

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN22LA152

VIDEO FILES

Specialist's Factual Report

February 12, 2024

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A. ACCIDENT

Location: Ash Flat, Arkansas
Date: March 25, 2022
Time: 16:15 central daylight time
Airplane: Bellanca 17-30A, private operator, N8869V

B. VIDEO FILES SPECIALIST

Specialist Kyle Garner
Sr. Aerospace Engineer – Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A video group was not convened.

The NTSB Vehicle Recorder Division received the following video files:

Video File #1: GOPR6153.mp4
Video File #2: GP026153.mp4

The video files were downloaded by non-NTSB personnel and forwarded via a secure file share service to the NTSB for review.

1.0 Video File Information

The video files were reviewed, and video containing the accident flight departure and impact was identified.

Metadata in the video files indicated they were recorded at a resolution of 1920x1080 pixels and had a frame rate of 29.97 frames per second. An audio track containing audio from the camera's internal microphone was also recorded. The camera was placed on the glareshield and alternated between facing inward and outward for the duration of the accident flight.

2.0 Video File Timing

The video file did not contain any timing information, thus, all observations in the summary are referenced to video elapsed time in *mm:ss*, which is the time since the beginning of the recording.¹

¹ Where mm = minutes and ss = whole seconds.

D. SUMMARY OF EVENTS

3.0 Video file 1 - GOPR6153.mp4

Video file 1 began with the aircraft on the ground at Baxter County Airport in Mountain Home, Arkansas. The camera was inward-facing and the pilot was partially visible. The engine was running, and the aircraft was taxiing to the departure runway. For the duration of video file 1, it was daylight conditions with no apparent restrictions on visibility.

At 02:45 video elapsed time, the pilot picked up the camera and placed it on the glareshield facing inward. The pilot was visible and the only occupant of the aircraft.

At 03:32, the aircraft reached the hold short line for runway 23 and the pilot began performing the before takeoff checklist. Included in the checklist was an engine run-up, which encompassed increasing the engine RPM and checking the magnetos, propeller, vacuum, fuel pressure, oil pressure, and oil temperature. The pilot completed the checklist and verbalized that everything was nominal.

At 06:50, the pilot released the brakes and taxied onto runway 23 for departure. During takeoff, the camera fell from the glareshield onto the floor and the pilot was no longer visible. During the takeoff and climb phase of the flight, the engine sounded nominal. The camera remained on the floor for the duration of the recording.

The video ended at 12:00 video elapsed time.

4.0 Video file 2 - GP026153.mp4

Video file 2 began with the aircraft in the cruise phase of the accident flight. The camera was placed on the glareshield and was inward-facing. For the duration of video file 2, it was daylight conditions and with no apparent restrictions on visibility.

The video from 00:01 to 06:28 video elapsed time was uneventful. The pilot was in cruise flight and communicating on the radio, however, the communications were unintelligible due to the engine noise.

At 06:28, the aircraft began a left turn.

At 07:04, the camera fell from its resting point on the glareshield. The pilot picked up the camera and placed it back on the glareshield facing outward.

At 07:57, the aircraft turned left to join the base leg of the left traffic pattern for runway 22 at Sharp County Regional Airport (CVK), Ash Flat, Arkansas.

At 09:35, the aircraft started a turn to the left to join the final approach for runway 22 at CVK.

At 09:49, runway 22, which had a displaced threshold, was visible ahead and the aircraft continued a final approach for landing.²

At 10:31, the markings for runway 22 were visible directly over the engine cowling. A flag was visible on the airport property and the winds appeared to be coming from the northwest.

At 10:37, the aircraft was over the runway 22 markings, and the runway aiming point markings were visible directly over the engine cowling.

At 10:43, the aircraft was over the runway aiming point markings but continued to float. The stall warning horn was briefly audible. Sound consistent with a slight increase in engine RPM was noted. The nose of the aircraft drifted to the left and the aircraft was no longer aligned with the centerline of the runway.

