Aviation Investigation Final Report

Location:	Driggs, Idaho	**Incident Number:**	DCA18IA264
Date & Time:	August 10, 2018, 06:40 Local	**Registration:**	N1410C
Aircraft:	Lindstrand 105A	**Aircraft Damage:**	None
Defining Event:	Midair collision	**Injuries:**	3 None
Flight Conducted Under:	Part 91: General aviation		

Analysis

The hot air balloon was operating under the provisions of 14 CFR Part 91 as a commercial passenger sightseeing flight, under visual flight rules, within Class G airspace. The pilot saw the sUAS (drone) maneuvering in the area just prior to the collision. There was no opportunity or ability for the balloon pilot to avoid the drone.

There was no evidence of any mechanical or software problems with the drone relevant to the flight. The pilot did not report any anomalies, and his narrative was in general agreement with the recorded logs and video. The drone operated as expected at all times. The Active Track feature occasionally lost lock on the camera target (the balloon), however, that was not unexpected given the nature of how the tracking feature operates and the visual appearance of the balloon envelope. The drone control app correctly and appropriately warned the pilot of the loss of Active Track lock. The drone remained connected with the remote controller and was controllable by the pilot at all times.

The drone pilot initiated his flight within 5 miles of an airport without notifying the airport authority, contrary to the provisions of 14 CFR 101.41.

The drone pilot was unaware of safe operating practices developed by any community-based model aircraft organization, and unaware of the requirement in 14 CFR 101.41 to at all times give way to manned aircraft. The pilot's flying skills were not sufficient to operate in proximity to another aircraft, namely the balloon, and he flew in proximity without coordination with the balloon pilot. The DJO GO control app gave the pilot numerous indications of losing track on the Active Track feature and initiation of Obstacle Avoidance feature, however, he continued to fly in close proximity to the balloon.

Probable Cause and Findings

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

the drone pilot's decision to fly without pre-coordination, and without the requisite skills and knowledge, to maneuver the drone in close proximity to another aircraft.

Findings

Personnel issues	Incorrect action performance - Pilot of other aircraft
Personnel issues	Knowledge of regulatory reqs - Pilot of other aircraft

Factual Information

History of Flight

Enroute-climb to cruise	Midair collision (Defining event)

HISTORY OF FLIGHT

On August 10, 2018, at 0640 mountain daylight time, an unregistered Dà-Jiang Innovations (DJI) Mavic Pro small unmanned aircraft system (sUAS, commonly known as a drone), operated by an individual, collided with a Lindstrand 105A hot air balloon, N1410C, operated by Elevated Ballooning as a revenue passenger sightseeing flight under the provisions of 14 *Code of Federal Regulations* (*CFR*) Part 91. The collision occurred in the vicinity of the Driggs-Reed Memorial Airport (KDIJ), Driggs, Idaho. The balloon was not damaged, the sUAS was substantially damaged, and there were no injuries or ground damage. Visual flight rules (VFR) conditions prevailed at the time of the incident.

The incident balloon had just taken off from the Teton County Fairgrounds, just north of the airport, and was climbing over a large open area. The balloon pilot reported that she was climbing the balloon through 300 feet above ground level (agl) when she and her passengers observed the drone flying near the balloon. She reported that she did not have any prior knowledge of the drone operation and was not in communication with the drone pilot but that her passengers believed that the drone was being operated by a passenger from another balloon operator. The balloon pilot saw the drone first strike the lower third of the balloon envelope, repeatedly strike the envelope, and then fall to the ground in the vicinity of the balloon. A passenger on the balloon reported seeing the drone collide with the envelope near the passenger basket, and eventually get tangled in lines before crashing.

The drone was operated by an individual who was a customer of a different balloon operator. He reported that he was waiting for the balloon in which he was to ride to complete inflation, and he decided to fly to photograph the other balloons and the scenery. He also set up a ground camera to capture images of the balloons. He did not notify the airport authority of his flight. The pilot reported, and logs confirmed, that he had to acknowledge the warnings on his tablet of proximity to the airport prior to flying and self-unlocked DJI's geofencing that was in effect at this airport area. DJI geofencing includes areas around airports called Authorization Zones, which appear yellow in the DJI GO map, and users will be prompted with a warning and flight is limited by default. Authorization Zones may be unlocked by authorized users using a DJI verified account. The drone pilot said he asked the pilot of the balloon he was preparing to ride in if there was any air traffic expected other than the balloons.

