

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

December 10, 2003

Cockpit Voice Recorder - 12

Addendum 1 to Group Chairman's Sound Spectrum Study

A. ACCIDENT

Location: Belle Harbor, New York
Date: November 12, 2001
Time: 0917 Eastern Standard Time
Aircraft: Airbus A-300-600R, N14053
Operator: American Airlines
NTSB Number: DCA02MA001

B. GROUP

Chairman: James R. Cash
Electronics Engineer
National Transportation Safety Board

Member: Captain Rudy Canto
Director, Flight Operations Technical
Airbus Industries

Member: Philippe Plantin de Hughes
Safety Investigator
Bureau Enquêtes-Accidents (BEA)

Member: Captain Ray Hayes
A-300 Check Airman
American Airlines

Member: Jim Wilson
Manager of Flight Safety
Allied Pilots Association (APA)

C. SUMMARY

A certified cassette re-recording of the air traffic control (ATC) transmissions at New York TRACON Radar Departure, controller position N90, was examined to document the unknown audio that was identified on the official Federal Aviation Administration's (FAA) transcript at time 1415:51 UTC.

D. DETAILS OF INVESTIGATION

The good quality audio recording was examined in an attempt to identify the source of the unknown audio at time 1415:51 UTC. The audio recording was digitized and examined in the NTSB Audio Laboratory using signal processing software. Figures 1 and 2 depict the waveform signals of the last two radio transmissions from the accident aircraft. All of the following waveform plots depict the audio signal by showing relative signal intensity or loudness along the vertical axis and time (in seconds) along the horizontal axis. The spoken words are annotated at the bottom of the plots for reference. The time shown on the bottom of the plots is in elapsed seconds from the beginning of the digitized file. The radio transmission shown in Figure 1 was made starting at ATC transcript time 1415:11 UTC and radio transmission shown in Figure 2 was made at ATC transcript time 1415:42 UTC.

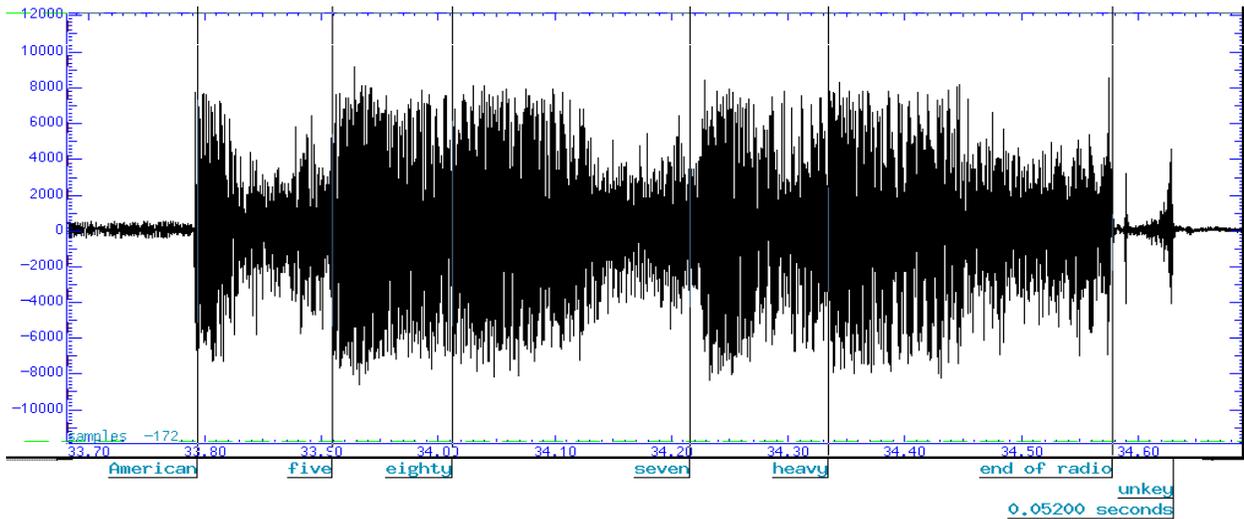


Figure 1: Waveform of radio transmission at 1415:11 UTC.

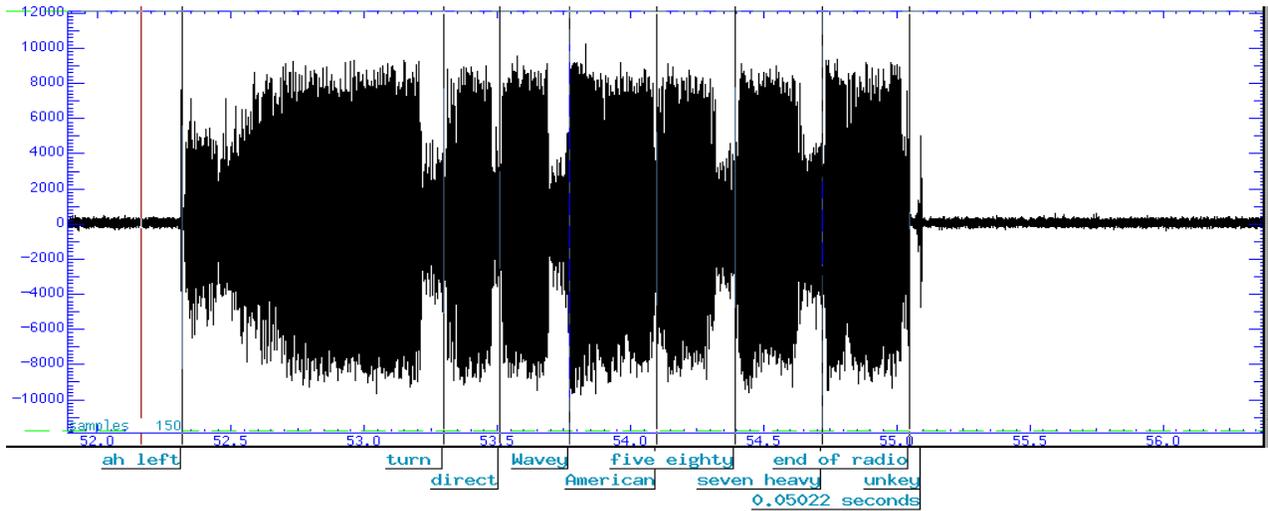


Figure 2: Waveform of radio transmission at 1415:42 UTC.

Both of the radio transmissions, shown in Figures 1 and 2, end with a unique microphone/transmitter un-keying characteristic. This can be seen more clearly in a time-expanded view of the end of the radio transmissions. Figures 3 and 4 depict the end of radio transmissions shown in the previous plots. Both figures were plotted with approximately the same time scale.

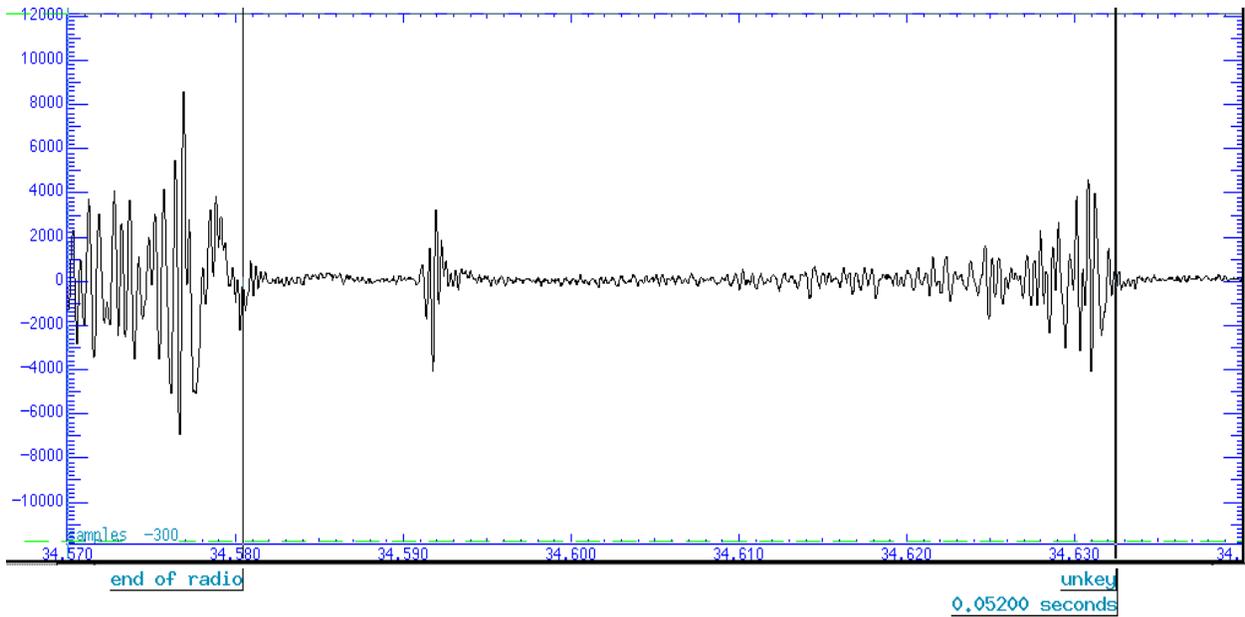


Figure 3: End of transmission (1415:11 UTC) - expanded time scale.

