft sustained damage to the under fuselage (belly), left and right wings leading edges, engine number 1 and two, and left and right propeller blades.

Figure 3: The aircraft post-accident.

1.4. Other Damage

1.4.1. A section of the private farm's barrier fence.

1.5. Personnel Information

Nationality	South African	Gender	Male	Age	29
Licence Type	Airline Transport Pilot Licence (ATPL)				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Night, Instrument, and Flight Instructor Grade III				
Medical Expiry Date	31 May 2025				
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	2116
Total Past 24 Hours	3.6
Total Past 7 Days	3.6
Total Past 90 Days	48.3
Total on Type Past 90 Days	3.6
Total on Type	234

1.5.1. According to the available records, the pilot was initially issued a licence by the Regulator (SACAA) on 5 June 2015. He had an Airline Transport Pilot Licence (ATPL) that was issued on 1 July 2024 with an expiry date of 31 May 2025. His Class 1 aviation medical certificate was issued on 14 November 2024 with an expiry date of 30 November 2025.

1.6. **Aircraft Information** (Source: Pilot's Operating Handbook)

1.6.1. *The Piper PA-60-600, also known as the Piper Aerostar 600, is a twin-engine, propeller-driven, light aircraft designed by Ted R. Smith and later manufactured by Piper Aircraft Corporation. The aircraft is equipped with a fully retractable tricycle landing gear that is electro-hydraulically controlled and also allows nose-wheel steering.*

Airframe:

Manufacturer/Model	Aerostar Aircraft Corporation/PA-60-600	
Serial Number	60-0309-114	
Year of Manufacture	1978	
Total Airframe Hours (At Time of Accident)	3645.7	
Last Inspection (Date & Hours)	2 August 2024	3616.2
Hours Since Last Inspection	29.5	
CRS Issue Date	2 August 2024	
C of A (Issue Date & Expiry Date)	28 August 2024	30 September 2025
C of R (Issue Date) (Present Owner)	11 October 1995	
Type of Fuel Used	AVGAS 100LL	
Operating Category	Part 91	
Previous Accidents	None	

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

Engine: No1

Manufacturer/Model	Lycoming/ IO-540-K1F5
Serial Number	L-14346-48A
Hours Since New	3616.2
Hours Since Overhaul	1711.1

Engine: No 2

Manufacturer/Model	Lycoming/ IO-540-K1F5
Serial Number	L-14347-48A
Hours Since New	3616.2
Hours Since Overhaul	1711.1

Propeller: No 1

Manufacturer/Model	Hartzell/ HC-8468-8R
Serial Number	CK 668
Blades Serial Number	(C59531; C59658; C59664)
Hours Since New	3616.2
Hours Since Overhaul	402.3

Propeller: No 2

Manufacturer/Model	Hartzell/ HC-C3YR-2UF
Serial Number	CK 3003
Blades Serial Number	F24410; F24421; F24455
Hours Since New	3616.2
Hours Since Overhaul	402.3

1.6.2. A review of the aircraft maintenance records such as logbooks (airframe, engines, and propellers), flight folio and mandatory periodic inspection was conducted. All manufacturer-issued Service Bulletins (SBs) and Service Instructions (SIs) letters were complied with by both the aircraft maintenance organisation (AMO) and the operator.

1.6.3. The aircraft had a Certificate of Airworthiness (C of A) that was issued by the Regulator on 3 September 2024 with an expiry date of 30 September 2025. The aircraft was registered to the current owner on 11 August 1995. A mandatory periodic inspection (MPI) of the aircraft was conducted and certified on 2 August 2024 at 3616.2 hours after which a Certificate of Release to Service (CRS) was issued with an expiry date of 2 August 2025 or at 3716.2 hours, whichever comes first.

1.6.4. A review of engine number 2's propeller maintenance records showed that it had undergone a mid-life maintenance inspection on 23 January 2024.

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 FABM on 19 March 2025 at 1500Z. FABM is located 700m from the accident site.

