

**NATIONAL TRANSPORTATION SAFETY BOARD**  
Vehicle Recorder Division  
Washington, DC 20594

April 18, 2019

## **Onboard Image Recorder**

**Specialist's Factual Report**  
**By Sean Payne**

### **1. EVENT**

|              |                      |
|--------------|----------------------|
| Location:    | Apple Valley, CA     |
| Date:        | July 22, 2017        |
| Aircraft:    | Panzl S-331E, N331ST |
| Operator:    | Private              |
| NTSB Number: | WPR17FA161           |

### **2. GROUP**

A group was not convened.

### **3. SUMMARY**

On July 22, 2017, about 1500 Pacific daylight time (PDT) a Panzl S331E airplane, N331ST, impacted terrain while conducting aerobatic maneuvers about 3 miles northeast of the Apple Valley Airport (APV), Apple Valley, California. The pilot, sole occupant, died and the airplane sustained substantial damage. The airplane was registered to and operated by the pilot as a 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed and no flight plan was filed. The local flight originated from APV about 1445.

### **4. DETAILS OF INVESTIGATION**

On July 31, 2017, the National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following image recorder:

|                              |                             |
|------------------------------|-----------------------------|
| Recorder Manufacturer/Model: | <b>GoPro Hero 4 Session</b> |
| Recorder Serial Number:      | <b>C3141327977132</b>       |

#### **4.1. Recorder Description**

The GoPro HERO is a compact, lightweight, POV<sup>1</sup> digital camera enclosed in a ruggedized housing that allows the camera to be mounted in a variety of

---

<sup>1</sup> 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.

positions using an array of supported accessories. Depending on the model, the camera supports 4K<sup>2</sup> HD<sup>3</sup> 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.<sup>4</sup> 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 SD<sup>5</sup> cards up to 64 GB in size. A built in Wi-Fi<sup>6</sup> 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 camera had not sustained any heat or structural damage and the information was extracted from the microSD card normally, without difficulty.

Figure 1 is a photo of the GoPro Camera, the associated microSD card and the associated mounting hardware.

**Figure 1. The GoPro camera and microSD card that was received by the laboratory.**



## 4.3. Video Files

The microSD card associated with the GoPro contained 12 video files. One video file was associated with the accident flight and was 12 minutes in duration. The 11 other video files contained recordings that continued after the aircraft impacted the ground. The 11 other recordings were consistent with a GoPro

---

<sup>2</sup> 4K – A resolution format of 3840 x 2160 pixels.

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

<sup>4</sup> 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.

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

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

video operation mode that continues to segment files every 12 minutes until the camera's battery is exhausted.

#### **4.4. Timing and Correlation**

Timing of the transcript is expressed as Video Elapsed Time (mm:ss), which is time from the beginning of the recording.

#### **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 video began as the pilot was using her hand to start the camera. The camera was attached to the aircraft's canopy and provided a view over the pilot's right shoulder. The field of view contained a small portion of the left aileron at the aileron's inboard root, but the trailing edge of the left aileron was not visible. The view included a larger, but still small, portion of the right aileron near its inboard root. The trailing edge of the right aileron was visible in the wing root area of the aircraft's right wing. Most of the instrument panel was captured, however, due to the panel's sparseness and arrangement, only a clear view of the altimeter and part of the airspeed indicator were visible. Most of the pilot's right leg and foot were visible, some of the pilot's left shin and foot were also visible. Each foot appeared to be in a stirrup that was attached to each respective rudder pedal. Most of the pilot's control stick inputs were visible, but sometimes the view was blocked when the pilot's body position slightly changed during the flight.

There was an Arresti sequence<sup>7</sup> card mounted in the center of the panel as well as an egg timer. The pilot was wearing an aerobatic type restraint harness over what appeared to be fabric consistent with a parachute harness. No anomalies were noted in the way the pilot was wearing the restraint system or the parachute.

The pilot put on gloves and closed the canopy by 00:20. At 00:35, the pilot shouted "clear" and started the aircraft. The pilot began taxiing around 01:10.

By 03:41, the pilot had stopped on a taxiway short of a runway. The pilot's feet activated toe brakes as the aircraft came to a stop. The pilot immediately performed a control surface check. First, the pilot pushed forward and back on the stick to check elevator control. The stick appeared free for movement and appeared to move through its full forward and aft range. The pilot then performed a forward and aft movement of stick again followed quickly by a side to side to motion consistent with checking movement of the aircraft's ailerons. When the pilot put the stick left, what was visible of both ailerons moved in the appropriate manner. When the pilot put the stick right, what was visible of both ailerons moved in the appropriate manner. At this time, there were no anomalies noted in

---

<sup>7</sup> Notation for figures flown in competition aerobatics.

the movement of the flight controls. The stick appeared to move through its entire range of motion and appeared to perform a free, unencumbered movement.

By 03:52, the pilot began a run-up of the aircraft's engine. The pilot's hand was visible moving the ignition key in a manner consistent with a magneto check. The mag check sounded nominal. The pilot then manipulated her right hand which was out of view of the camera, a sound was noted that was similar to one propeller governor check. The run-up, and associated engine noises, appeared nominal. By 04:09, the pilot began taxiing again.

By 04:50, the pilot was on an active runway and began a takeoff roll. The altimeter showed a field elevation of about 2,550 MSL. By 05:00, the aircraft was airborne. The pilot made a climbing left turnout from the departure runway and continued to climb.

