

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, DC 20594

April 15, 2019

Onboard Image Recorder

Specialist's Factual Report
By Sean Payne

1. EVENT

Location:	Pacoima, California
Date:	September 3, 2018
Aircraft:	Cessna 150L, N10789
Operator:	Rotor F/X
NTSB Number:	WPR18FA249

2. GROUP

A group was not convened.

3. SUMMARY

On September 3, 2018, about 1710 Pacific daylight time, a Cessna 150L airplane, N10789, impacted terrain shortly after takeoff from the Whiteman Airport (WHP), Los Angeles, California. The certified flight instructor was fatally injured, and the passenger was seriously injured; the airplane was substantially damaged. The airplane was registered to N10789 LLC and was operated by Rotor F/X as a Title 14 *Code of Federal Regulations* Part 91 local instructional flight. Visual meteorological conditions prevailed and no flight plan was filed.

4. DETAILS OF INVESTIGATION

On September 7, 2018, the National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following image recorder.

Recorder Manufacturer/Model:	GoPro Hero 3+ Black Edition
Recorder Serial Number:	H3S+A0114A8E2B6

4.1. Recorder 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

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.

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 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.

4.2. Recorder Damage

Upon arrival at the NTSB Vehicle Recorder Division, it was evident that the GoPro Hero had sustained only light structural damage. The device's memory card was undamaged and the video and audio information was extracted from the memory card normally, without difficulty

Figure 1 is a photo of the condition of the GoPro upon arrival to the Vehicle Recorder Laboratory.



Figure 1. The condition of the GoPro upon arrival to the laboratory.

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.

4.3. Video Files

The memory card contained eight video recording files in MP4 format. Seven of the recordings were of other instructional flights or the instructor pilot testing the camera. The last recorded .MP4 file was corrupted and would not play.

Methods used for recovery of corrupted video files were applied and the video was able to be played back normally. The recovered video contained a 10 minute and 28 second recording of the accident flight.

The recording device was shipped to the laboratory with an audio recording interface cable to facilitate recording voice communication from the aircraft's audio panel. There was no audio captured on either recording. It is not known why there was no audio information available.

The image recording contained an over the shoulder view of the aircraft occupants and the instrument panel. The camera was mounted on the headliner of the aircraft behind and between the instructor pilot and the passenger. Figure 2 is a redacted screenshot of the camera's field of view on a flight previous to the accident. The instructor is on the right and the passenger is on the left. The engine RPM gauge was occasionally visible depending on the instructor pilot's body position. Other engine instrument gauges which were mounted on the instrument panel in front of the instructor pilot were never visible on the recording.



Figure 2. A redacted screenshot of the camera's field of view.

4.4. Timing and Correlation

The timing of this report is expressed as video elapsed time, which is the time given in minutes and seconds from the start of the recording. The format given for

time is MM:SS, where MM stands for the number of elapsed minutes and SS, the number of elapsed seconds.

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 instructor pilot was taxiing northwest on taxiway A. The instructor pilot was the sole manipulator of the controls at this time. A document consistent in nature with a checklist was in the instructor's lap. The checklist was mounted on a kneeboard/clipboard-like device on the instructor's right thigh. The passenger was sitting with his hands in his lap. The passenger had a knee board in the vicinity of his right thigh. The instructor pilot turned his head to look at the GoPro, then resumed looking forward as he continued to taxi. The fuel gauges were briefly visible. It was not possible to read the fuel gauges, however, the needles for each gauge appeared around the 12 o'clock position.

At 00:41, the instructor pilot taxied into the runup area near runway 12. The instructor pilot was making gestures consistent with giving instruction to the passenger. By 01:15, the instructor pilot had pointed the aircraft toward the approach end of runway 12 and came to a stop within the runup area. The instructor reached across the passenger to the left side of the airplane and closed the passenger's window. The instructor began reading from a checklist and began performing actions consistent with a preflight takeoff check for a light general aviation aircraft.

