

# INVESTIGATION OF THE ASSASSINATION OF PRESIDENT JOHN F. KENNEDY

TUESDAY, SEPTEMBER 12, 1978

HOUSE OF REPRESENTATIVES,  
SELECT COMMITTEE ON ASSASSINATIONS,  
*Washington, D.C.*

The select committee met, pursuant to adjournment, at 9:15 a.m., in room 345, Cannon House Office Building, Hon. Louis Stokes (chairman of the select committee), presiding.

Present: Representatives Stokes, Devine, Preyer, McKinney, Sawyer, Dodd, Ford, and Fithian.

Staff present: G. Robert Blakey, chief counsel and staff director; Michael Goldsmith, senior staff counsel; and Elizabeth L. Berning, chief clerk.

Chairman STOKES. A quorum being present, the committee will come to order.

The Chair recognizes Professor Blakey.

## NARRATION BY G. ROBERT BLAKEY, CHIEF COUNSEL

Mr. BLAKEY. Thank you, Mr. Chairman.

Bullet trajectory has become a matter of considerable debate in the Kennedy assassination, for it, too, goes, as the testimony has indicated, to the heart of the issue of whether a single bullet wounded both the President and Governor Connally. It also locates the position of the assassin or assassins whom the medical evidence indicates hit their target.

The Warren Commission reasoned that an accumulation of medical and ballistics evidence demonstrated that the shots were fired from the sixth floor of the Texas School Book Depository. Its approach to the line of fire issue, therefore, was simply to determine that trajectory data was consistent with their ultimate conclusion.

On May 24, 1964, the FBI and Secret Service agents conducted a series of tests, reconstructing trajectories. Using the Zapruder, Nix, and Muchmore films, they were able to fix the locations of the Presidential limousine and its occupants. An FBI agent was positioned in the southeast corner window of the sixth floor of the Texas School Book Depository with the Mannlicher-Carcano that had been identified as having belonged to Lee Harvey Oswald.

Mounted on a tripod was a motion picture camera attached to the telescopic sight that viewed the target area precisely as the assassin would have seen it had he used the telescopic sight. The position of the limousine, as it corresponded to each frame of the Zapruder film, was recorded.

The agents observed that at frame 166 of the Zapruder film, the President passed behind the foliage of an oak tree, and but for a fraction of a second at frame 186, he did not move into an assassin's view until frame 210. This led the Commission to accept the probability that the President was not shot before frame 210. The assassin, the Commission reasoned, would have waited until after frame 210, at which point his view was again unobstructed.

At frame 210, however, Abraham Zapruder's view of the President was blocked by a highway sign, and the President did not emerge from behind the sign until frame 225, just short of a second later.

Although the Commission was unable to fix the exact time point the President was first hit, it was able to determine that it was during the period he was behind the sign. The Commission thought he showed no sign of injury before frame 210; he was obviously hit at frame 225. It should be emphasized, however, that there is no photographic evidence recording the precise instant of the first hit to the President.

Still, the Commission proceeded to plot the trajectory of the first shot to hit the President by assuming the position of the limousine to be between frames 210 and 225. At each intervening frame, the FBI agent at the sixth floor window lined up the telescopic sight on the points of entry wounds marked on stand-ins for the President and Governor Connally seated in the limousine.

The next step was to have a surveyor place his sighting device at the precise point of entry on the President's upper back for each frame of the Zapruder film. The surveyor then measured the angle to the muzzle of the rifle in the sixth floor window of the Texas School Book Depository. The measurements were averaged, and, taking into account the downward grade of the roadway, the probable angle through the President's body was calculated at 17 degrees 43 minutes 30 seconds, assuming he was sitting in a vertical position.

The Commission then concluded that this angle was consistent with the trajectory of a bullet that would have passed through both the President's neck and struck Governor Connally in the back.

The critics have decried the Commission's trajectory for the fact that it assumes the shot came from the rear. Here are examples of their commentaries:

Mark Lane in his "Rush to Judgment": The Commission

\* \* \* employed the unproved assertion that the bullet which struck the President came from the rear as the basic premise to prove that it "probably" hit Governor Connally as well.

Sylvia Meagher in her "Accessories After the Fact": The Commission did not give

adequate consideration to the possibility of assassins at locations other than the window or the overpass \* \* \*. There is a considerable body of evidence suggesting that shots were fired from the grassy knoll \* \* \*

Josiah Thompson in his "Six Seconds in Dallas" attempted a trajectory analysis and decided that there were four shots from three locations—two from the depository, one from the east side of Dealey Plaza, one from the stockade fence north on Elm Street.

