

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, DC 20594

June 3, 2013

Sound Spectrum Study

Specialist's Factual Report
By Bill Tuccio

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 group was convened on May 30, 2013.

Chairman: Bill Tuccio
Aerospace Engineer
National Transportation Safety Board

Member: Mike Folkerts
Air Safety Investigator
National Transportation Safety Board

Member: Dr. Steven C. McNeely
Director of Safety
ERA Helicopters LLC

Member: Stuart K. Drost
Engineer Team Lead
Sikorsky Military Systems

Member: Harold R. Barrentine
Senior Air Safety Investigator Specialist
Bell Helicopter

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 solid-state cockpit voice recorder (CVR) was sent to the National Transportation Safety Board's Audio Laboratory for readout.

4. DETAILS OF INVESTIGATION

The CVR Factual Report and air traffic control (ATC) transcript, included in the docket for this investigation, indicated there were two ATC transmissions made by the accident helicopter; one apparently routine transmission 53 seconds after the end of the CVR, and a report of a problem about 2 minutes and 45 seconds after the end of the CVR.

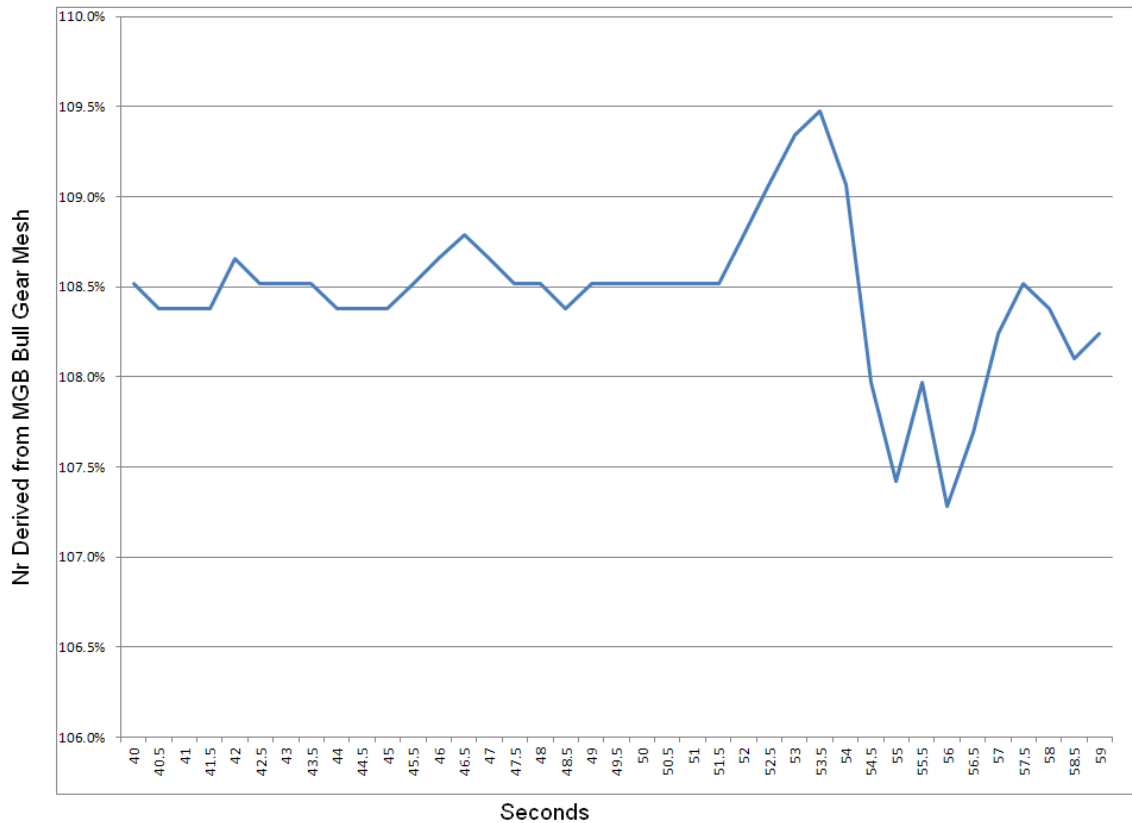
A sound spectrum study was performed to examine frequency distributions for the accident flight. The CVR cockpit area microphone (CAM) audio and the ATC audio were used in this study. Additionally, sounds on the hot microphone recorded channel were considered by the group.

