

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division

Washington, DC 20594

February 28, 2013

Sound Spectrum Study

Specialist's Factual Report

By Bill Tuccio

1. EVENT

Location:	Houma, Louisiana
Date:	October 22, 2012
Aircraft:	Agusta AW139, N385RH
Operator:	ERA Helicopters LLC
NTSB Number:	CEN13FA025

2. GROUP

A sound spectrum study group was not convened.

3. SUMMARY

On October 22, 2012, at 0602 central daylight time (CDT), an Agusta SPA AW139 helicopter, N385RH, collided with the terrain following a loss of control while the helicopter was being repositioned on the Houma-Terrebonne Airport (KHUM), Houma, Louisiana. One of the airline transport rated pilots was not injured and the other suffered a serious injury. The helicopter was substantially damaged. The helicopter was registered to and operated by ERA Helicopters LLC and was being operated under the provisions of 14 Code of Federal Regulations Part 91 at the time of the accident. Visual meteorological conditions prevailed.

A solid-state multi-purpose flight recorder (MPFR) was sent to the National Transportation Safety Board Vehicle Recorder Division's Audio Laboratory for evaluation.

4. DETAILS OF INVESTIGATION

A sound spectrum study was performed to examine the low frequency spectrum related to the main rotor operation. Two time periods recorded by the Penny & Giles MPFR of the cockpit area microphone (CAM) were examined in this study. The factual report of the MPFR recording was separately documented by the "Cockpit Voice Recorder Group Chairman's Factual Report."

The AW139 helicopter was equipped with a 5-bladed main rotor system. When operating at 100% rotor speed (Nr), the rotor generated a 24.7 Hz frequency, and when operating at 102% Nr, the rotor generated a 25.2 Hz frequency.

The first period examined was from the maintenance test flight between 0042:53.998 and 0043:13.191 CDT (“Maintenance Test Flight”). The second period examined was from the accident flight between 0601:46.493 and 0601:52.740 CDT (“Accident Flight”).

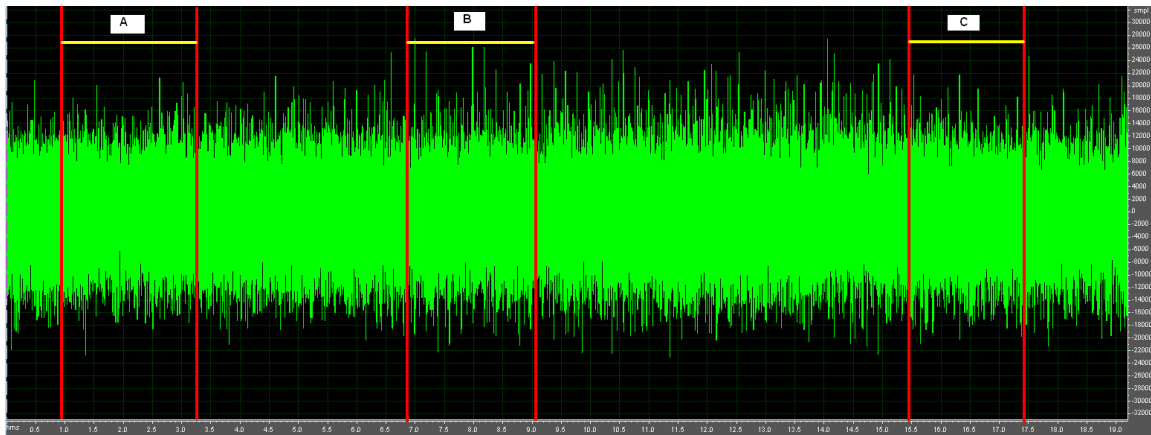
The audio time periods were examined for any superimposed frequency content below 100Hz contained in the higher frequency background noise. The CAM audio was demodulated to extract the lower frequencies. The demodulated audio had a Fourier Transformation applied to extract frequency spectrum information from three regions of the transformed audio. The three spectral regions were then compared.

