

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

February 20, 2020

Electronic Devices

Specialist's Factual Report by Kyle Garner

1. EVENT

Location: Mokuleia, HI
Date: June 21, 2019
Aircraft: Hawker Beechcraft 65-A90
Registration: N256TA
Operator: Oahu Parachute Center
NTSB Number: WPR19MA177

On June 21, 2019, at 1822 Hawaii-Aleutian standard time, a Beech 65-A90, N256TA, collided with terrain after takeoff from Dillingham Airfield (HDH), Mokuleia, Hawaii. The commercial pilot and ten passengers sustained fatal injuries, and the airplane was destroyed. The airplane was owned by N80896 LLC and was being operated by Oahu Parachute Center (OPC) under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a local sky-diving flight. Visual meteorological conditions prevailed, and no flight plan had been filed.

2. GROUP

A group was not convened.

3. DETAILS OF INVESTIGATION

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

Device 1:	GoPro HERO5 Session
Device 1 Serial Number:	Unknown
Device 2:	GoPro HERO5 Session
Device 2 Serial Number:	C3211355236180
Device 3:	GoPro HERO5 Session
Device 3 Serial Number:	Unknown
Device 4:	iPhone 8
Device 4 Serial Number:	Unknown
Device 5:	Unknown Display
Device 5 Serial Number:	Unknown

3.1. GoPro HERO5 Session Description

The GoPro HERO5 Session 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. The device is capable of recording a maximum of 4K² resolution video at frame rate of 30 frames per second (FPS). The camera supports 1080 HD³ 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 10 megapixels⁴. 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 microSD⁵ cards up to 128 GB in size. A built in Wi-Fi 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 HERO5 Session Damage

Upon arrival at the NTSB Vehicle Recorder Division, it was evident that the GoPro HERO5 Session cameras had sustained severe thermal and structural damage (see Figure 1). Device #1 contained a microSD card; however, the card was melted inside the card slot and could not be recovered. Device #2 contained a 32GB microSD card that appeared undamaged, as shown in Figure 2. Device #3 did not contain a microSD card, thus, no data were recovered.

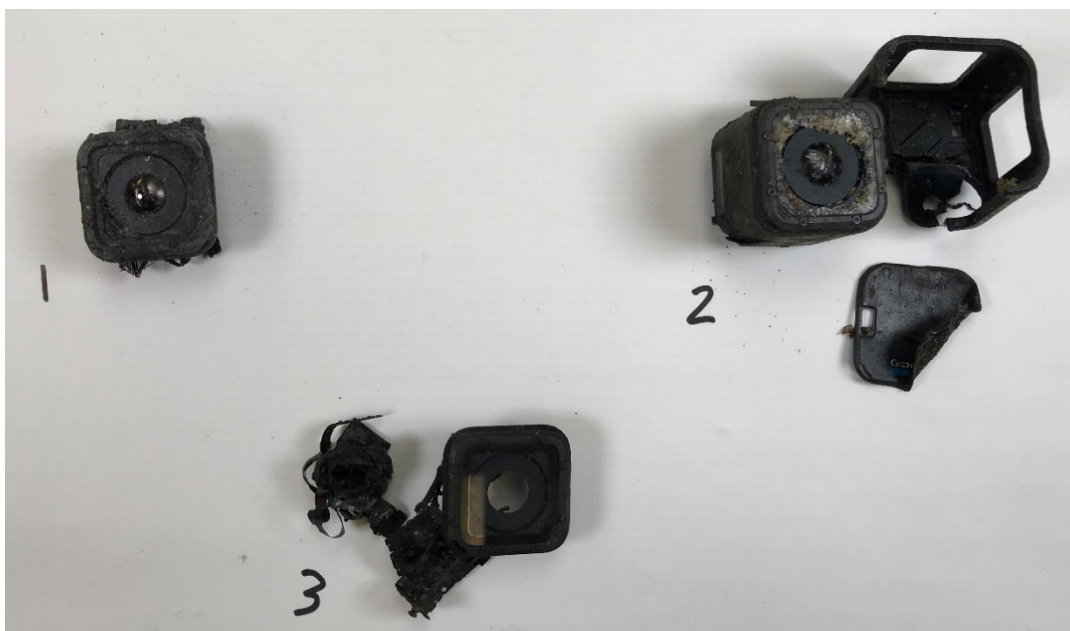


Figure 1. Condition of GoPro HERO5 Session cameras as received.

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 Resolution – A resolution consisting of a horizontal pixel count of around 4,000 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.



Figure 2. 32GB microSD card recovered from device #2.

On August 5th, 2019 the Investigator-in-Charge was notified that another GoPro HERO5 Session was found at the accident site after surfacing during a period of heavy rain. A 32GB microSD card was removed from the GoPro camera at the accident site and shipped to the Vehicle Recorder Division for analysis. The condition of this microSD card as received is shown in Figure 3 (left). An initial visual inspection noted a large surface crack beginning in the upper left corner of the card and terminating in the lower left corner. Another surface crack was found on the back side of the card across the pads, as shown in Figure 3 (center). The card also had a slight deformation, shown in Figure 3 (right).



Figure 3. 32GB microSD card recovered after heavy rain from accident site.

3.1.2. GoPro HERO5 Session Recovery

Recovery of the microSD card from device #2 was first attempted by inserting the card into a forensic reader attached to a computer, however, the computer did not recognize the card and no filesystem was found. The only option the computer presented was to format the device, which would have resulted in the loss of any accident flight data. Due to the cracks and deformation on the microSD card recovered from the accident site at a later date, a read-out using a forensic reader was not attempted.

Both microSD cards were sent to the State University of New York (SUNY) at Binghamton's Integrated Electronics Engineering Center (IEEC) for specialized analysis, including optical and acoustic microscopy and x-ray. Analysis of the card from device #2 found no evidence of thermal or mechanical damage. Analysis of the card discovered at the accident site at a later date found no evidence of thermal damage, however, an x-ray found that multiple internal wire bonds were broken and sonic imaging found the two cracks extended into the chip and circuitry in the laminate below the surface. Due to these anomalies, the possibility of data recovery on this card was considered doubtful. A copy of the analysis performed by SUNY IEEC on both microSD cards is provided as Attachment 1 to this report.

Both microSD cards were then sent to an outside firm that specializes in data recovery of flash memory devices for further analysis. Data recovery attempts by the outside firm for both microSD cards were unsuccessful.

The extent of the damage precluded normal and advanced recovery procedures and additional attempts were unsuccessful in yielding usable data. Therefore, no data pertinent to the event were recovered.

3.2. iPhone 8 – Personal Electronic Device (PED) Description

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 memory (NVM)⁶ and can be accessed through manufacturer-provided interfaces.

3.2.1. iPhone 8 PED Damage

Upon arrival at the NTSB Vehicle Recorder Division it was evident that the iPhone 8 had sustained severe thermal damage, as shown in Figure 4.



Figure 4. Condition of iPhone 8 as received

⁶ Non-volatile memory is semiconductor memory that does not require external power for data retention.

3.2.2. iPhone 8 PED Recovery

The extent of the damage precluded normal recovery procedures, therefore, no data pertinent to the event were recovered.

3.3. Unknown Display Description and Damage

An unidentified display was shipped to the NTSB Vehicle Recorder Division for analysis. Upon arrival it was evident that the display had sustained severe thermal damage and had no identifiable markings, as shown in Figure 5.



Figure 5. Condition of unknown display as received.

3.3.1. Unknown Display Recovery

There was no NVM located on the unknown display, thus, no data pertinent to the event were recovered.