

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division

Washington, DC 20594

November 4, 2013

On Board Image Recorder

Specialist's Factual Report

By Bill Tuccio, Ph.D.

1. EVENT

Location: Cataldo, Idaho
Date: August 18, 2013
Aircraft: KR2, N9028Q
Operator: Private
NTSB Number: WPR13FA380

2. GROUP

A group was not convened.

3. SUMMARY

On August 18, 2013, about 1930 Pacific daylight time, a Nelson Edgar H KR2, amateur-built experimental airplane, N9028Q, sustained substantial damage when it collided with trees and terrain, about four miles west of Cataldo, Idaho. The airplane was being operated by the pilot as a personal local flight, under the provisions of Title 14 *Code of Federal Regulations* (CFR) Part 91. Visual meteorological conditions prevailed at the time of the accident, and no flight plan was filed. The pilot received fatal injuries. The flight departed the Kellogg, Shoshone County Airport (KS83), Kellogg, Idaho, about 1900. A Contour video camera was sent to the National Transportation Safety Board's Image Laboratory for readout.

4. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division's Image Laboratory received the following video camera:

Recorder Manufacturer/Model: **Contour Roam 2**
Recorder Serial Number: **3021110802**

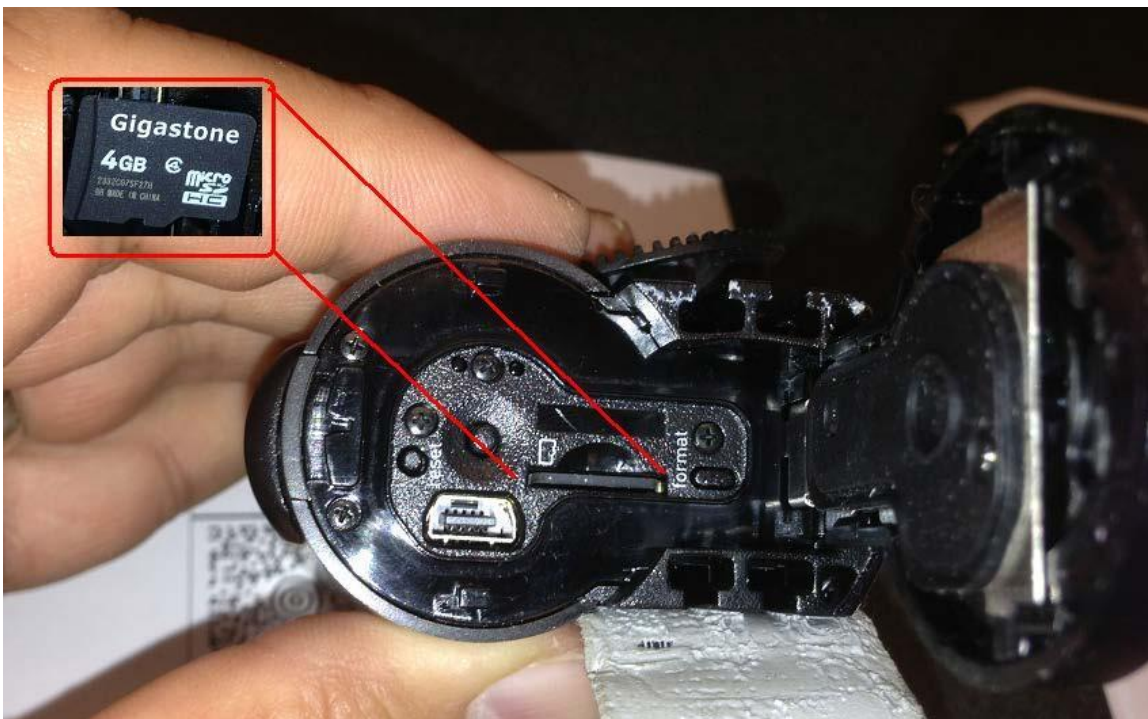
4.1. Recorder Description

The Contour Roam 2 is a portable, waterproof, rugged high definition capable video recorder. The camera is equipped with a 170 degrees wide-angle lens integrated into a 4 inch long, 2 inch wide body. The body also contains the camera controls, a laser for camera alignment, a battery, an internal microphone, a microSD memory card slot supporting up to 32 GB of storage, and a USB port. Recorded audio and video can be written directly to the microSD card as well as the USB port. The video is capable of recording up to 1920 x 1080 pixels at frame rate of 30 feet per second.

4.2. Recorder Damage

Upon arrival at the audio laboratory, it was evident that the camera had sustained only minor structural damage, as shown in figure 1. The 4GB microSD card was removed and video and audio information was extracted from the card normally, without difficulty.

Figure 1. Contour Roam 2 camera with microSD card in place.



4.2.1. Video Files

The video files were recorded at 30 frames per second and contained high definition video and audio content. The pertinent video was recorded on two files. FILE0005.mp4 was 2 minutes and 39 seconds and recorded the pilot starting the aircraft. FILE0006.mp4 was 3 hours and 47 minutes and recorded the accident flight and post-accident activities. The videos were recorded at a resolution of 1280 x 720 pixels and were of excellent quality.