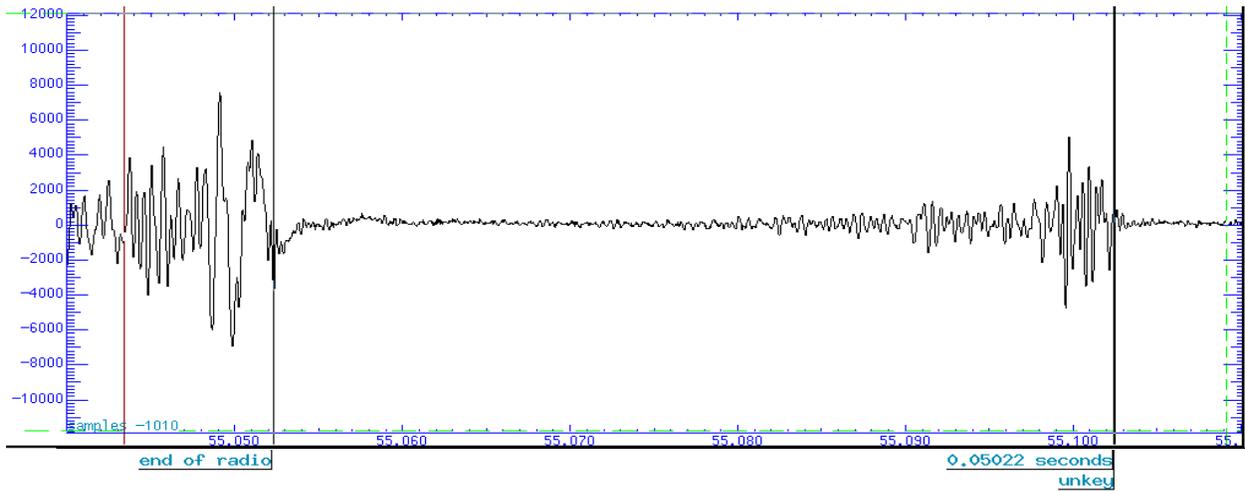


Figure 4: End of transmission (1415:42 UTC) - expanded time scale.

It can be seen that both radio transmissions end with the same un-key signature. The duration from when the radio stops to the final signature is 0.05 seconds long in both transmissions. Additionally the un-key's waveform signature is identical during the last 0.015 seconds of each transmission.

Other radio transmissions that were also found on the TRACON N90 cassette recording were examined to see if any other sources had a similar un-key signature. Figure 5 depicts the radio transmission from another aircraft, Baron N310C, recorded on the same frequency as American flight 587 in this time period (specifically at 1415:36 UTC). Figure 6 is representative of the TRACON N90 radar controller's transmissions. This radio call began at 1415:32 UTC. No other aircraft or ground radio transmission recorded on the cassette matched the distinctive timing and signature patterns shown in Figures 3 and 4.

