LIMITED ACCIDENT INVESTIGATION REPORT

Reference Number	CA18/2/3/10159					
Classification	Accident	**Date**	4 May 2022	**Time**	1038Z	
Type of Operation	Remotely Piloted Aircraft Systems (Part 101)					
Location						
Place of Departure	Seriti Middelburg Mine, Mpumalanga Province		Place of Intended Landing	Seriti Middelburg Mine, Mpumalanga Province		
Place of Accident	Seriti Middelburg Mine, Mpumalanga Province					
GPS Co-ordinates	Latitude	25°59'45.72" S	Longitude	029°22'46.15" E	Elevation	5 125ft
Aircraft Information						
Registration	ZT-XJD					
Make/Model	DJI Matrice 300 RTK (Serial Number: 1ZNBJ6F00C01D9)					
Damage to Drone	Substantial		Total Drone Hours	11 hours 21 minutes 42 seconds		
Pilot-in-command						
Licence Type	Remote Pilot Licence (RPL)		Gender	Male	Age: 33	
Licence Valid	Yes					
Total Hours on Type	89.0		Total Flying Hours	89.0		
People	N/A	Injuries 0	Fatalities	0	Other (On ground)	0
What Happened						

On Wednesday afternoon, 4 May 2022 at 1038Z, a DJI Matrice 300RTK drone with registration ZT-XJD took off from a remote location at Seriti Middelburg Mine. The drone was remotely controlled by a pilot with a Remote Pilot Licence (RPL). The flight was conducted under the provisions of Part 101 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot reported that he conducted a pre-flight inspection of the drone, and no anomalies were found. The take-off was uneventful, and the drone was established in hover flight at a height of approximately 260 feet (80 metres) above ground level (AGL). The pilot then heard an unusual sound coming from the drone and, shortly thereafter, it started spiralling towards the ground; this is when the pilot noticed that only three of four propulsion motors were functional. The drone was destroyed when it impacted the ground.

Figure 1: The location of the accident site (yellow pin) at Seriti Mine. (Source: Google Earth)

Figure 2: The DJI Matrice 300 RTK drone type. (Source: techau.com.au)