The sound spectrum study compared known frequency distributions for the S76A++ helicopter provided by Sikorsky to the audio sources of this accident. Some of the S76++ known frequencies are expected to be recorded by the CVR, and some of the frequencies are expected to be obscured by background noise of the helicopter. The main gear box (MGB) Bull Gear Mesh frequency was consistently observed on the CVR and ATC recordings. The MGB Bull Gear Mesh frequency of 779 Hz is known by Sikorsky to correspond to a main rotor RPM of 107%, the normal rotor RPM (Nr) for this model helicopter.

4.1. Cockpit Voice Recorder - CAM

The MGB Bull Gear Mesh frequency in the last 19 seconds of the CVR CAM recording was translated to Nr using Sikorsky S76A++ known relationships. Figure 1 shows the main rotor RPM for the last 19 seconds of the CVR recording. Nr evidenced a fluctuation at the end of the CVR recording.

Figure 1. Nr derived from MGB Bull Gear Mesh frequency analysis.



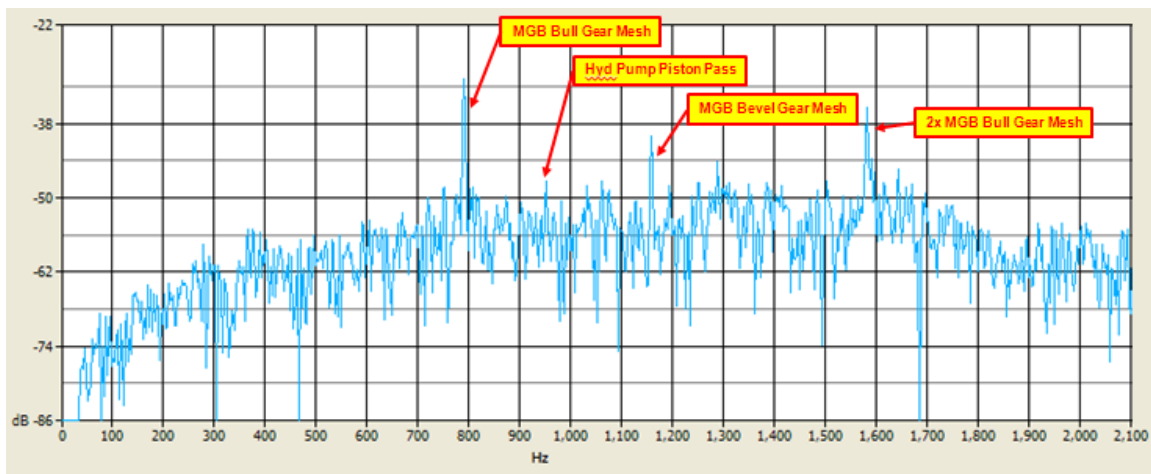
4.2. Cockpit Voice Recorder – Hot Microphone

There were two to three distinct snapping sounds recorded on the hot microphone at the end of the recording. Two of the snapping sounds were about .25 seconds in length. The source of the snaps may have come from at least two sources: (a) a sound in the aircraft or (b) an electronic artifact of the CVR power interruption. No testing was performed for this sound spectrum study to determine the source of the snaps.

4.3. Air Traffic Control Recording

The frequency spectrum of the ATC recording of the apparently routine call by the pilot of ERA 574 to Lake Charles Tower, that occurred 53 seconds after the end of the CVR recording, was examined during a pause in speaking during the transmission. Figure 2 shows an annotated view of frequencies observed during the pause in speaking. There were no frequencies recorded that were not expected compared to Sikorsky S76A++ documentation.

Figure 2. Frequency spectrum during pause in ATC transmission.



Note: The abbreviation “Hyd” means “Hydraulic.”

The frequency spectrum of the ATC recording of the last recorded radio transmissions by the accident helicopter, about 2 minutes 45 seconds after the CVR recording ended, were examined. There were no pauses in the radio transmission by the pilot, as such a frequency distribution could not be determined.

Pilot speech vibrations recorded on the ATC recording were examined to determine if underlying aircraft frequencies could be inferred. While frequency patterns were identified, no suitable comparison existed in any other portion of the ATC recording inhibiting further analysis.

4.4. Summary

The spectral analyses of the CVR CAM and the ATC recording that occurred 53 seconds after the end of the CVR recording revealed frequencies consistent with Sikorsky S76A++ documentation. Other sounds examined on the CVR and ATC recordings were inconclusive.