Wind Direction	260°	Wind Speed	4 kt	Visibility	9999 m
Temperature	15°C	Cloud Cover	Overcast	Cloud Base	Broken 1000ft
Dew Point	15°C	QNH	1019hPa		

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 during daylight on a private farm about 750m from RWY 11 at FABM.

Aerodrome Name	Bethlehem Aerodrome (FABM)
Aerodrome Location	Bethlehem, Free State Province
Aerodrome Status	Licensed
Aerodrome GPS coordinates	28°14'57.43"South, 028°19'54.11"East
Aerodrome Elevation	5561 ft
Runway Headings	11/29 and13/31
Dimensions of Runway Used	(1175m x 15m) and(1279m x 46m)
Heading of Runway Used	RWY 11
Surface of Runway Used	Asphalt
Approach Facilities	None
Radio Frequency	Unmanned

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**

Figure 4: An overview of the accident site. (Source: Google Earth map)

1.12.1. The accident occurred during the take-off phase from FABM (indicated by the green demarcated area). The final accident site was on a field at a private farm (blue demarcated area), approximately 750m east of Runway 11. The aircraft remained largely intact with most structural components still attached to the fuselage. The terrain at the accident site comprised several obstacles including a barrier fence and tall trees (see Figure 5).

Figure 5: Aerial view of the accident site. (Source: Operator)

1.12.2. After rotation, the aircraft struggled to gain height and crashed shortly after clearing the aerodrome's barrier fence. The initial impact occurred approximately 500m from RWY 11; the aft section of the aircraft struck the ground first, followed by both propellers.

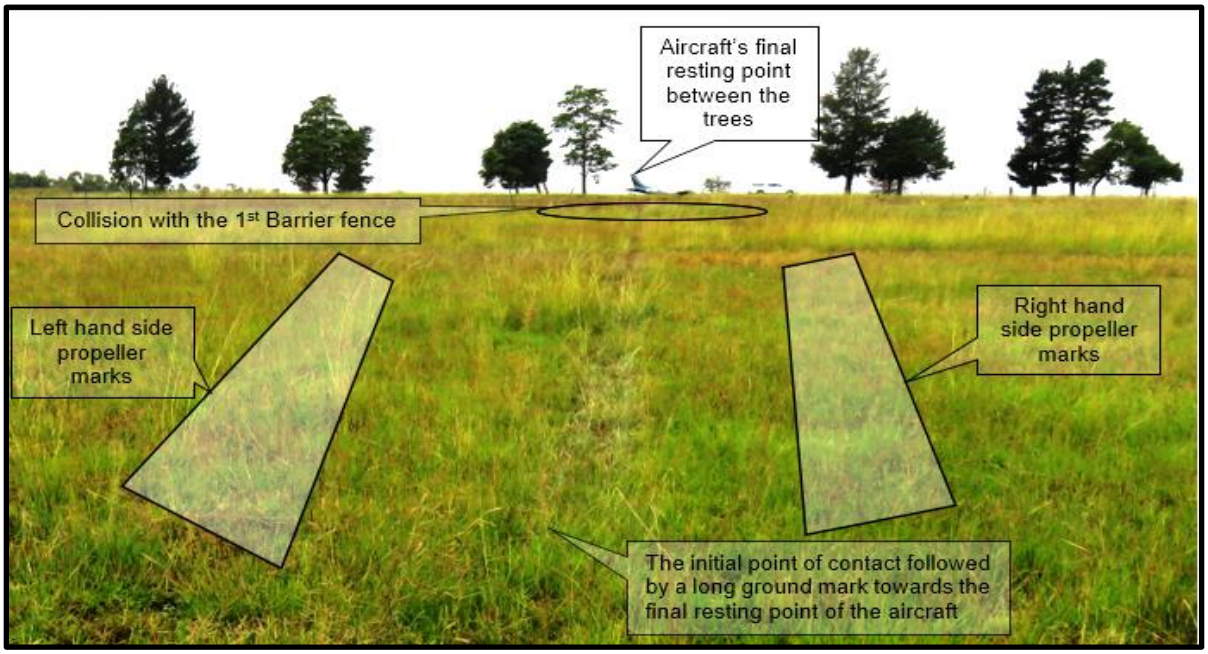

Figure 6: The point at which the aircraft initially touched down.

