

**LIMITED ACCIDENT INVESTIGATION REPORT**

<b>Reference Number</b>	CA18/2/3/10105						
<b>Classification</b>	Accident	<b>Date</b>	23 December 2021	<b>Time</b>	0038Z		
<b>Type of Operation</b>	Remotely Piloted Aircraft (Part 101)						
<b>Location</b>							
Place of Departure	Sibanye, Westonaria, Gauteng Province		Place of Intended Landing	Sibanye, Westonaria, Gauteng Cape Province			
Place of Accident	Sibanye, Westonaria, Gauteng Province						
GPS Co-ordinates	Latitude	S 26° 21' 28"	Longitude	E 27° 36' 33"	Elevation	5 370 ft	
<b>Aircraft Information</b>							
Registration	ZT-WVS						
Model/Make	DJI Matrice 200 (Serial Number: M200-38)						
Damage to Aircraft	Destroyed		Total Aircraft Hours	266.0			
<b>Pilot-in-command</b>							
Licence Valid	Yes		Gender	Male		Age	50
Licence Type	Remote Pilot Licence (RPL)						
Total Hours on Type	1 516.5		Total Flying Hours	1 516.5			
Pilots Controlling	1	Injuries	0	Fatalities	0	Other (On Ground)	0
<b>What Happened</b>							
<p>On 23 December 2021, a pilot operating a DJI Matrice 200 drone with registration ZT-WVS lifted off the drone on a surveillance flight at Sibanye in Gauteng province. The flight was conducted beyond visual line of sight (B-VLOS) by night and under the provisions of Part 101 of the Civil Aviation Regulations (CAR) 2011 as amended.</p> <p>The pilot stated that the accident flight was the 10th flight for the night. He conducted the circuit in auto mode, and he noted that there was adequate battery life remaining. The pilot proceeded in a fly-by-wire (FWB) mode to an area close to the landing site to check if the vehicle he spotted earlier was still parked at the same place. Shortly thereafter at 330 feet (ft) above ground level (AGL), an orange caution message – Inertia Measurement Unit (IMU) attitude – illuminated on the control screen. Then the image on the control video screen started to spin uncontrollably while the drone descended until the screen went blank. The drone did not return to launch (RTL) pad, and the pilot contacted dispatch to locate the</p>							

drone. The drone was located 174 metres (m) from the pilot's (departure) position. It had collided with a tree that was approximately 50ft tall. The drone was destroyed after it collided with the tree; no damage to property was reported.



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



**Figure 2:** Aerial view of the accident site, surrounded by trees and buildings. (Source: Google Earth)

**What was found:**

- According to the post-accident log analysis report, one of the back motors bearing ceased, and the drone experienced an electronic speed control (ESC) failure during operation which caused the back motor to overspeed, resulting in the drone spiralling down. (Source: Operator)

- *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. (Source: Unmanned Systems Technology)*
- The DJI Matrice 200 is equipped with a 3515 motor.



**Figure 3:** DJI Matrice 200 propeller motor. (Source: Manufacturer)

- The mandatory periodic inspection (MPI) carried out on the drone prior to the accident was conducted on 8 December 2021 and was certified at 211.27 airframe hours. During the MPI, the motor system was inspected and found to be clear of dirt or debris, the motor cables had no sign of wear and tear, no sign of abnormal noise when operated, and the motor was tightly installed. The next MPI was scheduled for 311.27 airframe hours or on 8 June 2022, whichever comes first.
- The drone was certified with a Remote Operator Certificate (ROC) no. CAA/G1219D on 25 October 2021 with an expiry date of 31 October 2022. The drone was issued a Remotely Piloted Aircraft (RPA) letter of approval on 16 March 2021 with an expiry date of 31 March 2022.
- The pilot was reissued a Remote Pilot Licence (RPL) on 22 February 2021 with an expiry date of 28 February 2023. His Class 3 medical certificate was issued on 4 October 2021 with an expiry date of 28 February 2022, with corrective lenses and hypertension protocol restrictions.
- Weather gathered by the pilot from windy.com:  
Wind 070° at 16kts, Ceiling and Visibility OK (CAVOK), Temperature 17°C.

**Probable Cause:**

The drone experienced an electronic speed control (ESC) failure on one of the back motors of the propeller which failed during flight and caused an imbalance that subsequently caused the drone to spin uncontrollably until it impacted a tree.

**Safety Action/s**

None.

**Safety Message**

None.

<b>Purpose of the Investigation</b>	
<i>In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011, 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 <b>not to apportion blame or liability.</b></i>	
<b>About this Report</b>	
<i>Decisions regarding whether to investigate, and the scope of an investigation are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, no 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 brief report. The report has been compiled using information supplied in the initial notification, as well as follow-up information 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 accident.</i>	
<i>This report provides an opportunity to share safety message/s in the absence of an investigation.</i>	
<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>	
<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**