

ACCIDENT

Aircraft Type and Registration:	DJI Matrice 210 (UAS, registration n/a)	
No & Type of Engines:	4 electric motors	
Year of Manufacture:	2017 (Serial no: 0G0DE8CLD30212)	
Date & Time (UTC):	20 December 2017 at 1610 hrs	
Location:	Near Albert Bartlett Farm, La Route de la Trinite, St Helier, Jersey	
Type of Flight:	Commercial Operation	
Persons on Board:	Crew - None	Passengers - None
Injuries:	Crew - N/A	Passengers - N/A
Nature of Damage:	Damage to landing gear legs, front arms, two propellers, camera gimbal and battery case	
Commander's Licence:	CI Aviation Permit	
Commander's Age:	46 years	
Commander's Flying Experience:	52 hours UAS (of which 1 was on type) Last 90 days - 17 hours Last 28 days - 6 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

During a training flight with the battery level indicating 12 minutes of flight time remaining, a 'LOW VOLTAGE BATTERY WARNING' appeared, all four electric motors stopped and the UAS began a rapid descent. A second later the warning disappeared and the motors reactivated but there was insufficient time to prevent the UAS from crashing at "considerable speed". The UAS manufacturer determined that it was caused by a battery firmware problem and has issued an update.

History of the flight

The DJI Matrice 210 is a quadcopter UAS (Figure 1) with a maximum takeoff mass of 6.14 kg and fitted with dual batteries. For the accident flight the mass was 4.57 kg.

The UAS was being operated on a training flight and took off with 31 minutes of flight time remaining on the battery level indication. During the flight the UAS lost satellite lock intermittently and the UAS controller displayed the message 'compass error'. While hovering the UAS rotated about its yaw axis without controller input. This was a known issue and the pilot changed flight modes to resolve it. After a short time the pilot initiated a descent to land. He noted that the battery level was indicating 12 minutes of flight time remaining.

When the UAS reached a height of 84 m the pilot noticed a warning, which he recalled showed 'LOW VOLTAGE BATTERY WARNING'. At the same time all four electric motors stopped and the UAS began descending rapidly. The warning cleared after about a second and the system recovered and the motors re-started. The pilot tried to apply full power to arrest the descent but the UAS crashed into a field at "considerable speed". The UAS did not yaw, roll or pitch during the descent and hit the ground in a level attitude.



Figure 1

DJI Matrice 210

Investigation by the UAS manufacturer

The UAS was sent to its manufacturer for repairs and analysis of the onboard recorded data. The data revealed that the voltage measured by the main controller at the time of the accident was 23.4 V. Full batteries have a voltage of 26.3 V; however, 23.4 V is sufficient for continued flight. The data also revealed anomalous measurements for battery 2. During the accident flight the battery 1 voltage gradually reduced from 25.5 V to 23.3 V at the time of the accident, whereas the battery 2 voltage indicated a steady 22.6 V throughout the flight, while indicating a steady high current output. The UAS manufacturer could not explain this anomaly but stated that it was aware of a battery firmware issue that results in actual battery levels being "ignored" and power to the motors being cut because the system considers the battery level too low. The manufacturer issued a firmware update in January 2018 to address this issue.