



# Aviation Investigation Final Report

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<b>Location:</b>	Young Harris, Georgia	<b>Accident Number:</b>	CEN21LA224
<b>Date &amp; Time:</b>	May 6, 2021, 10:45 Local	<b>Registration:</b>	FA3HW43WTF
<b>Aircraft:</b>	DJI Matrice	<b>Aircraft Damage:</b>	Minor
<b>Defining Event:</b>	Miscellaneous/other	<b>Injuries:</b>	1 Serious
<b>Flight Conducted Under:</b>	Part 107: Small UAS		

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## Analysis

The remote pilot in command (RPIC) of the small unmanned aircraft system (sUAS, commonly known as a drone), intended to complete a demonstration flight next to a prison and was unaware of the restricted zone surrounding the prison. Before takeoff, the pilot set the home point within the buffer zone, which surrounded the restricted zone. About 7 minutes after takeoff, the RPIC initiated the return-to-home (RTH) function and drone proceeded toward the set home point. Because the home point was located within the buffer zone, the drone reached the buffer zone boundary and would not proceed to the set home point. The RPIC attempted to land the drone, but there were obstacles (vehicles) that prevented it from auto-landing and the buffer zone prevented it from relocating while still in RTH mode. Since the RPIC did not exit RTH mode, the drone would not respond to any manual control inputs.

During the landing attempts, the RPIC exited RTH mode four times, which would have allowed the drone to respond to manual control inputs; however, each time, the RPIC reactivated RTH mode within a few seconds, which again prohibited any manual control inputs. The RPIC grabbed onto the landing gear and attempted to physically move the drone away from the vehicles. The drone resisted the physical displacement and maintained its position over the vehicle. The RPIC requested assistance from a demonstration attendee and handed him the remote controller. The RPIC ultimately attempted to remove the drone batteries, during which a propeller blade struck his right hand several times, which resulted in serious injury.

The RPIC could have manually landed the drone if he had exited RTH mode. Also, the pilot should have discovered the restricted zone during preflight planning and used a landing zone and home point farther away from the restricted zone.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The remote pilot-in-command's (RPIC) decision to physically hold onto the drone's landing gear in flight, which resulted in the rotors striking his hand and causing serious injury. Contributing to the accident was the RPIC's inadequate preflight planning and lack of airspace awareness.

## Findings

<b>Personnel issues</b>	Decision making/judgment - Pilot
<b>Personnel issues</b>	Flight planning/navigation - Pilot
<b>Environmental issues</b>	(general) - Awareness of condition
<b>Personnel issues</b>	Knowledge of geographic area - Pilot
<b>Personnel issues</b>	Aircraft control - Pilot

## Factual Information

### History of Flight

Other	Miscellaneous/other (Defining event)
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On May 6, 2021, about 1045 eastern daylight time, a Dà-Jiang Innovations (DJI) Matrice 300 RTK small unmanned aircraft system (sUAS, commonly known as a drone), FA3HW43WTF, was involved in an accident near Young Harris, Georgia. The remote pilot in command (RPIC) sustained serious injuries. The flight was operated as a Title 14 *Code of Federal Regulations* Part 107 demonstration flight.

The purpose of the flight was to demonstrate for the local sheriff's office the drone capabilities with a payload of a Zenmuse H20T camera and a Wingsland Z15 spotlight. The flight location was very close to a DJI GEO Zone no-fly zone (NFZ) designated as a "restricted zone."



Figure 1. Restricted Zone in red and approximate accident site denoted with a yellow circle.

The RPIC stated that he performed a normal takeoff and flew the drone to the west over a wooded area about 393 ft above ground level (agl). He stated that, during the spotlight demonstration, the drone was unresponsive to control inputs, so he utilized the return-to-home (RTH) function. During the RTH descent toward the home point, the drone hovered

about 7 ft agl over a vehicle in the parking lot and was still unresponsive to any control inputs. When the drone would not land, the RPIC grabbed onto the landing gear and attempted to physically move the drone away from the vehicles. The drone resisted the physical displacement and maintained its position over the vehicle. The RPIC requested assistance from a demonstration attendee and handed him the remote controller. With guidance from the RPIC, he attempted several times to shut down the motors while RPIC held onto the landing gear with both hands. Finally, the RPIC attempted to remove the drone batteries when a propeller blade struck his right hand several times, which resulted in tendon and nerve damage. The RPIC continued to hold onto the drone for several minutes until the batteries were exhausted and the motors stopped.