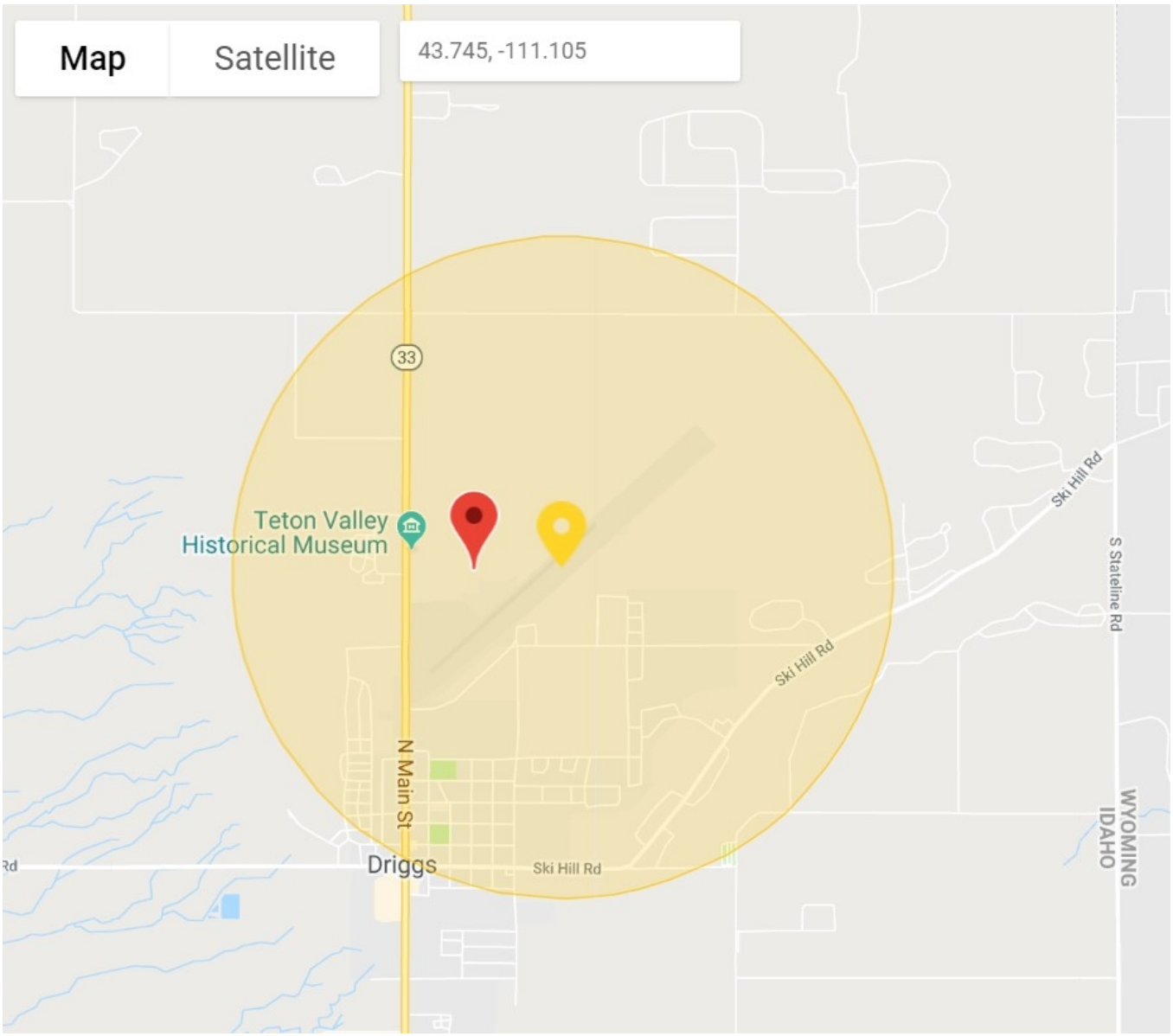

Figure 1 - Map of DJI geofencing authorization zone for Driggs Airport. Red symbol is the location of the drone pilot

The balloon launch area was in an open field adjacent to a horse-riding ring, about 2,000 feet north of the KDIJ runway. Review of data logs and videos recovered from the drone, as well as pilot statements, revealed that the drone pilot launched the drone while the incident balloon was in the final stages of inflation then maneuvered it around the field taking video of the two balloons and scenery. The pilot reported that he intended to use a feature called "Active Track" in which the drone positions itself so that its camera can remain focused on a subject framed in the camera view. He reported that he easily maintained visual contact with the drone during his intended maneuver but lost sight of it in the moments prior to the collision when it was blocked by the balloon envelope. Data logs indicated that the drone reached a maximum of 200 yards away from the home point (near which the drone operator was located).

After the incident balloon departed, the drone pilot continued to maneuver the drone in the area, taking video of the balloon continuously. Data logs indicated that the Active Track feature was used periodically, other times the drone was in GPS mode and directly maneuvered by the pilot.

About one minute prior to the collision, the drone was at 225 feet agl, entered Active Track mode and followed the balloon, apparently tracking on the skirt and basket portions. Twenty-nine seconds prior to the collision, the video showed that the balloon was moving visibly closer to the drone, and the drone yawed left and climbed to 270 feet, then lost track and hovered. The balloon skirt and envelope filled approximately half of the drone's video frame.

Figure 2 - Video snapshot 29 seconds prior to collision

The data showed that the drone pilot manually re-entered Active Track mode, and the drone briefly followed the balloon, but, 5 seconds later, the drone's forward obstacle avoidance triggered, it lost track, briefly switched to GPS and back to Active Track. Data logs showed that the drone operator applied forward elevator and full throttle stick movements, which moved the drone toward the balloon and climbed it, and another obstacle avoidance braking maneuver activated, causing the drone to again switch out of Active Track.

