

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division

Washington, D.C. 20594

November 1, 2018

Electronic Devices

Specialist's Factual Report by Sean Payne

1. EVENT

Location: Rotan, Texas
Date: June 15, 2018
Aircraft: Cessna 172N
Registration: N734BS
Operator: Private
NTSB Number: CEN18FA227

On June 15, 2018, at 1538 central daylight time (CDT), a Cessna 172N, N734BS, was destroyed when it impacted a power lines and terrain near Rotan, Texas. The pilot and passenger were fatally injured. The aircraft was registered to and operated by Aero Photo under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a business flight. Visual meteorological conditions existed at the time of the accident. The flight was not on a flight plan. The flight originated from the Midland Airpark (MDD), Midland, Texas, about 1331, and the Spicewood Airport (88R), Spicewood, Texas was the intended destination.

2. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following devices:

Device Manufacturer/Model:	Go Pro Hero 4
Serial Number:	C3131125800361
Device Manufacturer/Model:	Apple iPhone 6
Serial Number:	N/A
Device Manufacturer/Model:	Instagram "My Story" Video File
Serial Number:	N/A

2.1. Go Pro Hero 4 Device Description

The GoPro HERO is a compact, lightweight, POV¹ digital camera enclosed in a ruggedized housing that allows the camera to be mounted in a variety of positions using

¹ POV – Point of View Shot – A photography technique that records the character's viewpoint from a singular camera location mounted in a manner that represents the character's field of view.

an array of supported accessories. Depending on the model, the camera supports 4K² HD³ at 60 frames per second (fps) as well as other lower quality recording resolutions at higher frame rates. The camera can be set to record still images simultaneously or independently of a video stream at a resolution of up to 12 megapixels.⁴ The camera includes a wide angle aspherical f/2.8 glass lens that provides a maximum of 170 degrees viewing angle. The camera supports recording to micro SD⁵ cards up to 64 GB in size. A built in Wi-Fi⁶ module allows users to connect to the camera either via an accessory remote control or via a smart phone app that permits camera control and image transfer.

2.1.1. GoPro Hero 4 Data Recovery

The device was undamaged. The microSD card was found seated in the device's memory card slot. The microSD card was undamaged. Files were copied off the microSD card normally. Figure 1 is a photo of the GoPro Hero 4.



Figure 1. Photo of undamaged GoPro.

2.1.2. GoPro Hero 4 Time Correlation

Previously recorded media showed the user controlling the GoPro Hero 4 with the mobile application designed to interface with the camera. When the mobile application interfaces with the camera, the time can be automatically set by the device. The subsequent images on the camera's memory card appeared to be in alignment with CDT. No time offset was made for the media recovered from the camera's microSD card.

2.1.3. Go Pro Hero 4 Data Description

The GoPro camera's microSD card contained 181 files. 177 of the files were still photos, the other 4 files were video recordings.

² 4K – A resolution format of 3840 x 2160 pixels.

³ HD – High Definition – A resolution generally consisting of greater than 480 lines of horizontal resolution.

⁴ Megapixel – (MP) – A count of a million pixels in an image or used to express the number of individual image sensor elements on a digital camera image sensor.

⁵ SD – Secure Digital – a standard for nonvolatile memory card used in portable devices.

⁶ Wi-Fi – A local area wireless technology that allows electronic devices to exchange data over a network.

Seven still images had timestamps consistent with the accident flight. All images were taken from the front right seat of the aircraft. Observed meteorological conditions showed that the visibility was nearly unlimited and there was a layer of scattered clouds likely a few thousand feet AGL. The images are summarized below:

GOPR0977.JPG - 3:36:50 PM

A photo of only the instrument panel. The pilot's right hand was on the throttle. The throttle was set to a high power setting. The altimeter read just above 2,000 feet mean sea level (MSL). The vertical speed indicator showed a 300 feet per minute descent rate. The airspeed indicator was not captured in the photo.

GOPR0978.JPG - 3:36:56 PM

The camera was pointed directly ahead of the aircraft through the front windscreen. The aircraft was at a very low altitude. The aircraft was over a field but was headed toward a small plateau. The aircraft's altitude appeared approximately level with the plateau.

GOPR0979.JPG - 3:37:28 PM

The camera was pointed out of the right window. The aircraft was at a very low altitude. The aircraft was over a field of small trees and brush. A plateau was in the distance. The aircraft was about level with the plateau.

GOPR0980.JPG - 3:40:02 PM

The camera was likely hand held by the right front seat passenger. The camera was outside the aircraft and pointing forward. The aircraft was in a slight left bank. The altitude was very low. Some canyon-like features and those similar to the plateau previously seen in other photos were visible. The aircraft had climbed slightly since the last photos were taken.

GOPR0981.JPG - 3:40:06 PM

The camera was likely hand held by the right front seat passenger. The camera was outside the aircraft and pointing forward. The aircraft was over similar geographical features as in the previous photo. The aircraft's wings were level, the aircraft was pitched down in a descent. The aircraft was heading toward an area of small canyons.

GOPR0982.JPG - 3:40:06 PM

The camera was pointed directly ahead of the aircraft through the front windscreen. The aircraft had advanced forward toward the area of small canyons depicted in the previous picture. The aircraft was in a slight left bank.

GOPR0983.JPG - 3:40:50 PM

The camera was pointed directly ahead of the aircraft through the front windscreen. The aircraft had continued advancing forward toward the area of small canyons depicted in the previous photos. The aircraft was in a moderate left bank. The aircraft was about

level with the tops of the small canyons, which now nearly surrounded the aircraft. In the distance, on top of a small canyon to the right, a power pole structure was visible against the horizon. The estimated distance of the aircraft to the power pole structure was 2,000 feet. The orientation of the power pole structure suggested that associated power lines stretched in front of the aircraft's path of flight.

