

UAS LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10311						
Classification	Accident	Date	27 May 2023		Time	1701Z	
Type of Operation	Remotely Piloted Aircraft System – Surveillance (Part 101)						
Location							
Place of Departure	Harmony Savuka Mine, Gauteng Province		Place of Intended Landing	Harmony Savuka Mine, Gauteng Province			
Place of Occurrence	Harmony Savuka Mine in Gauteng Province						
GPS Co-ordinates	Latitude	26° 24' 58.24" S	Longitude	27° 24' 26.61" E	Elevation	5303 ft	
Aircraft Information							
Registration	ZT-XOD		Class	3A			
Make; Model; S/N	Arace; Sirin (Serial Number: SIR0024)						
Damage to Aircraft	Substantial		Total UAS Hours	534.2			
Pilot-in-command							
Licence Type	Remote Pilot Licence (RPL)		Gender	Male		Age	27
Licence Valid	Yes	Total Hours	755.3		Total Hours on Type	755.3	
Total Hours Past 90 Days	240.3		Total Flying Past 90 Days on Type	240.3			
Injuries	0	Injuries (On Ground)	0	Fatalities (On Ground)	0		
People Controlling	1						
What Happened							
<p>On 27 May 2023, an Unmanned Aircraft System (UAS) with registration ZT-XOM was engaged in a security surveillance flight at Harmony Savuka Mine in Carletonville, Gauteng province, when the accident occurred. The flight was conducted under beyond visual line of sight (BVLOS) rules by night and under the provisions of Part 101 of the Civil Aviation Regulations (CAR) 2011 as amended.</p> <p>The pilot reported that he conducted all the pre-flight checks before lift-off. The UAS was launched in ALT Hold (assisted flight mode with altitude hold only, used especially in windy environment) mode. As soon as the UAS took off, a sudden gust of wind pushed it towards the power cables and the wall. The pilot redirect the UAS away from the cables, but it was too late; the UAS impacted the power cables and the wall before it fell to the ground about 2 metres (m) from the pilot's position.</p> <p>The UAS sustained substantial damage to the propeller blades; there was no injury to persons on the ground.</p>							



Figure 1: The UAS after the accident. (Source: Operator)



Figure 2: The damaged propeller (left) and gimbal (right). (Source: Operator)



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

The weather information below was obtained from the Meteorological Aerodrome Report (METAR) that was issued by the South African Weather Service (SAWS) on 27 May 2023 at 1700Z, recorded at Potchefstroom Airport (FAPS), which is 20nm south-west of the accident site.

FAPS 271700Z AUTO 02006KT //// // // 17/10 Q1024=

Wind Direction	020°	Wind Speed	6kts	Visibility	9999m
Temperature	17°C	Cloud Cover	CAVOK	Cloud Base	CAVOK
Dew Point	10°C	QNH	1024hPa		

Findings

1. The pilot was issued a Remote Pilot Licence (RPL) with visual line of sight (VLOS) and beyond visual line of sight (BVLOS) ratings on 15 March 2022 with an expiry date of 31 March 2023.
2. His Class 3 medical certificate was issued on 12 February 2022 with an expiry date of 28 February 2027 with no medical restrictions.
3. The operator had a Remotely Piloted Aircraft Systems Operating Certificate (ROC) which was issued on 31 October 2022 with an expiry date of 31 October 2023. The operator's approved operation specifications included aerial patrol and survey (G3) for night operations.
4. The UAS was issued a Remotely Piloted Aircraft Systems Letter of Approval (RLA) on 26 September 2022 with an expiry date of 9 November 2023.

5. The mandatory periodic inspection (MPI) that was conducted on the UAS prior to the accident flight was conducted on 10 May 2022 and was certified at 485.0 airframe hours. The UAS was flown a further 49.2 hours since the last MPI.
6. The Remote Maintenance Technician (RMT) who performed the last MPI was issued an RMT licence on 6 May 2022 with an expiry date on 5 May 2024.
7. The Arace Sirin has a wind resistance of Category 6 (25 - 31 miles/hour [22 – 27 knots]).

8. Post-accident Log Analysis Report (Source: Manufacturer)

17:01 UTC: The pilot armed the aircraft in “Alt Hold” mode.

17:01 UTC: The aircraft ascended to 14.3 ft AGL and drifted towards a wall and the power cables before it fell to the ground, 5 metres from the home location.

17:01 UTC: The aircraft fell to the ground giving multiple warnings after it impacted the ground.

Findings

- 1. The home point was between buildings due to pilot safety.*
- 2. The accident happened seconds after take-off, thus the pilot did not have time to react.*
- 3. The aircraft drifted into a wall due to the aircraft being in “Alt Hold” mode.*
- 4. There was a sudden gust of wind, the pilot did not have enough time to react.*

Flight time	Flight mode	GPS Sat	Baro. Alt.	Sonar Alt.	Speed	Home Dist
00m 26.2s	Alt Hold	13	13.4ft	N/A	1.4m/s	3.0m
00m 26.7s	Alt Hold	13	14.3ft	N/A	1.1m/s	3.5m
00m 27.1s	Alt Hold	13	13.4ft	N/A	0.7m/s	3.6m
00m 27.5s	Alt Hold	13	12.4ft	N/A	0.4m/s	3.9m
00m 27.9s	Alt Hold	13	5.5ft	N/A	2.4m/s	3.8m
00m 28.4s	Alt Hold	13	-0.1ft	N/A	3.2m/s	3.5m
00m 28.8s	Alt Hold	13	-5.2ft	N/A	0.6m/s	3.8m

Figure 4: The maximum speed (purple block) reached in less than a second. (Source: Google Earth)

9. The closest weather station to the accident site is 20 nautical miles (nm). It is, therefore, probable that there could have been a gust of wind during the accident time which caused the UAS to drift off course.

Probable Cause

During lift-off, the UAS drifted off course due to a sudden gust of wind and impacted the power cables and the wall before it fell to the ground.

Contributing Factor(s)

None.

Safety Action(s)
None.
Safety Message
Avoid flying in confined spaces.
About this Report
<p><i>The decision to conduct a limited investigation 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