

UAS LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/3/2/10348						
Classification	Accident	Date	10 July 2023	Time	2325Z		
Type of Operation	Unmanned Aircraft Systems – Surveillance (Part 101)						
Location							
Place of Departure	Dipaleseng near Balfour, Mpumalanga Province		Place of Intended Landing	Dipaleseng near Balfour, Mpumalanga Province			
Place of Occurrence	Dipaleseng, approximately 9.7km from the launch site						
GPS Co-ordinates	Latitude	26° 42' 42" S	Longitude	028° 35' 26" E	Elevation	5452 ft	
Aircraft Information							
Registration	ZT-YFW		Class	3A			
Make; Model; S/N	Arace; Sirin (Serial Number: SIR127)						
Damage to Aircraft	Minor		Total UAS Hours	826.58			
Pilot-in-command							
Licence Type	Remote Pilot Licence (RPL)		Gender	Male		Age	21
Licence Valid	Yes	Total Hours	680.18	Total Hours on Type	680.18		
Total Hours 30 Days	35.53		Total Flying on Type Past 90 Days	179.18			
Injuries	0	Injuries (On ground)	0	Fatalities	0	People Controlling	1
What Happened							
<p>On Thursday, 10 July 2023 at approximately 2300Z, an Arace Sirin Unmanned Aircraft Systems (UAS) with registration ZT-YFW was engaged in a surveillance flight at Dipaleseng near Balfour, Mpumalanga province. The flight was conducted under beyond visual line of sight (BVLOS) rules at night and under the provisions of Part 101 of the Civil Aviation Regulations (CAR) 2011 as amended.</p> <p>According to the pilot, a pre-flight inspection was conducted with no anomalies found. The waypoints of the flight route were set. The UAS was launched with 99% battery power and, thereafter, it climbed to 394 feet (ft) above ground level (AGL). Approximately 16 minutes into the flight whilst at about 9.7 kilometres (km) from the launch position, the pilot noticed what looked like an interruption on his video feed and, soon after, the UAS impacted the power line pole. The pilot traced the UAS to the last recorded location and found it crashed on the ground.</p> <p>The UAS sustained damage to the right front landing gear; there were no injuries on the ground or damage to property.</p> <p>The weather information obtained from the pilot questionnaire (form: CA 12-03) was as follows: Wind: north-west at 13 knots (kts) and gusting 20 kts; Visibility: 10km; Temperature: 0°C; Dew point: -7°C with no cloud coverage.</p> <p>According to the design specifications of the UAS, it could operate in wind conditions of 40 kts (75 kph). The wind condition at the time of the flight was 20 kts gusting at a maximum of 20 kts. Good weather conditions prevailed at the time of the flight.</p>							

Figure 1 shows the view of the accident site. The pin location provided by the pilot indicated that the UAS was found under high-tension power lines. According to the Eskom report (Ch3Techdetails), the minimum clearance between the conductor and the ground must be 15.0 metres.



Figure 1: Overlay of the accident site. (Source: Google Earth)

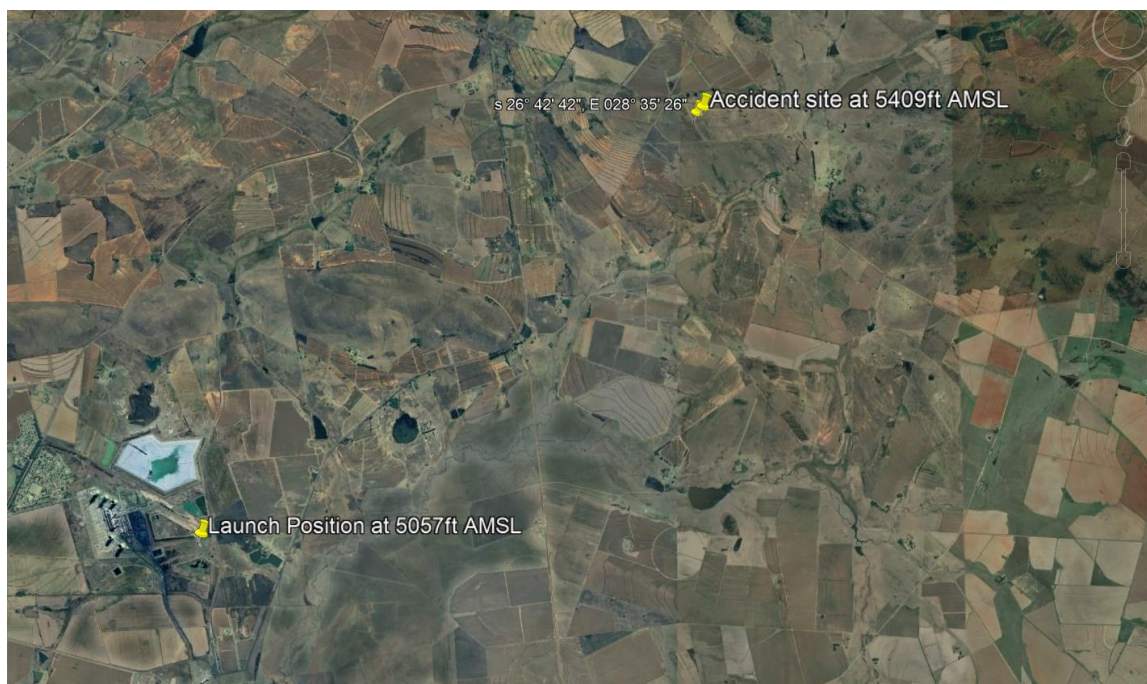


Figure 2: The elevation of the two points between the launch site and the accident site.

