SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10286								
Classification	Accident		**Date**	30 September 2022		**Time**	0736Z		
Type of Operation	Remotely Piloted Aircraft System Surveillance (Part 101) Areal Mapping								
Location									
Place of Departure	Cooke Randfontein Surface Operations (RSO) Mine Dump, Randfontein, Gauteng Province			Place of Intended Landing			Cooke Randfontein Surface Operations (RSO) Mine Dump, Randfontein, Gauteng Province		
Place of Occurrence	Cooke Randfontein Surface Operations (RSO) Mine Dump 38, Randfontein								
GPS Co-ordinates	Latitude	26°08'04.26" S		Longitude	027°42'36.90" E		Elevation	3145 ft	
Aircraft Information									
Registration	ZT-UKH								
Make; Model; S/N	DJI; Phantom 4 (Serial Number: P40016)								
Damage to Aircraft	Substantial			Total Aircraft Hours	323.32				
Pilot-in-command									
Licence Type	Remote Pilot Licence (RPL)			Gender	Male		Age	26	
Licence Valid	Yes	Total Hours	13.26		Total Hours on Type	13.26			
Total Hours 30 Days	13.26			Total Flying on Type Past 90 Days	13.26				
People Controlling	1	**Injuries**	0	**Fatalities**	0	**Other (on ground)**	0		

What Happened

On Friday morning, 30 September 2022, a remotely piloted aircraft (RPA) with registration ZT-UKH was engaged in an aerial surveillance operation abeam Cooke Randfontein Surface Operations (RSO) mine dump in Gauteng province when the accident occurred. Visual meteorological conditions (VMC) by day prevailed at the time of the flight. 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.

The pilot stated that after conducting the pre-flight checks with no anomalies detected, the RPA was launched with 99% battery power. Two surveillance flights were conducted successfully. During the third surveillance flight, approximately 5 minutes after launch, the pilot observed from his controller unit that the RPA was not moving. The pilot activated the return-to-launch (RTL) function, but the RPA did not return to launch as commanded.

The pilot drove to the last known position of the RPA and located it on the ground, approximately 0.3 nautical miles south-west of the launch site with substantial damage to the landing skids and camera. There were no injuries to persons reported on the ground.

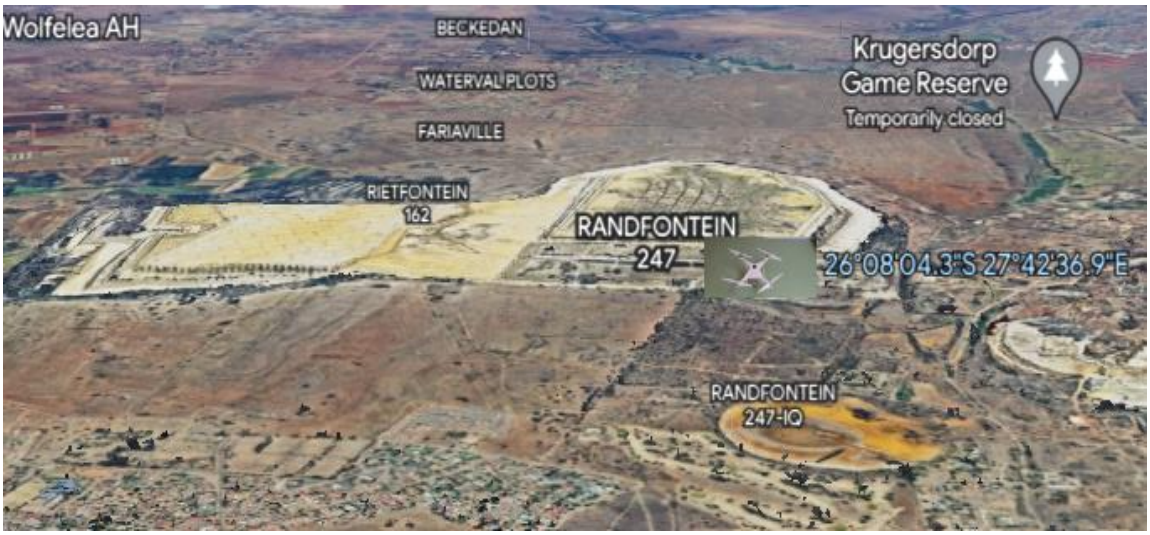

Figure 1: A view of the accident site. (Source: Google Earth)

