

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

May 7, 2021

Electronic Recorder Devices

Specialist's Factual Report
By W. Deven Chen

1. EVENT SUMMARY

Location: Silt, Colorado
Date: January 31, 2021
Aircraft: Cessna 172
Registration: N4376Q
Operator: Private
NTSB Number: CEN21LA119

2. GROUP

A group was not convened.

3. DETAILS OF INVESTIGATION

On February 8, 2021, the National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following electronic devices:

Device 1 Manufacturer/Model: **GoPro Hero+**
Serial Number: **C3191024892951**

Device 2 Manufacturer/Model: **Garmin GPSMAP 696**
Serial Number: **1H6000557**

3.1. GoPro Hero+ 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 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

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.

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.

supports recording to micro SD⁵ cards. 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.

3.1.1. GoPro Hero+ Data Recovery

The device was in good condition upon arrival at the Vehicle Recorder Division, as shown in Figure 1. A 256 GB microSD card was installed in the device. The microSD card contained flight recordings, however, the accident event was not captured. Thus, no data pertinent to the investigation were recovered.



Figure 1: GoPro Hero+ as received.

3.2. Garmin GPSMAP 696 Description

The Garmin GPSMAP 696 is a portable GPS receiver capable of storing date, route-of-flight, and flight-time information for up to 50 flights. A detailed tracklog, including latitude, longitude, date, time, and groundspeed information – is stored within the unit whenever the receiver has a lock on the GPS navigation signal. All recorded data is stored in non-volatile

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.

memory. The unit contains hardware and software permitting the download of recorded waypoint, route, and tracklog information to a PC via a built-in serial port. The unit can also communicate with external devices such as a computer using a built in USB port. An internal button-battery is used to back-up power to the internal memory and real-time clock during those periods when main power is removed.

3.2.1. Garmin GPSMAP 696 Data Recovery

The device had sustained severe impact damage upon arrival at the Vehicle Recorder Division, as shown in Figure 2. An SD card was recovered from the device; however, it did not contain any flight data. The non-volatile memory chip was removed, read out and converted into engineering units using laboratory tools.



Figure 2: Garmin GPSMAP 696 as received.

3.2.2. Garmin GPSMAP 696 Data Description

The recovered data contained 42 sessions, from March 9, 2001 to January 31, 2021. The device recorded data in UTC (Coordinated Universal Time). The last session recorded on January 31, 2021 was determined to be the accident flight. The session was approximately 43 minutes and 40 seconds, from 20:26:31 to 21:10:11. The data logging rate varied, ranging from a few second per sample to a few minutes per sample. The timestamps were converted

to the local time, mountain standard time (MST) for the rest of this report. The difference between MST and UTC is 7 hours.

3.2.3. Garmin GPSMAP 696 Parameters Provided

Table 1 describes data parameters provided by the GPS device. Date, Time, Latitude, Longitude, and GPS Altitude are recorded by the device. Groundspeed and Track are derived from the recorded parameters.

Table 1: Garmin GPSMAP 696 Data Parameters.

Parameter Name	Parameter Description
Date	Date for recorded data point (MM/DD/YYYY)
Time	Converted MST for recorded data point (HH:MM:SS)
Latitude (Deg)	Recorded Latitude (degrees)
Longitude (Deg)	Recorded Longitude (degrees)
GPS Alt (Ft)	Altitude above Mean Sea Level (feet)
Groundspeed (Kt)	Average groundspeed between current and previous data point (knots)
Track (Deg)	Path on the surface of the Earth directly below an aircraft (degrees)

3.3. Plots and Corresponding Tabular Data

The following three figures contain data recorded on the Garmin GPSMAP 696 on January 31, 2021. Figure 3 shows the data parameters plots for the entire flight; figures 4 and 5 show the Google Earth overlays of the accident flight.

Figure 3 is a plot of the data parameters for the entire accident flight recorded on January 31, 2021. The time interval displayed is 13:25:00 to 14:15:00 MST. The approximate elevation is 5,456 feet above sea level at Silt, Colorado.

