

I would say only one thing, I have never worked with a group of individuals, and I am speaking now of the staff of the committee, that have shown any more consideration and kindness to me than this group. You have all made me feel very much at home, very much a part of Government, and I appreciate it very much.

You are extremely courteous, kind and I have enjoyed my brief stay here. Thank you.

Chairman STOKES. We certainly want to, once again, thank you for having lent yourself to the service of the U.S. Congress and to the American people. You certainly, in a very articulate way this morning, have been extremely helpful to this committee, this panel. We thank you very much for your service.

Dr. PERRY. Thank you, Mr. Stokes.

Chairman STOKES. The Chair recognizes Professor Blakey.

NARRATION BY G. ROBERT BLAKEY, CHIEF COUNSEL AND STAFF DIRECTOR

Mr. BLAKEY. Thank you, Mr. Chairman.

Mr. Chairman, so far this week, the committee has heard testimony relating to President Kennedy's trip to Texas, the nature and extent of his wounds as well as those inflicted on Governor Connally, the number of bullets that struck President Kennedy and the direction from which they were fired.

For the rest of today, testimony will be taken from experts in the general field of ballistics, specifically including: One, an expert in wounds ballistics, or the science of bullet effects on the human body; two, a panel of experts in firearms analysis; and, three, an expert in neutron activation analysis, which is a method of analyzing bullet or other samples for their trace element characteristics, which makes possible conclusions about the probability of common origins.

It may be helpful before hearing from these experts, however, to review or to set out several of the issues that the committee will be examining today.

First, what is the validity of the single bullet theory? That is, did the slightly damaged bullet that was recovered and marked by the Warren Commission as exhibit 399 traverse the President's neck and cause all of Governor Connally's wounds?

Second, what is the best explanation for the apparent rearward movement of the President's head at the time of the fatal shot, as it is portrayed in the Zapruder film.

Third, what are we able to determine about the rifle found on the sixth floor of the Texas School Book Depository and identified as the one used to assassinate President Kennedy, as well as the revolver found at the scene of the murder of Dallas police officer J.D. Tippit?

Finally, what can our firearms experts tell us about the bullets fired in the Kennedy assassination and the Tippit murder in terms of type, number of bullets fired on, and so forth?

Since the turn of the century, when it first became possible to photograph bullets in flight, scientists have been collecting data on the trajectory and stability in flight of bullets. A highly specialized area in this general field of ballistics has been developed in recent years. It is a science of what occurs to a bullet when it strikes,

enters, and traverses a human body. It is called wounds ballistics and there are two important aspects of it here.

First, the determination of the factors involved in the potential of a projectile to cause injury, namely, its velocity, shape, momentum, energy and power; and second, the determination of the nature of the damage to tissues as a result of a projectile striking a human body.

The Warren Commission ordered wounds ballistics experiments in an effort to determine if the wounds to President Kennedy and Governor Connally could have been caused by the Mannlicher-Carcano rifle allegedly found in the book depository.

The tests were conducted by the Wounds Ballistics Branch of the U.S. Army Chemical Research and Development Laboratories at Edgewood Arsenal, Md. The Army measured the penetrating power and flight stability of the bullets fired by the Mannlicher-Carcano and it simulated the wounds to President Kennedy and Governor Connally by shooting anesthetized goats and materials that replicate the human body.

In part, as a result of these tests, the Commission concluded: One, that Governor Connally's wounds were caused by one bullet and that the bullet that traversed the President's neck probably then proceeded to inflict all of the wounds to Governor Connally.

Two, that a bullet fired from the Mannlicher-Carcano rifle at a distance of approximately 270 feet would cause a wound similar to the wound discovered in the President's head.

The committee has analyzed the reports of the tests at Edgewood. It also considered having a series of its own tests conducted. Rather than ask the Army to do additional experiments, it solicited a proposal from a private contractor, H. P. White Laboratory of Bel Air, Md. The company expressed its professional view that efforts to replicate the assassination would always be subject to theoretical questioning, since no material reacts in the exact manner of live human tissue when fired into.

Moreover, it is impractical to expect to be able to recreate Commission exhibit 399 by shooting bullets through a series of various substitute materials, such as gelatin blocks and bone fragments.

The main reason was the extreme unpredictability of the yaw motion of a bullet in flight as it traverses, exits, and re-enters a series of targets. The company, nevertheless, did propose shooting through smooth bore rifles in a series of tests estimated to cost in the first series, \$20,000, but it was not at all optimistic about exactly reproducing what occurred in Dallas. Indeed, the company indicated that the number of shots required to produce the chance result of Commission exhibit 399 could range from one up to infinity.

The committee discussed the proposal with Mr. Larry Sturdivan, a wounds ballistics expert employed by the Army, and it got advice from a specialist in scientific methodology, Dr. Gerald Gordon. The decision was made not to undertake expensive and perhaps useless further testing for the following reasons: Results of the tests with materials other than human bodies could always be theoretically questioned by those who would quarrel with its results.

Two, the number of shots to obtain a statistical sample could not be reasonably determined.

This next point is perhaps subtle but it is nonetheless important and I might add it is one often misunderstood by laymen, such as myself. It is an example, I think, of what Chairman Preyer indicated yesterday about commonsense.

The scientists we consulted indicated that under the best possible circumstances, the experiments could only yield a statement about probabilities. That is, there was no way, in their judgment, to prove scientifically that Commission exhibit 399 could not have inflicted the damage attributed to it by the Warren Commission.

The most such tests could establish is that such a series of events, that is, the wounding of both President Kennedy and Governor Connally, could have occurred, not that they actually did not occur. Consequently, the test could only raise a question about probabilities, something we already knew. The tests could not answer the question that everybody wants to have answered, can you prove or unequivocally disprove what happened in Dealey Plaza?

Mr. Sturdivan, who will be our next witness, received an M.S. degree in statistics from the University of Delaware in 1971 and a B.S. degree in physics from Oklahoma State University in 1961. He has studied mathematics and computer sciences at the Ballistics Institute of the Ballistic Research Laboratory, Aberdeen Proving Grounds, Md., and he has been a physical scientist with the Wounds Ballistics Branch of the Aberdeen Proving Ground Vulnerability Laboratory since 1964.

Mr. Sturdivan is the author of numerous professional articles and he is a frequent consultant in wound ballistics for such agencies as the Law Enforcement Assistance Administration and the Department of Justice as well as NATO.

Mr. Chairman, it would perhaps be appropriate for me to note now, for those who will follow carefully Mr. Sturdivan's testimony, that during that testimony, certain films will be shown. Those films involve the shooting of live and anesthetized goats. The Army, who prepared the films, has asked the committee to indicate to those who watch them that these experiments are not now being conducted. It also suggested, and I think perhaps rightly, that those who might be of delicate sensibility or small children should not watch these films.

Mr. Chairman, it would be appropriate now to call Mr. Sturdivan.

Chairman STOKES. The committee calls Mr. Sturdivan.

Would you raise your right hand and be sworn? Do you swear the testimony you give before this committee is the truth, the whole truth, and nothing but the truth, so help you God?

Mr. STURDIVAN. I do.

Chairman STOKES. Thank you, you may be seated.

TESTIMONY OF LARRY STURDIVAN, PHYSICAL SCIENTIST, ABERDEEN PROVING GROUND VULNERABILITY LABORATORY, ABERDEEN, MD.

Chairman STOKES. The Chair recognizes Counsel Charles Mathews.

Mr. MATHEWS. Mr. Sturdivan, would you state your name for the record?