4.1. Maintenance Test Flight Excerpt

The 19.133 second period from the Maintenance Test Flight is shown in figure 1, as extracted from the CAM before any transformations were applied. The three CDT periods annotated in figure 1 are:

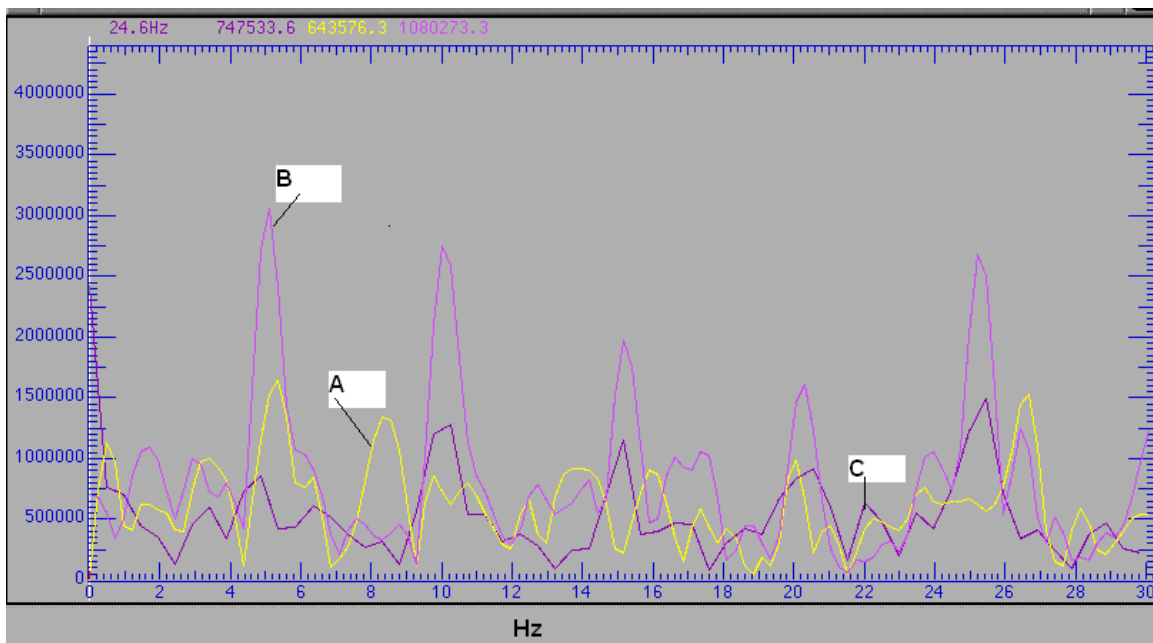
- Period A between 0042:54.9 and 0042:57.2;
- Period B between 0043:00.1 and 0043:03.1; and
- Period C between 0043:09.4 and 0043:11.4.

Figure 1. Maintenance Test Flight audio as extracted from the CAM.



The spectral analysis of each of the periods A, B, and C after demodulation is shown in figure 2. Period B shows 5 distinct peaks at approximate 5 Hz intervals to about 25.2 Hz. Period C shows peaks similar to Period B, of less intensity. The peaks of Period A are less defined compared to Periods B and C and are generally spaced less than 5 Hz.

Figure 2. Demodulation spectrum of Maintenance Test Flight.

