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

November 6, 2014

# Witness Video Sound Spectrum Study

**Specialist's Study Report**
**By Bill Tuccio, Ph.D.**

## 1. EVENT

| | |
|---|---|
| Location: | Grand Lake, Louisiana |
| Date: | March 15, 2013 |
| Aircraft: | Sikorsky S-76A++, N574EH |
| Operator: | Era Helicopters LLC, Flight ERA 574 |
| NTSB Number: | CEN13FA192 |

## 2. GROUP

A sound spectrum study group was not convened.

## 3. SUMMARY

On March 15, 2013, about 1147 central daylight time (CDT), a Sikorsky S-76A++ helicopter, N574EH, was substantially damaged after ground impact near Grand Lake, Louisiana. All three occupants onboard, the pilot and two maintenance personnel, were fatally injured. The helicopter was registered to Era Helicopters LLC and was operating under the provisions of 14 *Code of Federal Regulations* Part 91 as a post-maintenance check flight. Visual meteorological conditions prevailed for the local flight, which departed from Lake Charles Regional Airport (LCH), Lake Charles, Louisiana, at 1119.

A witness video of the helicopter was provided to the National Transportation Safety Board Vehicle Recorder Division for review.

## 4. DETAILS OF INVESTIGATION

The video was approximately 20 seconds in length and contained video and audio of the accident helicopter taken from a mobile phone. The witness vantage point was from a field located about a mile from the accident helicopter's flight path.

## 4.1. Summary of Video and Audio

The first part of the video showed the helicopter travelling from right to left; during the second part of the video, the camera was pointed at the ground and did not show the helicopter.

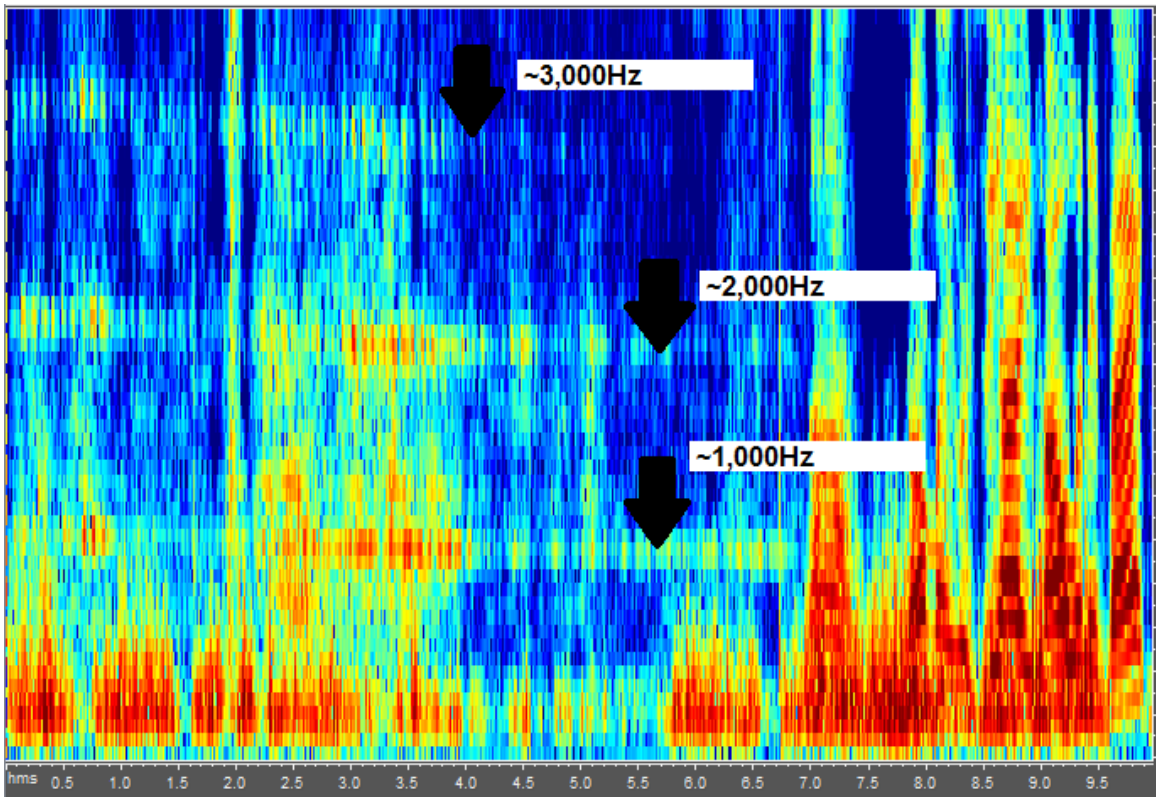
Audio from the recording contained sounds attributed to the helicopter along with intermittent microphone wind noise and commentary by the videographer.

Audio attributed to the helicopter exhibited a high pitch, warbling tone.

## 4.2. Sound Spectrum Evaluation

A frequency analysis of the audio revealed a fundamental frequency at about 1,000 Hz with harmonics[1] at 2,000 Hz and 3,000 Hz, as shown in figure 1. The frequencies decreased slightly throughout the recording, consistent with Doppler frequency effects of a sound source moving away from an observer[2].

**Figure 1. Frequency analysis of a 10-second portion of the recording.**




An effort was made to compare the frequencies captured on the video to known component frequencies for the S-76A++ helicopter. However, due to the

[1] Harmonics exist at integer multiples of the fundamental frequency.

[2] The Doppler Effect states that, for a source with constant emitted frequency, the measured frequency is higher than the emitted frequency as the source approaches, identical as the source passes, and lower as the source moves away.

low quality of the recording, limited information about component frequencies for the S-76A++, Doppler effect ambiguities, and the large number of possible component frequencies that may be the source of the observed frequency signature, no conclusions could be reached about the component sources of the video.

Attachment 1 to this report contains the witness video.