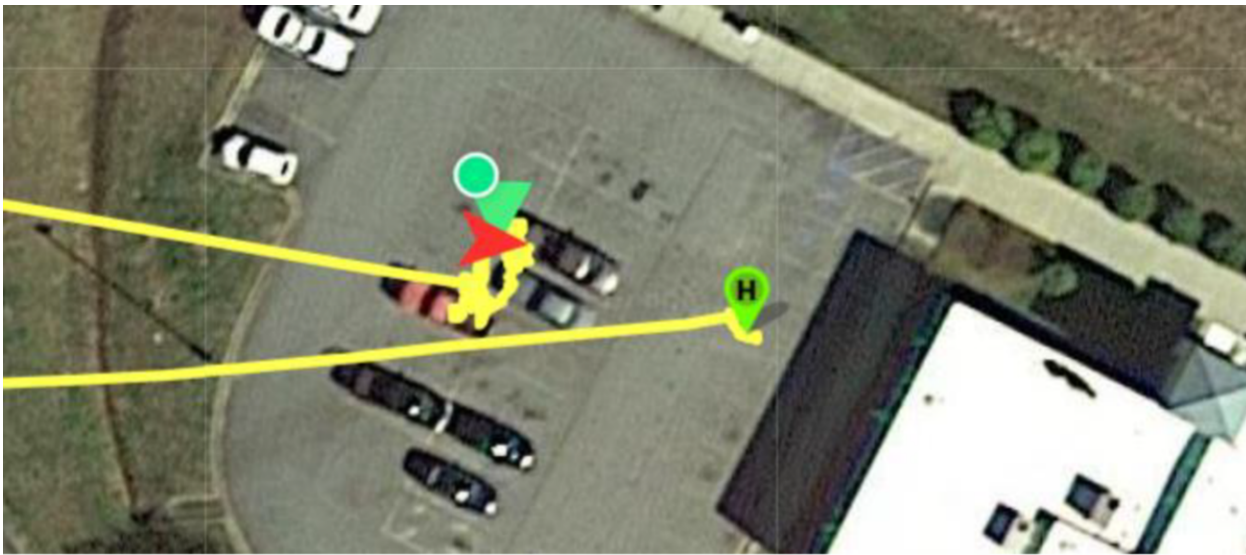


Figure 2. Accident flight path in yellow

According to DJI, in restricted zones, which appear red on the DJI application (app), users will be prompted with a warning and flight is prevented. GEO Zones that prohibit flight are implemented around locations such as airports, power plants, and prisons. NFZ's feature a "buffer zone" defined as an area about 66 ft wide surrounding the NFZ. The purpose of a buffer zone is to account for estimation and control errors in order to avoid breaching the NFZ when the drone has forward speed. When approaching the buffer zone, the drone will reduce speed and stop at the buffer zone border. After the accident, the RPIC stated that he was initially unaware of the restricted zone and never saw a notification on the remote controller during the flight. He added that he only discovered the Restricted Zone after a discussion with the National Transportation Safety Board (NTSB) investigator.

The accident flight logs and data were extracted and revealed that the home point was set within the buffer zone of the restricted zone. About 7 minutes after takeoff at 393 ft agl, the RTH function was initiated. The drone returned to 56 ft from the home point and stopped at the boundary of the buffer zone, when the DJI app prompted a restricted zone warning and the drone remained in RTH mode. The drone remained about 7 ft agl and would not respond to the RPIC's multiple control inputs since it was still in RTH mode. The logs showed multiple

altitude fluctuations and increased motor thrust, without corresponding control inputs, which indicated an external force was exerted on the drone. On four occasions, the RPIC exited RTH mode then reactivated RTH a few seconds later, and the drone would not respond to manual control inputs with RTH mode active. The battery level reached 9% and a battery installation error was prompted. The battery level reached 7%, and a critically low battery auto landing was initiated. The drone did not maintain altitude despite increased motor thrust, which indicated an external force was again exerted on the drone.

## Pilot Information

<b>Certificate:</b>	Private; Remote	<b>Age:</b>	63, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	None
<b>Other Aircraft Rating(s):</b>	Unmanned (sUAS)	<b>Restraint Used:</b>	None
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	April 1, 2019
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	April 6, 2021
<b>Flight Time:</b>	(Estimated) 1500 hours (Total, all aircraft), 90 hours (Total, this make and model)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	DJI	<b>Registration:</b>	FA3HW43WTF
<b>Model/Series:</b>	Matrice 300	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	None	<b>Serial Number:</b>	1ZNDH3L0010562
<b>Landing Gear Type:</b>	None; Skid	<b>Seats:</b>	
<b>Date/Type of Last Inspection:</b>		<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	4
<b>Airframe Total Time:</b>		<b>Engine Manufacturer:</b>	
<b>ELT:</b>	Not installed	<b>Engine Model/Series:</b>	
<b>Registered Owner:</b>	Gresco Technology Services	<b>Rated Power:</b>	
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KDZJ,1909 ft msl	<b>Distance from Accident Site:</b>	11 Nautical Miles
<b>Observation Time:</b>	10:55 Local	<b>Direction from Accident Site:</b>	223°
<b>Lowest Cloud Condition:</b>		<b>Visibility</b>	7 miles
<b>Lowest Ceiling:</b>		<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	4 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	330°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.14 inches Hg	<b>Temperature/Dew Point:</b>	13°C / 8°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Young Harris, GA	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Young Harris, GA	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>		<b>Type of Airspace:</b>	Class G;Restricted area

## Wreckage and Impact Information

<b>Crew Injuries:</b>	N/A	<b>Aircraft Damage:</b>	Minor
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	1 Serious	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Serious	<b>Latitude, Longitude:</b>	34.984329,-83.829269

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Lindberg, Joshua
<b>Additional Participating Persons:</b>	Shane Olson; Federal Aviation Administration; Atlanta, GA Javier Caina; DJJ; Palo Alto, CA
<b>Original Publish Date:</b>	August 19, 2022
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class 3</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.ntsb.gov/Docket?ProjectID=103104">https://data.ntsb.gov/Docket?ProjectID=103104</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).