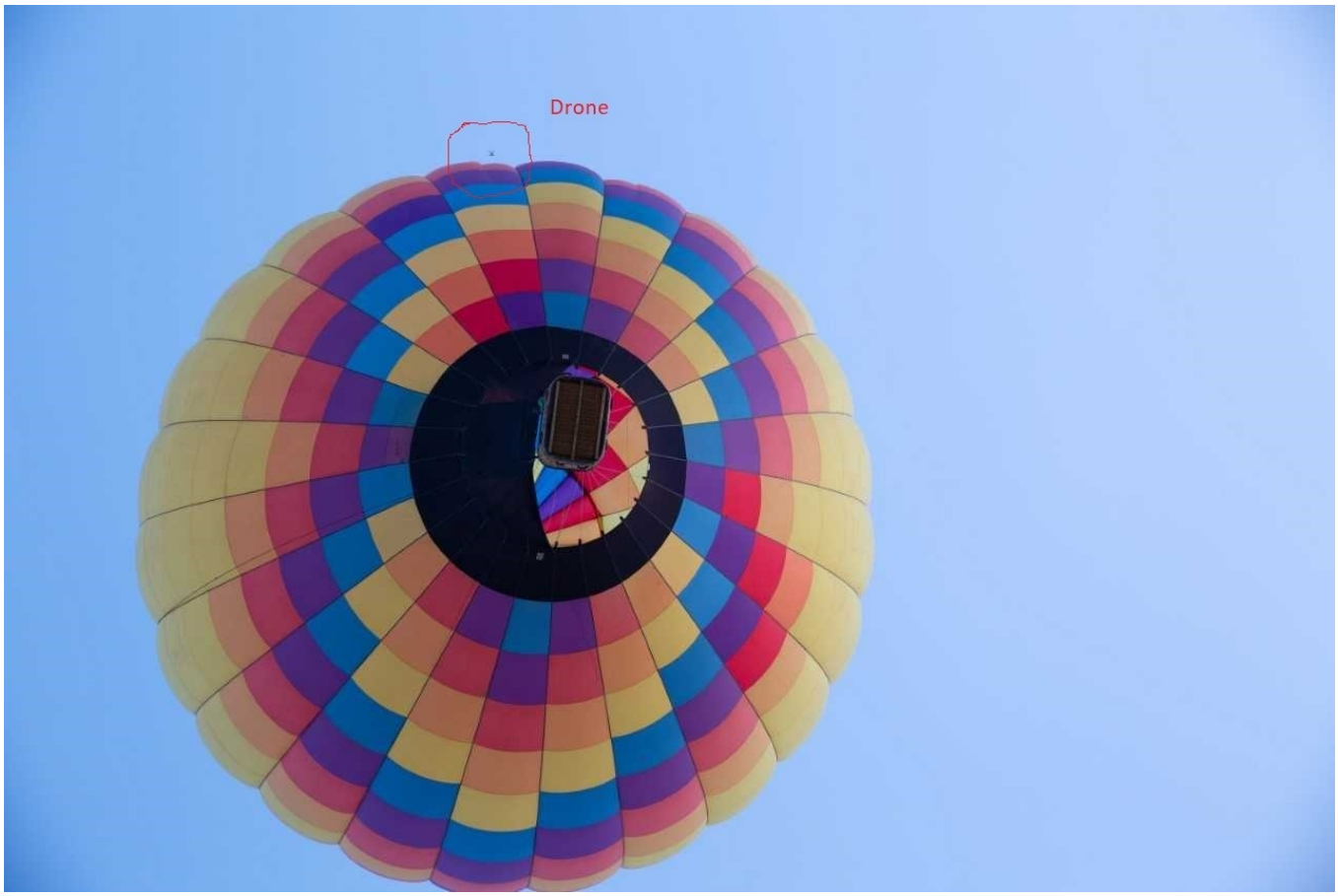

Figure 3 - Ground photo showing drone in proximity to balloon

Twenty seconds prior to the collision, the balloon moved into the center of the video frame, and Active Track was reestablished briefly. The drone altitude was 310 feet agl. At four seconds prior to the collision, obstacle avoidance was again triggered and the drone's flight mode switched to GPS. The balloon envelope almost filled the entire video frame. The drone pilot reported that he had lost sight of the drone behind the balloon envelope and attempted to avoid the passengers with a full power climb command. The video and logs were consistent with the drone climbing into the outward tapering gore of the balloon envelope, colliding and tumbling, becoming breifly entangled in the balloon load lines. Data logs continued to record for 7 seconds after the collision and indicated the full throttle command remained, and the drone rotated in all axes and lost altitude. Data logs and video ended prior to ground impact.

Figure 4 - Snapshot of data log replay

The balloon pilot reported that she assessed the envelope was not damaged and continued the flight with no further incident. She directed her ground crew to the location of the crashed drone and they retrieved it. The drone pilot reported that shortly after the collision, the pilot of the balloon he was to ride in advised it was time to board, and he packed up his equipment and boarded the balloon.

DAMAGE TO AIRCRAFT

There was no damage to the balloon.

The Mavic Pro drone was substantially damaged.

Figure 5 - Damaged Mavic Pro drone

PERSONNEL INFORMATION

The balloon pilot held an FAA commercial pilot certificate, with a lighter-than-air balloon rating, and had logged 414 hours. She held an FAA second class medical certificate. Her balloon tour company, Elevated Ballooning LLC, commonly operated from the KDIJ area. She did not have any previous experience encountering drones in proximity to her aircraft.

The Mavic pilot flew the drone recreationally only; he did not hold an FAA 14 *CFR* 107 Remote Pilot Certificate, did not participate in any community-based set of safety guidelines or within the programming of a community-based organization (as specified in 14 *CFR* 101.41(b), and held no manned aircraft certificates. He stated that he had not taken any drone training, and did not recall ever having to take an automated quiz via the DJI control app. He stated that he bought the drone at a well-known electronics chain, but did not recall any pamphlets, printed guidance, or other training material included in the package.