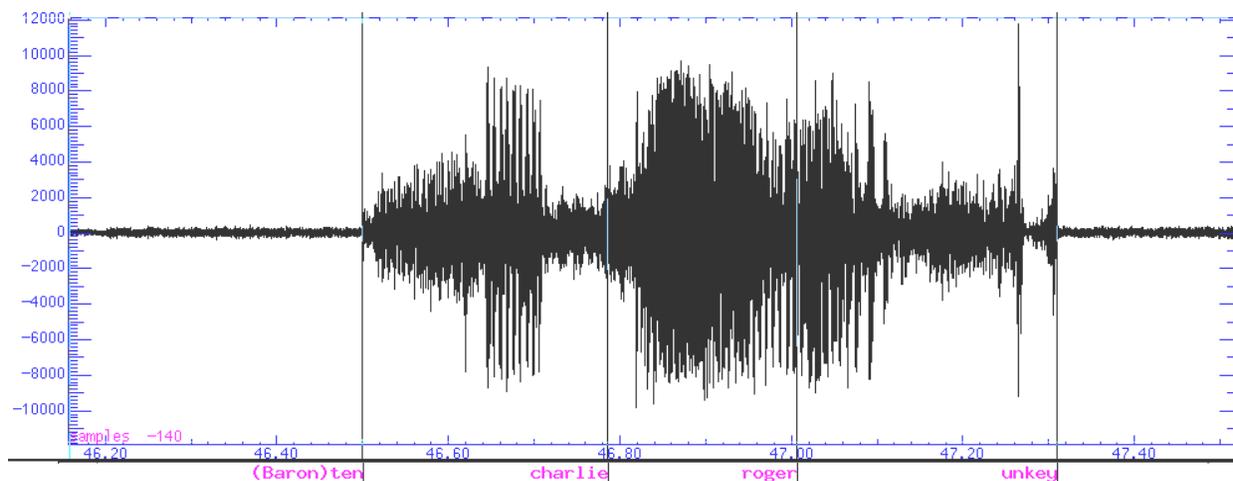


Figure 5: Waveform of transmission from Baron N310C at 1415:36 UTC.

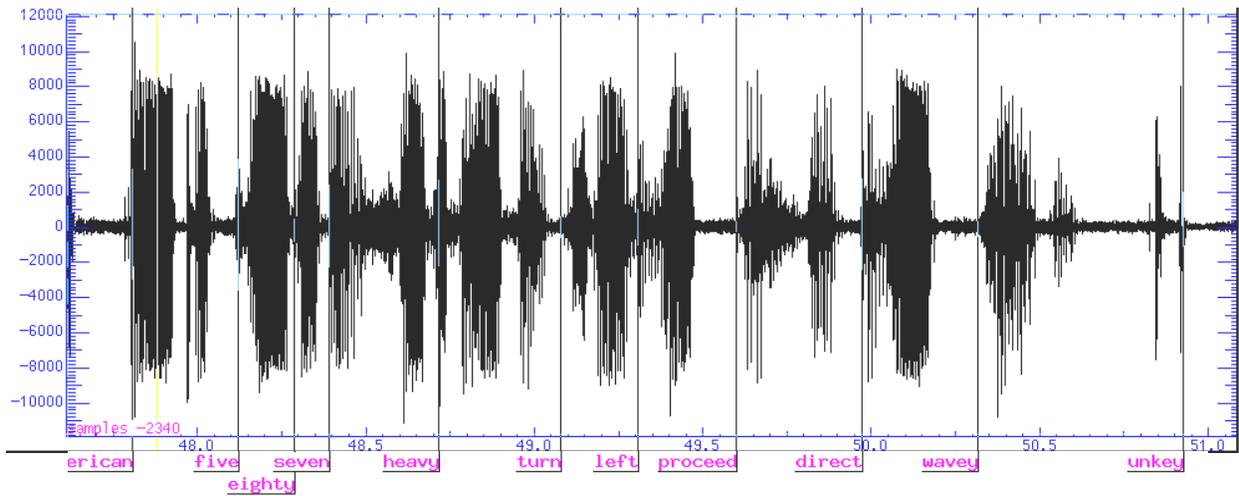


Figure 6: Waveform of transmission representative of N90 ATC controller (recorded at 1415:32 UTC).

The unknown audio recorded on the ATC cassette at time 1415:51 UTC is shown in Figure 7. The audio signals consist of three words spoken by what appears to be a female voice, identified on the FAA transcript as the local ATC controller at the JFK airport tower. This is followed by two words from what appears to be a male voice. Although there is no noticeable transition or pause between the female voice and the male voice, the two voices do not overlap or “step on” each other; the first voice stops and the second one begins, without any overlap.