1.12.3. The aircraft slid along the grass surface for approximately 42m until it impacted the first barrier fence.

Figure 7: The pictures show the damage caused to the barrier fences.

1.12.4. After the impact with the first barrier fence, the aircraft became momentarily airborne for approximately 15m before it touched down again.

Figure 8: The space between the barrier fence and the second impact marks.

After touching down on the ground for the second time, the aircraft continued to scrape along the ground and the right propeller (that had stopped turning) left a distinguishable line for approximately 181m before the aircraft impacted the second barrier fence and the subsequent third barrier fence, as well as the tree across the road (the tree was located 12m from the road).

Figure 9: Impact marks caused by both the fuselage and the right-side propeller.

1.12.5. The investigator found the aircraft resting on its belly between the trees. Four tyres were positioned under the left wing to support it.

Figure 10: The aircraft as it was found.

The tyres were placed by the pilot and the eyewitness (who was near the hangars at the aerodrome) to prevent fuel from leaking out of the damaged left wing. Both the left and the right wings sustained damage due to impact with the barrier fences. The right wing sustained impact damage from the barrier fences and the tree.

1.12.6. The aircraft structure was fairly intact; both wings and the propeller blade had damage that was visible to the eye.

Figure 11: Damage on both the left- and right-side of the propellers and the wings.

1.12.7. The propeller's variable pitch mechanism housing dome-cylinder was found loosened. The oil escaped from it and caused a significant oil loss from the engines and propellers.

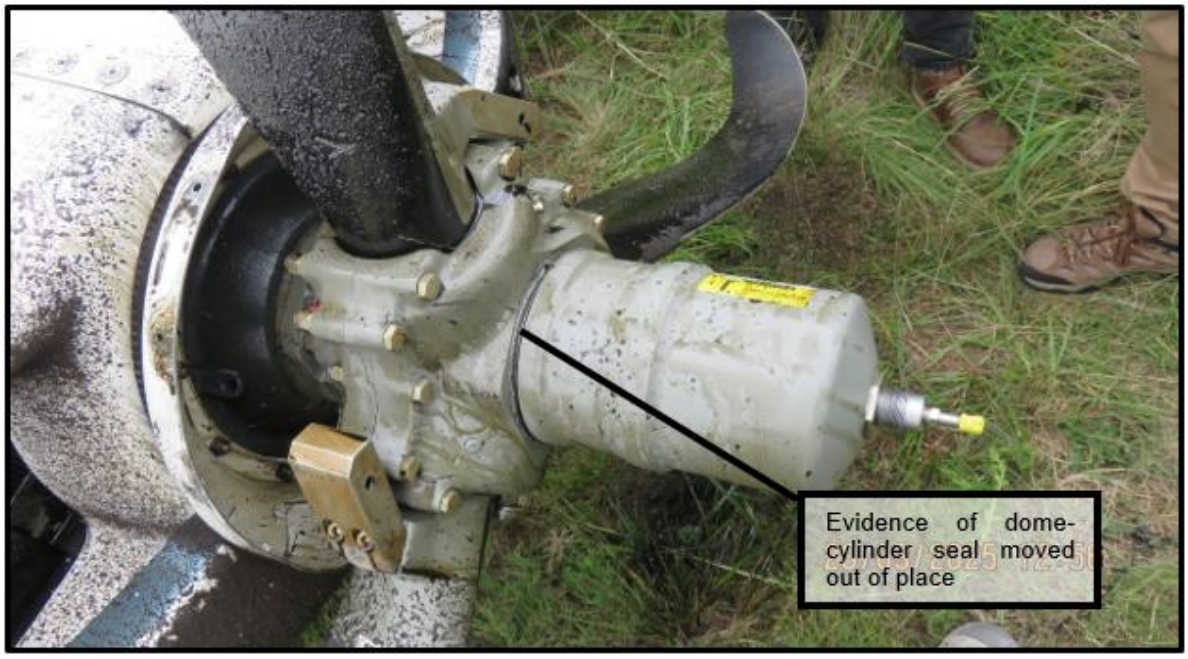

Figure 11: The propeller dome-cylinder mounting was found loose and showed evidence of oil leak.

