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The enclosed paper is self-explanatory.

We are sending it to you for a preliminary reading and invite your criticism and comment. Depending upon the nature of the comment which you may offer, with particular reference to technical accuracy and validity of conclusions drawn, we will then consider whether or not the paper should be submitted for publication.

Thanking you for your cooperation, I remain,

Sincerely yours,

Ralph F. Turner
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Professor

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Photographic Evidence and the
Assassination of President Kennedy

by
Don Olson

Foreword by Ralph F. Turner

25 July 1969

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FOREWORD

Ralph F. Turner

The assassination of John F. Kennedy in 1961 and the publication of the Warren Commission Report in 1964 has understandably generated a sizeable literature which deals with the events of the assassination and the interpretation of evidence associated with the case. Despite the careful attempts on the part of those charged with the responsibility of providing an official documentation of the tragedy, a considerable number of citizens and scholars continue to raise questions. Admittedly, a certain portion of the published literature is of a highly speculative and emotional nature, while other is sufficiently well balanced and scholarly to merit serious attention. The fact, nevertheless, remains that the Warren Commission Report, supplemented by some official disclosures pertaining to an examination of the X-rays of President Kennedy's body, released in 1968, is the only official document accessible to scholars at this date.

In my capacity as a practitioner and teacher of criminal investigation with special emphasis on scientific aspects, I feel that I have an obligation to encourage the inquiry into reasonable questions and hypotheses that may be posed about the interpretation of the Warren Commission Report. To this end I have supported the work which is reported in this paper.

Mr. Donald Olson of Toledo, Ohio, was graduated from Michigan State University in June 1969 with high honors in Physics (BS). He is currently enrolled as a graduate student continuing his work in physics at the University of California, Berkeley. Mr. Olson came to my office early in 1968 and acquainted me with his interest in a review of the interpretation of some facets of the evidence in the assassination of President Kennedy as outlined in the Warren Commission Report. I will not elaborate on the nature and extent of Mr. Olson's work, but will merely indicate for the record that he has spent a considerable amount of time and personal funds delving into the problem as he sees it. This has included two personally financed visits to the Archives in Washington, D.C., where he examined the Zapudar film, slides therefrom, and other pieces of evidence which were made available to him. In addition to this, he has engaged in correspondence with a considerable number of individuals and groups interested in the same problem. Suffice it to say that he has assembled an imposing collection of information and evidence.

As a result of his enthusiastic interest in developing his hypothesis, I have attempted to guide him in the preparation of a short paper which is now being submitted to you for consideration, review, and criticism. It is my feeling that Mr. Olson has stated a simple hypothesis, namely, that the first shot was fired at a time earlier than that reported by the Warren Commission, and has presented evidence to support this hypothesis.

Let us now examine the evidence as developed by Mr. Olson.

PHOTOGRAPHIC EVIDENCE AND THE ASSASSINATION OF PRESIDENT KENNEDY

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The evidential value of photographs taken by witnesses is discussed in relation to the assassination of President Kennedy. In particular, photographic evidence is presented to show on the one hand, that the Warren Commission was working from an inaccurate base of photographic analysis in its construction of the single-bullet theory, and on the other hand, that the first shot to strike the President was an extremely difficult shot if fired from the alleged position of the assassin.

INTRODUCTION

The common photographic techniques of criminal investigation are generally called into use only after a crime has been committed. However, it may occasionally happen that photographs of evidential value are taken by bystanders during the crime itself.

One of the most striking examples which comes to mind is the assassination of President Kennedy. Strangely enough, perhaps the first recorded case of this type of "accidental" evidence was also in a Presidential assassination--that of President McKinley in 1901. Kinematographs from the original Edison Laboratory recorded the events at the Buffalo Exhibition. Investigators who studied the films of the President's speech easily identified the assassin Czolgosz, as he made his way through the large crowd toward the President. Enlargements and drawings of the frames were studied in unsuccessful attempts to detect Czolgosz exchanging glances with some confederates.¹ Another motion picture camera was operating inside the Temple of Music and was just a few feet from McKinley at the exact time that Czolgosz came through the receiving line and fired the two assassination shots.²

The assassination of President Kennedy was a particularly well-photographed event. Over twenty-five photographers were present on November 22, 1963, in Dealey Plaza of Dallas, Texas. Witness Phil Willis, for example, was able to take six important color slides of the Presidential limousine.

