Enhancing the White House Tapes

Those Missing 18 Minutes

by George O'Toole

The headline on the *Washington Post* article read, "Tape Experts Say It May Be Possible To Restore Gaps." It was carried in the November 29 edition under the byline of John Hanrahan, and reported on his interviews with me and another former employee of the Central Intelligence Agency on the subject of restoring the 18-minute gap found on one of the White House tapes. I wouldn't (and didn't) call myself a "tape expert," but I am "a former CIA computer specialist," and it reported with perfect accuracy what I told the *Post* reporter. During the next 48 hours, I received a number of inquiries from various news media asking for additional information on how the missing 18 minutes might be restored, and several invitations from talk show producers to come on their programs and discuss the matter. I declined because, for one thing, there are the Espionage Acts and that famous CIA secrecy agreement; in my opinion, I didn't violate either in my statements to the *Post*, but it's difficult to keep from slipping over the line during repeated, detailed questioning about a matter that is closely related to national intelligence procedures. Secondly I did not want to give the impression that what I said *might* be feasible could *certainly* by done by good sound recording specialists. Finally I didn't want anyone to confuse the statements of a former CIA employee (I've been gone nearly five years) with an official pronouncement by the CIA or any other government agency.

Why then did I say anything in the first place? Because I doubted that anyone else who knew very much about this specialized subject would be likely to speak up. I know technical people. They tend only to answer the question they're asked and never volunteer anything more. Last May the Senate Watergate Committee interrogated James McCord, a former intelligence technician. McCord answered slowly and precisely, choosing his words carefully and never straying beyond the limits of the question he had been asked. After several days of this Senator Baker declared with some frustration that he felt McCord could tell the committee a great deal more than he had, if only its members knew the right questions to ask.

When I heard Senator Baker's comment, I remem-

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See last paragraph of this piece

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TILT!

O'Toole is guy who has told us lots about Hersh (and who tipped us off in 1st instance. But he may be may have maneuvered us into the Watergate thing, if those who dont believe the six tape experts have anything to say

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bered a meeting I attended some years ago at a government installation near Washington. A senior government official was trying to nail down the manager of a certain technical program and get a delivery date for a particular item that was needed. After several not very responsive responses from the technical man, the official said, "Look, I'm just trying to get a ballpark figure. Would I be far from wrong if I told the director this will be ready in six months?" The technocrat replied, "No, you wouldn't," and the official departed. I turned to the manager and expressed some amazement that he had promised delivery in six months on an item we both knew would take a minimum of 18 months to develop. The man looked at me evenly and said, "I didn't say that it would be ready in six months; I agreed that he wouldn't be far from wrong if he told the director that it will be ready in six months. If he tells the director it will be ready in six months, he won't be *far* from wrong, he will be *very close* to wrong. In fact, he will *be* wrong."

There wasn't even the hint of a twinkle in his eyes.

All I know about the White House tapes is what I read in the newspapers: that they are "of poor quality," that portions are "nearly inaudible," and that an important 18 minutes seem to have been erased. I also know that Judge Sirica appointed a panel of sound recording specialists agreed upon by the White House and the special Watergate prosecutor to answer such questions as: Were the tapes edited? Are they originals or copies? Was any one tape produced by two or more different recorders? Was the 18-minute gap the result of an accident? In other words, is the present condition of the tapes due to deliberate attempts to obstruct justice?

These are appropriate questions. But there is a more important question: can the present condition of the tapes be enhanced to the point where the inaudible portions are audible and, perhaps, even the erased 18 minutes restored?

I was gratified to read in the newspapers the day after the *Post* article that one of the court-appointed panel had announced that it might be possible to recover the missing minutes. I was disappointed to learn, when the panel made its preliminary report to Judge Sirica on December 13, that it had concluded that the missing portion probably could not be recovered (although this was "yet to be confirmed"). If the panel finally concludes that the gap is beyond restoration, I would not doubt that they had made their best efforts and failed [As we go to press the report of the technical experts is said to be imminent—*The Editors*]. However I would like to offer the layman a nontechnical explanation of enhancing tape recordings.

To begin with there is a security rule observed by the Department of Defense and other government agencies handling information relating to national security, which says that if a magnetic tape recording has highly classified information, that tape cannot be declassified simply by recording unclassified information over the classified data. Implicitly then, it might be possible to recover the classified information even after it had been "erased" by the process of re-recording.

Security people have developed, to very rigid government specifications, "degaussers,"* which are powerful electromagnets that can obliterate even the faintest latent trace of recorded information from a tape. The use of degaussers on computer tapes is standard security practice in the defense and intelligence communities.

Some years ago a government computer installation that processes highly classified data installed a computer which stored information on magnetic disk devices. The surfaces of these disks are coated with the same kind of material as magnetic recording tape and, except for their geometry which makes them more efficient, these devices are in effect magnetic tapes.