According to Google Maps location indicator, the UAS was launched at a field elevation of 5057 ft above mean sea level (AMSL). The accident occurred at a field elevation of 5409 ft AMSL. The height at which the UAS was operated (394 ft AGL) did not clear the obstacle due to the rising field which was higher than the launch site. The high-tension electrical power lines spanned across the UAS's flight path.



Figure 3: The UAS type. (Source: www.araceuas.com/sirin)

The UAS specifications provided in the Industrial UAV Solution (Operator/Manufacturer) website: www.araceuas.com/sirin/

The Sirin design operating altitude range is 16 000 ft above sea level (ASL). Field development takes less than 1 minute and requires no assembly. The RPAS is equipped with a multi redundancy for safe operation such as:

- *Triple inertial measurement units (IMUs)*
- *Dual Compass*
- *Dual GNSS/GPS (multi constellation)*
- *No pre-flight calibration is required*
- *Numerous built-in failsafe features*

The RPAS (UAS) can be operated up to a radius of 20 kilometres and can act as a relay with ARACE point to multi-point Mobile Remote Terminal (MRVT).



Figure 4: Damaged UAS landing gear. (Source: Operator)



Figure 5: Scratch marks on the rotor blade. (Source: Operator)

Findings

1. The pilot was initially issued a Remote Pilot Licence (RPL) by the Regulator on 7 July 2022 with an expiry date of 31 May 2024. The pilot had a Class 3 medical certificate that was issued on 2 April 2022 with an expiry date of 30 May 2026. The pilot was endorsed as a qualified multirotor UAS operator with visual line of sight (VLOS) and beyond visual line of sight (BVLOS) ratings. The pilot had accumulated a total of 680.18 hours as an UAS operator on the same UAS type.
2. The UAS was issued an Unmanned Aircraft Systems Letter of Approval (UASLOA) by the Regulator (SACAA) on 11 July 2022. The UASLOA renewal was issued on 24 May 2023 with an expiry date of 10 July 2024. The last periodic maintenance conducted on the UAS was on 1 July 2023 at 801.07 hours. The UAS was issued a Certificate of Registration (C of R) by the Regulator on 14 June 2022 under the current owner.
3. The UAS maintenance was conducted by a remote maintenance technician (RMT) with a RMT Certificate that was issued by the Regulator on 19 December 2022 with an expiry date of 18 December 2024.
4. The operator had a valid UAS Operating Certificate (UASOC) that was issued by the Regulator on 31 October 2022 with an expiry date of 31 October 2023. The operator's operation specifications, issued on 21 June 2023 with an expiry date of 30 June 2024, had the UAS type endorsement. The UAS was registered under Class 3A for BVLOS operations at a radius of 15 km and at a height restriction of 400 ft above ground level (AGL).
5. The operator had a permit issued on 23 June 2022 under the authority of their client (Transnet) to conduct Remotely Piloted Aircraft System surveillance operations over the petroleum and gas pipelines servitudes.
6. The UAS flight log analysis was requested from the operator; at the time of completion of this report, the operator had not submitted it to the investigators.
7. The UAS was operated in an area with rising terrain; it impacted the power lines which spanned across its flight path at a height of 15 metres AGL.

Probable Cause(s)

The UAS impacted the high-tension wires during a night operation in an area with rising terrain, which resulted in a crash.

Contributing Factor(s)
Poor flight planning as rising terrain risk was not considered.
Safety Action(s)
None.
Safety Message and/or Safety Recommendation/s
To avoid damage to property and injury, UAS operators and pilots operating in areas with rising terrain must incorporate varying heights in their flight planning.
About this Report
<p><i>The decision to conduct a limited investigate is based on factors including whether the cause is known and the evidence supporting the cause is clear, the level of safety benefit likely to be obtained from an investigation and that will determine the scope of an investigation. For this occurrence, a limited investigation has been conducted, and the Accident and Incident Investigations Division (AIID) has relied on the information submitted by the affected person/s and organisation/s to compile this limited report. The report has been compiled using information supplied in the initial notification, as well as from follow-up desk top enquiries to bring awareness of potential safety issues to the industry in respect of this occurrence, as well as possible safety action/s that the industry might want to consider in preventing a recurrence of a similar occurrence.</i></p> <p><i>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.</i></p>
Purpose
<i>In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011 and ICAO Annex 13, 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.</i>
Disclaimer
<i>This report is produced without prejudice to the rights of the AIID, which are reserved.</i>

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