It would seem that the critics have at least one point in their favor in attacking the Commission's analysis. The analysis assumes the firing position of the assassin as a known, then proceeds to compute the angle to the target. The objective was to verify that the resulting trajectory was consistent with the assumed position of the gunman.

The committee, however, has taken a different approach. It decided to take the entry wounds to the President and Governor Connally as the starting points in its calculations and work outward from there. It was hypothesized that, given a margin of error, the trajectory out from the limousine would lead to the position of the assassin.

The committee in part based its trajectory analysis on the location of the entrance and exit wounds supplied by its medical panel, and it relied on the evidence obtained from photographic and acoustical analysis. Since the trajectory study was underway well before the acoustical analysis was complete, data on the sound of shots was available only in the latter stages of the line-of-fire survey. It is likely, therefore, and it should be emphasized, that the final trajectory analysis may well be modified somewhat in order that the final results of the acoustical analysis might be incorporated.

Consequently, the testimony that you will hear today is preliminary in the sense that it has not yet incorporated the material from the acoustical analysis.

For the photographic phase of the survey, the committee called on 15-odd-man photo scientists who served either as contractors for the committee or as members of its photographic panel.

At a recent conference, they reviewed the Zapruder film from two standpoints, first: They sought to pinpoint when the President and Governor Connally first visibly reacted to being hit by shots. Second, they tried to determine whether the relative position of the two men at the moment Kennedy was probably first hit was consistent with the single bullet analysis or hypothesis.

The photo scientists who did the review represent a broad range of experience both academic and industrial. Their work for the committee has been extensive since, as the presentation on opening day indicated, the photographic issues in the Kennedy assassination are many and complex.

A member of the photographic evidence panel, Mr. Calvin McCamy, is here today to testify on part of the trajectory analysis that utilizes the Zapruder film. He will also discuss the photogrammetric technique that was used to locate precisely the position of the limousine at the time the shots that struck the President and Governor Connally were fired.

Mr. McCamy received a B.S. degree in chemical engineering and a M.S. degree in physics from the University of Minnesota. He has taught mathematics at the University of Minnesota and physics at Clemson University. He has been the Chief of Image Optics and Photography with the National Bureau of Standards. Currently, he is with the Macbeth Division of Kollmorgen Corp.

Mr. McCamy serves as chairman of the American National Standards' Working Group on Print Quality for Optical Character Recognition, chairman of the American Society of Photogrammetry

Standards Committee, and adviser to the U.S. delegation to the International Organization for Standardization Committee on Photography.

Mr. McCamy is a fellow of the Optical Society of America, the Society of Motion Picture and Television Engineers, and the Society of Photographic Scientists and Engineers. He serves on the editorial review boards of several technical journals and he has authored numerous papers on photography, color printing and other aspects of chemistry and physics.

It would be appropriate now, Mr. Chairman, to call Mr. McCamy.

Chairman STOKES. The committee calls Mr. McCamy.

Sir, will you stand, raise your right hand and be sworn.

Do you solemnly swear the testimony you will give before this committee will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. McCAMY. I do.

Chairman STOKES. Thank you.

You may be seated.

The Chair recognizes counsel for the committee, Mr. Michael Goldsmith.

Mr. GOLDSMITH. Thank you, Mr. Chairman.

Mr. McCamy, for what purposes were the photographic evidence panel and contractors asked to review the Zapruder film at its most recent conference?

#### TESTIMONY OF CALVIN McCAMY

Mr. McCAMY. Our first purpose was to ascertain from the photographic evidence, if possible, the first signs that the President or Governor Connally were in distress. The second objective was to ascertain from the photographic evidence, if possible, whether or not the President and the Governor were in positions in the limousine that would be consistent with the single bullet theory.

Mr. GOLDSMITH. How many panel members actually participated in the review of the Zapruder film, Mr. McCamy?

Mr. McCAMY. There were about 20 people altogether. The films were viewed many times in many sessions. They were not all present at all times. When we voted on specific issues, about 15 people voted.

Mr. GOLDSMITH. And did you view any particular version of the Zapruder film?

Mr. McCAMY. Yes; we had a copy, a direct copy, of the Zapruder film. We also had special films that were prepared by Mr. Groden.

These were rotoscoped, which means that they were slightly enlarged and stabilized.

Mr. GOLDSMITH. Does a rotoSCOPE version of the Zapruder film facilitate analysis?

Mr. McCAMY. Yes, it gives you a closer view, and as I said, it is stabilized, so, it seems to be more stable on the screen.

Mr. GOLDSMITH. Now how many times was this film viewed by the panel?

Mr. McCAMY. That is very hard to say, because we would look at a scene and attempt to determine what was happening, go back, look at it again, and then again and again. We have looked at it for