To the left of the photograph, the associated power lines were visible at almost the same altitude as the accident aircraft. The photograph showed at least 4 visible power lines. The power lines were grey in color and were only visible in the photograph where the power lines crossed in front of other terrain. The power lines were not visible in the area of the photograph in which they spanned the canyon, where there were no geographic features between the power lines and the sky.

The photograph depicted the aircraft's propeller turning in a manner consistent with it being propelled by the aircraft's engine. The still photo of the propeller exhibited effects from the camera's rolling shutter⁷ and suggested it was spinning.

No more photographs or videos were discovered on the device's microSD card that matched the time of the accident flight.

None of the photographs revealed any preaccident mechanical malfunctions or failures with the aircraft that would have precluded normal operation.

A forensic search of the microSD card's contents was not undertaken as the recovered media on the card did not suggest that the user was using the GoPro in a video mode.

2.2. iPhone 6 Device Description

Personal Electronic Devices (PEDs) are a category of devices comprised primarily of portable computing devices and mobile phones. Portable computing devices are typically capable of internet access, email, messaging services, and can run user-installed applications to perform specific tasks. Depending on the model, mobile phones can perform many of the same tasks as portable computing devices, plus have voice call and text messaging capabilities. PED user and system data is typically stored on non-volatile memory⁸ and can be accessed through manufacturer-provided interfaces.

2.2.1. iPhone 6 Data Recovery

The device's screen was cracked and the aluminum chassis was bent. The iPhone 6 is shown in figure 2. The device was opened, the internal memory board was found to be slightly bent. The device's internal memory board was removed and placed in a surrogate device. The surrogate device powered the screen but the device would not boot. No data was recovered from the device.

⁷ Rolling shutter – a digital imaging method that captures an image by scanning the cameras image sensor, as opposed to capturing all image data globally.

⁸ Non-volatile memory is semiconductor memory that does not require external power for data retention.



Figure 2. The damaged iPhone as received by the lab.

2.2.2. iPhone 6 Data Description

No data was recovered from the device.

2.3. Instagram “My Story” Description

Instagram is a social media application where user’s can share pictures or videos. Users have the option to publish a “story” which appears on their profile up to 24 hours after the original post is made. Followers of the users can view the user’s “My Story.” “My Story” media can include pictures, videos, or a combination of both. The media appears in chronological order from when it was posted by the user, but does not display a timestamp unless the user appends one to the post. The user has the ability to save their “My Story” posts on their hardware device, or to delete them before the 24 hour post window expires.

2.3.1. Instagram “My Story” Data Recovery

A “follower” of the user who published a story from the accident aircraft provided a screencaptured recording of the user’s “My Story” to the NTSB.

2.3.2. Instagram “My Story” Data Description

The user who posted the following videos was seated in the aircraft’s right front seat.

The first video was a recording of the aircraft’s wheel leaving the ground, consistent with takeoff from a hard surface runway. The video had a caption “*WEST TEXAS HERE WE COME.*” The video lasted about 12 seconds and showed the aircraft climbing.

The next post was a still picture, a selfie of the user. The user was wearing an aviation headset under a baseball cap and sunglasses. The picture displayed for about 6 seconds.

The next post was a user modified post of the still photo previously posted. The user had animated flames to appear from his sunglasses. The user added an animation of

Beavis and Butthead headbanging⁹ near the bottom of the post. The post lasted about 4 seconds.

The next post was a video taken looking out from the right window of the aircraft. The aircraft was flying over farmland at an altitude of a few thousand feet. The flaps were retracted. Nothing in the video suggested an abnormal condition of the aircraft. The aircraft appeared to be in cruise flight. The video lasted about 12 seconds.

The next post was a still photo, likely taken from the user's camera roll prior to the flight, of a person in a tracksuit stuffing multiple cigarettes in their mouth. The caption was "@[redacted user name] you're killing me." The post lasted about 5 seconds.

The next post was a video taken looking out from the front windscreen of the aircraft. The aircraft appeared to be traveling at a lower altitude, about 500 feet above ground level (AGL). The aircraft's propeller was turning in a manner consistent with it being propelled by the aircraft's engine. The recording of the propeller exhibited effects from the camera's rolling shutter and the propeller appeared to be turning at a high RPM. The user added the caption "TEXAS." Ground features were moving past the camera/aircraft at a high rate of speed. The video lasted about 7 seconds.

The next post was a video taken looking out from the right window of the aircraft. The aircraft was estimated to be about 30 feet AGL or less. The caption read "JUST CHECKING THE LIVESTOCK." The user panned the camera to look out of the aircraft's front windscreen, the aircraft had entered a left shallow banked turn. The video lasted about 15 seconds.

The next post was a video taken looking out from the right window of the aircraft. The aircraft was estimated to be about 100 feet AGL or less. The geography around the aircraft contained small hills and small rock outcroppings. The video lasted about 15 seconds. The aircraft was traveling at a high rate of groundspeed.

No more social media posts were made by the user.

None of the social media posts revealed any pre-accident mechanical malfunctions or failures with the aircraft that would have precluded normal operation.

⁹ Headbanging – "to violently shake one's head in time with music, most commonly in the rock, punk, and heavy metal music genres. Headbanging is sometimes used by musicians on stage." - <https://en.wikipedia.org/wiki/Headbanging>