The computer system, including the disks, was rented by the government from the manufacturer, with a view toward later upgrading to a different computer system. The rental on the disk devices was $600 per month per disk device, and there were many disk devices in the system. After a year or two the computer installation manager decided to make his move up to a larger system, and wanted to return these rented disk devices to the manufacturer along with the rest of the old equipment. There was one hitch, however: the security people had degaussers for computer tapes, but because of the different geometry of the disk devices, there was nothing available to erase all the classified information on the disks to their satisfaction. The manager had no choice but to buy the disk devices that the government had rented for so many months, and store them away in a vault. A staggering amount of money was involved, and I am sure that this particular security rule was given very careful review before the decision was made that the disk devices could not be turned back to the manufacturer.

So much for the *possibility* of restoring erased information. Let's take a look at the *how* of doing it. In principle it is a very simple matter. The tape is nothing more than a strip of plastic coated on one side with a finely powdered metal that can easily be magnetized and demagnetized. The vibrations in the air, i.e., the sound, are transformed into electrical vibrations by a microphone, and leave a magnetic trail in the powdered metal coating on the strip of tape as it moves past an electromagnet. When the tape is again moved past the electromagnet, the magnetic trail—the signal—repro-

*A reference to the basic unit of magnetic field strength; the Gauss, named after Johann Karl Friedrich Gauss, a German mathematician and physicist.

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duces those electrical vibrations, and they in turn are amplified and transformed back into sound by a loudspeaker.

The situation becomes a little more complicated when we want to reuse the tape—to replace the magnetic trail that's already there with a new one. If we simply repeated the process, we then would have two trails on the tape, and when we played it, we would hear both the new and the original sound. Therefore a tape recorder must first pass the tape over another electromagnet to remove the original signal before it puts a new magnetic trail on the tape. This electromagnet is called an *erase head*, and the other electromagnet—the one that actually puts the sound signal on the tape, and also picks up the sound signal again when the tape is played back—is called the *record/playback head.*

For reasons that are too technical to go into here, the erase head does its job by recording a very high frequency signal on the tape—something on the order of 80,000 cycles per second, which if the tape recorder could transform into sound (and it can't), only bats and dolphins could hear. Once the tape is past the erase head, this new signal has rendered the old signal inaudible, i.e., so weak that were it moved past the record/playback head, it would not produce an electric current that could be amplified into sound again *by conventional tape equipment.*

If the designer of the tape recorder wanted to ensure that the old signal was *totally* erased, he could do so by making the erase signal so powerful that it removed even the faintest latent trace of the old signal. Designers don't do this because the design requirement of an audio tape recorder's erase head is merely that it render the original signal inaudible. Designing an audio recorder with an erase head that removed every trace of the original signal would be "overdesigning." It would make the recorder more expensive to manufacture, but no more valuable to the consumer. The average consumer, that is.

If all this talk of latent magnetic signals and erase heads has put off the nontechnically inclined, let me offer an analogy. Imagine the kind of long blackboard that spans the front wall of a large classroom. Imagine also that someone has written one long sentence from the leftmost end of the blackboard, extending all the way to the rightmost end. Call this sentence the original signal. Now let's suppose that I wish to replace this sentence with another one. To save time, I have an assistant with a chalk eraser walking a few feet ahead of me, erasing the original signal from the blackboard. Then I follow along and write the new signal. Functionally, this is how a tape recorder erases one sound from a tape and records another sound in its place. But the chalk eraser does not always completely remove the writing from the blackboard. Often we can read the "latent signal" afterwards, and sometimes we can make it out *even after someone has written over it.* (As a matter of fact, a photographer could probably recover such a latent signal from a blackboard by using infrared film, or even ordinary black and white film printed on high contrast paper.) The chances of recovery would depend on: 1) How hard the person who wrote the original sentence was pressing on the chalk (strength of original signal), 2) How hard my assistant was pressing on the chalk eraser (strength of erase signal), and 3) The relationship of the size and shape of my handwriting to the size and shape of the handwriting of the original sentence.

This third factor needs some explanation. Visualize this classroom situation and imagine that the original writing was in a small hand, with the words and letters close together, and further imagine that my own handwriting—which is covering the erased trace of the first sentence—is large, with large spaces between words and letters. Obviously the portions of the latent signal lying in those large spaces have not been further obliterated by the new handwriting.

Now to draw the 18-minute gap in the White House tape into an analogy, we have the original handwriting (the conversation between President Nixon and Mr. Haldeman regarding Watergate matters), the assistant with the chalk eraser (the erase head on Rose Mary Woods' Uher 5000 tape recorder), and the new handwriting (the strange hum or buzz that was recorded over the original conversation). Apart from the strength of the Uher erase signal (which, as previously noted, is probably insufficient to completely obliterate the latent traces of all previously recorded signals), the factors affecting the chance of recovering the missing 18 minutes are not yet known, i.e., how strong the original signal was (some reports say that President Nixon and Mr. Haldeman can be plainly heard just before the hum begins), and the shape of the mysterious hum. We cannot, therefore, say how likely it may be that the presidential conversation can be recovered, but we can engage in some informed speculation.

The strength of the original signal would depend on how close Haldeman and the President were standing to the microphones during the 18 minutes. They may have walked around the room during that interval, but we would expect the strength of the signal at the beginning of the gap to be about the same as it is in the unerased portion immediately preceding it, and vice versa for the last minute or two of the missing 18.

The shape of the new signal—the mysterious buzz or hum—is more difficult to guess at, but the use of those words, rather than "screech" or "whistle" to describe it, is encouraging. A hum sometimes gets into equipment by one route or another, and the source is often the 60 cycles of the alternating current that powers the equipment. If the mysterious hum is a 60-cycle a.c. hum, then there is no problem. It is below the normal range of human voices, which goes from

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85 cycles up to 1100 cycles per second. In other words the new handwriting left a lot of blank spaces for the latent image of the old handwriting to show through. Better yet, the mathematically simple shape of the 60-cycle a.c. signal makes it possible simply to strip it from the tape by means of electronic filtering techniques.

In any event there is some solid reason to hope that the latent magnetic record of the President's chat with Mr. Haldeman may yet be on the tape or, to use my classroom analogy, the handwriting may still be on the wall. But assuming the latent signal is found, how can it be transformed into audible sound?

If you take a fresh reel of tape from its carton, put it on your recorder and play it, you will hear nothing—except a hiss. The technical term for the hiss is "noise." To an engineer any electronic communication medium (including tape) contains just two things: signal and noise. Signal is what you want to hear and noise is what you don't. Nonetheless the noise is always there, random electrical impulses that carry no information. Tape recorders (and other electronic communication instruments) work because it is possible to make the signal very much stronger than the noise, so when you listen to a recording you don't usually hear the noise because the signal—the music or speech—is so much louder.

The function of the erase head, as described earlier, is to drive this signal down to the point where it is almost no stronger than the noise. If a latent trace of the presidential conversation remains, some means will be necessary to "pull" the signal back up out of the noise.

The problem will, in fact, be very similar to that encountered by NASA in receiving video signals from deep space probes such as the Mariner series. Many of us have seen the television pictures of the surface of the planet Mars sent back by the Mariner spacecraft. A few of us have also seen some of these same pictures in the form they were first received, before they had been subjected to a computer process known as "image enhancement." The unprocessed pictures were extremely faint, as though they had been taken through a thick fog. Only vague outlines of Mars' surface features could be distinguished, and some of the pictures appeared at first glance to be completely blank. After image enhancement, craters, chasms, mountain ranges and a variety of other details were visible in nearly perfect clarity.

The television signal from Mariner, after crossing millions of miles of interplanetary space, was faint. It was not very much stronger than the noise that accompanied it as it was picked up by those giant antennas in the Southwestern desert. In order to transform it into a useful picture, some means—image enhancement—had to be used to "pull" the signal back up out of the noise. And those means were dramatically effective.

How the trick was done is a little difficult to explain, but I shall attempt to do so through another analogy: the color vision test. The test consists of some 20-odd black cards. Each card bears a circle, within which there are many dots of different colors. The subject is shown the cards and is asked if he can see the outline of a number. The numeral is formed by a series of dots which seem to stand out from the background and can be connected up by the eye. These dots are "signal," and the other surrounding dots are "noise."

Someone who is slightly color-blind will fail to make out a few of these numbers because the retinas of his eyes fail to distinguish among slightly different hues of the same color. He is not able to separate the "signal" from the "noise." However if someone else with perfect color vision marked each of the dots forming the number with an "x," the color-blind person would soon be able to see the pattern for himself. The signal would have been enhanced and separated from the noise. This analogy takes some liberties with the color vision test in order to convey only a partial understanding of the signal enhancement process, but it serves to illustrate the basic principle involved.

Now, an audio signal and a video signal are alike in that both are electronic signals carrying information. But they are different in that the video signal is much more complicated than the audio signal (the inside of your television set is so much more complicated than the inside of your radio). It would follow, then, that the problem of enhancing a faint audio signal must be a great deal simpler than that of enhancing a faint video signal.

Where does all this leave us? In the matter of recovering those lost 18 minutes we come up with a big "maybe." There is, at least, some substantial reason to hope the missing conversation can be restored, although it is an iffy proposition. Regarding the rest of the tapes, which are "of poor quality," or "nearly inaudible," I think there is every reason to expect that the technical resources of our government are adequate to the task of enhancing them to the point where they are of good quality and completely audible.

When the Secret Service "bugged" the White House, it did so with the full knowledge and cooperation of the occupant, an unusual circumstance for an audio surveillance operation. And yet the results were "of poor quality," and "nearly inaudible." Yet this must be an old, familiar problem to the intelligence community. And since they continue to use audio surveillance so much, one might conclude that they have come up with some pretty good solutions to it. I am an expert in neither sound recording nor signal enhancement, and if someone dumped the White House tapes in my lap and said, "All right, enhance them!" I couldn't do it. Not by myself. But I know the people I would ask for assistance.

They work for the government.