AIRCRAFT INFORMATION

The Lindstrand 105A is a commonly used ride balloon of 105,000 cubic foot air capacity, with a basket capable of carrying 6 occupants. Hot air is provided via a Jetstream 2 double model propane burner.

The Mavic Pro is a small unmanned aircraft system of quad-copter configuration, with foldable motor arms, and is about 14 inches across when in flight configuration. It is powered by four electric brushless motors and a 3-cell 11.4v lithium-polymer battery. The maximum takeoff weight is 1.62 pounds, maximum altitude is approximately 16,404 feet msl. Maximum endurance is 27 minutes. Specified maximum range of the remote controller is 4.3 miles, using the 2.4gHz frequency band. The aircraft is equipped with a GPS/GLONASS navigation system and a flight controller enabling various automated functions. The aircraft is equipped with a digital camera based on a 1-2/3" CMOS sensor capable of 12-megapixel still photos, 4K HD video recording, and first-person view display. Aircraft telemetry and video is transmitted to the remote controller in the 2.4 gHz or 5.8 gHz band and displayed on a smartphone or tablet of the pilot's choice using an app called GO4, supplied by the manufacturer. The incident aircraft was using firmware version 01.03.09.00, dated November of 2017, and GO4 app version v4.2.16(3138). The pilot did not use any 3rd party apps.

The Mavic Pro includes a feature to provide automatic obstacle avoidance under certain conditions. Obstacle avoidance uses optical and ultrasound sensors to detect obstacles up to about 43 to 50 feet away from the aircraft and initiate braking or avoidance. The forward obstacle avoidance covers approximately a 60-degree field of view, downward covers approximately a 40-degree field of view. There is no obstacle avoidance in the upward direction.

The Mavic Pro includes a feature called Active Track, in which the drone will automatically move the camera and drone to maintain the desired subject in the video frame. The user identifies the desired object on the mobile device screen by drawing a box and tapping. The drone will follow the object and keep it in the frame. The user manual describes limitations in which the feature could lose the ability to track. In those cases, the box will turn red and a message will be displayed. The aircraft will stop and hover if it loses lock. Obstacle avoidance is not available in certain modes of Active Track.

METEOROLOGICAL INFORMATION

The KDIJ surface observation at 5:56 local reported clear skies, 10 miles visibility and calm wind.

AIDS TO NAVIGATION

Data logs from the Mavic indicated sufficient GPS signals throughout the flight. There were no NOTAMs of any GPS outages or anomalies in the area.

AERODROME INFORMATION

The Driggs-Reed Memorial Airport is a public use general aviation facility located about one mile north of the city of Driggs, Idaho. It has one paved runway, 7,300 feet long, aligned northeast/southwest, and a turf landing area between the runway and taxiway. The airport elevation is 6,231 feet above mean sea level (msl). The airport also has heavy glider activity in the summer months as well as sightseeing balloon operators. The airport underlies Class G airspace to 700 feet agl.

FLIGHT DATA

The Mavic Pro records full flight parameters on non-volatile on-board memory, and video or still photography on a micro SD card in the aircraft. The aircraft was retrieved by the balloon pilot and sent to the NTSB for examination. The NTSB recovered the on-board memory and video files.

The DJI GO4 app records select telemetry parameters to the pilot's display tablet. The drone pilot provided a screen capture of his tablet data logs to the investigation for analysis. Under the direction of the NTSB investigator, the drone pilot uploaded his tablet data logs to the manufacturer for analysis.

Data from the above sources is cited in the History of Flight section of this report and included in the public docket.

WRECKAGE AND IMPACT INFORMATION

The Mavic Pro was recovered by the balloon ground crew. The propellers were mostly missing, the right side motor arms were broken, with the right rear arm appearing to have been pulled outwards, consistent with the video and passenger information indicating it became briefly entangled in one of the balloon lines.

TESTS AND RESEARCH

The investigation reviewed pertinent regulations and guidance:

Public Law 112-95 § 336(c) (Feb. 14, 2012) defines "model aircraft" as an unmanned aircraft that is:

(1) Capable of sustained flight in the atmosphere;

(2) Flown within visual line of sight of the person operating the aircraft; and

(3) Flown for hobby or recreational purposes.

14 CFR 1.1 (and 101.1) state in part:

Model aircraft *means an unmanned aircraft that is:…*

(2) Flown within visual line of sight of the person operating the aircraft; and

(3) Flown for hobby or recreational purposes.

14 CFR 101.41 states in part:

Applicability.

This subpart prescribes rules governing the operation of a model aircraft that meets all of the following conditions …

(a) The aircraft is flown strictly for hobby or recreational use;

(b) The aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization;…

(d) The aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft…

(e) When flown within 5 miles of an airport, the operator of the aircraft provides the airport operator … with prior notice of the operation.

