

**LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL**

<b>Reference Number</b>	CA18/2/3/10236						
<b>Classification</b>	Accident	<b>Date</b>	24 October 2022		<b>Time</b>	1510Z	
<b>Type of Operation</b>	Surveillance (Part 101)						
<b>Location</b>							
Place of Departure	Sun City, North West Province		Place of Intended Landing	Sun City, North West Province			
Place of Occurrence	Sun City, North West Province						
GPS Co-ordinates	Latitude	25° 20'49.05" S	Longitude	027° 06'15.77" E	Elevation	3626 ft	
<b>Aircraft Information</b>							
Registration	ZT-XWX						
Make; Model; S/N	DJI Mavic 2 (Serial Number: MAV0082)						
Damage to Aircraft	Substantial			Total Aircraft Hours	183		
<b>Pilot-in-command</b>							
Licence Type	Remote Pilot Licence (RPL) Multi Rotor		Gender	Male		Age	24
Licence Valid	Yes	Total Hours	553		Total Hours on Type	433	
Total Hours 30 Days	87		Total Flying on Type Past 90 Days	180			
<b>People Controlling</b>	1	<b>Injuries</b>	0	<b>Fatalities</b>	0	<b>Other (on ground)</b>	0
<b>What Happened</b>							
<p>On 24 October 2022, a DJI Mavic 2 remotely piloted aircraft (RPA) with registration ZT-XWX was launched for surveillance duties at Sun City Family Resort in the North West province. The operation was conducted beyond visual line of sight (BVLOS) by day and under the provisions of Part 101 of the Civil Aviation Regulations (CAR) 2011 as amended.</p> <p>The pilot stated that he conducted a pre-flight inspection and no anomalies were detected. He then launched the RPA with the battery power at 100%, and it climbed to 400 feet (ft) above ground level (AGL). After a few minutes into the flight at approximately 1.5 kilometres (km) from the take-off position, the pilot's controller screen froze and the RPA lost Command and Control (C2) connection. The pilot activated the return-to-launch (RTL) and waited a few minutes for the RPA to return. After about 10 minutes with no visual of the RPA, the pilot made his way to its last (known) location, but did not find it.</p>							



**Figure 1:** The crash site. (Source: Google Maps)

Drone Command and C2 Technology (Source: <https://www.unmannedsystemstechnology.com/expo/command-and-control/>)

*Command and Control (C2), also referred to as Control and Non-Payload Communication (CNPC), refers to the communications link between a UAV (unmanned aerial vehicle) and its ground station that is responsible for the management and control of the aircraft. C2 links are an essential part of drone operations whether the aircraft is being directly remotely piloted by a human or programmed to fly autonomously.*

<b>Findings</b>
<ol style="list-style-type: none"> <li>1. The pilot was initially issued a Remote Pilot Licence (RPL) on 10 January 2022 with an expiry date of 31 January 2024. The visual line of sight (VLOS) and beyond visual line of sight (BVLOS) ratings were endorsed on his licence. His Class II medical certificate was issued on 20 November 2021 with an expiry date of 30 November 2022 with no restrictions.</li> <li>2. The last inspection carried out on the RPA prior to the accident flight was on 17 October 2022 at 169 hours. It was flown a further 14 hours after the inspection.</li> <li>3. The operator was issued a Remotely Piloted Aircraft Systems (RPAS) Letter of Approval (LOA) on 9 May 2022 with an expiry date of 8 May 2023. The operator was also issued an RPAS Operating Certificate (ROC) on 31 October 2022 with an expiry date of 31 October 2023.</li> <li>4. Fine weather conditions prevailed at the time of the flight. The weather had no bearing to this accident.</li> <li>5. According to the operator, when the RPA loses signal with the pilot's controller unit, it spells a strong indication of Electromagnetic Interference (EMI). In the Sun City area, there are radio masts and communication infrastructures installed on most surrounding hills and mountains which may cause EMI.  The log files from the RPA would normally confirm this scenario. However, if the RPA is not found, this scenario could not be confirmed. After analysis of available evidence, the EMI was the most probable cause.</li> </ol>
<b>Probable Cause(s)</b>
The RPA lost C2 communication link with the pilot, which resulted in the loss of control and the (likely) subsequent crash.
<b>Contributing Factor(s)</b>
It is likely that the EMI blocked transmission between the RPA and the pilot's controller unit.
<b>Safety Action(s)</b>
None.
<b>Safety Message</b>
<ol style="list-style-type: none"> <li>1. Pilots operating RPAs must avoid operations along areas with radio masts.</li> <li>2. Pilots operating RPAs must conduct risk assessments of areas of their operations.</li> </ol>
<b>About this Report</b>
<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</i>

*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.*

*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.*

**Purpose**

*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.*

**Disclaimer**

*This report is produced without prejudice to the rights of the AIID, which are reserved.*

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