Around 01:25, the instructor began walking the passenger through how to perform a flight control check. The passenger grabbed the yoke and followed along with the instructor pilot as he boxed⁷ the flight controls. The instructor pilot pointed out to the passenger how the controls moved during the flight control check. The instructor pilot pointed to the trim wheel.

Around 02:15, the engine runup portion of the preflight check began. Carburetor heat was in the "OFF/COLD" position and the mixture control set to was fully rich. The engine RPMs increased to around 1700 RPM. The instructor gestured to and pointed out the magneto control switch to the passenger. The passenger manipulated the magneto control switch. Both the instructor pilot and passenger looked toward the RPM gauge, however, the gauge was not visible at all times due to the instructor pilot's body placement. A change in the propeller's RPM was noted on the video recording in lieu of being able to see the RPM gauge. Around 03:21, the passenger again manipulated the magneto control switch. At this time, the visible propeller RPM and the instructor's actions were consistent with correcting the passenger's action of placing the magneto control switch in the "OFF" position.

⁷ A term for moving the flight controls throughout their range of motion in a predetermined manner, typically as follows: full forward elevator, full forward and full right roll, full aft and right roll, full aft left roll, full forward and left roll, controls neutral.

The instructor pilot manipulated the magneto control switch to the right and the propeller's visible RPM returned to a higher setting. The passenger reacted with surprise. The instructor pilot then walked the passenger through the sequence again. The RPM gauge was briefly visible on the recording when the magneto control switch position had been returned to a position consistent with "BOTH." At this time, engine RPM read about 1700 RPM. At 03:49, the instructor pilot showed the passenger how to apply carburetor heat. Visible propeller RPM was consistent with a slight RPM drop when the carb heat was selected to "ON/HOT". Carburetor heat was then returned to "OFF/COLD" and visible propeller RPM was consistent with returning to a higher RPM. By 04:08, the throttle was reduced, and the engine RPM gauge was visible again displaying around 1000 RPM. The instructor pilot checked and set the directional gyro to the magnetic compass. The instructor pilot then set the altimeter to 1000 feet MSL (0 feet AGL).

Around 04:51 the instructor pilot began taxiing the aircraft toward the hold short line for runway 12. At this time the passenger gripped the yoke with both hands, however, the instructor pilot appeared to be the manipulator of the controls. Around 05:22 the aircraft was holding short runway 12. The RPM gauge read around 1000 RPMs as the aircraft was holding short.

At 05:53, the instructor pilot checked his wrist watch. The time on the watch displayed around 1705.

At 08:43, the shadow of a landing aircraft on runway 12 passed in front of the accident airplane. The accident airplane continued to hold short runway 12.

At 09:14, the instructor pilot manipulated the throttle and began taxiing the aircraft across the hold short line and onto runway 12.

At 09:33, the accident aircraft was lined up with runway 12 and stopped. A few seconds later, the passenger advanced the throttle. Both the passenger and the instructor pilot had both hands on the yoke as the aircraft began rolling on runway 12.

At 09:48, the accident aircraft became airborne over the runway 12 displaced threshold markings. The airspeed indicator read about 50 mph. The engine RPM gauge displayed about 2500 RPM. Both the passenger and the instructor pilot were holding the yoke with both hands. The instructor pilot appeared to have a firm grip on his yoke, the passenger appeared to have a looser grip on his own yoke when compared to the instructor pilot.

At 09:57, the instructor briefly removed his hands from the yoke and gave a thumbs up, the accident aircraft was in a pitch up attitude and was climbing. The airspeed indicator read about 70 mph. The altimeter read about 1020 feet MSL (20 feet AGL).

Two seconds later, around 09:59, the pitch attitude changed and nose dropped.

Immediately, the instructor pilot put his right hand on the right horn of the yoke and his left hand on the throttle. The RPM gauge indicated between 2200 to 2300 RPM. The airspeed indicator read about 75 mph. The instructor pilot appeared to verify that the throttle was set to full power. RPM read about 2300 RPM. The instructor pilot appeared to verify that the mixture adjustment lever was full in (rich). The mixture lever appeared set to full rich. The engine RPM gauge was briefly visible again and the engine RPM read about 2200 RPM.