Information

Certificate:	**Age:**
Airplane Rating(s):	**Seat Occupied:**
Other Aircraft Rating(s):	**Restraint Used:**
Instrument Rating(s):	**Second Pilot Present:**
Instructor Rating(s):	**Toxicology Performed:**
Medical Certification:	**Last FAA Medical Exam:**
Occupational Pilot:	**Last Flight Review or Equivalent:**
Flight Time:	

Aircraft and Owner/Operator Information

Aircraft Make:	Lindstrand	**Registration:**	N1410C
Model/Series:	105A No Series	**Aircraft Category:**	Balloon
Year of Manufacture:	2006	**Amateur Built:**	
Airworthiness Certificate:	Balloon	**Serial Number:**	5345
Landing Gear Type:		**Seats:**	
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	
Airframe Total Time:		**Engine Manufacturer:**	
ELT:		**Engine Model/Series:**	
Registered Owner:	Elevated Ballooning	**Rated Power:**	
Operator:	Elevated Ballooning	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	DIJ,6231 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	05:55 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	
Precipitation and Obscuration:			
Departure Point:	Driggs, ID (KDIJ)	**Type of Flight Plan Filed:**	None
Destination:	Driggs, ID (KDIJ)	**Type of Clearance:**	None
Departure Time:	06:35 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	Driggs KDIJ	**Runway Surface Type:**	
Airport Elevation:	6231 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	None
Passenger Injuries:	2 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 None	**Latitude, Longitude:**	43.742778,-111.096664

Administrative Information

Investigator In Charge (IIC):	English, William
Additional Participating Persons:	
Original Publish Date:	March 13, 2020
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98040

Aviation Investigation Final Report

Location:	Driggs, Idaho	**Incident Number:**	DCA18IA264
Date & Time:	August 10, 2018, 06:40 Local	**Registration:**	UNREG
Aircraft:	DJI Mavic	**Aircraft Damage:**	Destroyed
Defining Event:	Midair collision	**Injuries:**	N/A
Flight Conducted Under:	Part 107: Small UAS		

Analysis

The hot air balloon was operating under the provisions of 14 CFR Part 91 as a commercial passenger sightseeing flight, under visual flight rules, within Class G airspace. The pilot saw the sUAS (drone) maneuvering in the area just prior to the collision. There was no opportunity or ability for the balloon pilot to avoid the drone.

There was no evidence of any mechanical or software problems with the drone relevant to the flight. The pilot did not report any anomalies, and his narrative was in general agreement with the recorded logs and video. The drone operated as expected at all times. The Active Track feature occasionally lost lock on the camera target (the balloon), however that was not unexpected given the nature of how the tracking feature operates and the visual appearance of the balloon envelope. The drone control app correctly and appropriately warned the pilot of the loss of Active Track lock. The drone remained connected with the remote controller and was controllable by the pilot at all times.

The drone pilot initiated his flight within 5 miles of an airport without notifying the airport authority, contrary to the provisions of 14 CFR 101.41.

The drone pilot was unaware of safe operating practices developed by any community-based model aircraft organization, and unaware of the requirement in 14 CFR 101.41 to at all times give way to manned aircraft. The pilot's flying skills were not sufficient to operate in proximity to another aircraft, namely the balloon, and he flew in proximity without coordination with the balloon pilot. The DJO GO control app gave the pilot numerous indications of losing track on the Active Track feature and initiation of Obstacle Avoidance feature, however he continued to fly in close proximity to the balloon.

Probable Cause and Findings

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

the drone pilot's decision to fly without pre-coordination, and without the requisite skills and knowledge, to maneuver the drone in close proximity to another aircraft.

Findings

Personnel issues	Knowledge of regulatory reqs - Pilot
Personnel issues	Incorrect action performance - Pilot

Factual Information

History of Flight

Maneuvering	Midair collision

HISTORY OF FLIGHT

On August 10, 2018, at 0640 mountain daylight time, an unregistered Dà-Jiang Innovations (DJI) Mavic Pro small unmanned aircraft system (sUAS, commonly known as a drone), operated by an individual, collided with a Lindstrand 105A hot air balloon, N1410C, operated by Elevated Ballooning as a revenue passenger sightseeing flight under the provisions of 14 Code of Federal Regulations (CFR) Part 91. The collision occurred in the vicinity of the Driggs-Reed Memorial Airport (KDIJ), Driggs, Idaho. The balloon was not damaged, the sUAS was substantially damaged, and there were no injuries or ground damage. Visual flight rules (VFR) conditions prevailed at the time of the incident.

The incident balloon had just taken off from the Teton County Fairgrounds, just north of the airport, and was climbing over a large open area. The balloon pilot reported that she was climbing the balloon through 300 feet above ground level (agl) when she and her passengers observed the drone flying near the balloon. She reported that she did not have any prior knowledge of the drone operation and was not in communication with the drone pilot but that her passengers believed that the drone was being operated by a passenger from another balloon operator. The balloon pilot saw the drone first strike the lower third of the balloon envelope, repeatedly strike the envelope, and then fall to the ground in the vicinity of the balloon. A passenger on the balloon reported seeing the drone collide with the envelope near the passenger basket, and eventually get tangled in lines before crashing.

The drone was operated by an individual who was a customer of a different balloon operator. He reported that he was waiting for the balloon in which he was to ride to complete inflation, and he decided to fly to photograph the other balloons and the scenery. He also set up a ground camera to capture images of the balloons. He did not notify the airport authority of his flight. The pilot reported, and logs confirmed, that he had to acknowledge the warnings on his tablet of proximity to the airport prior to flying and self-unlocked DJI's geofencing that was in effect at this airport area. DJI geofencing includes areas around airports called Authorization Zones, which appear yellow in the DJI GO map, and users will be prompted with a warning and flight is limited by default. Authorization Zones may be unlocked by authorized users using a DJI verified account. The drone pilot said he asked the pilot of the balloon he was preparing to ride in if there was any air traffic expected other than the balloons.

