

## The Hindenberg Flies Again...And Sounds Better

Most of us use Diamond Cut for restoration of music recordings. That's fine, but Diamond Cut can be used for so much more. In our forensic audio course, we teach the analysis of recordings so that we can not only hear what is happening, but also so that we can learn more about the recording.

As a fun exercise, we thought that you might enjoy analyzing a recording from a forensic audio perspective. For this example, we'll use a recording you have all heard - the audio report of the Hindenburg disaster.

If you'd like to perform this analysis, download the MP3 file here:

<http://www.historybuff.com/audio/index.html>

Just scroll down and look for the Hindenberg title. Where it says "click here to play recording", just right click and tell it to "Save Target As" Then copy it to your desktop so you can begin to work with it.

Now our first forensic lesson - we would always want to work with an original recording when possible. Original recordings have the most and the best audio in existence of the event we are studying.

However, the National Archives is unlikely to lend us the original recording so we'll use what we have. That's the way it is with even high profile forensic cases - we try to get the best we can, but we use what we have.

In this case, we have an MP3 file which is another big blow to us. MP3 files are not even audio files the way we normally think of them. To understand how MP3 does its magic (and its mischief!) we've covered this in our movie, **Audio: The Movie**. Suffice it to say that MP3s are good for music, but they are a definite problem in the forensic world. Still, it's what we have to work with, so we have to soldier on.

Next, we want to find out what we can as to how the recording was made. This is easy in this case. The Hindenburg crash occurred on the first voyage of its second season of flying to New York. The public was amazed and enthralled by this behemoth and the newsreels were full of pictures of the giant craft floating by the Manhattan skyline. Even in this second season, interest was still high and Chicago radio station WLS decided to send a reporter to cover the landing. The hook was this - the reporter, Herb Morrison and his engineer, Charlie Nehlsen brought along a "portable" recording machine in order to record Herb's description "live". In 1937, there was no magnetic tape, so the recorder was a Presto Disc Cutting machine. It actually cut grooves on a record.

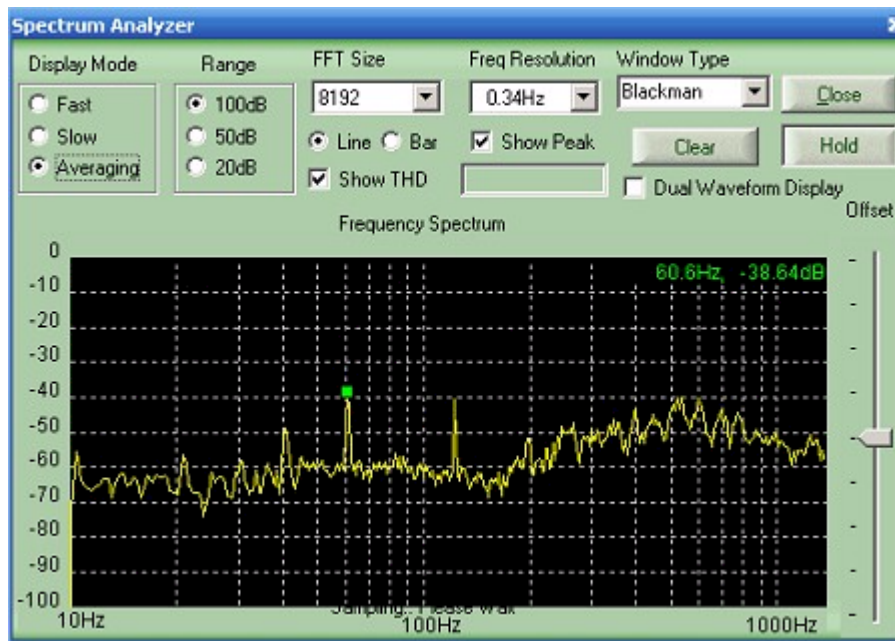
So now we know the machine that was used, the basic circumstances behind the recording and the types of technology involved.

Now, finally, we want to listen to the recording. Go ahead and open it in Diamond Cut. Remember, when you choose File/Open Source, you'll need to choose MP3 under the Files of Type box. This will cause Diamond Cut to convert it to a wave file.

Since we want to analyze this recording, we want to listen carefully with headphones or near field monitors such as you see here:

Most folks will want to focus on the noise of the recording first. What are the noises here? We have both a broadband continuous noise and a hum. The hum is quite annoying. With Diamond Cut, we want to start with our easiest tool, so we'll start with EZClean. This does a very good job with all three sliders at about 70 or so. You can hear it reduces the continuous noise a lot and also cuts the hum - but the remaining hum is still annoying.