The pilot performed turns in the vicinity of the airport as the aircraft continue to climb. By 07:49, the pilot had begun a 45 degree downline and performed three wing waves. The altimeter read about 6,000 feet MSL at the start of this maneuver.

The pilot began an aerobatic sequence that seemed consistent with what was printed on the Arresti card mounted on the instrument panel. Due to the pilot's body position during the stress of aerobatic maneuvers, the small inboard root portion of the left aileron was not always visible. As the pilot performed aerobatic maneuvers, the right aileron moved in unison with the control stick and the aircraft's subsequent maneuvers.

Around 10:04, the pilot pulled out a vertical downline, the altimeter read about 3,700 feet MSL as the pilot pulled level to the horizon. The pilot started a climb and by 10:48, the altimeter indicated around 5,200 feet MSL as the aircraft again became level.

The pilot performed a diving right turn and leveled at 4,500 feet MSL. The pilot pulled to a vertical upline and performed what appeared to be a three point hesitation roll. The right aileron moved in conjunction with the pilot's control stick inputs, the left aileron was not visible because of the pilot's body position.

By 11:12, the pilot came over the top of the vertical upline and flew into a vertical downline. At 11:13, the pilot was visible pushing the stick fully forward and then quickly fully back to the right. The right aileron responded nominally to this control input. The airspeed indicator at the entry to this maneuver was visible in the three o'clock position. The aircraft performed what appeared to be two snap rolls to the right. By 11:17, the aircraft finished snap rolling and the aircraft had completed exactly two snap rolls, a total of 720 degrees of rotation, when referencing perpendicular dirt roads directly below the aircraft which served as ground reference points in the recording.

By 11:18, the aircraft pilot began to level the aircraft from the vertical downline. The altimeter read 4,500 feet MSL. The airspeed indicator was not visible because of the pilot's head position which was blocking the camera's view. By 11:21, the pilot pulled level and the altimeter indicated 4,000 feet MSL. The airspeed indicator was in the seven o'clock position as the pilot leveled the aircraft.

At 11:26, the pilot pulled to a vertical upline. The pilot performed one full roll to the left. The right aileron responded nominally and in conjunction with the pilot's control stick input. The roll stopped when the pilot gave an input commanded on the control stick.

By 11:34, the pilot came over the top of the vertical maneuver, the altimeter read about 5,000 feet MSL. By 11:38, the aircraft entered a 45 degree inverted downline. At 11:39, the pilot pushed stick fully forward then immediately fully aft and right. The aircraft performed one and a half snap rolls to the right. By 11:43, the pilot had completed the maneuver and the aircraft momentarily stopped rolling. The altimeter read 4,100 feet.

At 11:43, the pilot made a diving turn to the left, the right aileron moved trailing edge downward, consistent with the pilot's control stick input which was not fully visible due to the pilot's body position which blocked some of the camera's view. The plane began rolling left.

At 11:44, the pilot's body position changed slightly, although the pilot's control stick input was not visible, the pilot's torso movement was consistent with making a right control stick input. The right aileron responded appropriately, the left aileron and specifically, the left aileron's trailing edge, was not visible due to the pilot's body position.

Within the same second, the aircraft's roll rate seemed to increase to the left despite the right roll input. The right aileron was still in the right roll commanded position. The control stick was not visible, but the pilot was leaning her upper torso toward the right of the aircraft's cockpit.

The aircraft continued to roll left, the pilot's body remained leaned to the right of the cockpit, the right aileron's trailing edge was "up" in a manner consistent with a right roll input. The left aileron's leading edge was visible, but an aileron deflection position could not be inferred. The aircraft appeared to be on almost a vertical downline, the altimeter was now blocked by the pilot's head which was still leaning right and blocking the camera's view.

The aircraft continued to roll left as it descended. The pilot's body position and the aircraft's right aileron were still in the position as described above. The aircraft continued to roll left as it descended almost vertically.

The aircraft continued to roll left as it descended toward impact. The pilot's body position remained toward the right of the cockpit, the right aileron position indicated a right roll command but was nowhere near fully deflected up (full right roll command).

In the final frames before impact, around 11:50, the pilot's body remained leaned to the right side of the cockpit, but the right aileron's trailing edge appeared to have a position where the right aileron's trailing edge met the wing's trailing edge evenly (a roll neutral position).

The aircraft's shadow was visible on the ground and details of shrubbery came into view. The right aileron's position had increased slightly, the pilot's body was still leaned toward the right of the cockpit, the aircraft continued to roll left.

Within the same second (11:50), the aircraft impacted terrain. The pilot's body leaned slightly right and slightly back just prior to impact. The right aileron exhibited a slight right roll command. The left aileron was for the most part not visible during the accident sequence.

Wreckage filled the camera's view and the accident recording ended at 12:00.

A new video recording file started when the previous file ended at 12:00. Around 17:00, a witness arrived to the accident scene. The witness stated, "She was just doing a full roll on a 45 degree down and lost control of the airplane and just flew it into the ground. It was a snap and a half \* \* \* forty five and she wasn't low and she just never pulled power and couldn't recover from an unusual attitude." The witness made some non-accident related comments and ended the phone call shortly thereafter.

Around 23:45, the sound of a helicopter was audible.

Around 31:30, an emergency vehicle arrived at the wreckage site.

No further summary of the remaining video recordings were made. The recordings ended around 126 minutes elapsed.