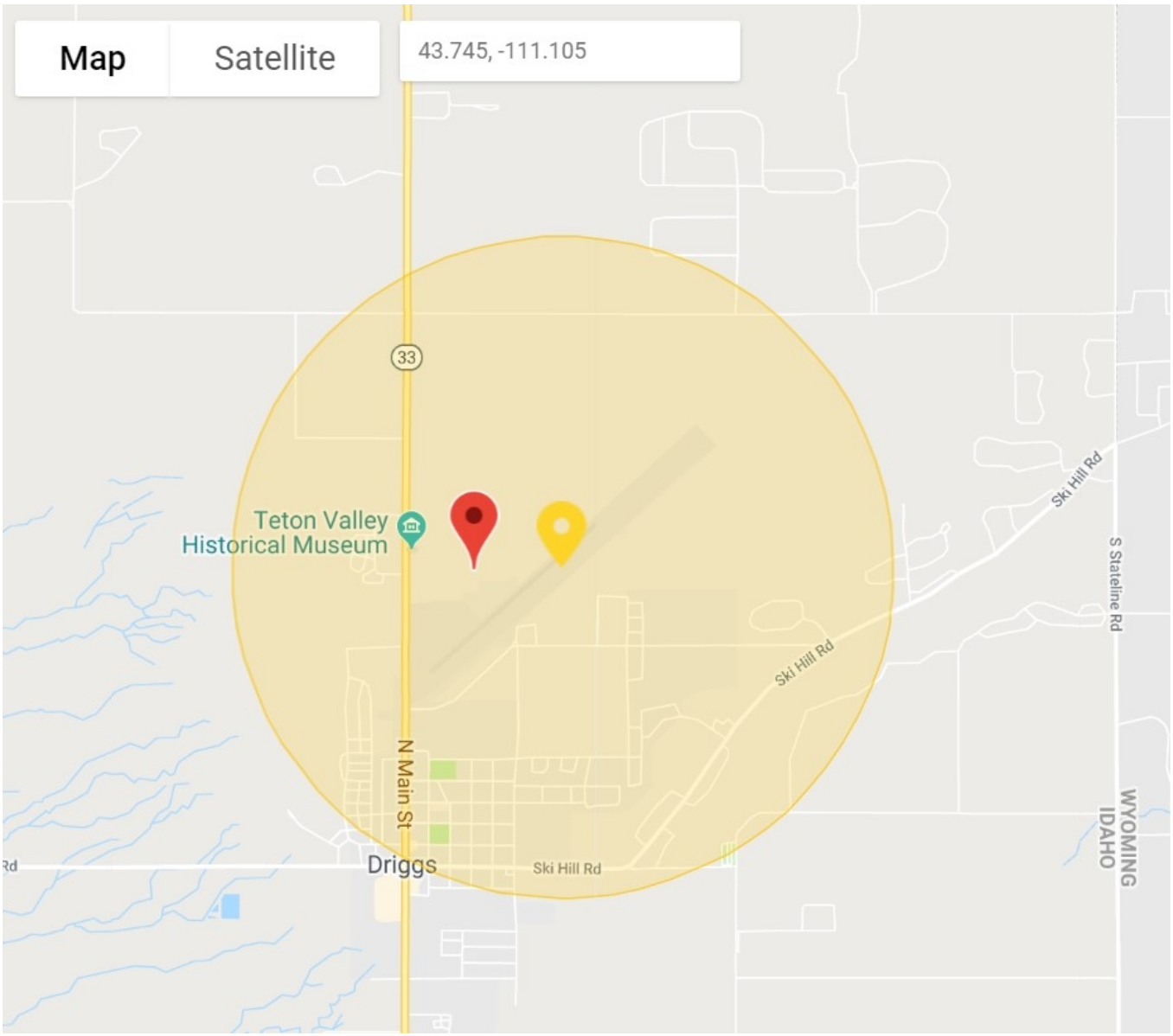

Figure 1 - Map of DJI geofencing authorization zone for Driggs Airport. Red symbol is the location of the drone pilot

The balloon launch area was in an open field adjacent to a horse-riding ring, about 2,000 feet north of the KDIJ runway. Review of data logs and videos recovered from the drone, as well as pilot statements, revealed that the drone pilot launched the drone while the incident balloon was in the final stages of inflation then maneuvered it around the field taking video of the two balloons and scenery. The pilot reported that he intended to use a feature called "Active Track" in which the drone positions itself so that its camera can remain focused on a subject framed in the camera view. He reported that he easily maintained visual contact with the drone during his intended maneuver but lost sight of it in the moments prior to the collision when it was blocked by the balloon envelope. Data logs indicated that the drone reached a maximum of 200 yards away from the home point (near which the drone operator was located).

After the incident balloon departed, the drone pilot continued to maneuver the drone in the area, taking video of the balloon continuously. Data logs indicated that the Active Track feature was used periodically, other times the drone was in GPS mode and directly maneuvered by the pilot.

About one minute prior to the collision, the drone was at 225 feet agl, entered Active Track mode and followed the balloon, apparently tracking on the skirt and basket portions. Twenty-nine seconds prior to the collision, the video showed that the balloon was moving visibly closer to the drone, and the drone yawed left and climbed to 270 feet, then lost track and hovered. The balloon skirt and envelope filled approximately half of the drone's video frame.

Figure 2 - Video snapshot 29 seconds prior to collision

The data showed that the drone pilot manually re-entered Active Track mode, and the drone briefly followed the balloon, but, 5 seconds later, the drone's forward obstacle avoidance triggered, it lost track, briefly switched to GPS and back to Active Track. Data logs showed that the drone operator applied forward elevator and full throttle stick movements, which moved the drone toward the balloon and climbed it, and another obstacle avoidance braking maneuver activated, causing the drone to again switch out of Active Track.

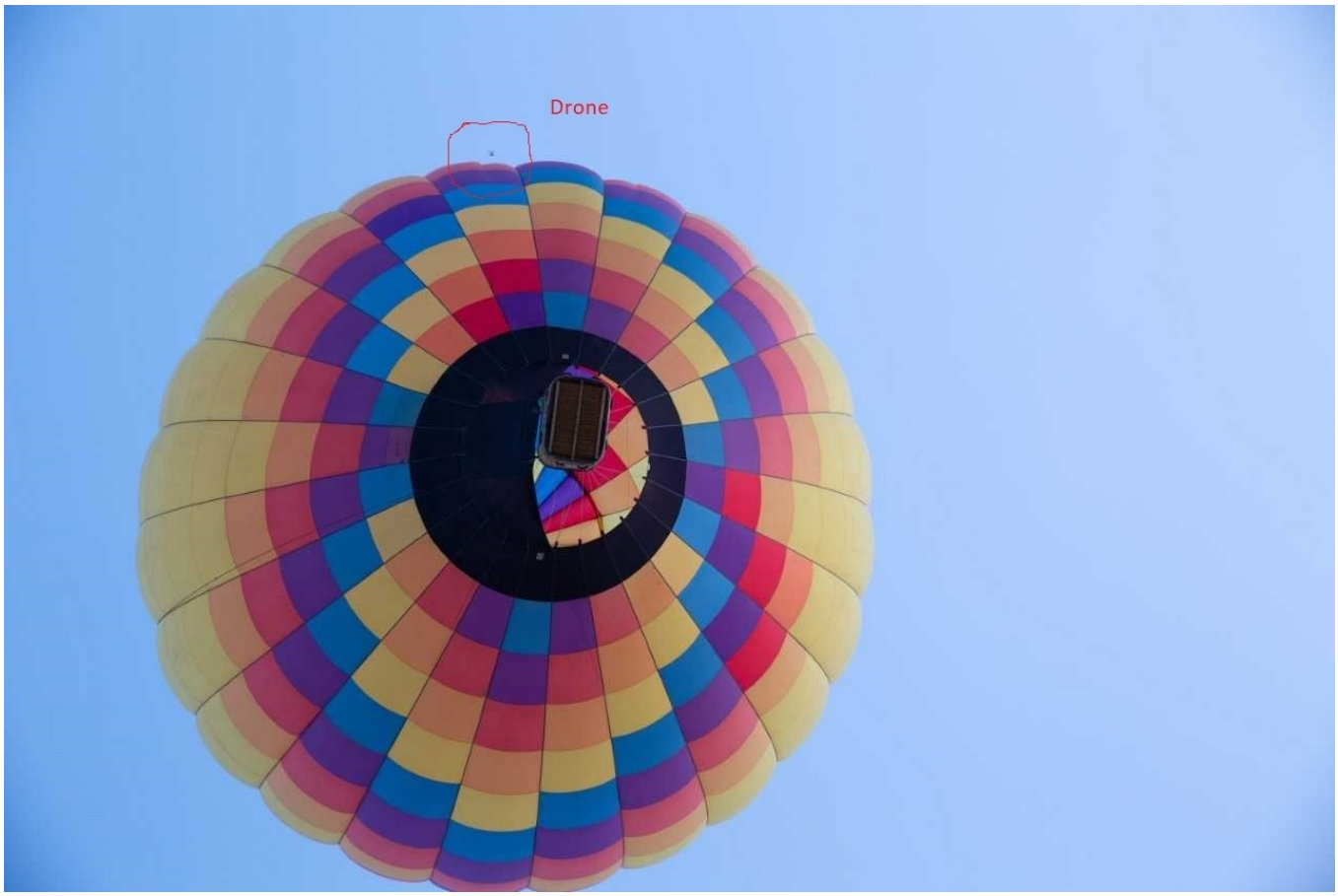

Figure 3 - Ground photo showing drone in proximity to balloon

Twenty seconds prior to the collision, the balloon moved into the center of the video frame, and Active Track was reestablished briefly. The drone altitude was 310 feet agl. At four seconds prior to the collision, obstacle avoidance was again triggered and the drone's flight mode switched to GPS. The balloon envelope almost filled the entire video frame. The drone pilot reported that he had lost sight of the drone behind the balloon envelope and attempted to avoid the passengers with a full power climb command. The video and logs were consistent with the drone climbing into the outward tapering gore of the balloon envelope, colliding and tumbling, becoming breifly entangled in the balloon load lines. Data logs continued to record for 7 seconds after the collision and indicated the full throttle command remained, and the drone rotated in all axes and lost altitude. Data logs and video ended prior to ground impact.

Figure 4 - Snapshot of data log replay

The balloon pilot reported that she assessed the envelope was not damaged and continued the flight with no further incident. She directed her ground crew to the location of the crashed drone and they retrieved it. The drone pilot reported that shortly after the collision, the pilot of the balloon he was to ride in advised it was time to board, and he packed up his equipment and boarded the balloon.

DAMAGE TO AIRCRAFT

There was no damage to the balloon.

The Mavic Pro drone was substantially damaged.

