NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Vehicle Recorder Division
Washington, D.C. 20594

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

WPR13FA370

By

Bill Tuccio, Ph.D.

WARNING

The reader of this report is cautioned that the transcription of video recording is not a precise science but is the best product possible from a Safety Board group investigative effort. The transcript or parts thereof, if taken out of context, could be misleading. The transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information.

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January 2, 2014

Video Recorder

Group Chairman's Factual Report
By Bill Tuccio, Ph.D.

A. EVENT

Location:	Paradise, California
Date:	August 13, 2013
Aircraft:	Champion 7GCAA, N9607S
Operator:	Private
NTSB Number:	WPR13FA370

B. GROUP

A group was convened on December 18, 2013.

Chairman:	Dr. Bill Tuccio Aerospace Engineer National Transportation Safety Board
Member:	Andrew Swick Aviation Accident Investigator National Transportation Safety Board
Member:	Ken McClure Helicopter Operations Manager Pacific Gas and Electric Company
Member:	David Wood Process Owner, Patrol Pipeline Pacific Gas and Electric Company

C. SUMMARY

On August 13, 2013 about 1130 Pacific daylight time, a Champion 7GCAA, N9607S, collided with the ground while maneuvering near Paradise, California. The airplane was registered to the pilot and operated by AA Aerial Surveillance, LLC. under the provisions of Title 14 *Code of Federal Regulations* Part 91 as an aerial observation flight. The commercial pilot and passenger were fatally injured and the airplane was substantially damaged. Visual meteorological conditions prevailed and a flight plan was not filed. The cross-country flight originated from the Nut Tree Airport (VCB), Vacaville,

California about 0850 with a destination of Chico Municipal Airport (CIC), Chico, California. A video camera mounted on the left wing strut assembly was sent to the National Transportation Safety Board's Recorder Laboratory for readout. The video group prepared a narrative transcript of the pertinent part of the recorded video.

D. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division's Recorder Laboratory received a Contour+2 video camera.

Recorder Description

The Contour+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. This model camera also has the ability to record GPS coordinates along with audio and video. The video is capable of recording up to 1920 x 1080 pixels at frame rate of 30 feet per second.

Recorder Damage

The camera suffered significant heat and structural damage, as shown in figures 1 through 3. Figure 4 shows the camera model after the damaged lens was removed. Despite the damage to the camera, the 32GB microSD card was not physically damaged and was removed from the camera without difficulty, as shown in figure 5. The mounting configuration of the camera is shown in figure 6, using an exemplar aircraft. According to the operator, the camera was typically pointed down about 45 degrees relative to the longitudinal axis of the aircraft.

Figure 1. Contour+2 camera side view.

Figure 2. Contour+2 lens view.

Figure 3. Contour+2 back view.

Figure 4. Contour+2 after damaged lens removed.

Figure 5. Contour+2 microSD card removed from camera.

Figure 6. Camera mounting configuration on exemplar aircraft.

Recording Recovery

The microSD card file system was examined. A number of Quicktime* movie files were recorded; however, none were identified as the accident flight. One movie file was corrupted and would not play. The corrupted file was repaired and was identified as the accident flight; however, the accident was not captured on the repaired movie file.

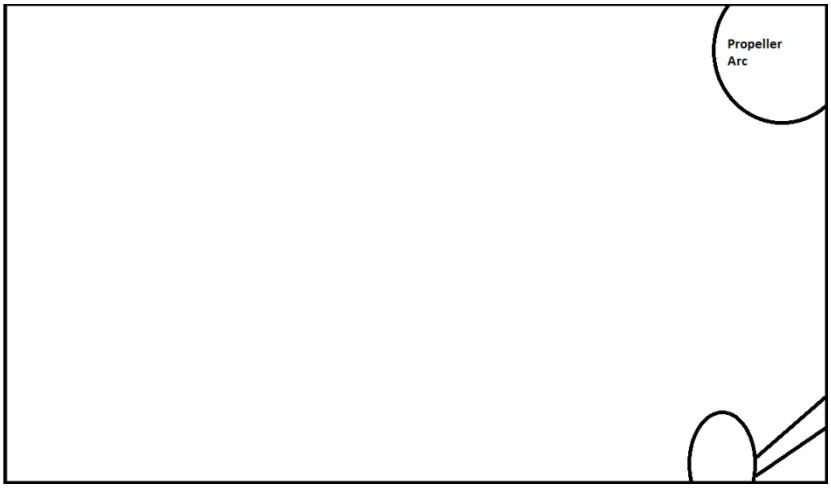
The camera manufacturer, Contour, indicated it is possible for video file fragments to exist on the microSD cards, yet be hidden from the file system or a corrupted recording. These hidden file fragments may exist when the camera is shutdown improperly or when the microSD card is dislodged during recording.