Figure 4 is a Google Earth overlay of the entire accident flight. The reported wreckage location is shown with a red pin. Due to data buffering on the GPS unit, the data recording may have ended before the end of accident flight. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Figure 5 is a Google Earth overlay of an overview of the end of the accident flight.

The corresponding tabular data used to create figures 3 through 5 are provided in electronic comma-delimited (.csv) format as Attachment 1 to this report.

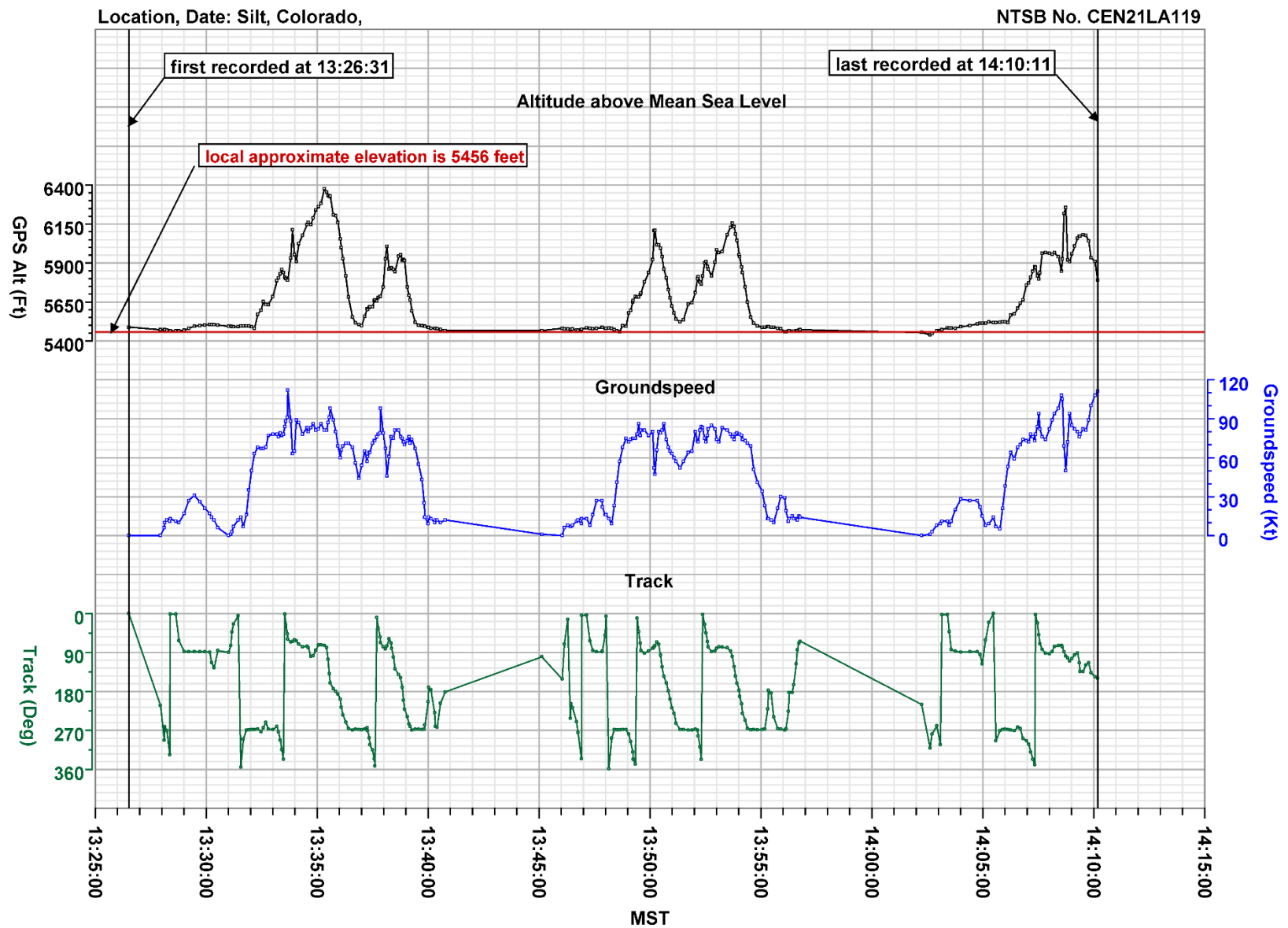


Figure 3: Plot of the data parameters of the entire accident flight.