4.3. Timing and Correlation

Timing of this summary is expressed as Video Elapsed Time, which is time from the beginning of each recording.

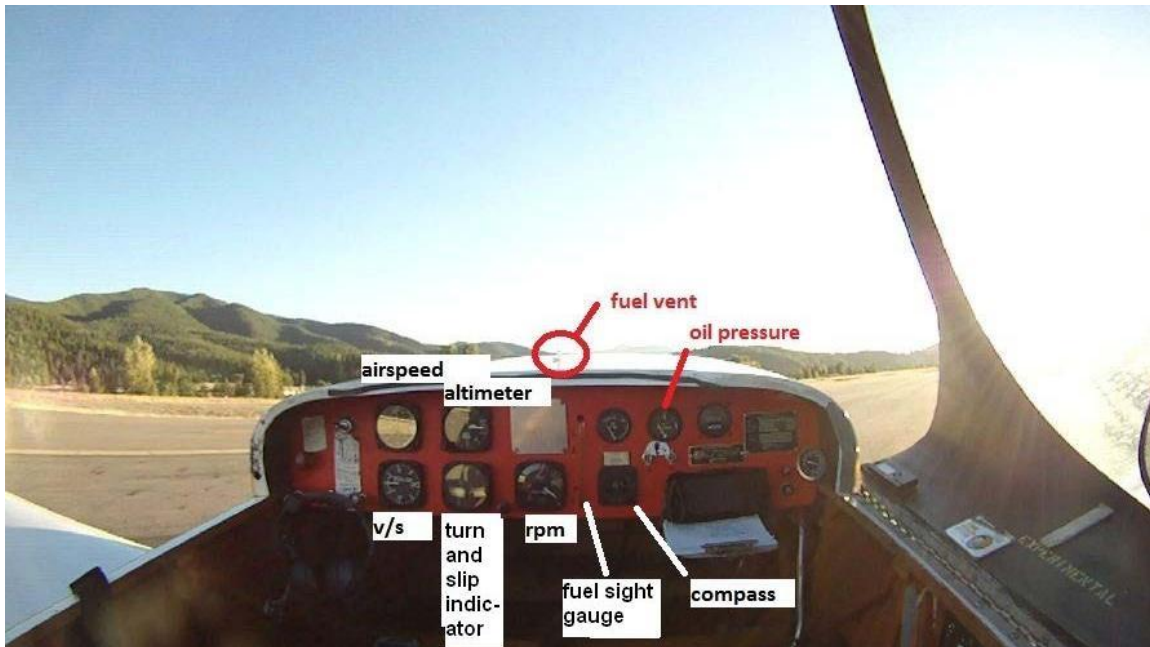
4.4. Summary of Recording Contents

In agreement with the Investigator-In-Charge, a video group did not convene and only this summary report was prepared. Times are expressed as hhmm:ss, where hh is hours, mm is minutes, and ss is seconds.

4.4.1. Video Recording One: FILE0005.mp4

When the recording began, the aircraft was pointed about 20 degrees left of the sun and the engine was off. The canopy was open and labeled "EXPERIMENTAL." The sky was clear and visibility was greater than 30 miles. The panel instruments were as shown in figure 2. The pilot entered the video from the left and began speaking, "hello my friends..." then continued to describe that he was going to fly the aircraft to compare two different camera manufacturers. The pilot is the only person visible in the video and he only spoke to the camera, engaging in no discourse with any other person.

Figure 2. Accident aircraft camera view with annotated instrument panel.



The pilot narrated his actions as he walked to the left-front side of the cockpit, turned off the key, and pulled the throttle all the way back. The pilot then walked to the front of the plane and pulled the propeller through a few times. Thereafter, the pilot walked back to the left-front side of cockpit, turned the key

on, and pushed the throttle in; narrating the throttle position as a “quarter throttle.”

The pilot walked to the front of the plane and pulled the propeller through. The engine started on the first manual propping attempt. The pilot walked around the propeller, in front of the wing to the left side of the cockpit, and adjusted the throttle. He then walked around the front of the plane, forward of the right wing, and removed the right chocks. Thereafter, he walked around the front of the plane to the left side, forward of the wing, and removed the left chocks. He then walked around the left wing and entered the cockpit from the left side, aft of the wing.

The pilot then turned off the camera.

4.4.2.Video Recording Two: FILE0006.mp4

The recording began as the pilot was back taxiing on a runway, away from the sun. The canopy was closed, the engine was running, the sky was clear, visibility was greater than 30 miles, and the altimeter indicated 2,200 feet. The aircraft was the same one as in the prior video. The pilot was wearing a shoulder harness with a headset over a baseball cap. During the entire recording, it was not possible to discern any details about the state of the fuel sight gauge.

When the back taxi was complete, the pilot turned the aircraft 180 degrees on the runway, towards the sun. After testing the flight controls and performing an engine runup, the pilot began his takeoff roll into the sun (westward) at 0002:36.