So, now let's use something else. Let's use our spectrum analyzer to look at the hum and see what we have. Set the Spectrum Analyzer to high resolution the way you see here:



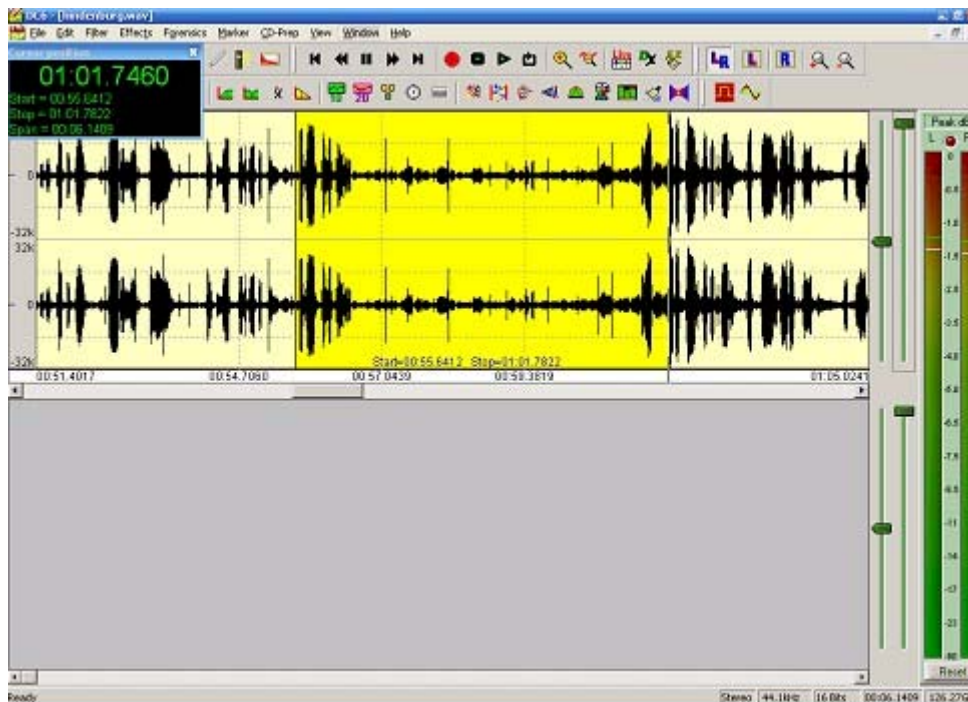
Notice the two hum signals - one at 60hz and another at 120hz. Aha! This is why our Ezclean only got half the hum - it works on Odd harmonics (which would be 60 and 180hz), while this is the more unusual even harmonics - 60 and 120hz.

Two notch filters will get rid of this noise! So grab your Multifilter and let's put in a couple of notches and the Continuous Noise filter and I think you'll find the file greatly improved as far as noise goes. Now we can listen.

Hmmm. Herb's voice sounds high pitched to me. This could be because this is the way his voice really is, or it could be because the recording is running a bit fast. How can we tell?

The answer is our 60hz signal. It reads 60.6hz in the spectrum analyzer so we may be a bit too fast. We would slow it down a bit if you'd like using the Change Speed tool in Diamond Cut. Slowing it down even more can help with understanding some words and we'll use that trick if we need to.

Now the last thing we'll note is the sharp drop in volume as he says "It burst into flames!" at about 56 seconds. If you zoom in, you can see the volume drop easily:



So how do we explain this? A mistake on the part of the engineer? Did Herb lose his voice, drop the mic or what?

The answer can't be found by looking at this recording, but the original record does tell the tale. At this exact spot, the needle dug deep into the record resulting in greater distortion and less signal. You can see this on the original record. This was caused by the great air pressure from the explosion itself. So this loss of volume is due to record damage caused by lathe pressing down too hard due to the overpressure from the Hindenburg explosion.

We hope you enjoyed analyzing this file in the way we might work on a forensic audio file. This is not CSI, but you can learn a lot about files with the tools in Diamond Cut. If you are interested in upgrading to the full DC Live Forensic version with many more forensic specific tools, just give us a call or click here.

<http://www.tracertek.com/khxc/index.php?app=ccp0&ns=prodshow&ref=dclive>