Unlike the McKinley case, however, the Kennedy assassination has raised wide controversies which show little signs of easy resolution. Some seventy books have been written, defending the Warren Commission findings, attacking them, or proposing various alternatives to the official lone-assassin theory.

¹Criminal Investigation, by Hans Gross, Carswell Company Ltd., Toronto, 1962, Richard Jackson, editor, p. 146.

²Two Reels and a Crank, by Albert Smith, Doubleday, Garden City, New York, 1952, p. 132.

Only the conduct and findings of the President's autopsy at Bethesda may have received more attention than the discussions and interpretations of the abundant photographic evidence--particularly the 8-mm color film of Abraham Zapruder, well-known through the publication of selected frames in Life magazine.³ This paper will show how the photographic evidence is used to analyze the timing of assassination shots and to examine some of the problems raised by the Warren Commission reconstruction of the event.

BACKGROUND INFORMATION

Some background information is necessary prior to the photographic analysis of the gunfire which killed President Kennedy and seriously wounded Governor Connally. The events of the assassination are generally placed in time sequence relative to the Zapruder film frames, which were sequentially numbered by the FBI. (18HL-80)⁴ For example, at a frame numbered 313 a head wounding of the President is clearly visible.

During the frames 208-224 of this film, the President was blocked from the Zapruder camera by a Stemmons Freeway road sign at the curb of Elm Street. (R98)⁵ This left a certain ambiguity, for many people believe that the President was first wounded during this interval.

It should also be noted that during the time of Zapruder frames 166-209 the view of the President from the alleged assassin's window in the Texas School Book Depository was blocked by a tall live oak tree along the north side of Elm Street. Only for about a tenth of a second at frame number 186 of this interval was the President visible through a gap in the foliage. (R98, 18H87, 17H883) Thus the period of frames 210-224 also represent the first point at which an assassin the south-east window of the 6th floor could have had a shot at the President clear of the tree foliage.⁶

³Life: November 29, 1963; October 2, 1964; November 25, 1966.

⁴Shorthand notations such as these will be used to refer to the volumes published by the Warren Commission. For example, "R98" indicates the Report of the President's Commission on the Assassination of President John F. Kennedy, page 98. "18HL-80" indicates the Hearings Before the President's Commission on the Assassination of President Kennedy, Volume 18, pages 1 through 80.

⁵Ibid.

⁶Of course, the view was perfectly clear as the car approached the Depository on Houston Street, but at this point the eyes of the Secret Service agents would very likely be on the Depository windows. More puzzling is why an assassin would not fire the short shot to the car position at about frame 150, leaving the blind time under the tree for working the rifle bolt.

FBI tests on the Mannlicher-Carcano assassination rifle established a minimum time of about 2.3 seconds for the firing of two successive shots (R97), although this time did not include allowance for aiming at a moving target. Since the FBI had determined that the Zapruder camera ran at 18.3 frames per second (R97), one can calculate that at least 42 frames of film time must elapse between any two shots, under the lone-assassin theory. Thus if an assassin fired a clear shot as early as frame 210, his second shot could not follow until frame 252 or later.

WARREN COMMISSION HYPOTHESIS

An FBI report prepared for the Commission included:

"Shot one was fired from a gun probably braced for a steady shot sighted-in on a predetermined point on the parkway just clear of tree foliage."⁷

According to the analysis of the Warren Commission:

"President Kennedy was first struck by a bullet which entered at the back of his neck and exited through the lower front portion of his neck, causing a wound which would not necessarily have been lethal." (R19)

"...the evidence indicated that the President was not hit until at least frame 210 and that he was probably hit by frame 225. The possibility of variations in reaction time in addition to the obstruction of Zapruder's view by the sign precluded a more specific determination...". (R105)

The above Commission statements do not seem unreasonable, since the FBI photographic analysts noted nothing unusual in the frames prior to number 210, and since President Kennedy seems to be in obvious reaction to a wound in frames 225-227, as he comes from behind the sign. These Commission hypotheses are not without some difficulty, however. It was the firm belief of Governor Connally, as well as all the commenting witnesses, that Connally was struck with the second shot fired. Yet the Zapruder film shows the Governor reacting substantially before the frame 252 at which a second shot could have been fired, and significantly after the frame 225 in which the President is seen reacting. In fact, the Governor seems to undergo no change until frame 234, at which point he slumps suddenly; he appears to be in strong reaction to the shock of a bullet impact by frame 242. On these grounds it would seem that the following "single-bullet theory" is necessary to avoid the conclusion that a second rifleman was firing at the motorcade:

"...there is very persuasive evidence from the experts to indicate that the same bullet which pierced the President's throat also caused Governor Connally's wounds." (R19)

⁷National Archives, Commission File 298, p. 14.

