SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED ACCIDENT NVESTIGATIONREPORT

Reference Number	CA18/2/3/10121								
Classification	Accident	**Date**	7 February 2022		**Time**	2000Z			
Type of Operation	Remotely Piloted Aircraft System (Part 101)								
Location									
Place of Departure	Crown Douglas Substation, Mpumalanga Province		Place of Intended Landing		Crown Douglas Substation, Mpumalanga Province				
Place of Accident	Crown Douglas Substation in Mpumalanga Province								
GPS Co-ordinates	Latitude	25°50'34.3" S	Longitude	28°55'10.0" E	Elevation	4737ft			
Aircraft Information									
Registration	ZT-XJY								
Make/Model	DJI Mavic 2 (Serial No. MAV 0075)								
Damage to Aircraft	Destroyed		Total Aircraft Hours		76				
Pilot-in-command									
Licence Type	Remote Pilot Licence (RPL)		Gender	Male	Age: 26				
Licence Valid	Yes								
Total Hours on Type	71.75		Total Flying Hours		71.75				
People On-board	0	Injuries 0	Fatalities	0	Other (on ground)	0			
What Happened									

On Monday evening, 7 February 2022, a remotely piloted DJI Mavic drone with registration ZT-XJY took off on a surveillance flight from Crown Douglas Railway Station at 1941Z. Fine weather conditions prevailed at the time of flight with a surface wind of 8 knots and temperature of 16°C. The pilot was monitoring the drone on the display monitor.

The pilot reported that when the drone was about 3.5 kilometres (km) away from home base, he pressed the return-to-home (RTH) button and the drone started making its way back to home base but at a lower speed than normal.

The pilot pushed the throttle forward to increase speed, but the drone remained at a constant speed of 10 metres per second (m/s). The pilot also noted that the battery was depleting fast. The pilot decided to go (move) towards the drone; he got on the rear of a light delivery vehicle with another person driving. Meanwhile, the drone started descending uncommanded as it approached high tension power lines. Thereafter, the pilot lost connection of the drone from the control unit; the drone had approximately 6% battery life remaining.

There were no injuries reported and the drone was not recovered.

Following the disconnection, the pilot reported that the drone disappeared from his screen while he was driving along the service road next to the railway line. The pilot then requested security officials to assist him in searching for the drone. The search started at 2159Z until 0205Z, and again at 0318Z until day break, without success. As his shift was ending, the pilot asked the colleague who was about to take the next shift to continue with the search. This search was also not successful.

Figure 1: The drone flight path. (Source: Operator)

CAR 2011 Part 101 Beyond visual line-of-sight

(1) An RPA shall not be operated beyond visual line-of-sight unless by the holder of an ROC and as approved by the Director in the operations manual.

(2) The Director may approve B-VLOS operation subject to the operator meeting the requirements prescribed in Document SA-CATS 101.

(3) Approved B-VLOS operations may only be conducted in VMC, below 400ft above surface level, unless otherwise approved by the Director.

SACATS Part 101.05.11 BEYOND VISUAL LINE OF SIGHT

(1) Outside controlled airspace

An RPAS, intended for BVLOS operations shall as a minimum, meet the following operational and technical requirements –

(a) The operator shall demonstrate compliance with the following technical requirements –

- *(i) that the RPA will only be operated using command inputs;*
- *(ii) has met the requirements prescribed in Technical Standard 101.02.2;*
- *(iii) that the RPA has the ability to remain clear from obstacles and any other hazards and can take appropriate action to execute collision avoidance from such obstacles or other aircraft*

where necessary. This ability shall be applicable for normal and lost/degraded C2 links unless –

(aa) the area is void of other air traffic; or

(bb) the operation occurs in specifically delimited or segregated airspace; or

(cc) any other mitigation is in place to avoid other aircraft, obstacles or any hazards;

(iv) the C2 data link frequency to be used for data link is deemed appropriate by the Director; and

(iv) the C2 performance requirements as specified in Technical Standard 101.05.8 are acceptable to the Director.

