

Section/division Accident and Incident Investigations Division

Form Number: CA 12-57

LIMITED OCCURRENCE INVESTIGATION REPORT - FINAL

Reference Number	CA18/2/3	/10199										
Classification	Accident			ate 2	2 August 2022			Time		е	0852Z	
Type of Operation	Remotely Piloted Aircraft (Part 101)											
Location												
Place of Departure	Gamsberg Mine, Northern Cape			Place of Intended Landing				Gamsberg Mine, Northern Cape				
Place of Occurrence	Overhead Tailings Dam in Gamsberg Mine											
GPS Co-ordinates	Latitude	29° 11' 51.	9" S	Longitude		18°	° 56' 46.5" E		Elev	ation	3080 ft	
Aircraft Information												
Registration	ZT-XDC											
Make; Model; S/N	DJI; Matrice 200 (Serial Number: 0FZDFAP0P30036)											
Damage to Aircraft	Destroyed				Total Aircraft Hours			3	28.3			
Pilot-in-command												
Licence Type	Remote F	Pilot Licence (RPL)		Gender			Male		Age		20	
Licence Valid	Yes	Total Hour	S	15.9			Total Hours on		n Type		5.5	
Total Hours Past 90 days	5.5			Total Hours on Type Past 9				t 90	days		5.5	
People Controlling	1+0	Injuries	0	Fatalities 0			0	Other (on ground) 0				

What Happened

On 2 August 2022, a pilot operating a remotely piloted aircraft (RPA) DJI Matrice 200 with registration ZT-XDC launched the RPA on a surveillance flight at Gamsberg Mine in the Northern Cape province. The flight 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.

The pilot stated that this was the last surveillance flight over Tailings Dam in Gamsberg Mine. He was flying the RPA in a manual grid pattern when he noticed that the batteries were at approximately 43%. He then activated the Return-to-Home (RTH) button to command the RPA to return to the last recorded home point, which was the pilot's position. The pilot was continuously monitoring the RPA via the remote-control screen, and whilst it was approximately 428 metres (m) away from the launch position, the RPA began to shake violently. He immediately searched for the RPA visually and observed it spiralling (right) towards the ground. He then switched back to the manual remote control of the RPA and attempted to stop the RPA's descent by applying the left control stick (controls up and downwards movement) but to no avail. The pilot did not observe any warning signals on the remote control; only the RTH audio was audible as the RPA spiralled until it impacted the ground.

The RPA was destroyed during the accident sequence; no person on the ground was injured.

SRP date: 11 October 2022 Publication date: 12 October 2022



Figure 1: The wreckage of the RPA as found on site. (Source: Operator)



Figure 2: An aerial view of the accident site. (Source: Google Earth)

Findings

- 1. The pilot was issued a Remote Pilot Licence (RPL) on 10 May 2022 with an expiry date of 30 April 2024. His Class 3 medical certificate was issued on 13 September 2021 with an expiry date of 30 September 2025 with no medical restrictions.
- 2. The mandatory periodic inspection (MPI) carried out on the RPA prior to the accident flight was conducted on 27 May 2022 and was certified at 18.51 airframe hours. During the MPI, the propulsion system was inspected, and the motor had no signs of abnormal sound when operated. Also, the motor shaft was rigid with no play. The RPA operated a further 9.79 hours after the inspection.

3. The RPA was certified with a Remotely Piloted Aircraft Systems (RPAS) Letter of Approval (RLA) on 3 September 2021 with an expiry date of 2 September 2022.

The operator was issued an RPAS Operating Certificate (ROC) number CAA/G1279D with an endorsement of Part 101 by the Regulator (SACAA) on 28 June 2022.

- 4. Weather forecast gathered by the pilot from the unmanned aerial vehicle (UAV) was as follows: Wind: NE at 19kts (10m/s), Ceiling and Visibility OK (CAVOK), Temperature: 18°C, Dew Point: 8°C.
- 5. Flight Log Review (Source: Operators Preliminary Accident Report)

 During the flight log analysis, we observed that the PIC was flying a BVLOS mapping mission manually.

 The pilot mentioned that he was under a bit of pressure to conduct these flights, resulting in poor planning. The PIC carried out this manual flight with ease and all aircraft telemetry seemed normal. When the PIC reached the end of this specific leg (grid), the aircraft returned to home. During return to home, we could see that the aircraft yawed erratically and compensated for this. During the return to home phase of the flight, the pilot picked up new batteries for the next flight leading to reduced focus on the aircraft position and telemetry. The aircraft then suddenly and continuously yawed to the right while losing altitude. A few seconds after the aircraft entered this state, the PIC attempted to regain control, but was unable to stabilise the aircraft. The aircraft then spiralled to the ground.

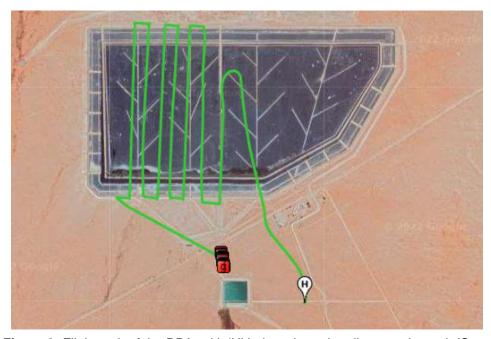


Figure 3: Flight path of the RPA, with 'H' being where the pilot was situated. (Source: Operator)

- 6. Root Cause (Source: Operators Preliminary Accident Report)

 Below are possible root causes; 1 Being most likely and 4 being less likely.
 - 1. Failure on the front right or rear left ESC.
 - 2. Motor failure on the front right or rear left motor.
 - 3. Stone/obstacle jamming a motor.
 - 4. High wind or impact (bird strike) during flight causing damage to the prop or compass.

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7. Electronic Speed Controllers (Source: Unmanned Systems Technology)

The electronic speed controllers (ESC) are devices that allow drone flight controllers to control and adjust the speed of the aircraft's electric motors. A signal from the flight controller causes the ESC to raise or lower the voltage to the motor as required, thus, changing the speed of the propeller.

Probable Cause

It is likely that the RPA experienced a failure of one of the electronic speed controllers (ESC), resulting in an uncontrolled right spin descent and impact with the ground.

Contributing Factor/s

None.

Safety Action

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.

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This report is issued by:

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