

RPAS/UAS LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10366							
Classification	Accident	Date	20 June 2023			Time	1645Z	
Type of Operation	Unmanned Aircraft System – Surveillance (Part 101)							
Location								
Place of Departure	Navigation Colliery Mine, Witbank, Mpumalanga Province		Place of Intended Landing		Navigation Colliery Mine, Witbank, Mpumalanga Province			
Place of Occurrence	Navigation Colliery Mine, Witbank, Mpumalanga Province							
GPS Co-ordinates	Latitude	25°54'33.6"S	Longitude	29°09'40.8"E	Elevation	5125ft		
Aircraft Information								
Registration	ZT-YLL		Class	3A				
Make; Model; S/N	DJI; MAVIC 2 Enterprise Advanced (Serial Number: MAV123)							
Damage to Aircraft	Substantial		Total UAS Hours		467.46			
Pilot-in-command								
Licence Type	Remote Pilot Licence (RPL)		Gender	Male		Age	33	
Licence Valid	Yes	Total Hours	535.12		Total Hours on Type	535.12		
Total Hours 30 Days	69		Total Flying on Type Past 90 Days		185.10			
People Controlling	1	Injuries (On ground)	0		Fatalities	0	Fatalities (on ground)	0
What Happened								
<p>On Tuesday evening, 20 June 2023, an unmanned aircraft system (UAS) with registration ZT-YLL was engaged in a surveillance flight at Navigation Colliery Mine in Witbank, Mpumalanga province, when the accident occurred. 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.</p> <p>The pilot stated that after conducting the pre-flight checks with no anomalies detected, he launched the UAS at 1630Z with 99% battery voltage and 60 minutes endurance. The pilot further reported that he engaged the Loiter mode (manually operated) and climbed to 394 feet (ft) above ground level (AGL) and conducted surveillance for approximately 2.6 kilometres (km) over a 15-minute period at West Diesel Dam. Whilst the UAS was at West Diesel Dam, the control room notified the pilot of the suspects at Bore 7, which was less than a kilometre from the West Diesel Dam. The pilot spotted the suspects on the north-east side. Whilst the pilot directed the armed response officials, the smart return home activated on the remote control and, moments later, the remote pilot station lost connection with the UAS. The pilot made his way to the last recorded location on the same night, but he could not find the UAS. The search continued the following morning and, at approximately 0900Z, the UAS was found crashed on the ground with three broken propeller blades.</p>								

There was no reported damage to property or injury to personnel on the ground.

The post-accident investigation found that the terminals of the UAS's battery accumulated dust which resulted in the loss of battery connection and, thus, the UAS lost thrust and impacted the ground.



Figure 1: The RPA's flight path from the launch site. (Source: Google Earth)



Figure 2: The RPA at the accident site. (Source: Operator)

Pursuant to PART 101, SUBPART 1:

GENERAL PROVISIONS

Applicability

101.01.1 (1) *Subject to subregulation (3) this Part applies to aspects relating to the operation of Classes 1 and 2 UAS, unless otherwise determined by the Director.*

According to the Operational Specifications (Ops Specs), the ZT-YLL is a class 3A UAS and its specifications did not conform to Part 101, however, the Director has made determination and approved the UAS to be flown on BVLOS and night operations.

Types of Air Service approved are:

- G3 – Aerial patrol, observation and survey.
- G4 – Aerial recording by photographic or electronic using the licensee's equipment to produce a pictorial and product.
- G16 – Remotely Piloted Aircraft Systems.

Findings

1. The pilot was initially issued a Remote Pilot Licence (RPL) by the Regulator (SACAA) on 8 November 2022 with an expiry date of 31 November 2023. The pilot had a visual line of sight (VLOS) and a beyond visual line of sight (BVLOS) ratings which were endorsed on his licence. The pilot conducted a skills test for BLOVS rating on 7 November 2022.
2. The pilot's Class 3 medical certificate was issued on 16 July 2022 with an expiry date of 31 July 2026.
3. The UAS's mandatory periodic inspection (MPI) was certified on 19 June 2023 at 462.51 total airframe hours, with an expiry date of 20 November 2023 or at 662.51 airframe hours, whichever occurs first. At the time of the accident, the UAS had accumulated 467.46 airframe hours. The UAS was flown a further 4.95 airframe hours since the last MPI. The MPI is conducted every six months or at every 200 hours.
4. The UAS's Certificate of Registration (C of R) was issued to the current owner on 5 August 2022.
5. The UAS was issued an Unmanned Aircraft Systems Letter of Approval (UASLOA) by the Regulator on 2 September 2022 with an expiry date of 1 September 2023.

<p>6. The operator had an UAS Operating Certificate (UASOC) that was issued by the Regulator on 31 October 2022 with an expiry date of 31 October 2023.</p> <p>7. According to the operating specifications, ZT-YLL was a Class 3A UAS. The Director had made determination and approved it to be flown in BVOLS and night operations.</p> <p>8. The investigation found that the UAS was airworthy, and the battery voltage was sufficient for the UAS to return to the launch site.</p> <p>9. The investigation concluded that the terminals of the UAS's battery were not properly latched, and this resulted in the battery losing connection with the remote pilot station; the UAS lost thrust and impacted the ground.</p>
<p>Probable Cause(s)</p> <p>Inadequate pre-flight inspection as the UAS's battery was not properly latched, thus, it lost connectivity with the remote pilot station; the UAS lost thrust before it crashed.</p>
<p>Contributing Factor(s)</p> <p>None.</p>
<p>Safety Action(s)</p> <p>None.</p>
<p>Safety Message and/or Safety Recommendation/s</p> <p>None.</p>
<p>About this Report</p> <p><i>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.</i></p> <p><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></p>
<p>Purpose</p> <p><i>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.</i></p>
<p>Disclaimer</p> <p><i>This report is produced without prejudice to the rights of the AIID, which are reserved.</i></p>

**This report is issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa**