SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10217						
Classification	Accident		**Date**	23 May 2022		**Time**	1100Z
Type of Operation	Aerial Survey (Part 101)						
Location							
Place of Departure	Black Rock Manganese Mine in Hotazel, Northern Cape Province		Place of Intended Landing	Black Rock Manganese Mine in Hotazel, Northern Cape Province			
Place of Occurrence	On a rocky terrain in the mine area						
GPS Co-ordinates	Latitude	S27° 15’ 75. 06”	Longitude	E22° 92’.05 10”		Elevation	3 344 ft
Aircraft Information							
Registration	ZT-XNU						
Make; Model; S/N	DJI Matrice 300 RTK (Serial Number: 1ZNBJ7F00C01KE)						
Damage to Aircraft	Substantial		Total Aircraft Hours	39.38			
Pilot-in-command							
Licence Type	Remote Pilot Licence (RPL)		Gender	Male		Age	27
Licence Valid	Yes	Total Hours	22.30	Total Hours on Type		19.46	
Total Hours Past 90 days	19.46		Total Flying Hours on Type Past 90 days	19.46			
People Controlling	1	**Injuries** 0	**Fatalities**	0	**Other (on ground)**		0

What Happened

On Monday, 23 May 2022 at 1051Z, a pilot launched a DJI Matrice 300 RTK remotely piloted aircraft (RPA) with registration ZT-XNU to conduct aerial survey at the Black Rock Manganese Mine facility in Hotazel, Northern Cape province, with the intention to return to the mine facility. The flight was conducted in visual line of sight (VLOS) by day and under the provisions of Part 101 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot reported that a pre-flight inspection was conducted on the RPA and no anomalies were noted. The pre-flight checks included checking for software updates, ensuring that the Global Positioning System (GPS) satellite was acquired, the home point was set to the take-off location and both batteries were fully charged and correctly installed. The RPA was launched at 1051Z, whereafter it climbed 240 metres (m) above ground level (AGL). However, approximately 9 minutes into the flight, numerous electronic speed control (ESC) related errors appeared on the DJI controller/remote screen. The RPA did not respond to the pilot’s inputs; but it started an uncontrolled descent until it impacted the ground at 1100Z. The RPA sustained substantial damages. No damage to property was caused and no people on the ground were injured.

Figure 1: The RPA at the accident site. (Source: Operator)

The Pilot

The pilot was initially issued a Remote Pilot Licence (RPL) by the South African Civil Aviation Authority (SACAA) on 15 November 2021 with an expiry date of 30 November 2023. The pilot had a valid Class 3 aviation medical certificate which was issued on 29 October 2021 with an expiry date of 31 October 2023. At the time of the accident, the pilot had flown a total of 22.30 hours, of which 19.46 hours were during the past 90 days.

The Remotely Piloted Aircraft

The DJI Matrice 300 RTK is the latest commercial RPA with an advanced flight controller system, six directional sensing and positioning system, and first-person view (FPV) camera. It features several advanced flight functions including a return-to-home and obstacle sensing. It is constructed of a magnesium aluminium composite shell and with carbon fibre arms that hold the motors and landing struts. During the flight, these arms are raised to allow unobstructed views from the camera that is suspended by the gimbal below the RPA. The accident RPA, with serial number 1ZNBJ7F00C01KE, had a maximum take-off weight (MTOW) of 7.124 kilograms (kg). It also had a maximum flight time of 55 minutes with batteries fully charged. The RPA could be operated 15 kilometres (km) away from the launch position.