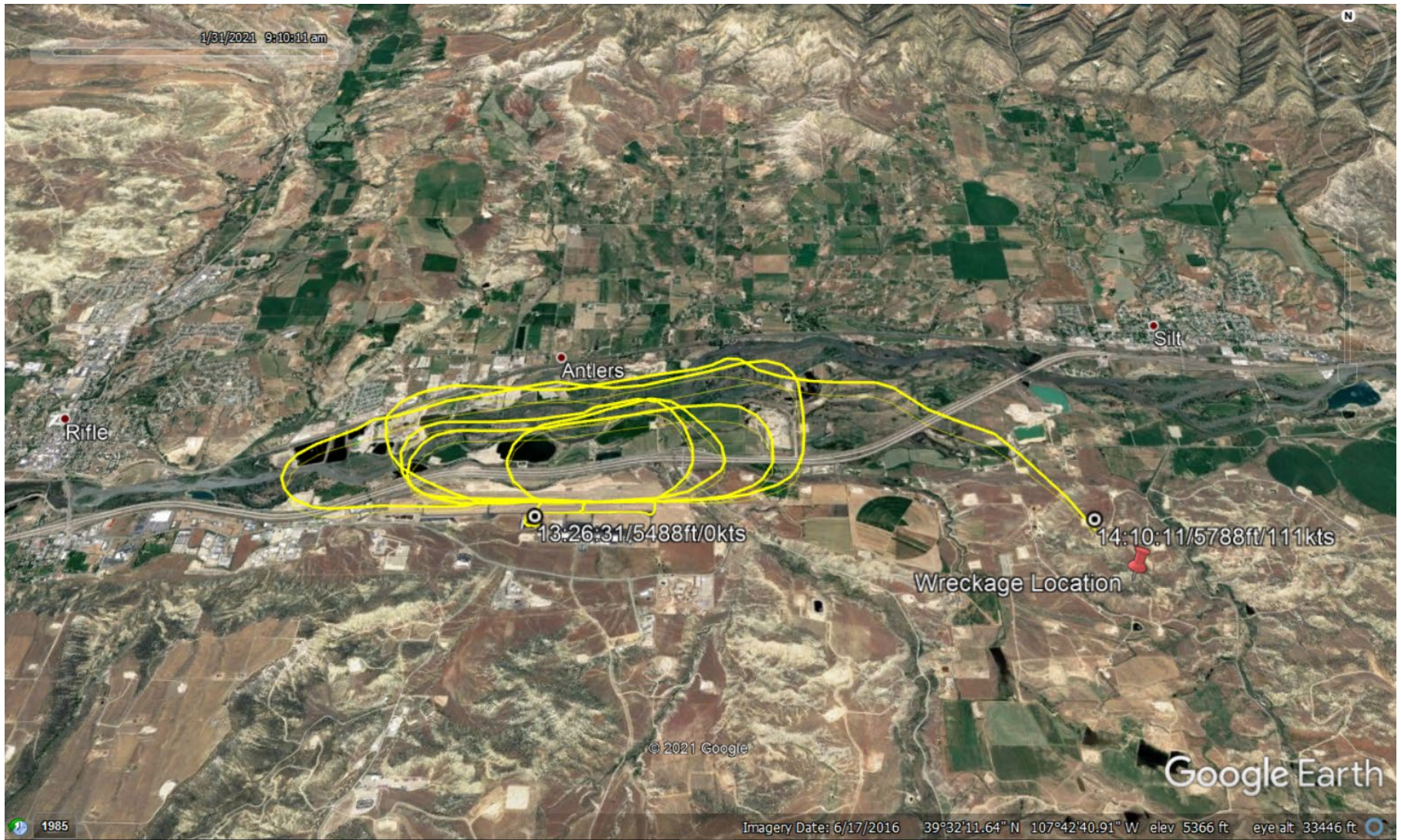


Figure 4: Google Earth overlay of the overview of the entire accident flight.

