PRELIMINARY ACCIDENT REPORT

Accident and Incident Investigations Division

Accident
- Preliminary Report -
AIID Ref No: CA18/2/3/10526

Figure1: The Airbus AS350B3 helicopter. (Source: Operator)

Description:

On Thursday, 21 November 2024, a pilot and two passengers on-board an Airbus AS350B3 helicopter with registration ZS-RWG took off from Ultimate Heli in Midrand, Gauteng province, to conduct surveillance in the east of Pretoria with the intention to return to Ultimate Heli.

On their return leg at approximately 0923Z whilst the helicopter was 400 feet (ft) above ground level (AGL), the pilot heard a loud sound (gong) which was followed by an engine failure. The Vehicle and Engine Monitoring Display (VEMD) indicated that the engine torque and engine power available (NG) were offline as they were on the yellow arc. As the main rotor revolutions per minute (RPM) decreased to about 360, the pilot initiated an autorotation heading south-west. The helicopter descended rapidly and the pilot identified a suitable area on which to conduct a forced landing. The helicopter impacted the ground hard with the left skid and slid on the grass before it stopped 20 metres from the first point of impact. After it had stopped, the pilot immediately shut down the critical electrical systems, including the fan and gyroscope; he let the main rotors slow down before applying rotor brake. Once the rotors had stopped, he switched off the battery and evacuated the helicopter with the passengers. Preliminary findings suggested a potential Electrical Control Unit (ECU) failure that may have contributed to the malfunction of the fuel control unit.

Occurrence Details

Reference Number	**:** CA18/2/3/10526
Occurrence Category	**:** Category 1
Type of Operation	**:** Surveillance (Part 127)
Name of Operator	**:** Ultimate Heli
Helicopter Registration	**:** ZS-RWG
Helicopter Make and Model	**:** Airbus AS350B3
Nationality	**:** South African
Place	**:** Open field near Midstream, Centurion, Gauteng Province
Date and Time	**:** 21 November 2024 at 0923Z
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 an Airbus AS350B3 helicopter which occurred in Centurion, Gauteng province, on 21 November 2024 at 0923Z. 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 had 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 State (France) has appointed an accredited representative and advisor. 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 investigation accident
   Helicopter— the Airbus AS350B3 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
AGL	Above Ground Level
AIID	Accident and Incident Investigations Division
AOC	Air Operational Certificate
ASL	Air Service Licence
ASLC	Air Service Licence Council
ATPL	Airline Transport Pilot Licence
CAR	Civil Aviation Regulations
CIT	Cash-in-transit
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
DOT	Department of Transport
FDR	Flight Data Recorder
ft	Feet
GPS	Global Positioning System
GTP	Gauteng Traffic Police
hPa	Hectopascal
kt	Knots
m	Metres
METAR	Meteorological Aerodrome Report
NG	Engine Power Available
RPM	Revolutions per Minute
SACAA	South African Civil Aviation Authority
SAR	Search and Rescue
SAWS	South African Weather Service
QNH	Altitude Above Mean Sea Level
UL	Ultimate Heli
VEMD	Vehicle and engine Multifunctional Display
VMC	Visual Meteorological Condition
Z	Zulu (Term for Universal Co-ordinated Time - Zero Hours Greenwich)

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1. On Thursday, 21 November 2024, a pilot and two passengers on an Airbus AS350B3 helicopter with registration ZS-RWG took off from Ultimate Heli (UL) helipad in Midrand, Gauteng province, to conduct surveillance in the east of Pretoria with the intention to land back at the same helipad. The flight was conducted under visual meteorological conditions (VMC) and under the provisions of Part 127 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.2. The pilot was on a call-out for a surveillance operation and the two passengers on-board were members of the Gauteng Traffic Police (GTP). The flight took off at approximately 0900Z and routed north. The surveillance operation was completed without incident. On their return leg at approximately 0923Z whilst flying south-westerly overhead the Eco-Park Estate at 400 feet (ft) above ground level (AGL), the pilot heard a loud sound (gong). This was followed by the engine torque and engine power available (NG) indicators moving to the yellow range of the Vehicle and Engine Multifunctional Display (VEMD). The pilot also observed the main rotor revolutions per minute (RPM) rapidly spooling down; when they reached approximately 350 RPM, it was confirmation to the pilot that the engine had failed.

