SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Section/division **Accident and Incident Investigations Division** Form Number: CA 12-57

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10263										
Classification	Accident		**Date**	20 December 2022			**Time**	2137Z			
Type of Operation	Aerial Surveillance (Part 101)										
Location											
Place of Departure	Exxaro Leeuwpan Coal Mine, Mpumalanga Province			Place of Intended Landing			Exxaro Leeuwpan Coal Mine, Mpumalanga Province				
Place of Occurrence	Exxaro Leeuwpan Coal Mine										
GPS Co-ordinates	Latitude	26° 10' 43" S		Longitude	28° 44' 59" E		Elevation	5112 ft			
Aircraft Information											
Registration	ZT-YIX										
Make; Model; S/N	DJI Mavic Enterprise (Serial Number: MAV134)										
Damage to Aircraft	Unknown			Total Aircraft Hours	21.21						
Pilot-in-command											
Licence Type	Remote Pilot Licence (RPL)			Gender	Male		Age	27			
Licence Valid	Yes	Total Hours		51.21	Total Hours on Type		51.21				
Total Hours Past 90 Days	51.21			Total Flying Past 90 Days on Type	51.21						
People Controlling	1	Injuries	0	Fatalities	0		Other (on ground)	0			

What Happened

On Tuesday evening, 20 December 2022, a pilot controlling a remotely piloted aircraft (RPA) with registration ZT-YIX was engaged in aerial surveillance operation at Exxaro Leeuwpan Coal Mine in Mpumalanga province. Visual meteorological conditions (VMC) by night prevailed at the time of the flight. The flight was conducted under beyond visual line of sight (BVLOS) rules and under the provisions of Part 101 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot stated that after conducting pre-flight checks with no anomalies detected, he launched the RPA at 2118Z with 100% battery power available. After approximately 19 minutes into the flight, the RPA headed back to the launch site with a critically low battery indication on the controller unit. The RPA activated an emergency landing (automatically without the pilot's input) approximately 450 metres (m) from the launch site in a wetland; the RPA was not recovered. There were no injuries reported.

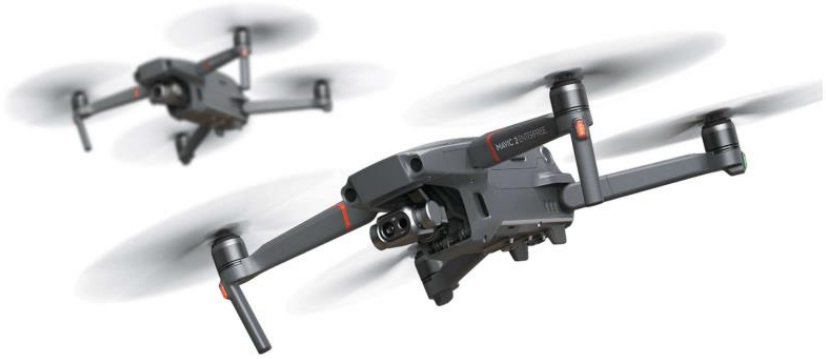

Figure 1: The Mavic Enterprise. (Source: https://djiauthorisedretailer.co.za/?gclid=EAIaIQobChMImqnj1Ova_QIVzu3tCh2ZBgwqEAAYASAAEgKpufD_BwE)

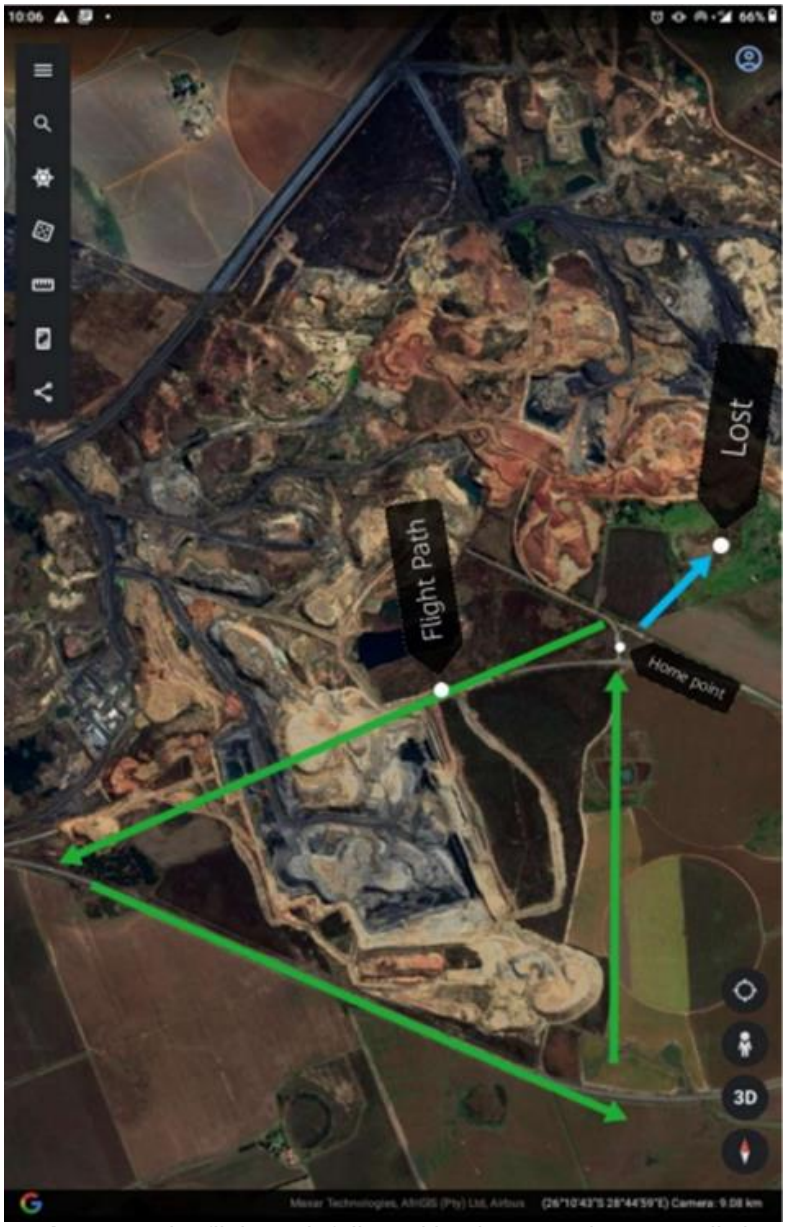

Figure 2: The flight path followed by the RPA. (Source: Pilot)

Findings

1. The pilot was issued a Remote Pilot Licence (RPL) with visual line of sight (VLOS) rating endorsement on 14 September 2022 with an expiry date of 30 September 2024. His Class 3 medical certificate was issued on 20 August 2022 with an expiry date of 31 August 2026 with no medical restrictions. The pilot also had a beyond visual line of sight (BVLOS) rating endorsement on his licence, which was issued on 22 November 2022 with an expiry date of 30 September 2024.

2. The operator was issued a Remotely Piloted Aircraft Systems Operating Certificate (ROC) no. CAA/G1291D on 31 October 2022 with an expiry date of 31 October 2023. The operator was also issued a Remotely Piloted Aircraft (RPA) Letter of Approval (LOA) on 6 September 2022 with an expiry date of 5 September 2023.

3. The RPA had accumulated 21.21 hours since new and, thus, had not reached its mandatory periodic inspection (MPI) of 6 months, 100 hours or 200 flights.

4. Post-accident log analysis report was not available because the RPA was not found.

5. The operator had a policy on battery reserves during the operations (Source: Operator Manual of Procedure)

2.3.1 Battery Reserve

During flight planning, the Pilot in Command shall ensure the aircraft has enough battery power to complete the flight, plus a safe reserve.

For the safety of the operation and protection and longevity of all battery packs, the following minimum battery reserves shall be included in flight planning:

- *Bathawk landing Voltage – 20.3V*
- *All DJI aircraft Landed Voltage – 25%*
- *Sirin – 25%*
- *Griffin – 25%*
- *Condor – 20%*
  - *16000mah over home point which results in 17000mah once on the ground*

i. *All Aircraft will be setup accordingly and may not be changed or modified*
ii. *No-one shall override any messages or notifications with regards to the battery voltage*
iii. *Considering this is a planned reserve, a 5% tolerance will be granted unless in an abnormal/emergency situation during which one needs to make use of the reserve*
iv. *In the event that one is in pursuit of suspects, an exception shall be made, however the relevant safety precautions shall be exercised to prevent incidents and accidents.*
v. *Any deviation from the above, in excess of 5% must be noted in the flight folio under "INCIDENT"*

6. Part 101 of the CAR 2011 as amended, Subpart (101.05.23): Power Reserves

(1) During VLOS operations, the remote pilot shall ensure that the aircraft has enough fuel or electrical charge to complete the flight, plus a reserve of at least 10%.

(2) During B-VLOS operations, the remote pilot shall ensure that the aircraft has enough fuel or electrical charge to complete the intended flight plus a reserve of at least 10%.

Probable Cause(s)
The RPA battery voltage was critically low, which led to the RPA activating an automatic emergency landing but crashed in the wetland. The RPA was not found.
Contributing Factor(s)
The RPA was operated with the battery voltage below the minimum requirement stated in the Standard Operating Procedure.
Safety Action(s)
None.
Safety Message and/or Safety Recommendation/s
None.
About this Report
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. *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