The aircraft was abeam a control tower off to the right of the aircraft. At this position on the runway, approximately 2200 feet of runway was remaining. The altimeter read about 1050 feet MSL (50 feet AGL).

Within the next few seconds, by 10:03, the instructor pilot pulled the power back quickly. The RPM gauge dropped accordingly and showed about 1300 RPM. Within the next second, the instructor pilot pushed the throttle back to a position consistent with full power and then rechecked that the mixture was set to full rich. The mixture was set full rich. The engine RPM gauge read about 2200 RPM at this time.

For the next few seconds, the instructor's gaze appeared to be outside of the cockpit. By 10:10, the instructor pilot's gaze moved down toward the throttle area. The instructor pilot appeared to recheck that the mixture was set full rich and looked outside the cockpit again.

Throughout the above described sequence and through the rest of the recording until impact, the passenger had both hands on the yoke. The passenger's grip on the yoke did not appear to influence the movement of the flight controls, however, the passenger's influence on the controls could not be conclusively determined. The instructor pilot appeared to be the pilot flying throughout the short flight and subsequent accident sequence. The instructor pilot did not appear to be fighting the passenger for control at any time.

At 10:16, the instructor pilot initiated a left bank. The airspeed indicator read about 60 mph. The aircraft's pitch attitude was nose high, about +10 degrees (read from the artificial horizon). The altimeter read about 1100 feet MSL (100 feet AGL).

The aircraft continued in approximately a +15 to +20 degree left bank. The pitch attitude was still nose high, at least +10 degrees (read from the artificial horizon). Airspeed began showing a decreasing trend from around 60 mph until under 40 mph during the portion of the left turn in which the aircraft was in controlled flight.

As the accident aircraft continued in the left bank, the turn and slip showed the ball was almost full deflection right (skid condition). The instructor pilot's control input showed a roll right command throughout the left bank. The position of the control

yoke became more aft as the accident aircraft continued through the left bank. The airspeed indicator showed a decreasing airspeed trend.

Throughout the left bank, the engine RPM gauge read no less than 2000 RPM. The engine RPM gauge appeared steady and did not fluctuate. The airspeed indicator continued to show a decreasing airspeed trend.

Around 10:23, the accident aircraft departed controlled flight and rapidly entered a spin to the left. The position of the yoke just after spin entry was full aft (nose up) and nearly full right (right roll command). The airspeed indicator showed less than 40 mph. The turn slip indicator showed the ball full right (skid condition), the altimeter read about 1050 MSL (50 feet AGL), the airspeed read slightly less than 40 mph. The engine RPM gauge read about 2100 RPM. Just prior to spin entry the artificial horizon showed the aircraft was in approximately a 15 to 20 degree left bank and a +10 degree nose up pitch.

Within the next second, the aircraft became nose down and almost vertical to the ground. The instructor pilot lessened the amount of right roll input, however, the yoke was still slightly right (right roll command). The aircraft continued into a left spin, the ground began filling the windscreen. The instructor pilot was leaning hard right and aft as the ground rushed in the windscreen. The yoke was aft (pitch up command).

By 10:25, the accident aircraft had completed about $\frac{1}{2}$ turn of a left spin. The instructor pilot had neutralized the right roll command, but pitch command still appeared aft (nose up). The roof of a one-story hangar structure was visible and filled most of the windscreen. It was not possible to determine because of the camera's field of view if any rudder inputs were being made by the instructor pilot.

The aircraft had completed about 270 degrees of a full turn of the left spin when impact occurred around 10:27. The nose of the accident aircraft struck the ground immediately adjacent to the hangar structure. The aircraft's pitch at impact was vertical (nose down). The position of the yoke in the final moment was aft (pitch up command) and slightly left (left roll command). The airspeed indicator read approximately 40 mph. The camera broke off of its mount and the recording ended at 10:28.