Figure 2: Damage to the aircraft (circled in orange). The orange arrow shows the Trackimo tracking module attachment point. (Source: Operator)

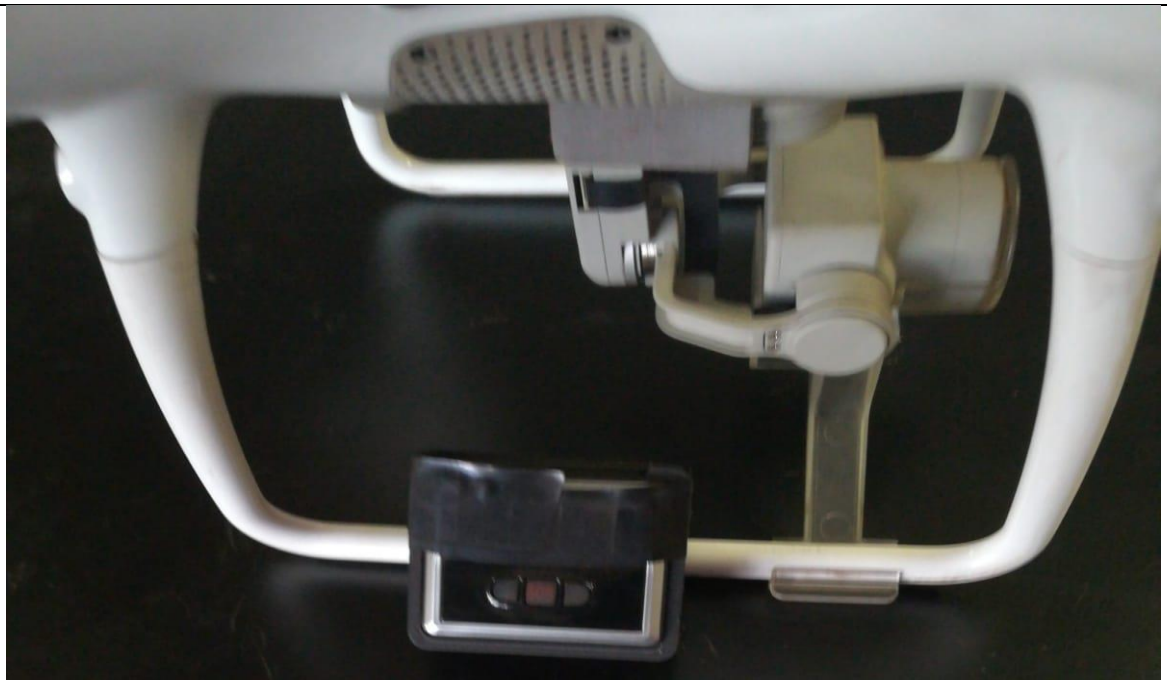

Figure 3: The new position of the Trackimo tracking module in a 3D printed holder attached to the skid. (Source: Operator)

The operator provided the following information which was extracted from the flight log analysis report:

Sequence of events:

1. *The aircraft stopped mid-air during a mapping (surveillance) flight.*
2. *The pilot-in-command (PIC) attempted to initiate 'ATTI' (attitude) mode and RTL to no avail.*
3. *The aircraft was located approximately 0.3 nm south-west of the launch site, crashed.*
4. *The tracking module was placed in a 3D printed holder and attached on the skids to limit Global Positioning System (GPS) signal interference (Figure 3).*

