ACCIDENT

Aircraft Type and Registration:	DJI Phantom 4 Pro (UAS, registration n/a)	
No & Type of Engines:	4 DJI Electric motors	
Year of Manufacture:	2016	
Date & Time (UTC):	17 June 2018 at 0545 hrs	
Location:	Worcester, Worcestershire	
Type of Flight:	Commercial Operations	
Persons on Board:	Crew - N/A	Passengers - N/A
Injuries:	Crew - N/A	Passengers - N/A
Nature of Damage:	Extensive	
Commander's Licence:	Other	
Commander's Age:	61 years	
Commander's Flying Experience:	25 hours (of which 16 were on type) Last 90 days - 3 hours Last 28 days - 1 hour	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

While on a surveying task the pilot was unexpectedly presented with a 'LANDING' warning, followed by several other warnings, before the aircraft entered a hover. Despite several attempts the pilot was unable to take control. The aircraft subsequently descended, colliding with a building as it did so, and was extensively damaged.

History of the flight

The aircraft was being flown on a surveying task in a built-up area, for which the pilot had approval. It took off on its third flight of the day with the battery indicating 51% charge and 13 minutes and 17 seconds of flight time remaining.

After an uneventful few minutes, the enunciated flight mode, on the aircraft's controller, changed from 'GPS' to 'LANDING' without any warning or input by the pilot. This was followed by the following messages also being displayed on the controller:

> *'Obstacle sensing will be disabled when aircraft is landing. Fly with caution*
>
> *Aircraft is close to home point. Initiate return to home will now trigger Auto Landing'*

The aircraft then entered a hover. Despite several attempts by the pilot to take control of the aircraft, including selecting A [Attitude] Mode and selecting RTH [Return to Home], the aircraft continued to hover. The pilot then rebooted the manufacturer's application on the monitor connected to the controller, but this had no effect. He then changed the monitor for a portable electronic device, but the aircraft continued to hover and not respond to any inputs. The pilot then reconnected the monitor and 'LANDING' continued to be displayed.

Shortly thereafter, having flown for about 6 minutes and 30 seconds, while it was in a hover, when the battery was indicting 11% and 2 minutes and 51 seconds of flight time remaining, the aircraft started to descend. As it did, it made contact with the side of a building and fell 30 ft. It came to rest on a flat roof, sustaining extensive damage to the aircraft.

Aircraft information

The *Phantom 4 Pro/Pro+ User Manual*, V1.4 states:

'***Intelligent Flight Battery**: The new 5870 mAh DJI Intelligent Flight Battery… provide up to 30 minutes of flight.*

Aircraft Status Indictor Description [1]

…

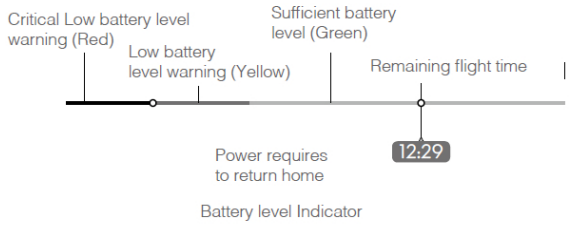
Warning	
Ⓨ ····· Fast yellow flashing	Remote Controller Signal Lost
Ⓡ ····· Slow red flashing	Low Battery Warning
Ⓡ ····· Fast red flashing	Critical Battery Warning

Low Battery RTH

The low battery level failsafe is triggered when the DJI Intelligent Flight Battery is depleted to a point that may affect the safe return of the aircraft. Users are advised to return home or land the aircraft immediately when prompted. The DJI GO 4 app will display a notice when a low battery warning is triggered. The aircraft will automatically return to the Home Point if no action is taken after a ten-second countdown. The user can cancel the RTH procedure by pressing the RTH button on the remote controller. The thresholds for these warnings are automatically determined based on the aircraft's current altitude and distance from the Home Point.

The aircraft will land automatically if the current battery level can only support the aircraft long enough to descend from its current altitude. The user can still use the remote controller to alter the aircraft's orientation during the landing process.

The Battery Level Indicator is displayed in the DJI GO 4 app, and is described below:



Footnote

[1] The Aircraft Status Indicators communicate the system status of the aircraft's flight controller by way of different coloured LEDs on the rear of the aircraft. The Critical Battery Warning illuminates when the battery has about 10% of charge remaining.

Battery Level Warning	Remark	Aircraft Status Indicator	DJI GO 4 App	Flight Instructions
Low battery level warning	Battery power is low. Land the aircraft.	Aircraft status indicator blinks RED slowly.	Tap "Go-home" to have the aircraft return to the Home point and land automatically, or "Cancel" to resume normal flight. If no action is taken, the aircraft will automatically go home and land after 10 seconds. Remote controller will sound an alarm.	Fly the aircraft back and land it as soon as possible, then stop the motors and replace the battery.
Critical Low battery level warning	The aircraft must land immediately.	Aircraft status indicator blinks RED quickly.	The DJI GO 4 app display will flash red and the aircraft will start to descend. The remote controller will sound an alarm.	Allow the aircraft to descend and land automatically.

Aircraft examination

The aircraft was initially inspected by a UK repair agency, which concluded that it had experienced an "unknown behaviour".

The aircraft, without its battery, was then sent to the manufacturer for further analysis. They concluded the accident was due to a "critical low battery landing" but were unable to provide further information as to what may have caused the loss of control.

Other events

During 2018, there were several events to aircraft fitted with the manufacturer's TB50[2] and TB55[3] batteries where they indicated incorrect power levels. This was resolved by a firmware update[4]. The manufacturer commented that this accident was not related to this issue.

Pilot's comments

The pilot commented that he was not presented with any low battery warnings during the accident flight. He has subsequently recharged and used the accident battery several times, in a new aircraft, without event.

Discussion

The manufacturer concluded that the accident was the result of the aircraft commencing an automatic landing when its battery was nearly depleted. This may have been the case once the battery had reached 11% of charge remaining and started to descend. However, the pilot did not receive a low battery level warning, as stated in the aircraft's user manual.

Footnote

[2] The TB50 batteries are fitted to the manufacturer's Matrice 200 series and Inspire 2 aircraft.
[3] The TB55 batteries are fitted to the manufacturer's Matrice 200 series of aircraft.
[4] Link to manufacturer's concluding statement on TB55 battery investigation: https://www.dji.com/uk/newsroom/news/dji-concludes-tb55-battery-investigation [accessed March 2019]

Also, the aircraft did not commence the automatic landing for several minutes after the message that it would do so was enunciated on the controller. No explanation for this, or the failure of the aircraft to respond to the pilot's inputs, could be established.