1.13. Medical and Pathological Information

1.13.1. None.

1.14. Fire

1.14.1. There was no pre-or post-impact fire during the accident.

1.15. Survival Aspects

1.15.1. The cockpit and cabin structure were found intact, and the occupants had used the aircraft safety belts during the flight.

1.16. Tests and Research

1.16.1. The on-site investigation determined that the propeller pitch-changing mechanism housing cylinder had detached from its mounting position which caused oil to leak. The propeller was disassembled by a qualified propeller specialist on 26 March 2025 at an AMO facility. Upon inspection, the ON switch screwing threads were damaged. A metallurgical analysis has been commissioned to establish the root cause of the failure, and the results will be discussed in the final report.

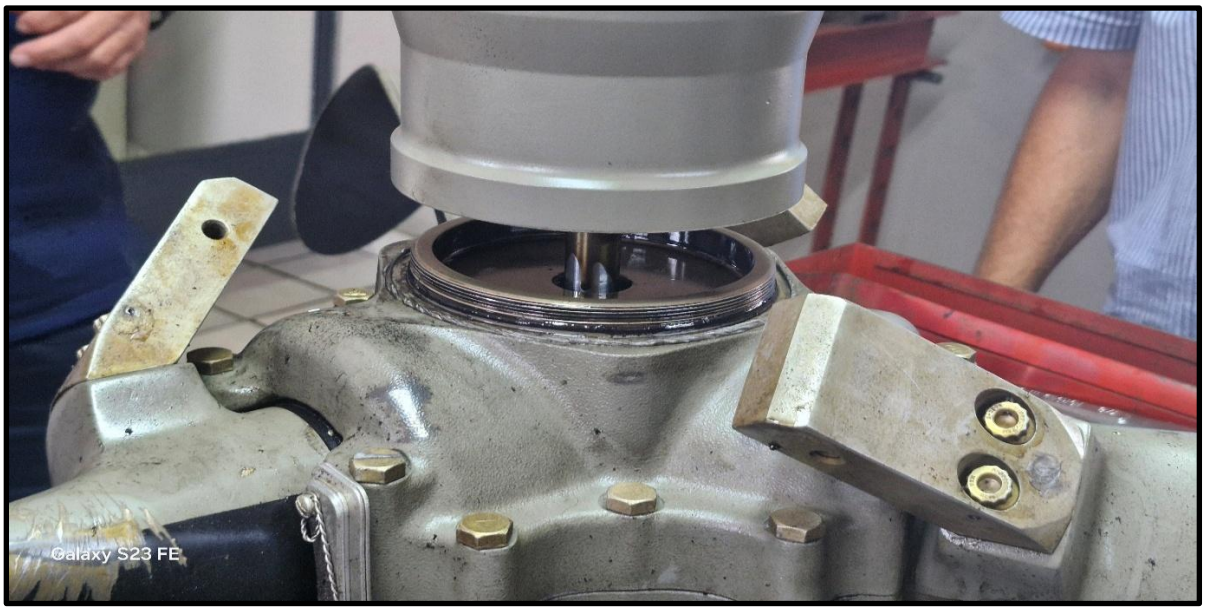

Figure 13: The disassembly of the propeller dome-cylinder.

