

# HOW THE TAPE SLEUTHS DID IT

How did the experts decipher the gap in the tape?

Since late November, the six-man panel of audio technicians has spent the equivalent of 200 to 300 man-days in labs in six states, studying the mysterious eighteen and a half minutes of buzzing with sophisticated tools ranging from computers and spectrographs to statistical analysis. Last week, they turned a Washington courtroom into a makeshift physics lecture hall—and when the technical sleuths were done, the evidence scattered along the nearly 98 feet of erasures seemed almost as conclusive as fingerprints dusted by detectives.

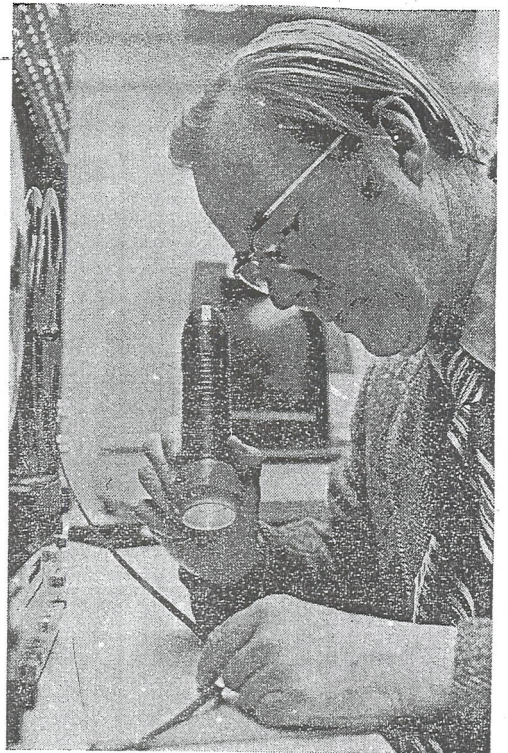
The key to the experts' findings, said spokesman Richard H. Bolt, chairman of an acoustics laboratory in Cambridge, Mass., was a laboratory technique known as development, in which the recording tape is washed in a fluid containing a suspension of minute ferrite particles. As the liquid dries, the particles cling to the magnetic impressions on the tape itself, making those impressions visible.

The most conspicuous of these markings—called signatures by the experts—are left on the tape by a machine's recording and erasure heads. When the machine is recording, the two small electromagnets are in contact with the tape; the erasure head removes any prior sig-

nals before the recording head leaves new ones. By disconnecting the microphone, the recording mode can be used for simple erasure. But pressing the STOP, START, FAST FORWARD or REWIND buttons turns off the erase-record mechanism and ends both processes. To prevent mishaps, erasures can be made manually only by pressing two buttons—START and RECORDING—simultaneously.

Most significant in proving the multiple erasures was the signature of the erasure head of the Uher 5000 tape recorder used by Rose Mary Woods—four parallel lines running about 3 millimeters across the width of the tape. The mark is left on the tape whenever the recording mode of the machine is manually shut off, causing a sudden electric pulse to shoot out around the edges of the erasure head. Since five of these signatures were found along the length of the tape, the experts concluded that somebody—on at least five different occasions—started and stopped erasing manually.

**Chart:** The experts discovered nine other, equally distinctive signatures which result whenever the recording mode is begun, causing the recording head to come into contact with the tape. This leaves a single line 2½ millimeters long. Since the experts could pair at least five of these beginning signatures with



Dan Bernstein

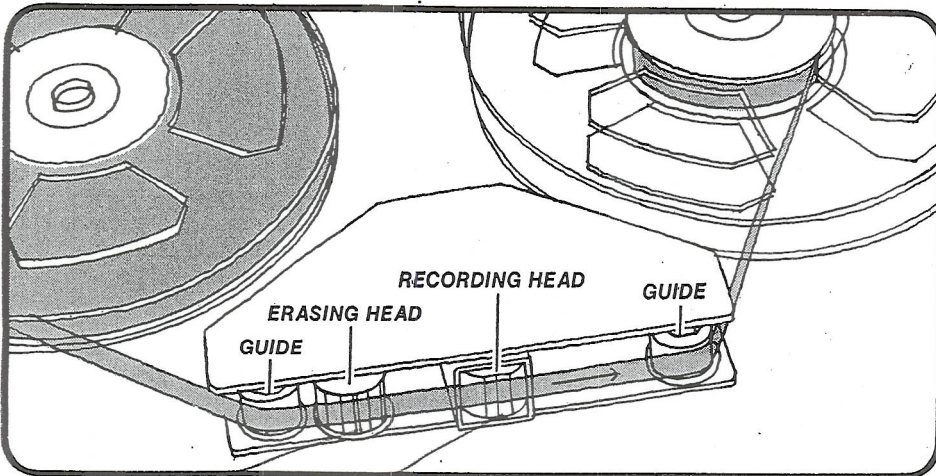
**Bolt:** A case for development

the motion of the tape and does not deactivate the erasure head. If the tape were erased—as the White House and Miss Woods suggested—by accidental pressure on the foot pedal while the recording button was engaged, the characteristic signature would not be found at any point during the erasure.

There were three small fragments—the longest lasting 1.2 seconds—of speech-like sound on the tape. The segments of tape containing the fragments apparently had been moved past the machine's erasure head when its power was turned off—perhaps when someone tried to back up and resume erasing. As a result, the speech was preserved but buried beneath the buzzing sound.

**Rectifier:** The buzz was traced to pulses on the household power lines, picked up either because of a faulty diode bridge rectifier—a component in the amplifier system—or because a ground wire was improperly fastened. After the recorder broke down during testing, and the rectifier was replaced and the ground wire tightened, the experts were unable to duplicate the buzz. Similar Uher machines tested by the experts would not produce the sound, and efforts to pick it up from Miss Woods's Tensor lamp or electric typewriter—early suspects in the problem—also failed.

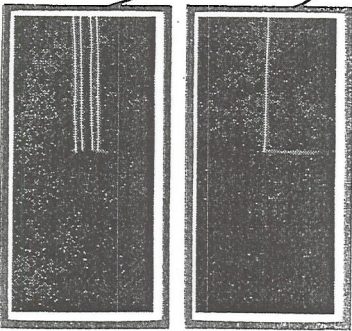
The major evidence that it was Miss Woods's Uher 5000 that recorded the buzz came in analysis of what the experts call flutter, or electronically measurable variations in frequencies left on the tape by the idiosyncrasies of a particular machine. The experts said the sound patterns made by Miss Woods's machine "much more closely matched" those on the tape than did any other White House machine.



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five corresponding ending signatures, they were able to chart five uninterrupted segments of erasure. Four of the beginning signatures could not be paired with ending signatures, leading the panel of experts to conclude that someone had rewound the tape to a point somewhere within the previous erasure segment and erased the ending signature in the next segment.

Beyond any doubt, the technicians said, the erasures could not have resulted from the accidental use of the machine's foot pedal. Unlike the four buttons on the Uher 5000 which when pressed make the erasure head leave its signature, the foot pedal controls only



Photos by Robert R. McElroy—Newsweek

**The Uher 5000:** The recording and erasing heads, and their 'signatures'