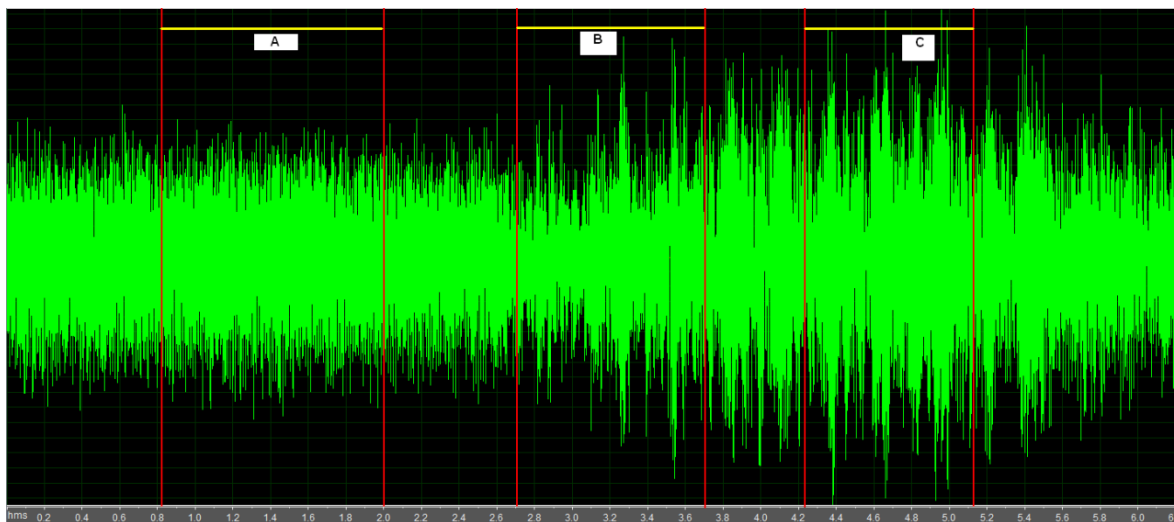


4.2. Accident Flight Excerpt

The 6.247 second period from the Accident Flight is shown in figure 3, as extracted from the CAM before any transformations were applied. The three CDT periods annotated in figure 3 are:

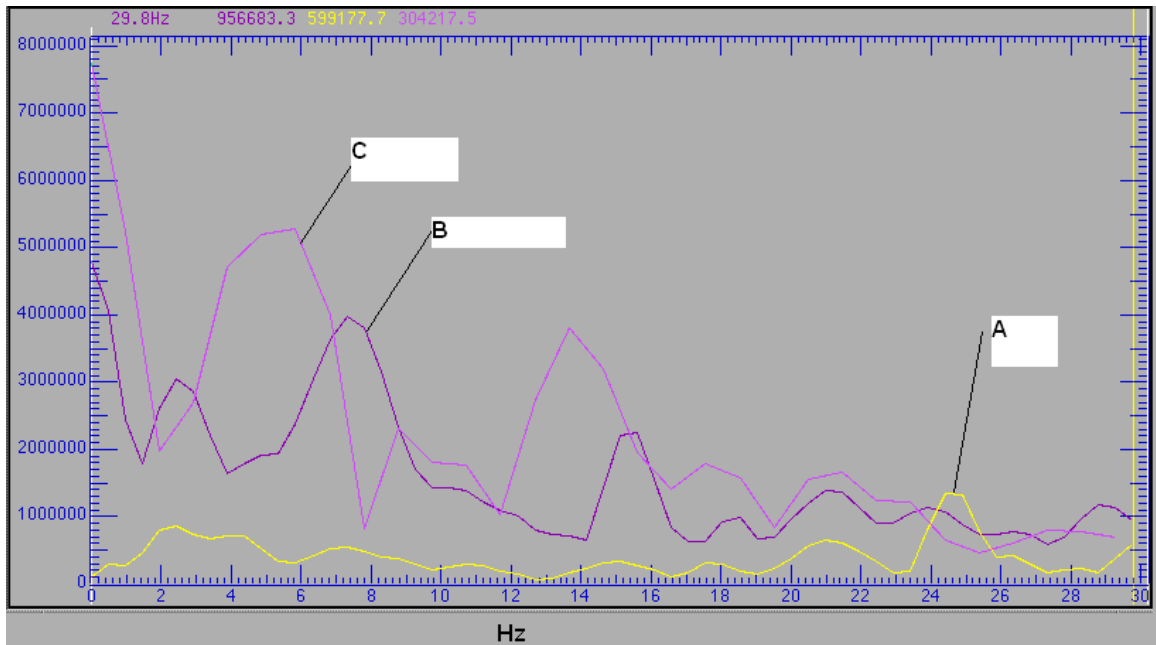
- Period A between 0601:47.3 and 0601:48.5;
- Period B between 0601:49.2 and 0601:50.2; and
- Period C between 0601:50.7 and 0601:51.6.

Figure 3. Accident Flight audio as extracted from the CAM.



The spectral analysis of each of the periods A, B, and C after demodulation is shown in figure 4. Period A shows a distinct peak at about 24.7 Hz. Periods B and C show distinct frequency peaks below 25 Hz.

Figure 4. Demodulation spectrum of Accident Flight.



4.3. Summary

The spectral analysis of the maintenance test flight and accident flight evidence frequency peaks below the expected 24.7 and 25.2 Hz at 100% Nr and 102% Nr, respectively. Period B of the maintenance test flight had the most pronounced low frequency peaks of all periods examined.