Figure 5 - Damaged Mavic Pro drone

PERSONNEL INFORMATION

The balloon pilot held an FAA commercial pilot certificate, with a lighter-than-air balloon rating, and had logged 414 hours. She held an FAA second class medical certificate. Her balloon tour company, Elevated Ballooning LLC, commonly operated from the KDIJ area. She did not have any previous experience encountering drones in proximity to her aircraft.

The Mavic pilot flew the drone recreationally only; he did not hold an FAA 14 CFR 107 Remote Pilot Certificate, did not participate in any community-based set of safety guidelines or within the programming of a community-based organization (as specified in 14 CFR 101.41(b), and held no manned aircraft certificates. He stated that he had not taken any drone training, and did not recall ever having to take an automated quiz via the DJI control app. He stated that he bought the drone at a well-known electronics chain, but did not recall any pamphlets, printed guidance, or other training material included in the package.

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The Mavic Pro includes a feature to provide automatic obstacle avoidance under certain conditions. Obstacle avoidance uses optical and ultrasound sensors to detect obstacles up to about 43 to 50 feet away from the aircraft and initiate braking or avoidance. The forward obstacle avoidance covers approximately a 60-degree field of view, downward covers approximately a 40-degree field of view. There is no obstacle avoidance in the upward direction.

The Mavic Pro includes a feature called Active Track, in which the drone will automatically move the camera and drone to maintain the desired subject in the video frame. The user identifies the desired object on the mobile device screen by drawing a box and tapping. The drone will follow the object and keep it in the frame. The user manual describes limitations in which the feature could lose the ability to track. In those cases, the box will turn red and a message will be displayed. The aircraft will stop and hover if it loses lock. Obstacle avoidance is not available in certain modes of Active Track.

METEOROLOGICAL INFORMATION

The KDIJ surface observation at 5:56 local reported clear skies, 10 miles visibility and calm wind.

AIDS TO NAVIGATION

Data logs from the Mavic indicated sufficient GPS signals throughout the flight. There were no NOTAMs of any GPS outages or anomalies in the area.

AERODROME INFORMATION

The Driggs-Reed Memorial Airport is a public use general aviation facility located about one mile north of the city of Driggs, Idaho. It has one paved runway, 7,300 feet long, aligned northeast/southwest, and a turf landing area between the runway and taxiway. The airport elevation is 6,231 feet above mean sea level (msl). The airport also has heavy glider activity in the summer months as well as sightseeing balloon operators. The airport underlies Class G airspace to 700 feet agl.

FLIGHT DATA

The Mavic Pro records full flight parameters on non-volatile on-board memory, and video or still photography on a micro SD card in the aircraft. The aircraft was retrieved by the balloon pilot and sent to the NTSB for examination. The NTSB recovered the on-board memory and video files.

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Data from the above sources is cited in the History of Flight section of this report and included in the public docket.

WRECKAGE AND IMPACT INFORMATION

The Mavic Pro was recovered by the balloon ground crew. The propellers were mostly missing, the right side motor arms were broken, with the right rear arm appearing to have been pulled outwards, consistent with the video and passenger information indicating it became briefly entangled in one of the balloon lines.

TESTS AND RESEARCH

The investigation reviewed pertinent regulations and guidance:

Public Law 112-95 § 336(c) (Feb. 14, 2012) defines "model aircraft" as an unmanned aircraft that is:

(1) Capable of sustained flight in the atmosphere;

(2) Flown within visual line of sight of the person operating the aircraft; and

(3) Flown for hobby or recreational purposes.

14 CFR 1.1 (and 101.1) state in part:

Model aircraft means an unmanned aircraft that is:…

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14 CFR 101.41 states in part:

Applicability.

This subpart prescribes rules governing the operation of a model aircraft that meets all of the following conditions …

(a) The aircraft is flown strictly for hobby or recreational use;

(b) The aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization;…

(d) The aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft…

(e) When flown within 5 miles of an airport, the operator of the aircraft provides the airport operator … with prior notice of the operation.

Information

Certificate:	**Age:**
Airplane Rating(s):	**Seat Occupied:**
Other Aircraft Rating(s):	**Restraint Used:**
Instrument Rating(s):	**Second Pilot Present:**
Instructor Rating(s):	**Toxicology Performed:**
Medical Certification:	**Last FAA Medical Exam:**
Occupational Pilot:	**Last Flight Review or Equivalent:**
Flight Time:	

Aircraft and Owner/Operator Information

Aircraft Make:	DJI	**Registration:**	UNREG
Model/Series:	Mavic 1P	**Aircraft Category:**	Helicopter
Year of Manufacture:	2018	**Amateur Built:**	
Airworthiness Certificate:	None	**Serial Number:**	08rde7m001020r
Landing Gear Type:		**Seats:**	0
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	
Airframe Total Time:		**Engine Manufacturer:**	
ELT:		**Engine Model/Series:**	
Registered Owner:	On file	**Rated Power:**	
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	DIJ,6231 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	05:55 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	
Precipitation and Obscuration:			
Departure Point:	Driggs, ID (KDIJ)	**Type of Flight Plan Filed:**	None
Destination:	Driggs, ID (KDIJ)	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Class G

Airport Information

Airport:	Driggs KDIJ	**Runway Surface Type:**	
Airport Elevation:	6231 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	N/A	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	N/A	**Latitude, Longitude:**	43.742778,-111.096664

Administrative Information

Investigator In Charge (IIC):	English, William
Additional Participating Persons:	
Original Publish Date:	March 13, 2020
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98040