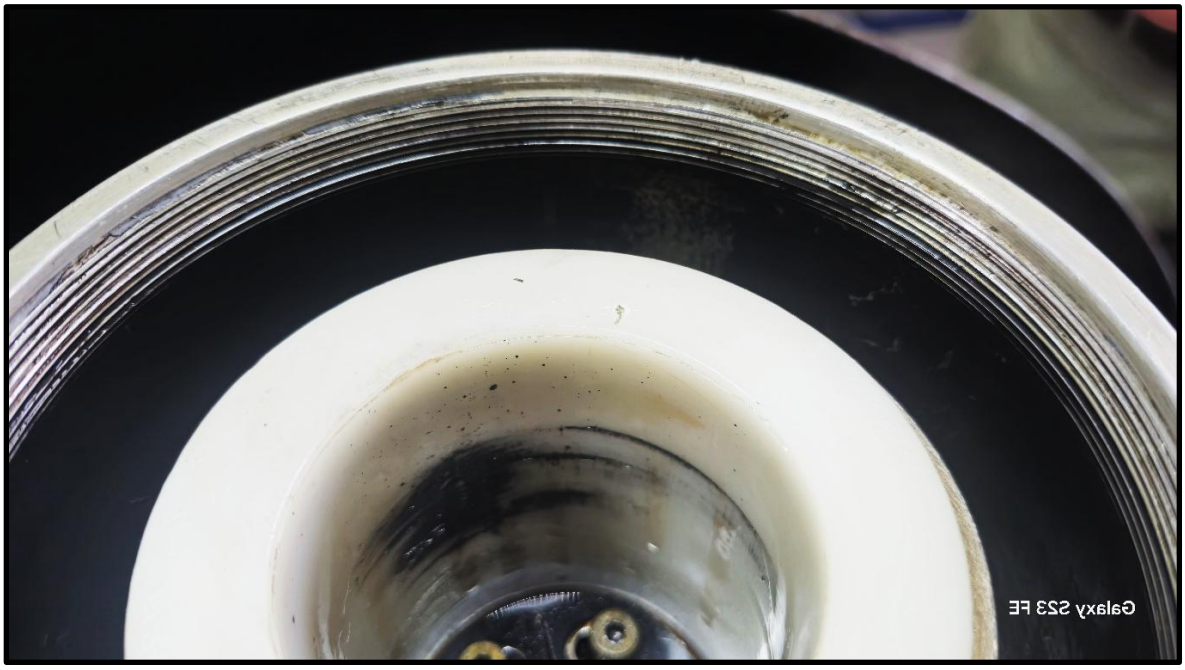

Figure 14: The damaged front threads of the dome-cylinder.

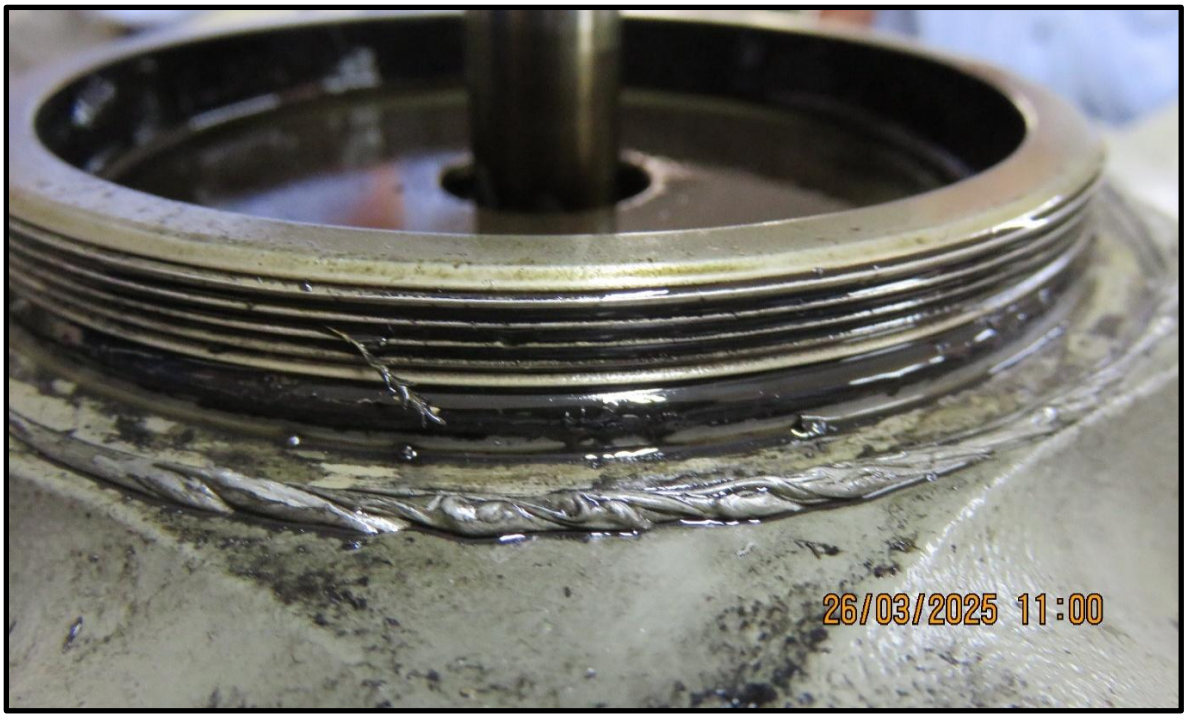

Figure 14: The threads of the intact propeller assembly with the rubber seal in place.

1.17. **Organisational and Management Information**

1.17.1. The aircraft is privately owned. It was privately operated on the day of the accident under the provisions of Part 91 of the CAR 2011 as amended.

1.17.2. The AMO that conducted maintenance of the aircraft was issued a Regulator-approved AMO Certificate on 24 April 2024 with an expiry date of 30 April 2025.

1.18. Additional Information

1.18.1. The schematic diagram (below) of the propeller hub assembly identifies item number 70 as the propeller cylinder. Item number 380 refers to the O-ring used to seal the dome-cylinder. The dome-cylinder houses the propeller pitch-changing mechanism which includes a spring-loaded piston actuated by engine oil pressure during operation.