(b) The operator shall demonstrate to the satisfaction of the Director the following operational capabilities prior to receiving approval for BVLOS operations –

(i) show how the intended RPA will perform all its flight tasks through control inputs whilst in flight, and that such device is not ordinarily required to be flown manually;

(ii) command the RPA to follow a predetermined course or group of waypoint inputs;

(iii) provide inputs to the RPA that in the event of needing to avoid any aircraft or other obstacle, the RPA pilot is able to interrupt or introduce commands or instructions to the RPA, such that the RPA can be interrupted from its set course and can safely fly an alternative course, or land, to avoid known traffic;

(iv) how the exact position of the RPA is displayed to the pilot, in real-time, on a moving map, such that the RPA pilot will be able to make radio calls and report the position of such RPA to any aircraft in the vicinity or to an ATSU providing services or controlling such airspace;

(v) how it reacts in the event of receiving a flight position command that conflicts with obstacles or high ground.

What was found

- The pilot was issued a Remote Pilot Licence (RPL) on 5 January 2022 with an expiry date of 31 January 2024. A Beyond Visual Line of Sight (BVLOS) multi rotor pilot rating was endorsed on his licence. His Class 3 medical certificate was issued on 30 October 2021 with an expiry date of 30 October 2025.
- The drone was issued a Certificate of Registration on 11 November 2021 with the current owner.
- The operator was issued a Remote Operator Certificate (ROC) on 25 October 2021 by the Regulator (SACAA) with an expiry date of 31 October 2022.
- The last maintenance inspection that was carried out on the drone prior to the accident flight was certified on 25 January 2022 at 59 hours. At the time of the accident, the drone had been flown a further 17 hours since the last maintenance inspection.
- The operator was issued a letter of permission on 7 January 2021 by the landowner to overfly the drone in the area from 1 January 2022 with an expiry date of 1 January 2023.
- According to the operator, the drone was approximately 18 minutes into the flight, travelling at 5 m/s when it failed to return to base. The drone had 96% battery life when it took off. The endurance of the drone is 34 minutes with full battery.
- The operator activated their internal Emergency Response Procedure (ERP) for investigation into the accident. (See Appendix A). The operator stated that it was possible that the drone (or what was left of it) could have been picked up by an unknown person (passer-by).
- The operator abandoned the search after a week.

DJI Mavic 2 Specifications:

Weight

570 g

Size • Folded: 180×97×84 mm (Length×Width×Height) Unfolded: 183×253×77(Length×Width×Height)

Diagonal Distance

302 mm

Max Ascent Speed • 4 m/s (S Mode) 4 m/s (N Mode)

Max Descent Speed • 3 m/s (S Mode) 3 m/s (N Mode) 5 m/s (S Mode and N Mode during a sharp descent) 3 m/s (all modes at elevations over 4500 m)

Max Service Ceiling Above Sea Level

5000 m

Max Flight Time (without wind) • 34 minutes

Max Hover Time (without wind) • 33 minutes

Max Flight Distance • 18.5 km

Max Horizontal Flight Speed • 19 m/s (S Mode) 12 m/s (N Mode) 5 m/s (T Mode)

Max Wind Resistance • 8.5-10.5 m/s (Level 5)

- The drone was being operated beyond the maximum flight distance.

Probale cause

The drone was operated at night and out of line of sight and may have impacted an object on the return to base flight.

Contributory factor

Not adhering to CAR 2011 Part 101.05.11 read together with SACATS Part 101.05.11.

Safety Action/s

None.

Safety Recommendations

1. Drone operators should ensure that they conduct safety risk assessments in the areas of operation and in operations conducted at night.
2. The DCA is requested to investigate the need to further increase safety drone operations at night and in areas where the drones can cause injuries or damage to property.