At 10:47, the aircraft was still floating over the runway. The nose of the aircraft pitched up and the stall warning horn was briefly audible. The aircraft appeared to be slowly gaining altitude.

At 11:07, as the pitch angle continued to increase, the stall warning horn was audible. Immediately thereafter, the engine RPM decreased, and popping sounds consistent with a rough operating engine were noted.

At 11:12, the rough engine popping noise ceased, and the engine RPM returned to a higher power setting. The pitch angle continued to increase, and the stall warning horn was audible.

At 11:14, the aircraft began to bank to the left and was losing altitude.

At 11:20, the camera fell from the glareshield and briefly showed the cockpit and right wing. The aircraft appeared to be in a 70 to 80-degree left bank.

At 11:22, the aircraft impacted the ground, and the camera came to rest.

The video ended at 12:01 video elapsed time.

E. SOUND SPECTRUM STUDY

The objective of the sound spectrum study was to estimate the speed of the aircraft's engine before the accident using the audio from video file 2.

² Per FAA data, the displaced threshold for runway 22 at KCVK is 154 feet.

5.0 Engine Information

The aircraft was equipped with one Continental Aerospace Technologies IO-520-K six-cylinder, four-stroke direct drive piston engine, and a McCauley three-bladed propeller. According to the type certificate data sheet, the engine was rated for a take-off performance of 2,850 RPM and a maximum continuous performance of 2,700 RPM.³

6.0 Engine Speed Estimation

A three-dimensional spectrogram was generated, as shown in Figure 1, from the audio extracted from video file 2 from 10:30 to 12:01 video elapsed time. The x-axis represents time in CDT and the y-axis represents sound frequency in Hertz (Hz). The color represents sound intensity, with blue being the lowest intensity sound and red being the highest intensity. The shaded area represents when popping sounds consistent with a rough operating engine were noted. Additionally, the time of the accident is noted with a dashed vertical line.

³ FAA TCDS No. E5CE, revision March 8, 2022.

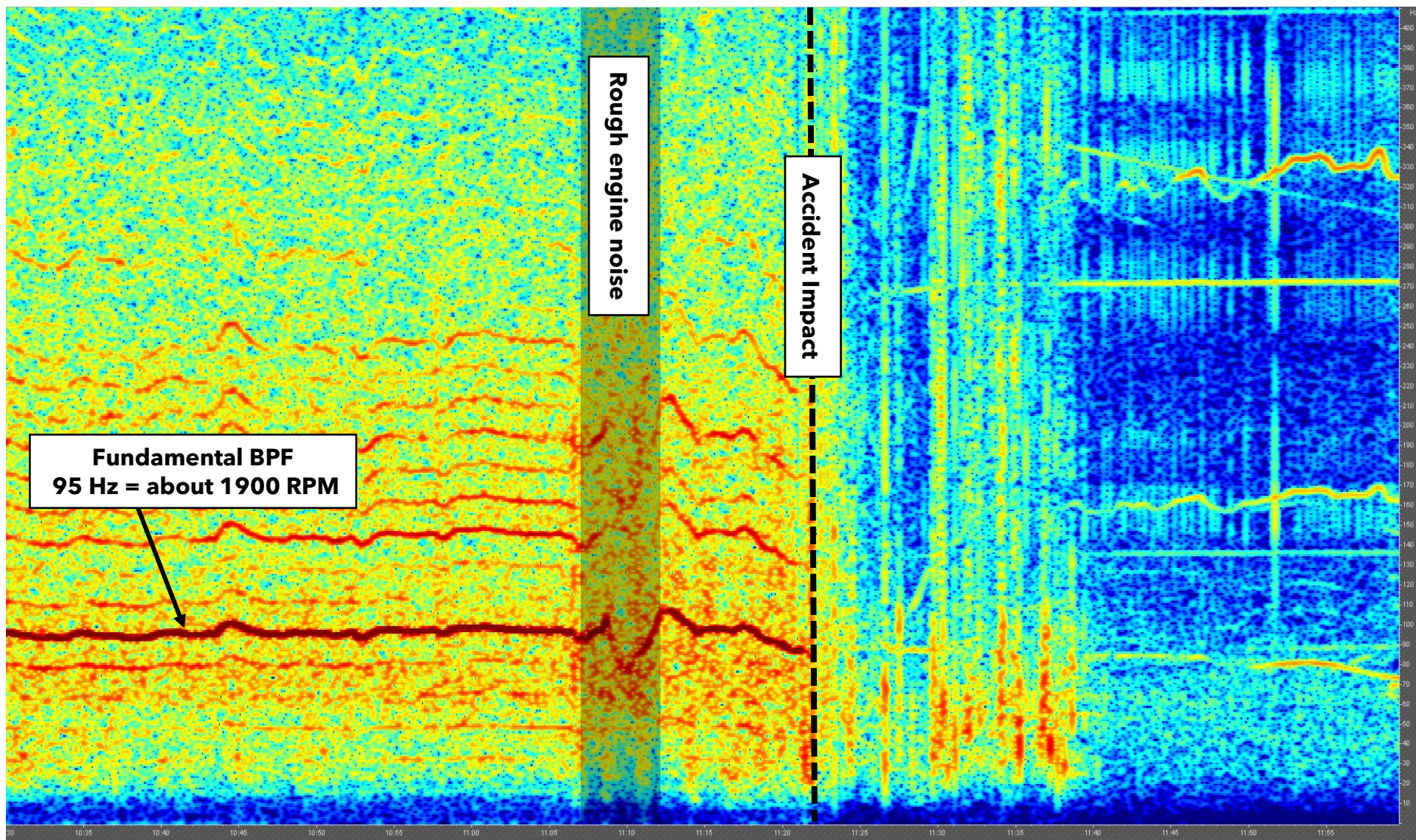


Figure 1. 3D spectrogram of audio from video file 2 - 10:30 to 12:01 video elapsed time.

The noise generated by the propeller for this type of engine configuration is generally the strongest at the fundamental blade passage frequency (BPF).⁴ By measuring the BPF from the spectrogram, the RPM of the propeller can be determined using the expression below:

$$RPM_{prop} = BPF \left[\frac{blades}{sec} \right] \times \frac{1}{3} \left[\frac{rev}{blades} \right] \times 60 \left[\frac{sec}{min} \right] \quad (\text{eqn. 1})$$

The fundamental blade passage frequency from 10:30 to 11:06 video elapsed time remained relatively constant at about 95 Hz, as annotated in Figure 1. Using equation 1, this represents an engine speed of about 1900 RPM.

From 11:07 to 11:12, popping sounds consistent with a rough engine were noted and the spectrogram shows a variation in the BPF and sound intensity during this time. The cause of the variation in BPF and sound intensity could not be determined by this study.

At 11:13, the popping engine noise ceased and the BPF was 105 Hz, which represents an engine speed of about 2100 RPM.

The BPF decreased from 105 Hz to 86 Hz (or about 1700 RPM) from 11:13 to the time of the accident impact at 11:22. During this time, the video showed the aircraft was in an increasing left bank and losing altitude.

7.0 Study Findings

Audio from a video recording was used to estimate the speed of the aircraft's engine before the accident. As the aircraft passed over the runway 22 markings at CVK, the speed of the engine was about 1900 RPM. 15 seconds before the accident, a variation in the BPF and sound intensity consistent with a rough operating engine were noted, the cause of which could not be determined in this study. When the rough engine noises ceased and nominal sound intensity returned 9 seconds before the accident, the engine speed was about 2100 RPM. The engine speed gradually decreased to 1700 RPM at the time of the accident. The study determined that the engine was operating at the time of impact.

Submitted by:

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⁴ Smith, M. (1989). "Aircraft Noise." Cambridge University Press.