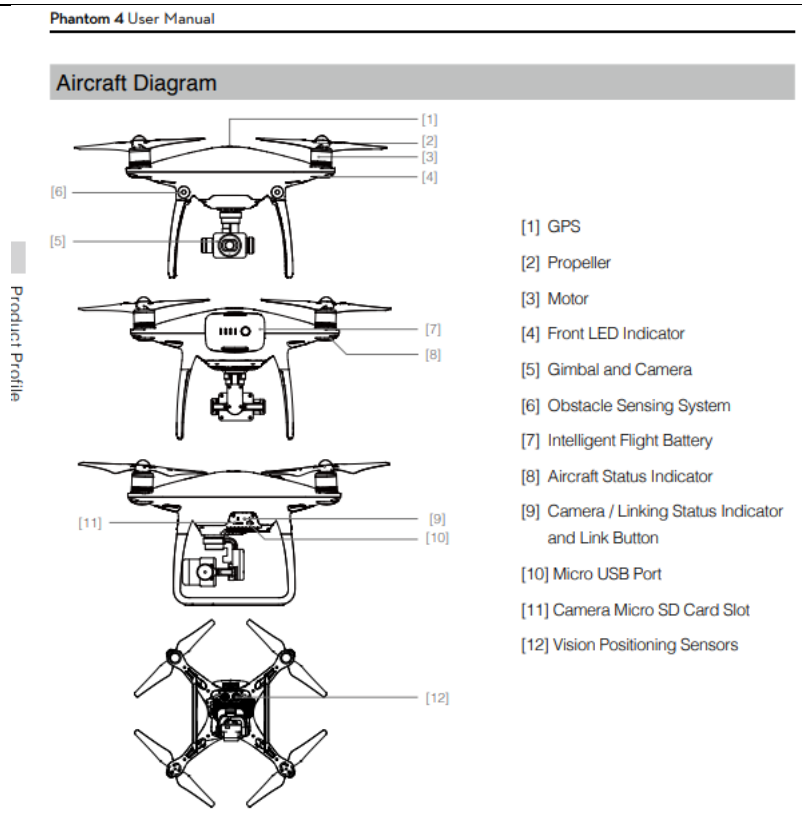

Illustration 1: The position of the GPS sensor (1). (Source: Aircraft User Manual)

Findings

1. The pilot was initially issued a Remote Pilot Licence (RPL) by the Regulator (SACAA) on 25 November 2020. The RPL was reissued on 18 November 2022 with an expiry date of 30 November 2024.

2. The pilot's Class 3 medical certificate was issued on 15 October 2018 with an expiry date of 31 October 2023. The pilot had a beyond visual line of sight (BVLOS) rating which was endorsed on his licence.

3. The RPA was issued a Remotely Piloted Aircraft System Letter of Approval (RLA) by the Regulator on 2 May 2019 with an expiry date of 31 May 2023. The RPA had undergone a repair maintenance on 22 September 2022 at 322.57 hours. The RPA was operated a further 45 minutes before the accident. The RPA's Certificate of Registration (CRS) was issued to the current owner on 14 March 2018.

4. The operator had a Remotely Piloted Aircraft System Operating Certificate (ROC) No: CAA/G1291D that was issued by the Regulator on 25 October 2021 with an expiry date of 31 October 2022.

5. The RPA maintenance log entries entered on 31 August 2022 stated that the RPA initiated an un-commanded auto land, and also had a weak GPS signal in-flight during missions. The RPA maintenance technician (RMT) replaced the GPS tracking module and updated the firmware on 22 September 2022, however, the problem persisted.

6. The Trackimo module which uses GPS and cellular signals to track the RPA was attached atop the RPA and, possibly, interfered with the primary RPA's GPS signals. This led to the erroneous recording of the RPA's GPS signals on the log files. After the accident, the Trackimo module was relocated to the landing skid in a 3D printed holder; no further issues were reported after relocation.

Probable Cause(s)

Secondary GPS device on the RPA interfered with or reduced GPS signal strength.

Contributing Factor(s)

Positioning of GPS tracking device.

Safety Action(s)

The operator relocated the Trackimo module to reduce GPS signal interference.

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.

Disclaimer

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