1.1.3. Thereafter, the pilot initiated an autorotation whilst scanning the area for a suitable location to execute a forced landing as the helicopter was rapidly losing altitude. The pilot identified an open area on which to conduct a forced landing; however, the helicopter impacted the ground hard with its left front skid which caused the bottom skid bar to break off. Subsequently, the left side of the helicopter's nose contacted the ground forcefully and the helicopter skidded forward. It continued to slide on the ground and eventually settled on its skids. During the accident sequence, the tail boom bent downward which caused the tail rotor drive shaft to decouple near the front shaft assembly bearing (Part no: 350A34-1015-2201). The helicopter came to a stop approximately 20 metres (m) facing south-west.

1.1.4. The pilot immediately shut down all electrical systems after the helicopter had come to a stop, including the gyroscope and the fan. He then let the main rotors to slow down to a safe rotational speed before he engaged the rotor brake. Once the main rotors had stopped, the pilot switched off the battery and disembarked from the helicopter, followed by the passengers. All occupants were not injured; the helicopter sustained substantial

damage to the left landing skid, left side of the nose section, and tail boom which was bent due to the impact and rotating shaft coupling.

1.1.5. The accident occurred on an open field in Plot 399 JR, Brakfontein, at Global Positioning System (GPS) co-ordinate determined to be S 25° 53' 58" E 028° 10' 27", at a field elevation of 4921 ft.

Figure 2: Aerial view of the accident location. (Source: Google Earth)

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	1	-	2	3	-
Total	**1**	**-**	**2**	**3**	**-**

Note: Other means people on the ground.

1.2.1. No person was injured during the accident.

1.3. **Damage to Helicopter**

1.3.1. The left landing skid, tail boom and the left side of the nose section were substantially damaged.

Figure 3: The helicopter post-accident.

1.4. **Other Damage**

1.4.1. None.

1.5. **Personnel Information**

Nationality	South African	Gender	Male	Age	38
Licence Type	Airline Transport Pilot Licence (ATPL)				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Game/Livestock Cull, Night, Class 2 Test Pilot, Under Sling/Winching				
Medical Expiry Date	31 December 2024				

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	4542
Total Past 24 Hours	4
Total Past 7 Days	14
Total Past 90 Days	69
Total on Type Past 90 Days	62
Total on Type	1506

1.5.1. The pilot had an Airline Transport Pilot Licence (ATPL) that was initially issued by the Regulator (SACAA) on 31 July 2019. The renewed licence was issued on 2 August 2024 with an expiry date of 31 July 2025. His Class 1 aviation medical certificate was issued on 7 December 2023 with an expiry date of 31 December 2024.

1.6. Aircraft Information

1.6.1. The information below is an extract from the Pilot's Operating Handbook (POH).

The Eurocopter AS350 B3 is a single-engine, light utility helicopter that is particularly recognized for its high-altitude and hot-weather performance, making it ideal for challenging environments such as mountain regions or dense forests. Its versatility in various operational settings, from Search and Rescue (SAR) to aerial work and law enforcement, makes it one of the leading helicopters in its class.

Airframe:

Manufacturer/Model	Eurocopter/Airbus AS 350B3	
Serial Number	3773	
Year of Manufacture	2003	
Total Airframe Hours (At Time of Accident)	4419.2	
Last Inspection (Date & Hours)	1 July 2024	4296.10
Hours Since Last Inspection	123.1	
CRS Issue Date	14 December 2023	
C of A (Issue Date & Expiry Date)	17 January 2024	28 February 2025
C of R (Issue Date) (Present Owner)	6 September 2024	
Type of Fuel Used	Jet A-1	

Operating Category	Part 127
Previous Accidents	None

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

Engine:

Manufacturer/Model	Turbomeca, Arriel 2B
Serial Number	22443
Part Number	0292005340
Hours Since New	4419.2
Hours Since Overhaul	989.2

Main Rotor:

Manufacturer/Model	355A1003064
Serial Number	42408/ 42410/ 42481
Part Number	N/A
Hours Since New	1 026.05
Hours Since Overhaul	TBO not yet reached

Tail Rotor:

Manufacturer/Model	350A120050-14
Serial Number	22302
Part Number	N/A
Hours Since New	1443.8 hrs
Hours Since Overhaul	TBO not yet reached

1.6.2. A review of the helicopter's maintenance records was conducted, including the airframe and engine logbooks, as well as the recent mandatory periodic inspection (MPI) record. All records were found compliant to the regulatory requirements. The MPI of the helicopter is conducted every 150 airframe hours in accordance with their established maintenance plan. This was verified by the aircraft maintenance organisation (AMO). The helicopter was issued a Certificate of Airworthiness (C of A) on 17 January 2024 with an expiry date of 28 February 2025.

1.6.3. The maintenance of the helicopter was conducted on 1 July 2024 at 4296.10 airframe hours after which a Certificate of Release to Service (CRS) was issued with an expiry date of 1 July 2025 or at 4442.5 airframe hours, whichever comes first. The helicopter had accrued 123.1 airframe hours since the last MPI.

1.6.4. There were no issues identified which related to the operation and maintenance of the helicopter in the logbooks.

1.7. **Meteorological Information**

1.7.1. The following weather information was obtained from the Meteorological Aerodrome Report (METAR) that was issued by the South African Weather Service (SAWS), recorded in Irene, Centurion, on 21 November 2024 at 0900Z. Irene is located 0.4 nautical miles from the accident site.

Wind Direction	350°	Wind Speed	5 kt	Visibility	9999m
Temperature	28°C	Cloud Cover	FEW	Cloud Base	2000 ft
Dew Point	10°C	QNH	Q1023hPa		

1.7.2. Good weather conditions prevailed at the time of the flight.

1.8. **Aids to Navigation**

1.8.1. The helicopter 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 helicopter 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 on an open field in Plot 399 JR, Brakfontein, at GPS co-ordinate determined to be S 25° 53' 58" E 028° 10' 27" at a field elevation of 4921 ft.

1.11. Flight Recorders

1.11.1. The helicopter 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 helicopter type.

1.12. Wreckage and Impact Information

1.12.1. The accident occurred on a field, approximately 200m from the industrial and residential areas. The accident site had potential obstacles, including tall trees to the north (direction of approached) and high-tension electrical power lines (see Figures 4 and 5).

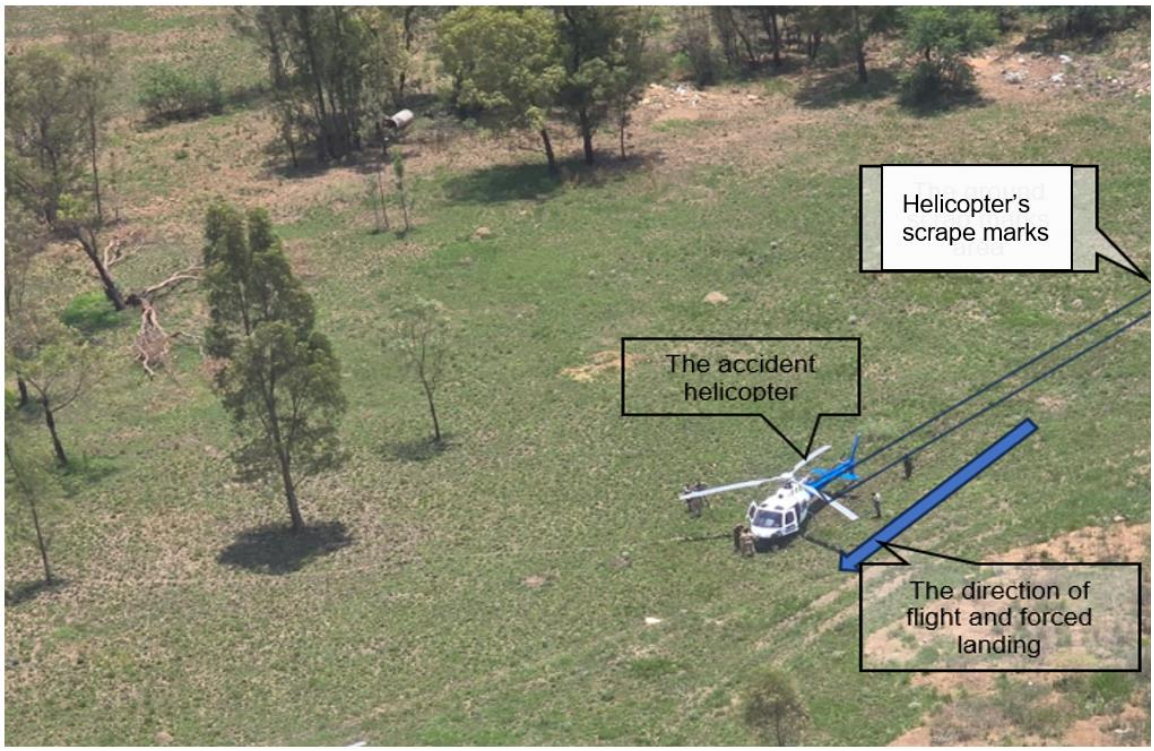

Figure 4: Arial view of the accident site showing the surrounding obstacles and the ground scrape marks. (Source: Operator)

1.12.2. Post-accident, the helicopter was found to be relatively intact except for the damage on the left landing skid, as well as the separation of the sidestep bar. The operator and the GTP requested the removal of the official police livery and markings on the helicopter to mitigate attention (see Figure 3).

1.12.3. The bottom skid bar broke into three pieces (segments) during the accident sequence. The damage pattern suggested that it was subjected to significant impact forces, likely from a heavy object, which resulted in the structural failure (see Figure 5).

Figure 5: Damage on the left skid.

- The bottom of the nose section towards the left side had damage consistent with contact with the ground whilst the helicopter skidded and, possibly, subjected to heavy, momentary forces (see Figure 6).

Figure 6: Damage to the bottom nose section.

The helicopter's tail boom had bent near the attachment points which led to the tail rotor shaft decoupling. Both components (coupler and the shaft) sustained minor damage during decoupling whilst the helicopter was rotating. The coupling caused damage to the tail rotor shaft covering fairing panels (see Figures 7 and 8).

Figure 7: Damage to the tail boom attachment section and the decoupled tail rotor shaft. (Photo was taken after the helicopter was recovered).

Figure 8: Decoupled tail rotor drive shaft.

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 helicopter's impact attitude and speed did not compromise the integrity of the cockpit and cabin areas. The accident was considered survivable.

1.16. **Tests and Research**

1.16.1. After the accident, an examination of the helicopter's VEMD was conducted to assess the cause of failure. The following test reference modes were retrieved during the analysis: 44, 47, 48, 49, and 53. Each test mode displayed an "INVAL" message, followed by the name of the corresponding parameter, with either the "R" or "L" designation (indicating invalid parameter) which pointed to a failure in the Full Authority Digital Engine Control (FADEC) left module. These recorded failure modes all occurred within the final minutes before the accident, coinciding with the reported engine failure event.

Failure Analysis and Interpretation for Mitigation (Source: Manufacturer's Maintenance Manual of the engine)

TEST REF shows one of following codes "44, 47, 48, 49, 53" with the message "INVAL" followed by the name of a parameter, by "R" or "L" (Invalid parameter).	The VEMD has detected that the value of the parameter cited and delivered by the FADEC is not valid. See the LRU NAME list.	Replace or repair the component on the LRU NAME list which is most likely to be faulty. If the fault is still detected after the replacement, replace the next component on the LRU NAME list. Continue in this way until the fault is no longer detected. Refer to the Engine Maintenance Manual (EMM TURBOMECA) for the faults incriminating the FADEC.

1.17. **Organisational and Management Information**

1.17.1. The helicopter was operated in accordance with the provisions outlined in Part 127 of the CAR 2011 as amended. This operation was conducted under a contractual agreement between the operator, Ultimate Heli, and the Gauteng Traffic Police (GTP) for the provision of airborne support in co-ordination with the government's crime prevention initiatives in Gauteng province. The flight adhered to the established Standard Operating Procedures (SOP) which stipulated that a special flight should be launched within 90 minutes of business hours during weekdays in response to emergencies such as cash-in-transit (CIT) heists or car hijackings. On the day of the accident, the helicopter was in the process of returning to base after completing a call-out in east Pretoria.

1.17.2. The operator had an Air Service Licence (ASL) that was issued by the Air Service Licence Council (ASLC) on behalf of the Department of Transport (DOT) on 25 January 2017 which covered domestic and international operations.

1.17.3. The Air Operating Certificate (AOC) was issued by the Regulator on 26 April 2024 with an expiry date of 30 April 2025.

1.17.4. The helicopter's maintenance was performed by an approved aircraft maintenance organisation (AMO) in compliance with the manufacturer's maintenance procedures. The AMO had a valid AMO Certificate that was issued by the Regulator on 16 May 2023 with an expiry date of 31 May 2024. The helicopter was listed in the AMO's operational maintenance specifications.

1.18. Additional Information

1.18.1. Processes and Procedures between the Operator and Gauteng Traffic Police (Source: Operator)

The standard operational procedure defines the processes and procedures applicable to air operations conducted by the operator (Ultimate Heli) and any other service provider stipulated by Ultimate Heli for Gauteng Traffic Police (GTP).

Flight to Perform

Flights shall be performed according to the instructions of GTP Air Operations through the issue of a Flight request by the GPT Flight coordinator/ Pilot (FC). To be received by UH Flight Ops by 1700 for the flight to be conducted the next day.

Special flights to be conducted, such as emergency CIT or car hijackings, etc., shall be launched within 90 minutes during weekday work hours.

After hours and over weekends, the flight must be launched within 120 minutes. Notwithstanding the above, crews shall endeavour to complete all flight planning and preparation safely rather than take the scheduled take-off time.

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 had an Airline Transport Pilot Licence (ATPL) that was initially issued by the Regulator on 31 July 2019. The renewed licence was issued on 2 August 2024 with an expiry date of 31 July 2025. His licence was endorsed with the following ratings: Game/Livestock Cull, Night, Test Pilot Class 2, and Under Sling/Winching. The helicopter type was also endorsed on the licence.

2.2.2. The pilot's Class 1 aviation medical certificate was issued on 7 December 2023 with an expiry date of 31 December 2024.

2.2.3. The pilot had 4542 total flying hours of which 1506 hours were accumulated on the helicopter type.

2.2.4. The helicopter was issued a Certificate of Airworthiness (C of A) by the Regulator on 17 January 2024 with an expiry date of 28 February 2025. The Regulator registered the helicopter under the current owner on 6 September 2024.

2.2.5. The helicopter maintenance was conducted on 1 July 2024 at 4296.10 airframe hours after which a Certificate of Release to Service (CRS) was issued with an expiry date of 1 July 2025 or at 4442.5 airframe hours, whichever comes first. The helicopter had accrued 123.1 airframe hours after the last MPI.

2.2.6. The helicopter was operated in accordance with the provisions outlined in Part 127 of the Civil Aviation Regulations (CAR) 2011 as amended. This operation was conducted

under a contractual agreement between the operator, Ultimate Heli, and the GTP for the provision of airborne support in co-ordination with the government's crime prevention initiatives in Gauteng province.

2.2.7. The helicopter's maintenance was performed by the approved AMO in compliance with the manufacturer's maintenance procedures. The AMO had a valid approval certificate that was issued by the Regulator on 16 May 2023 with an expiry date of 31 May 2024.

2.2.8. Five test references for failure modes were recorded which related to the ECU malfunction and were registered at the time of the engine failure, leading to the accident. This led to the removal of the ECU which was sent to the state of manufacturer's investigation authorities for further tests and analysis.

2.2.9. The operator had an Air Service Licence (ASL) that was issued by the Air Service Licence Council (ASLC) on behalf of the Department of Transport on 25 January 2017 which covered domestic and international operations.

2.2.10. The Air Operation Certificate (AOC) was issued by the Regulator on 26 April 2024 with an expiry date of 30 April 2025.

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. The investigation will also focus on the powerplant and fuel supply system.

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