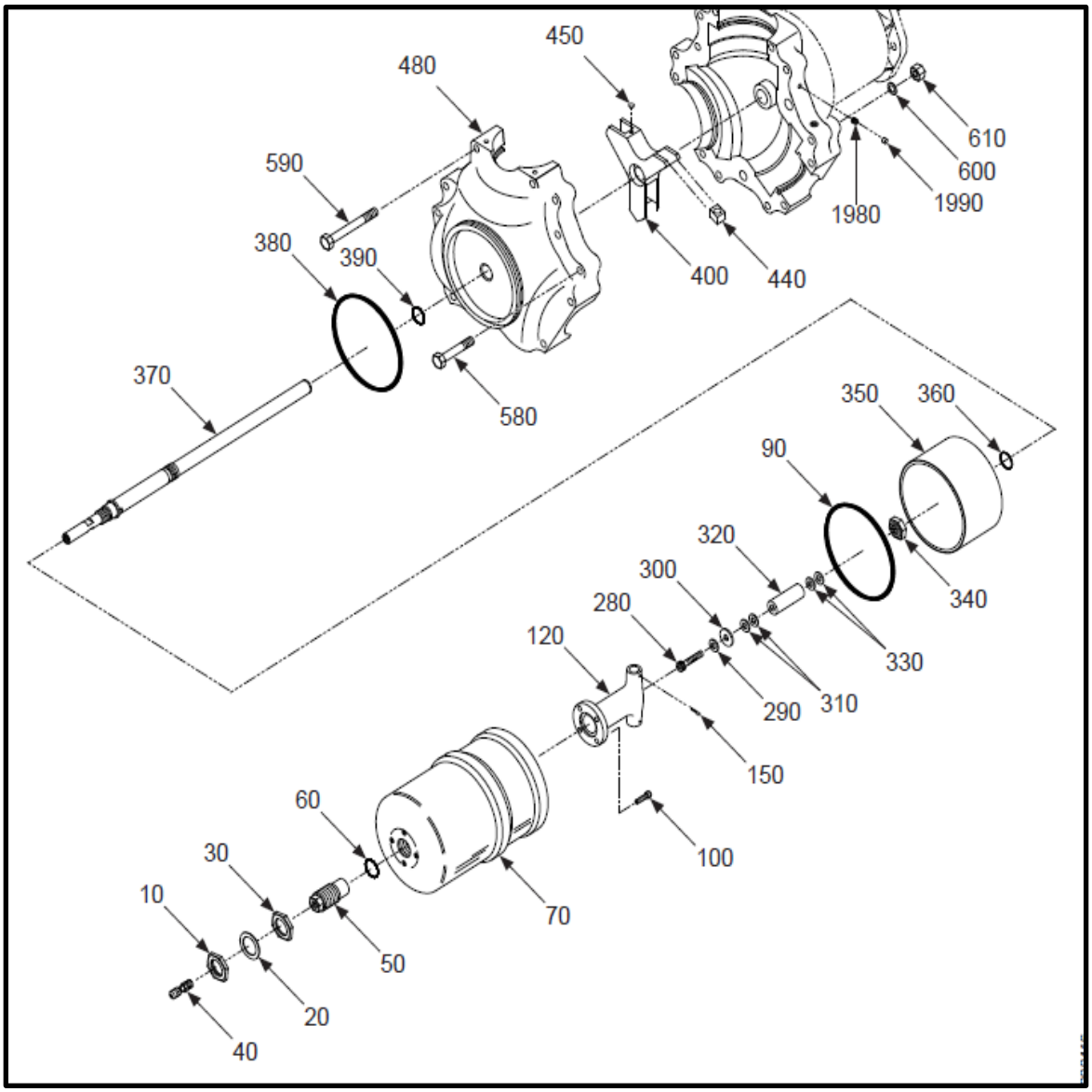

Diagram 1: The schematic diagram of the propeller hub assembly.

1.18.2. The installation of the dome-cylinder does not require torque application.

1.19. **Useful or Effective Investigation Techniques**

1.19.1. None.

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 pilot was initially issued a licence by the Regulator on 5 June 2015. He had an Airline Transport Pilot Licence (ATPL) that was issued on 1 July 2024 with an expiry date of 31 May 2025. His Class 1 aviation medical certificate was issued on 14 November 2024 with an expiry date of 30 November 2025.

2.2.2. The pilot had a total of 2116 flight hours of which 234 hours were accumulated on the aircraft type. His licence was endorsed with Night, Instrument and Flight Instructor Grade III ratings. The aircraft type was endorsed on his licence.

2.2.3. The aircraft had a Certificate of Airworthiness (C of A) that was issued by the Regulator on 3 September 2024 with an expiry date of 30 September 2025. The aircraft was registered to the current owner on 11 August 1995.

2.2.4. A mandatory periodic inspection (MPI) of the aircraft was conducted and certified on 2 August 2024 at 3616.2 hours after which a Certificate of Release to Service (CRS) was issued with an expiry date of 2 August 2025 or at 3716.2 hours, whichever comes first.

2.2.5. The aircraft maintenance organisation (AMO) responsible for the maintenance of the aircraft had an AMO Certificate that was issued on 24 April 2024 with an expiry date of 30 April 2025.

2.2.6. The aircraft is privately owned. It was privately operated on the day of the accident under the provisions of Part 91 of the CAR 2011 as amended.

2.2.7. The pitch-changing mechanism housing cylinder of the aircraft's right engine propeller (engine number 2) detached from its mounting position which caused loss of oil. As a result, the engine oil pressure dropped and this led to the variable pitch propeller to default to a feathered position. This sequence of events resulted in loss of thrust from the right engine which led to the pilot conducting an unsuccessful forced landing.

3. ON-GOING INVESTIGATION

3.1. The AIID investigation is on-going and the investigator will investigate other aspects of this occurrence which may or may not have safety implications.

3.2. A metallurgical test is underway to determine the cause of failure.

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. To be discussed in the final report.

5. APPENDICES

5.1. None.

This report is issued by:

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