Purpose of the Investigation

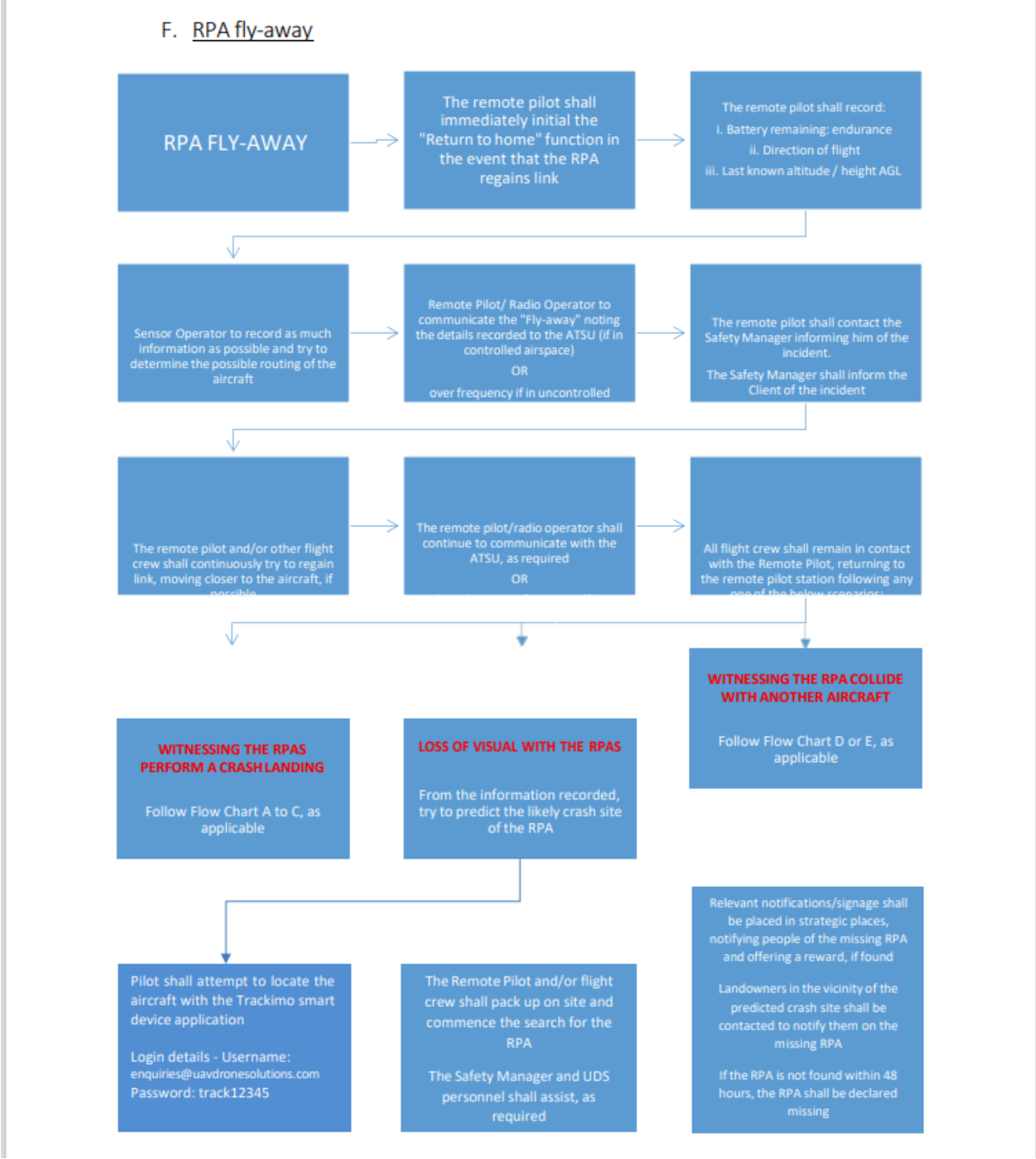
In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to apportion blame or liability****.*

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.

APPENDICES

1. Appendix A (UDS Emergency Response Procedure (ERP)

APPENDIX A



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