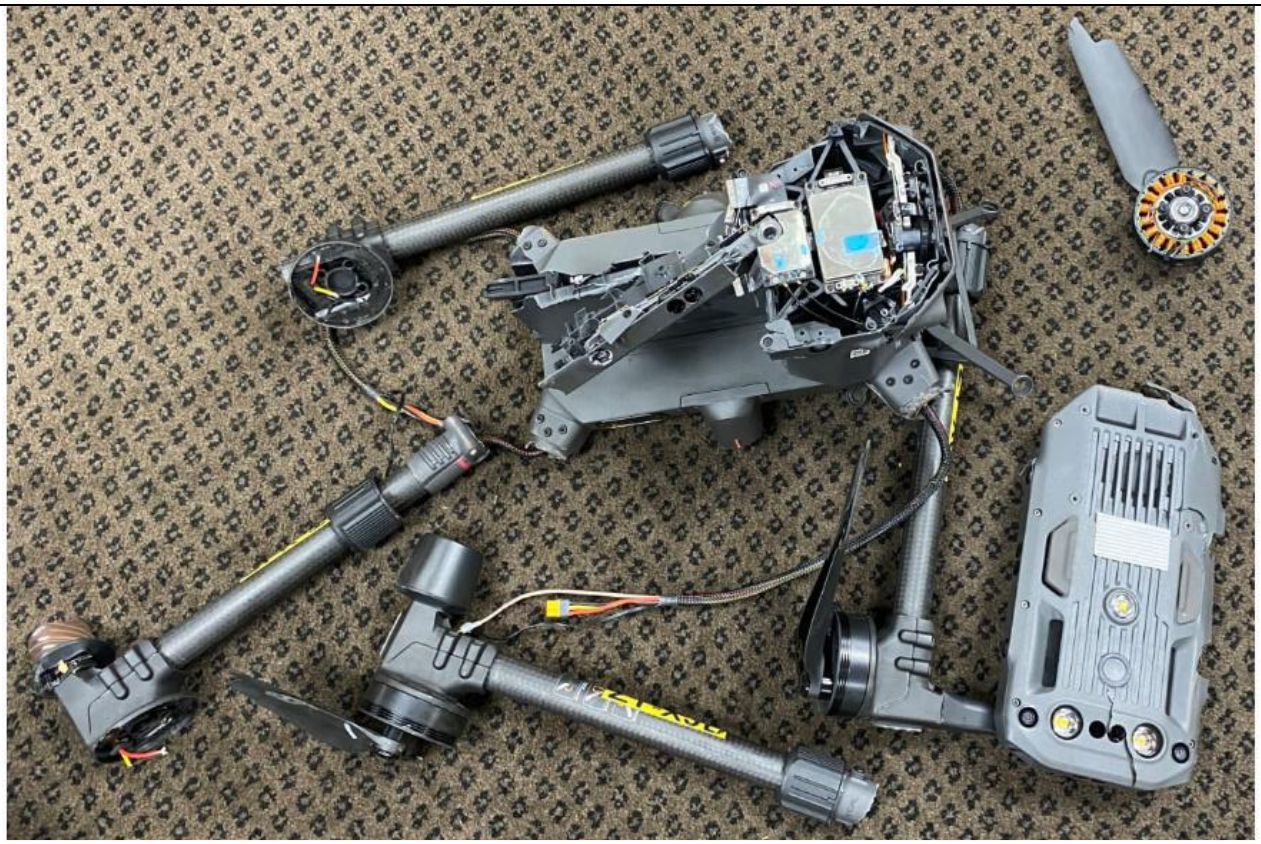

Figure 3: This photograph was taken after the drone was recovered. (Source: Operator)

The Pilot

The pilot was issued a Remote Pilot Licence (RPL) by the Regulator (SACAA) on 16 August 2017 with an expiry date of 30 September 2023. At the time of the accident, the pilot had flown a total of 89 hours, of which 4 hours were during the past 90 days.

The Drone

The drone, a DJI Matrice 300 RTK with serial number 1ZNBJ6F00C01D9, was manufactured in 2020. The last maintenance inspection prior to the accident flight was carried out on 25 November 2021 at 00 hours 34 minutes 33 seconds (00:34:33). A further 11 hours and 26 minutes were flown since the inspection. The drone was issued a Remotely Piloted Aircraft Systems (RPAS) Letter of Approval on 21 September 2021 with an expiry date of 20 September 2022. A Certificate of Registration was issued to the present owner on 3 August 2021.

Figure 4: Damage to the camera that was attached to the drone. (Source: Operator)

Weather Information

The tables below show the meteorological aerodrome reports (METARs) data for Witbank Aerodrome (FAWI) at 1000Z and 1100Z on 4 May 2022. FAWI is located 14 nautical miles (nm) north-west of the accident site.

FAWI 0401000Z AUTO 22004KT //// // ////// 19/06 Q1029=

Wind Direction	220°	Wind Speed	4 knots	Visibility	> 10km
Temperature	19°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	6°C	QNH	1029 hPa		

FAWI 041100Z AUTO 18003KT //// // ////// 20/04 Q1028=

Wind Direction	180°	Wind Speed	3 knots	Visibility	> 10km
Temperature	20°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	4°C	QNH	1028 hPa		

Reporting of Accident

The accident was reported to the Accident and Incident Investigations Division (AIID) 14 days after it had occurred, and this was in contravention of Part 12.02.1 of the CAR 2011 as amended, which states:

12.02.1 Notification of accidents

(1) The PIC of an aircraft involved in an accident within the Republic, or if he or she is killed or incapacitated, a flight crew member, or if there are no surviving flight crew members or if they are incapacitated, the operator or owner, as the case may be, shall, as soon as possible but at least within 24 hours since the time of the accident, notify—

(a) the Executive Manager: Aircraft Accident and Incident Investigation;

(b) an ATSU; or

(c) the nearest police station,

of such accident.

