

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, DC 20594

November 18, 2019

Onboard Image Recorder

Specialist's Factual Report
By Sean Payne

1. EVENT

Location: Calhoun, GA
Date: March 23, 2019
Aircraft: Commuter Craft Innovator
Registration: N257AR
Operator: Private
NTSB Number: ERA19FA134

2. GROUP

A group was not convened.

3. SUMMARY

On March 23, 2019, at 1535 eastern daylight time, an experimental amateur-built Commuter Craft Innovator, N257AR, was destroyed by collision with terrain during an uncontrolled descent after takeoff from Thomas B. David Field (CZL), Calhoun, Georgia. The pilot/owner/designer/builder was fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the flight test which was conducted under the provisions of *Title 14 Code of Federal Regulations* Part 91.

4. DETAILS OF INVESTIGATION

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

Recorder Manufacturer/Model: **GoPro Hero 7 Black**
Recorder Serial Number: **C3281325067807**

4.1. 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 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.

4.2. Recorder Damage

Upon arrival at the NTSB Vehicle Recorder Division, it was evident that the GoPro has sustained impact damage. The device's lens was broken, but the camera body was intact. A microSD memory card was removed and the video and audio information was extracted from the memory card normally, without difficulty.

4.3. Electronic Files

The device's memory card contained a number of video recordings. The last series of video recordings were associated with the accident flight and were reviewed for this report.

Video Files

The original recording was made at a resolution of 4000 x 3000 pixels and a frame rate of 23.976 frames per seconds (FPS). Due to the recording logic of the GoPro, the accident flight was made up of three consecutive recordings. For ease of playback, the three consecutive recordings were combined into one recording and the resolution of the video was reduced to a 1920 x 1080 pixel frame, in which the original 4:3 resolution was maintained by using black bars to either side of the video data. The files contained an audio track which contained a recording of the pilot's voice when the VOX (voice operated interchanged) on the audio panel activated, as well as radio traffic on the active communications frequency.

The camera was mounted on the inside of the aircraft's right cabin window and provided an inward view of entire cockpit area.

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.

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.

Other Files

The system's MP4 streams are capable of storing embedded AHRS and acceleration data. Since the aircraft's flight displays contained this information and were successfully downloaded, the embedded MP4 streams were not exploited.

4.4. Timing and Correlation

Timing of the transcript is expressed as Universal Coordinated Time (UTC). The timing of the video events was compared to an GPS record which was recorded by the aircraft's flight displays. Data showed the time the aircraft left the ground was approximately 19:32:45. The following time formula was used to convert events from the video recording to UTC:

$$\text{GoPro Hero Elapsed Time} + 69,835 \text{ Seconds} = \text{UTC}$$

4.5. Summary of Recording Contents

In agreement with the Investigator-In-Charge, a video group did not convene and a summary report was prepared.

The pilot was seated in the pilot's seat and secured to the aircraft via a four-point harness. The control stick was visible. The rudder pedals were not visible. The instrument panel was visible, however, characteristics of the instrument panel were not easily observable. For a detailed report about data recovered from the aircraft's primary flight display, refer to "Cockpit Displays – Specialist's Factual Report" which is available in the public docket for this accident.

The recording began at 19:23:55. The engine was already running. The pilot's door was open and the pilot was making inputs on the aircraft's PFD via the device's touchscreen. The pilot looked at the camera and gave a thumbs up.

At 19:24:15, the pilot closed the pilot's door. The pilot appeared to be monitoring the aircraft's flight displays at this time.

Around 19:26:15, the pilot opened the throttle and began taxiing. The pilot appeared to be monitoring the aircraft's flight displays during the taxi portion. The taxi portion appeared nominal and the aircraft came to a stop around 19:29:37.

Around 19:29:40, the pilot began a run-up. The run up included a magneto check and two cycles of the aircraft's constant speed propeller. By 19:30:15, the run up was complete. The run-up appeared and sounded nominal. The aircraft remained stopped on a taxiway.

Around 19:31:07, a voice on the radio asked, "alright [Pilot's name], you ready to go?" The pilot responded, "ready to go." The same voice then stated he was departing runway 35 at Calhoun in a Grumman Tiger. Around the same time, the

pilot of the accident aircraft began taxiing and stopped near the hold short area near runway 35.

Around 19:32:08, the pilot of the accident aircraft announced his intent to depart runway 35 at Calhoun airport. At 19:32:28, the pilot applied power, slowly but progressively to the throttle's maximum range limit of motion (full power) and began a takeoff roll. The pilot's hand remained on the throttle at a maximum power setting during the takeoff roll. At 19:32:45, the aircraft became airborne. The aircraft immediately exhibited both a pitch and roll oscillation. For details of the aircraft's pitch and roll oscillations, refer to "Cockpit Displays – Specialist's Factual Report" which is available in the public docket for this accident.

The aircraft continued to climb a shallow angle away from the runway. During this portion of flight, the aircraft exhibited additional pitch and roll oscillations. The pilot's control stick movement was noted in both the pitch and roll axis. The deflection of the pitch and roll inputs were not quantified but cannot be described as small. The power setting remained on or near maximum power.

By 19:33:30, the aircraft had climbed above the tree line and appeared to be on a left crosswind leg for runway 35. At the same time, the pilot announced via radio, "Calhoun traffic, two five – two five seven alpha romeo- re—returning to threee—runway three five – will be in the uhh downwind for three five. Calhoun." During this time, the aircraft continue to gain altitude. Less roll oscillations were observed, however, pitch oscillations persisted. The pilot's control stick movement was noted in more so in the pitch axis than the roll axis. The pilot's control stick movements appeared to be opposite that of the observed aircraft pitching motion. This condition generally existed for the remainder of the recording. The power setting remained on or near maximum power.

At 19:33:54, data from the recovered cockpit displays ceased to be recorded due to a buffering issue. For additional details refer to "Cockpit Displays – Specialist's Factual Report" which is available in the public docket for this accident.

By 19:33:58, the aircraft appeared to be on downwind for runway 35 and was no longer obviously climbing. The power setting remained on or near maximum power.

At 19:34:06, a large negative pitch oscillation was observed. The pitch oscillation was large enough in magnitude to push the pilot upward out of his seat. The pilot's head the hit the headliner of the aircraft at this time. the pilot's body appeared to be restrained by the four point harness. The power setting remained on or near maximum power.

Moments later at 19:34:09, another larger negative pitch oscillation was observed. The pitch oscillation was large enough in magnitude to push the pilot upward out of his seat. The pilot's head the hit the headliner of the aircraft at this time. The

pilot's body appeared to be restrained by the four-point harness. The power setting remained on or near maximum power.

At 19:34:11, an annunciation for "oil pressure" was audible on the recording.

Pitch oscillations continued. At 19:34:14, another large pitch oscillation was observed in the same manner noted above. The pilot appeared to reduce the power setting slightly.

The recording ended at 19:34:16 during another large pitch oscillation.