The pilot climbed the aircraft, performing a variety of turns and airspeed changes. Some of the turns and airspeed changes were similar in characteristics to steep banked Lazy 8 maneuvers¹. During the climb, the pilot adjusted his shoulder harness a number of times.

As the pilot climbed through about 5,700 feet, the throttle was full forward. The oil pressure indicator was in the middle of the gauge and the RPM indicator was at about the 10 o'clock position.

At 0016:22, the aircraft was in a slight climb at 5,800 feet and the airspeed indicator was decreasing towards the 12 o'clock position. The pilot pulled the throttle all the way aft, the sound of the engine reduced, and the RPM gauge reduced to the 1 o'clock position. The pilot pulled back on the stick while simultaneously pushing the left rudder to the floor of the aircraft. The pilot was wearing white socks and sandals.

At 0016:24, the nose began pitching down rapidly as the aircraft yawed and rolled to the left.

At 0016:25, the aircraft was rolling left and was about 30 degrees from inverted. The vertical speed was increasing through 1,500 feet per minute (fpm).

At 0016:26, the nose of the aircraft was nearly vertical down and the aircraft was spinning about the yaw axis to the left. The pilot began to release

¹ The FAA Airplane Flying Handbook (FAA-H-8083-3A) defines a Lazy Eight as “consist[ing] of two 180° turns, in opposite directions, while making a climb and a descent in a symmetrical pattern during each of the turns.”

the left rudder and add right rudder. The stick was neutral in the lateral axis and aft in the longitudinal axis. The pilot briefly added power. The aircraft remained in a left spin for the duration of the flight.

At 0016:27, the pilot pushed forward on the stick, as the stick remained neutral in the lateral axis. The aircraft was spinning rapidly to the left (a rate of about .5 turns per second) and the inclinometer ball² was about one ball width from full scale left. The pitch of the aircraft was about 50 degrees nose down. During this time, the engine noise decreased as the RPM indication reduced to about the 2 o'clock position, the oil pressure reduced to about the 10% position, the vertical speed was at its full-scale position of 2,000 fpm, and the airspeed was reducing through about the 12:30 o'clock position. By 0016:31, the airspeed reached the 12 o'clock or 0 position for the rest of the flight.

At 0016:29, the RPM indication reduced to the 3 o'clock position.

At 0016:33, the oil pressure indication reached the minimum position on the gauge.

At 0016:36, the RPM indication surged to about the 2 o'clock position coincident with an audible clunking sound.

At 0016:37, the propeller stopped rotating and the RPM indicated 0. The altimeter was passing through 4,700 feet.

At 0016:38, fuel momentarily spewed out of the exterior fuel vent.

At 0016:40, the spin characteristics reached a steady state for the remainder of the flight and did not change despite a variety of control inputs made by the pilot. The aircraft was spinning left at about .6 rotations per second, the nose was about 20 degrees down, the inclinometer ball was full left, and the propeller was stopped. Throughout the remainder of the flight, the pilot made a variety of control inputs including: (a) stick forward, (b) stick aft, (c) right rudder, (d) left rudder, (e) left stick, (f) right stick. The inputs were made in various combinations of rudder, forward/aft stick, left/right stick. At some points, the pilot moved his right knee upward trying to move the stick full left.

At 0016:42, the aircraft passed through 4,300 feet.

At 0016:43, fuel momentarily spewed out of the exterior fuel vent.

At 0016:48, fuel momentarily spewed out of the exterior fuel vent.

At 0016:52, the aircraft passed through 3,500 feet.

At 0017:05, fuel momentarily spewed out of the exterior fuel vent as the aircraft passed through 2,500 feet.

At 0017:08, the aircraft impacted the ground. The total number of spin revolutions from 0016:22 was about 25.

By 0017:10, all motion ceased and the camera continued to record video and audio. The video image was that of blades of grass and a small, unidentified part of the aircraft structure. The audio recorded a sound similar to a spinning component until 0017:26.

From 0017:10 until about 0135, various sounds of strained breathing were recorded. Additionally, distant sounds of dogs, geese, and motor vehicles were occasionally recorded. As darkness approached, crickets were also recorded.

² The inclinometer is part of the turn-and-slip indicator.

At 0021:32, an electronic tone, similar to a cell phone text/voice message alert was recorded.

At about 0037:38, a siren could be heard in the distance as the daylight in the camera image began to decrease.

By about 0050, the image was completely black, consistent with nighttime, unlit conditions.

By about 0116:35, helicopter sounds of varying intensity were recorded until the end of the recording.

At 0311:42, a song started playing, similar to a cell phone ringtone, and lasted about 30 seconds³.

At 0326:18, voices of first responders were first recorded on the audio.

By 0337:44, as first responders were talking, light similar to a flashlight was recorded on the video image.

The recording ended at 03:46:47, as first responders were on scene and some light was visible, similar to a flashlight. When the recording ended, there was no audio or camera movement that may have suggested a first responder turned the camera off.

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³ The ringtone was identified by the title "VZW Airwaves" used on Verizon phones (<http://www.youtube.com/watch?v=aiuOh0UhQqk>).