(2) If an ATSU or police station is notified of an accident in terms of sub-regulation (1), such ATSU or police station shall, immediately on receipt of the notification, notify—

(a) the Executive Manager: Aircraft Accident and Incident Investigation; and

(b) where such accident occurs on an aerodrome, the aerodrome manager.

On-site photographs or video footage were not taken prior to the recovery of the drone. From the photographs that were taken post-recovery, it could be seen that the drone was destroyed.

Follow-up investigation

The operator provided the AIID with a report on their findings. Following communication with the operator, it was noted that the unit was still within its warranty period. The drone was sent to the local distributor, but no official report was made available as this is a warranty claim. The original equipment manufacturer (OEM) had requested that the unit be returned to the factory.

Information in the table below was sourced from the DJI Matrice 300 RTK System Safety Document that the operator made available to the investigator:

Emergency	**Probable Effect**	**Crew Action**
Loss of propulsion power	Uncontrollable flight	Pilot to call ***"EMERGENCY"*** Loss of one propulsion system will trigger Three-Propeller Emergency Landing. Land aircraft immediately or attempt to steer Remotely Piloted Aircraft (RPA) away from people, structures and roads, if possible. Activate Emergency Response Plan (ERP) if necessary.

Three-Propeller Emergency Landing:
Source: DJI Matrice 300 RTK System Safety Document

"If one of four propulsion system fails while the aircraft is in flight, the aircraft will automatically enter into Three-Propeller Emergency Landing Mode. The flight controller will attempt to maintain the stability and controllability of altitude and velocity of the aircraft and land the aircraft. The controller will vibrate to indicate a failure to the pilot. When this mode is activated, the aircraft will spin rapidly and automatically descend to land. The stick that controls back and forth movement will be adjusted to control north-south movement and the stick that control left and right will be adjusted to control west-east direction. The pilot can manage the flight and land the aircraft in the appropriate emergency landing zone."

What was found:

(i) The pilot was initially issued a Remote Pilot Licence on 16 August 2017 with an expiry date of 30 September 2023.

(ii) The pilot had flown 89 hours, of which 4 hours were during the past 90 days.

(iii) This flight was conducted under the provisions of Part 101 of the Civil Aviation Regulations (CAR) 2011 as amended.

(iv) The last maintenance inspection that was carried out on the drone prior to the accident flight was certified on 25 November 2021 at 34 minutes total flight time. A further 11 hours and 26 minutes were flown since the last inspection.

(v) The drone was issued a RPAS letter of approval (LOA) on 21 September 2021 with an expiry date of 20 September 2022.

(vi) One of the four propulsion motors failed in-flight, and the drone spiralled towards the ground and was destroyed on impact (with the ground).

(vii) No photographs were taken by the operator on site before the drone was recovered.

(viii) Fine weather conditions with a light southerly to south-westerly wind prevailed at the time of the flight.

(ix) No person was injured during the accident sequence.

(x) The drone did not enter the Three-Propeller Emergency mode.

Probable cause

The drone entered an uncontrollable descent and impacted terrain following failure of one of the propulsion motors in-flight. The cause of the motor failing could not be determined.

Safety Action

None.

Safety Recommendation/Message

Safety Recommendation: The OEM System Safety Document includes a statement that reads: "*a safe landing could be achieved when the aircraft is in an automated emergency landing and spiralling out of control"*. This statement needs to be reviewed. The OEM System Safety Document must clearly state that *this might be achieved if the aircraft is flown without any cameras or similar type of equipment attached to it*. Attaching equipment is likely to cause change to the Centre of Gravity (CG) of the aircraft.

Safety Message: Pilots or operators of RPAS are reminded to report the occurrences prior to recovering the accident/incident drone/s (aircraft). If the drone/s are recovered before the occurrence is reported, this is likely to hinder the investigation process, as well as lead to the cause of the accident/incident not being determined due to evidence that has been tampered with or the unavailability of the failed components.

Purpose of the Investigation
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 ***not to apportion blame or liability****.*
About this Report
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. *This report provides an opportunity to share safety message/s in the absence of an investigation.* *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.*
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