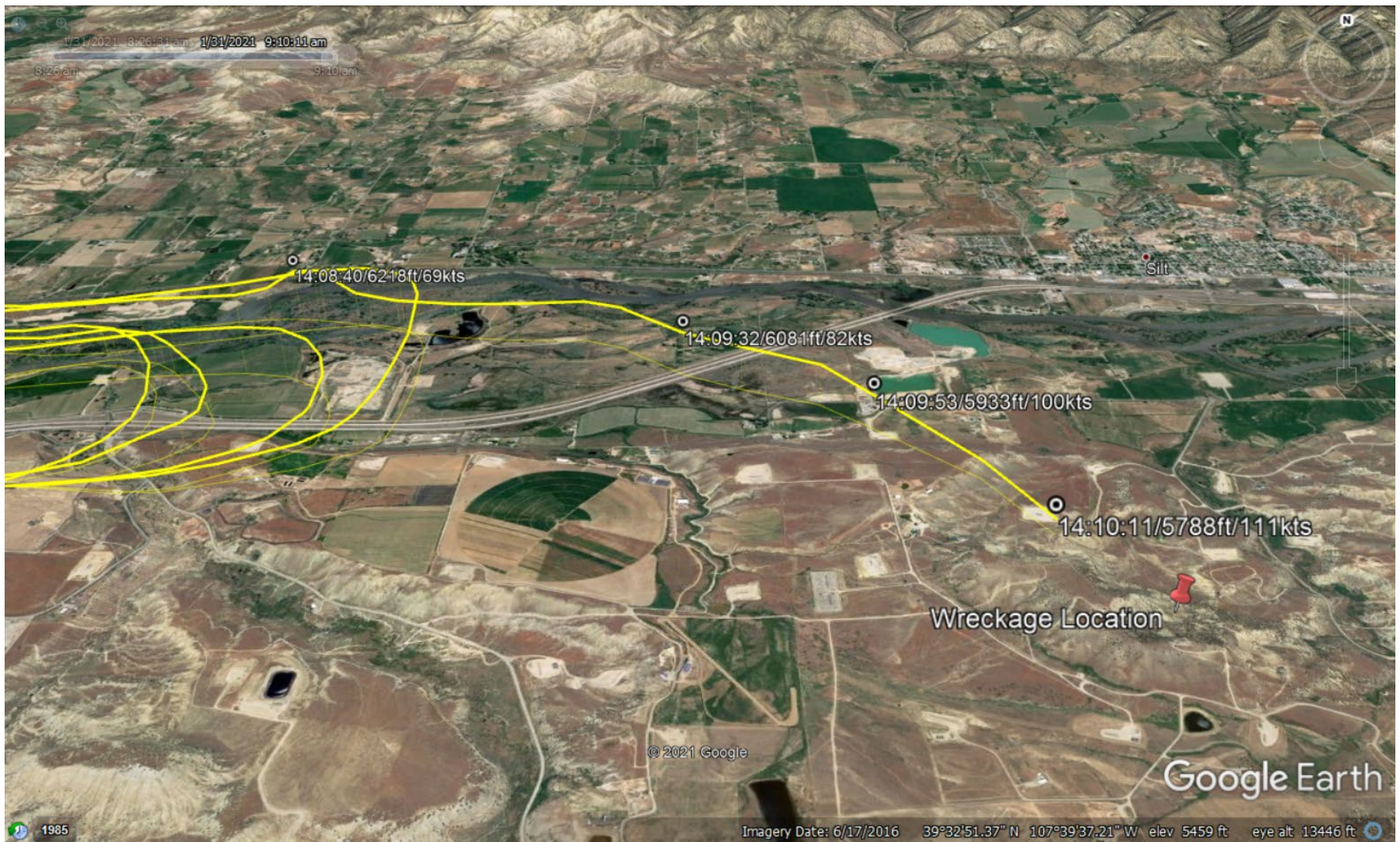


Figure 5: Google Earth overlay of the overview of the end of the accident flight.