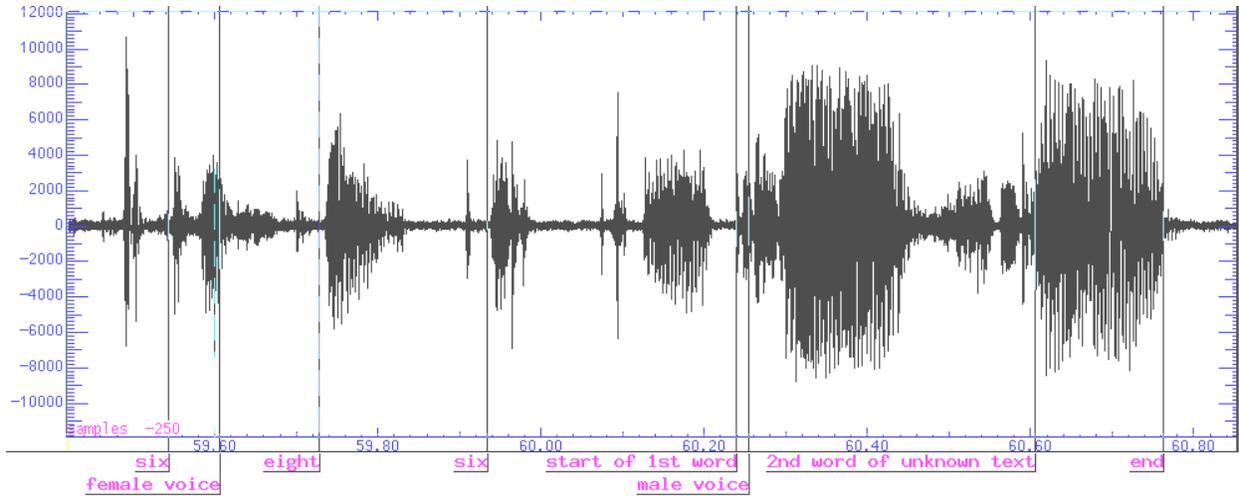


Figure 7: Unidentified audio at 1415:51 UTC.

Since there was no discernable end to the first part of the audio with the female voice, an un-key signature could not be identified. The end of the second part of the audio was examined. Figure 8 depicts the end section of the unidentified audio recorded at 1415:51 UTC. The time scale for Figure 8 is approximately the same as shown on Figures 3 and 4. It can be seen that the end of the unidentified audio does not match the end of the two previous normal radio transmissions that originated from the accident aircraft.

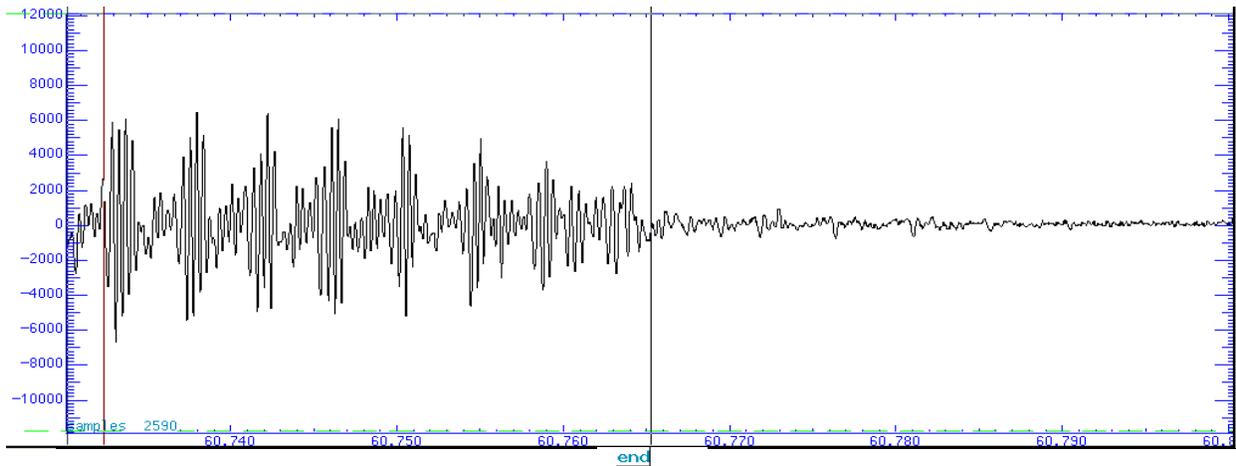
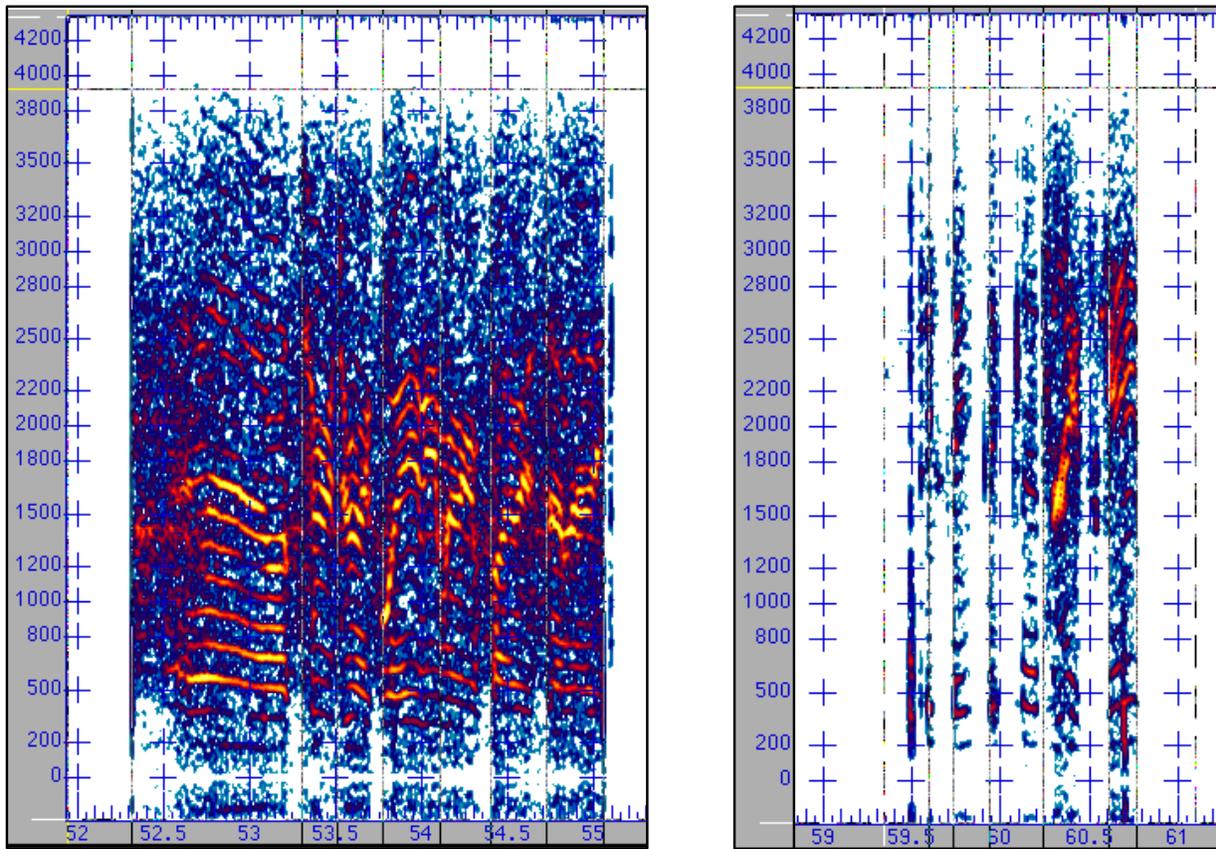


Figure 8: End of unidentified transmission - expanded time scale.

An additional means of looking at the radio signals was used. The last radio transmission from the accident aircraft and the unknown audio signature were analyzed by examining the frequency content of the signals. Figures 9a and 9b are the spectrograph plots of the audio. The two plots are depicted with the same time scale and the same energy scale. The plot shows frequency (hertz) along the vertical axis, time (in elapsed seconds) along the horizontal axis and energy of the signal shown by the various colors of the chart. Color on the spectrograph represents the relative magnitude of the energy of the signal—specifically, from low strength to high strength: white, blue, red, orange, yellow.



a. Figure 9: a.) Spectrograph of the American 587 transmission at 1415:42 UTC and b.) spectrogram of unidentified audio at 1415:51 UTC.

It can be seen from Figure 9a that there is considerable background noise in the radio transmission from the accident aircraft—this can be seen in the high concentration of random blue specks. The unidentified audio (Figure 9b) does not contain the same background noise that is seen in the American 587’s radio transmission. This fact is especially evident in the lower frequencies (toward the bottom of the vertical scale). In the accident aircraft’s transmission there is a significant amount of background noise present in the 200-1500 hertz range, but in the unknown audio signal there is a lower amount of background noise (blue color specks) in this same frequency region.

While the source of the unknown audio found on the recording could not be identified, it is highly unlikely that the unknown audio originated from the American flight 587 aircraft. This is based on the radio turn off or un-key characteristics and the fact that the low frequency background noise did not match the two previous radio calls from the accident aircraft.

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