In order to search for file fragments, a binary image was created of the microSD card. File fragments of the accident flight were identified and were reconstructed. The reconstruction process resulted in video without audio or GPS information.

The recovered video resolution was 1280x720 pixels recorded at 30 frames per second. Figure 7 shows the field of view of the camera from the accident flight. The image was fish-eye distorted due to the wide angle lens used on the camera.

* Quicktime is a file format developed and maintained by Apple, Inc.

Figure 7. Camera field of view.



Time Correlation

Times are expressed as minutes and seconds from the start of the recovered video.

Recording Description

17:38. Start of transcript narrative.

17:38. The airplane passed a large cross with the name “JESUS” on a south facing slope. The sky condition was clear and visibility was unlimited throughout the video. The airplane appeared to maintain a relatively constant MSL altitude, while the terrain rose until the upset at 19.41. The pipeline being patrolled was off the left side of the airplane; the airplane was flying relatively parallel to the fairly straight pipeline. From this point until the end of the video, based upon the movement of trees and tall grasses, there was little to no wind. Also, there was no evidence of airframe vibration and the propeller maintained about the same RPM from this point until the end of the video.

18:22. From this point until the end of the video, other than the dirt road over the pipeline, there were no man-made disturbances, structures, animals, birds, or people observed in the video. Hamlin Canyon began to enter the right field of view of the recording.

19:06. The wings rocked back and forth less than 10 degrees roll left and right, and the pitch varied up and down about 2 degrees. The airplane was approaching the edge of Hamlin’s Canyon. The canyon doglegged left in front of the airplane’s path.

19.16. The airplane banked to the right changing the track of the airplane right, towards the canyon’s edge. The turn to the right occurred just after the pipeline being patrolled turned towards the right. By this time, the airplane was about 300 feet above ground level.

19.21. The airplane banked to the left, changing the track of the airplane to parallel a turn of the pipeline to the left.

19.23. The shadow of the airplane was visible on the ground in the left lower quadrant of the field of view. The shadow was consistent with the airplane in a left bank.

19.29. The airplane leveled out and the track was parallel to the pipeline. The airplane was flying over the edge of Hamlin Canyon. The shadow of the airplane was still visible, and both wings and both sides of the elevator were visible in the shadow.

19:32. From this point until the upset, the airplane was over Hamlin Canyon; the top edge of the canyon was near the airplane's left side and still about 300 feet below the airplane. The nose of the airplane pitched up slightly. The shadow of the airplane was no longer visible.

19.38. The airplane pitched down slightly. The shadow of the airplane was again visible in the lower left quadrant of the field of view, to the left of the canyon edge.

19.41. The airplane upset began as the airplane rolled to the right, while the pitch attitude lowered slightly. Any airplane yaw could not be reliably determined. The airplane was over the canyon, just to the right of the canyon edge. The airplane shadow was not visible.

19.43. The airplane was rolling to the right, through 90 degrees, the roll rate increasing; the nose was slightly down relative to the horizon, and the nose continued to move lower. At this point, the camera was pointed in the direction of the ground impact point. From this point until the end of the recording, the impact point remained relatively centered in the field of view of the camera; however, the camera was mounted about 45 degrees down relative to the airplane's longitudinal access.

19.44. The airplane was inverted, still rolling rapidly to the right. The pitch of the airplane was significantly down, relative to the horizon. The airplane had rolled a total of 180 degrees from the start of the upset.

19.45. The airplane continued in the right roll, and had rolled 270 degrees. The nose was about 30 degrees below the horizon[†], and remained at about this angle until impact.

19.45.5. The airplane continued to roll right, through level, and was about 30 degrees right. The airplane had rolled a total of 390 degrees from the start of the upset.

19.45.75. The airplane continued to roll to the right, and the airplane was in a 90 degree bank to the right. The airplane had rolled a total of 450 degrees from the start of the upset.

19.46. The roll continued to the right, and the airplane was inverted again. The airplane had rolled a total of 540 degrees from the start of the upset.

[†] The group factored in the mounting angle of the camera in determining the nose angle relative to the horizon.

19.47. The airplane's shadow re-entered the field of view near the top left quadrant of the field of view. The shadow rotated counterclockwise towards the bottom of the field of view. The airplane continued to roll right at a fast rate until the end of the recording.

The airplane impacted the ground at about 19.49. The shadow of the airplane was visible for about a second prior to impact. The shadow showed both wings, the propeller, fuselage, and empennage intact.

By the time of impact, the airplane made 3 complete, 360 degree rolls from the time the upset began at 19.41.