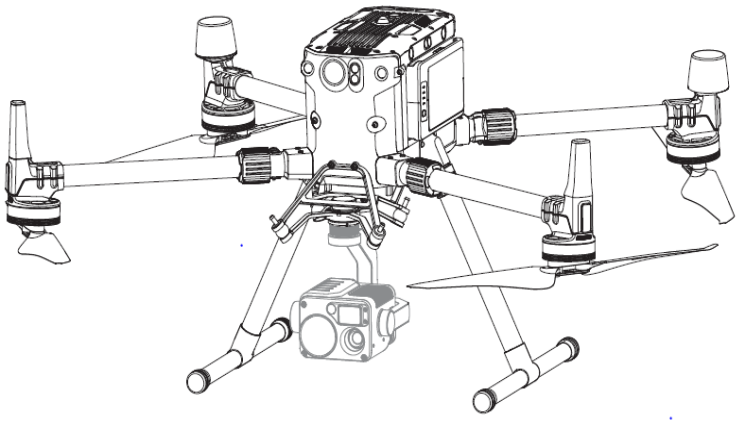

Diagram 1: An illustration of the DJI Matrice 300 RTK RPA in landing configuration. (Source: DJI)

The last maintenance inspection conducted on the RPA prior to the accident flight was certified on 29 April 2022 at 33 hours and 33 minutes (33hrs:33min). The RPA was flown a further 6 hours and 5 minutes since the last inspection. The operator was issued a Remotely Piloted Aircraft Systems (RPAS) Letter of Approval (LOA) on 29 April 2022 with an expiry date of 30 April 2023. The RPA's Certificate of Registration was issued to the present owner on 11 October 2021.

Weather Information

The weather conditions estimated by the pilot at the take-off point were as follows:

Wind Direction	110°	Wind Speed	5 knots	Visibility	> 10km
Temperature	22.5°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	8°C	QNH	1019 hPa		

Reporting of Accident

The accident was reported to the Accident and Incident Investigations Division (AIID) four months after it had occurred; this is not in line with the requirements 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;

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 where such accident occurs on an aerodrome, the aerodrome manager.

Follow-up investigation

The operator provided the investigator with a technical report on their post-accident findings. In the report, the pilot stated that the RPA showed no signs of power loss or a propulsion system defect during the aerial survey flight. Approximately 70 percent of power was still available before the accident, and the controller signal strength was almost 100 percent during the flight.

The flight record log files downloaded from the DJI controller revealed the following: after 8 minutes and 59 seconds (08min:59sec) of flight time whilst the RPA was operated at 239.6m AGL at a distance of approximately 431m, a side shock was detected on the RPA's airframe, after which it rolled sharply and uncontrollably to the left. This indicated a possible bird strike. This is when the ESC related errors appeared on the DJI remote screen.

No photographs were taken that showed evidence of bird strike on the RPA structure. The operator disposed of the RPA as the assumption was that this was not a reportable occurrence.

K	08m 59s	239.6 m	431 m	⚠ Detected side shock / possible collision, aircraft is rolling sharply to the left

Table 1: The downloaded DJI flight record log file.

Findings

i. The pilot was initially issued a Remote Pilot Licence (RPL) by the SACAA on 15 November 2021 with an expiry date of 30 November 2023.

ii. The pilot had a valid Class 3 aviation medical certificate which was issued on 29 October 2021 with an expiry date of 31 October 2023.

iii. The pilot had flown 22.30 hours, of which 19.46 hours were during the past 90 days.

iv. Fine weather conditions prevailed at the time of the flight.

v. The last maintenance inspection on the RPA prior to the accident flight was certified on 29 April 2022 at 33 hours and 33 minutes (33hrs:33min). The RPA was flown a further 6 hours and 5 minutes since the last inspection.

vi. The RPA sustained substantial damages during the accident sequence.

vii. No person was injured on the ground during the accident sequence.

viii. Photographs showing evidence of bird strike on the RPA structure were not taken before the RPA was disposed as the operator had assumed the occurrence was not a reportable case.

ix. The Certificate of Registration was issued to the present owner on 11 October 2021.

Probable Cause

A possible bird strike caused the RPA to enter an uncontrollable descent and finally impacted terrain; this resulted in the substantial damage to the RPA.

Contributing Factor(s)

None.

Safety Action(s)

None.

Safety Message and/or Safety Recommendation/s

None.

About this Report

A 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 issued by:

Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa