SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED ACCIDENT INVESTIGATION REPORT

Reference Number	CA18/2/3/10158										
Classification	Accident		**Date**	4 May 2022		**Time**	1328Z				
Type of Operation	Remotely Piloted Aircraft (Part 101)										
Location											
Place of Departure	Lincoln Farm, KwaZulu-Natal Province		Place of Intended Landing			Lincoln Farm, KwaZulu-Natal Province					
Place of **Accident**	Lincoln Farm										
GPS Co-ordinates	Latitude	S 29º 55' 17.34"	Longitude	E 030º 25' 20.50"		Elevation	6131ft				
Aircraft Information											
Registration	ZT-XIY										
Model/Make	Agras T30 / DJI (Serial Number: 3UB5J45001001J)										
Damage to Aircraft	Substantial			Total Aircraft Hours		15.58					
Pilot-in-command											
Licence Type	Remote Pilot Licence (RPL)		Gender	Male		Age	27				
Licence Valid	Yes										
Total Hours on Type	60.4			Total Flying Hours		257.40					
People Controlling	1+0	Injuries	0	Fatalities	0	Other (on ground)	0				

What Happened

On Wednesday, 4 May 2022 at approximately 1328Z, a Remotely Piloted Aircraft System (RPAS) aircraft, Agras T30, with registration ZT-XIY was launched for agricultural operation from Lincoln Farm in KwaZulu-Natal province. The aircraft was programmed to land back at the same launch location. 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.

Whilst the aircraft was being prepared for launch for the second section of crop-spraying operation on the field, the pilot identified a power line which posed an obstacle. He then mapped out a route to fly over the power line to avert a probable collision. The pilot programmed the A-B route operation mode on the aircraft, as well as recorded the turn points. Upon launch, the aircraft took off to the intended field, flying at a height of approximately 7 metres (m) above ground level (AGL). During its flight, the aircraft's sensors detected an obstacle (electrical power line) on its path and, hence, paused the aircraft prior to reaching the intended destination (this is a design feature to avoid colliding with obstacles). As a result, the pilot engaged the manual operating mode. According to the pilot, *to resume manual operation mode control of the aircraft when it has been programmed for obstacle avoidance and had paused, the flight controls on the remote control must be quickly moved "forward and backward" to allow the aircraft to resume flying*. Following the inputs by the pilot, the aircraft moved very close to the power line, causing electrical arcing which

ultimately electrified the aircraft. A fire erupted soon after, and the aircraft fell to the ground. The aircraft was substantially damaged. No persons on the ground were injured during the accident sequence.

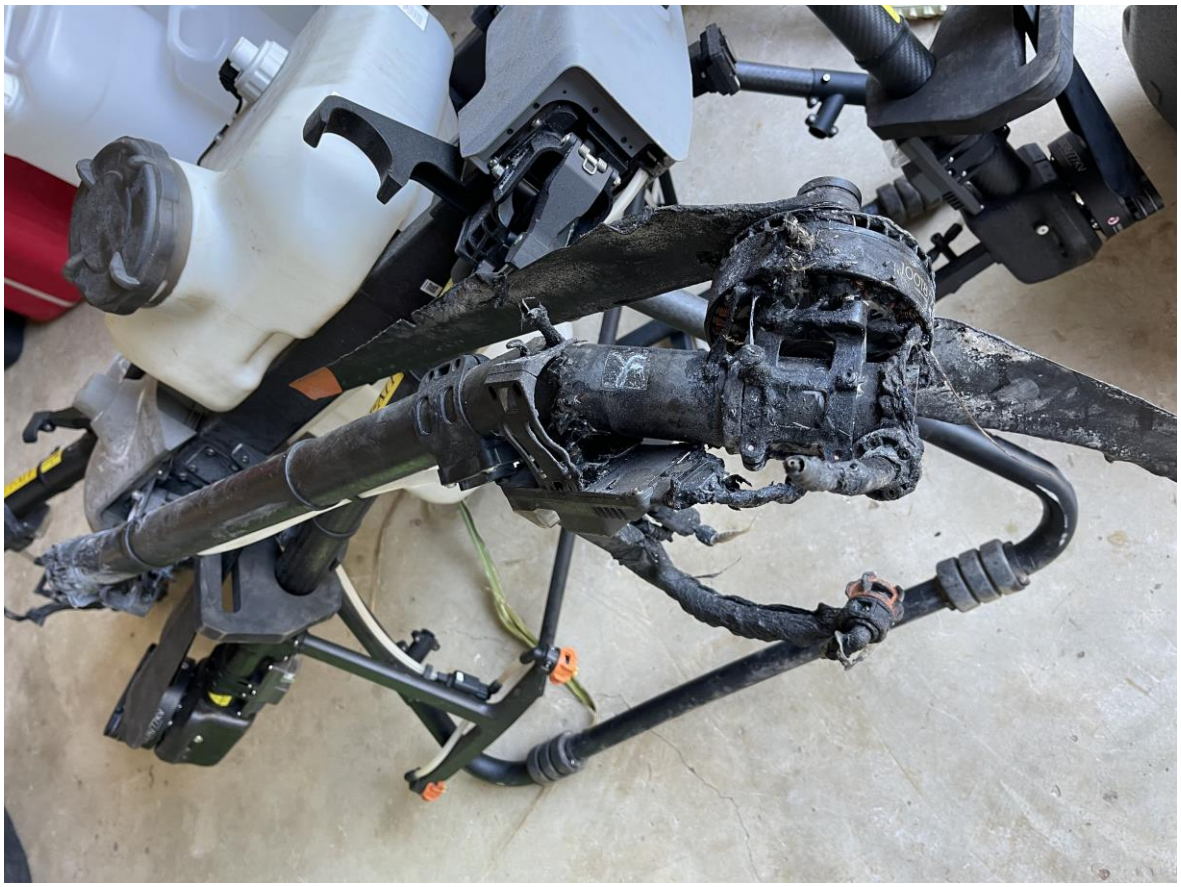

Figure 1: Damages on the aircraft. (Source: Operator)

About the Aircraft (Source: Operation Manual)

The DJI Agras T30 crop-spraying wonder drone is a PACSys Southern African distributor designed solely for agricultural operation. The drone design includes waterproof, dustproof and corrosion-resistance features. The drone has a quadrilateral folding structure design equipped with detection sensors built into the frame arms, enabling the aircraft to perform a folding mechanism self-check to ensure the arms are properly unfolded. The aircraft supports centimetre-level positioning when used with the onboard D-RTK while the dual-antenna technology provides strong resistance against magnetic interference. The remote controller is able to reach its maximum transmission distance of 4km in an open area with no electromagnetic interference, and at an altitude of approximately 2.5m (8.2 feet). The aircraft is prohibited to operate approximately 4.5m (14.8 feet) above sea level. The drone uses a dedicated DJI industrial flight controller to provide multiple operation modes for various applications. The Spherical Radar System provides terrain following an obstacle circumvention in all horizontal directions as well as obstacle sensing in all horizontal directions and upward direction. Obstacle avoidance function enables the radar module which allows the aircraft to detect an obstacle 15m away to brake and allow the aircraft to hover (disabling further movement towards the obstacle function). The drone is also equipped with a return-to-home function as a default home point, which is the first location where it received the strong GNSS signal point during launching point. This function is activated in the following three instances: smart RTH (manually activated), low battery RTH and failsafe RTH (when

communication signal is lost with the command control remote or is out of the recommended operation range). The drone is equipped with a 30-litre container for agricultural crop-spraying chemical solution spraying through 16 nozzles at a rate of 2.7 litres per min and covers a range of between 4-9 metres width when adjusted accordingly.

A-B Route Operation Mode

In A-B operation mode, the drone travels along a pre-planned route after recording turning points A and B. Operation resumption, data protection, altitude stabilisation, obstacle avoidance, and auto obstacle circumvention functions of the radar module are available in this mode and the drone maintains the same distance from the vegetation. The length of the dotted lines, called route spacing, can be adjusted. The turning angles for the turning points of the operation route will change according to the present heading for points A and B.

Figure 2: A similar drone type to the accident drone. (Source: Operation Manual)

What was found:

- After the accident, the aircraft wreckage was recovered by the operator.
- The pilot who operated the aircraft had a Remote Pilot Licence (RPL) with VLOS ratings issued by the Regulator (SACAA) on 24 February 2022 with an expiry date of 29 February 2023. His Class 2 medical certificate was issued on 6 January 2021 with an expiry date of 31 January 2026.
- The aircraft was issued a Remotely Piloted Aircraft Systems (RPAS) letter of approval (LOA) by the Regulator on 16 March 2022 with an expiry date of 15 March 2023.
- The operator was issued a Remote Operating Certificate (ROC) by the Regulator on 28 April 2022 with a Class 3 Air Service Licence and with operational specifications for A4/H1 aircraft type under G3, G4, G5 and G16 operation categories.

- Maintenance (inspection) of the aircraft was conducted during the initial assembly and the aircraft's functional system tests were conducted on 7 April 2022 at zero (0) airframe flight hours.

- The aircraft was issued an Authorised Release Certificate (ARC) Airworthiness Approval tag by a drone service organisation on 7 April 2022 at 0.00 airframe hours with an expiry date of 7 October 2022 or at 100 airframe hours.

Probable cause:

The aircraft was electrified by power lines during an attempt (by the pilot) to manually restore flight of the aircraft, following an obstacle detection.

Safety Action

None.

Safety Message and/or Safety Recommendation/s

None.

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 issued by:

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