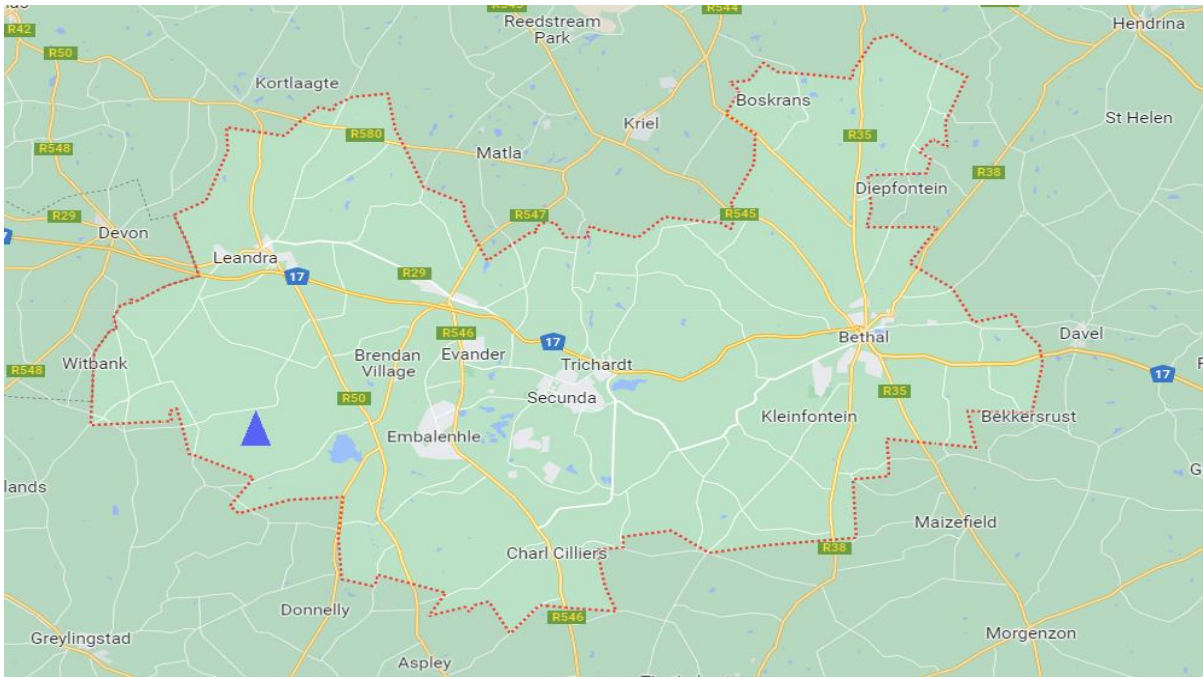


<b>UAS LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL</b>
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<b>Reference Number</b>		CA18/2/3/10340							
<b>Classification</b>		Accident	<b>Date</b>		26 June 2023	<b>Time</b>		2002Z	
<b>Type of Operation</b>		Unmanned Aircraft System – Surveillance (Part 101)							
<b>Location</b>									
Place of Departure		Private Farm in Embalenhle, Mpumalanga Province		Place of Intended Landing		Private Farm in Embalenhle, Mpumalanga Province			
Place of Occurrence		Embalenhle, Mpumalanga Province							
GPS Co-ordinates		Latitude	26°35'18.78"S	Longitude	028°49'35.04" E	Elevation	5 105 ft		
<b>Aircraft Information</b>									
Registration		ZT-YWO		Class		3A			
Make; Model; S/N		Arace Sirin (Serial Number: SIR151)							
Damage to Aircraft		Substantial		Total UAS Hours		131.52			
<b>Pilot-in-command</b>									
Licence Type		Remote Pilot Licence (RPL)		Gender		Male	Age	25	
Licence Valid		Yes	Total Hours		382.14	Total Hours on Type		382.14	
Total Hours 30 Days		49.2		Total Flying on Type Past 90 Days		150			
<b>Injuries</b>	0	<b>Injuries (On ground)</b>		0	<b>Fatalities (on ground)</b>		0	<b>People Controlling</b>	1
<b>What Happened</b>									
<p>On Monday, 26 June 2023, a pilot launched the Arace Sirin Unmanned Aircraft System (UAS) with registration ZT-YWO for inspection on a farm in Embalenhle, Mpumalanga province, with the intention to return to the take-off launch. The flight was conducted under beyond visual line of sight (BLOS) 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 a pre-flight inspection was conducted on the UAS. No anomalies were noted apart from the glitch of incorrect altitude readings from time to time that the pilot experienced with the UAS on the day. The pre-flight checks included checking for the UAS's software updates, ensuring that the Global Positioning System (GPS) satellite was acquired, and that the home point was set to the take-off location. The battery voltage indicated 98 percent at the time of launch.</p> <p>The UAS was launched at 1940Z and it climbed to 262 feet (ft) above ground level (AGL) before the pilot started his mission. The pilot stated that after the UAS was airborne for approximately 22 minutes and whilst it was within the operating range as recommended by the manufacturer, it disconnected from the remote pilot station unit and did not initiate the failsafe mode to return-to-launch position. The pilot climbed on the top of his vehicle in the hope to revive the connection between the UAS and the pilot remote station but to no avail; he then drove closer to the UAS's position but the connection was erratic. The pilot then made his way to the last known location recorded on the remote pilot station unit and found it crashed on the ground with substantial damage.</p>									

No damage to property was caused, and no people were injured on the ground.



**Figure 1:** The blue triangle indicates the accident site. (Source: Google Earth)

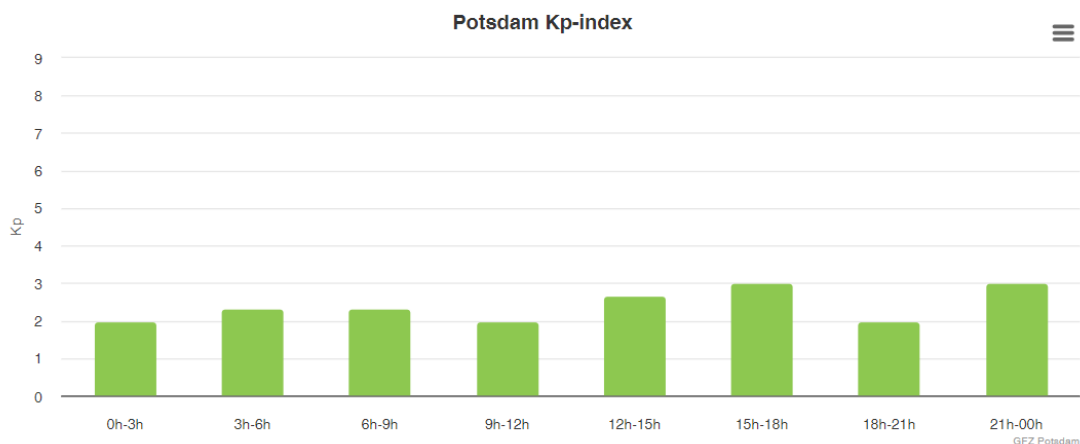


**Figure 2:** The UAS at the accident site before recovery. (Source: Operator)

1. The KP's excellent index was low at the time of the flight.  
(Note: Kp is an indicator of disturbance in the Earth's magnetic field)

## Viewing archive of Monday, 26 June 2023

### GFZ Potsdam official Kp-index



**Graph 1:** GFZ Postdam official Kp index for 26 June 2023.

(Source: <https://www.spaceweatherlive.com/en/archive/2023/06.html>)

**Kp Index** (Source: <https://spaceweather.gfz-potsdam.de/products-data/nowcasts/nowcast-kp-index/what-is-the-kp-index>)

*Geomagnetic disturbances can be monitored by ground-based magnetic observatories recording the three magnetic field components. The global Kp index is obtained as the mean value of the disturbance levels in the two horizontal field components, observed at 13 selected, subauroral stations. The name Kp originates from “planetarische Kennziffer” (= planetary index).*

Siebert (1971) has given the following definition of K variations:

*K variations are all irregular disturbances of the geomagnetic field caused by solar particle radiation within the 3-h interval concerned. All other regular and irregular disturbances are non K variations. Geomagnetic activity is the occurrence of K variations.*

*Local disturbance levels are determined by measuring the range (difference between the highest and lowest values) during three-hourly time intervals for the most disturbed horizontal magnetic field component. First, however, the quiet-day variation pattern has to be removed from the magnetogram, a somewhat subjective procedure. The range is then converted into a local K index (first introduced 1938 for the magnetic observatory Niemegek near Potsdam) taking the values 0 to 9 according to a quasi-logarithmic scale, which is station specific; this is done in an attempt to normalize the frequency of occurrence of the different sizes of disturbances. But K still remains a local index, describing disturbances in the vicinity of each observatory. According to the geographic and geomagnetic coordinates of the observatories, each observatory still has an annual cycle of daily variations. Using*

*statistical methods, Julius Bartels generated conversion tables to eliminate these effects. By applying the conversion tables, a standardized index Ks for each of the 13 selected observatories is determined.*

### **Findings**

1. The pilot was issued a Remote Pilot Licence (RPL) with visual line of sight (VLOS) rating on 11 September 2022, and beyond visual line of sight (BVLOS) rating on 8 November 2022 with an expiry date of 30 September 2024.
2. His Class 3 medical certificate was issued on 20 August 2022 with an expiry date of 31 August 2026 with no medical restrictions.
3. The remote maintenance technician (RMT) was initially issued a RMT Licence on 6 May 2022 with an expiry date of 5 May 2024.
4. The operator was issued a Remotely Piloted Aircraft Systems Operating Certificate (ROC) on 31 October 2022 with an expiry date of 31 October 2023.
5. The UAS was initially issued a Remotely Piloted Aircraft Systems Letter of Approval (LOA) on 15 December 2022 with an expiry date of 14 December 2023.
6. The UAS was issued a Certificate of Registration on 1 December 2022.
7. The UAS's last inspection was conducted at 73.01 total hours. The UAS had accumulated 58.51 hours since the last mandatory periodic inspection (MPI).
8. The downloaded logs were inconclusive, and the operator sent the logs to the manufacturer to be reviewed, and the following was discovered by the manufacturer:

*It was evident that it (UAS) was not flying away. What was noticed was that the RPA (UAS) kept receiving new home point setting commands from the ground station. This could have been because the pilot was inputting commands. Therefore, as the home point was relocated, the UAS (in RTL mode) kept trying to fly to that location. Hence it was flying away (and not towards the operator). Possibly because the pilot was driving and resetting the home point until he made a mistake.*

### **Probable Cause(s)**

The pilot kept changing the home point and, thus, the UAS kept flying further in return to launch (RTL) mode until it crashed.

<b>Contributing Factor(s)</b>
None.
<b>Safety Action(s)</b>
None.
<b>Safety Recommendation/s</b>
None.
<b>About this Report</b>
<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>
<b>Purpose</b>
<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>
<b>Disclaimer</b>
<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**