Thus one bullet, Commission Exhibit 399 (the so-called "magic Bullet") was believed to have caused the wounds to the President's neck, and to the Governor's chest, right wrist, and left thigh. The Governor was theorized to have experienced a delayed reaction to his wounds in believing that he had been struck by a second shot, distinct from the one which wounded the President.

Although it was not possible to rule out completely that the assassin had taken an early wild shot through the tree, the Commission strongly hinted that such was not the case, on the reasonable grounds that there was no motivation for such a blind shot:

"...it is unlikely that the assassin would deliberately have shot at him with a view obstructed by the oak tree when he was about to have a clear opportunity. It is also doubtful that even the most proficient marksman would have hit him through the oak tree." (R98)

The Commission seems to be on solid ground in favoring that the first shot to strike the President was the first shot fired. Virtually all of the witnesses were of this opinion. Representative testimony is that of Secret Service Agent Clint Hill:

"...I heard a noise from my right rear, which to me seemed to be a firecracker. I immediately looked to my right...and I saw President Kennedy grab at himself and lurch forward and to the left... This is the first sound that I heard; yes, sir. I jumped from the car, realizing that something was wrong, ran to the Presidential limousine." (2H138)

ALTERNATE HYPOTHESIS

Besides the statements of Agent Hill, much related testimony and evidence will be presented in the following sections. In light of the previous discussions, the frames prior to number 210 may be referred to as the "early frames." The following sections of this paper will present evidence to support the following thesis regarding this portion of the assassination:

Contrary to the theory of the Warren Commission, the evidence developed will show that President Kennedy was first wounded in the early frames of the Zapruder film, prior both to the time when he disappeared behind the Stermons Freeway sign and to the time at which a clear shot was possible from the alleged position of the assassin. Specifically, at a time of about frame 193 of the Zapruder film, the first shot fired struck President Kennedy and threw him forward and to the left.

Nine points relative to the photographic evidence will be developed.

(1) Phil Willis

Witness Phil Willis took his fifth color slide from a vantage point on the south curb of Elm Street. Willis can be seen in the early Zapruder frames; e.g., number 183, where he identified himself as: "the individual who stands almost directly behind the first motorcycle policeman in that picture...With my camera raised...". (7H493)

Willis indicated that the first shot came just before this picture. He testified about the fifth slide:

"...in fact, the shot caused me to squeeze the camera shutter, and I got a picture of the President as he was hit with the first shot. So instantaneous, in fact, that the crowd hadn't had time to react...". (7H493)

Mr. Liebeler. Do you remember hearing the shot?

Mr. Willis. Absolutely. I, having been in World War II, and being a deer hunter hobbyist, I would recognize a high-powered rifle immediately.

Mr. Liebeler. And you heard it just about the time you took the picture that has been marked?

Mr. Willis. That's right.

Mr. Liebeler. Prior to the time you took the picture, which is marked Hudson Exhibit No. 1?

Mr. Willis. Absolutely." (7H495)

Fortunately, there is a simple and accurate method for the determination of the time of exposure of the Willis slide. Just as Willis is shown in the Zapruder frames, so is Mr. Zapruder visible in the Willis slide, which shows him standing on a pedestal of a concrete arcade. The view of the motorcade captured by the Willis slide must correspond to only one point of the Zapruder film. Furthermore, the direct line joining the two cameras is a quantity remaining undistorted between the two perspectives. In the Willis slide this line passes just north of the Stemmons Freeway sign.* Directly below this two-camera line is the edge of the left shoulder of Agent Clint Hill, who rides the left front running board of the Presidential follow-up car. Study of the Zapruder frames reveals that the corresponding view over Hill's shoulder is realized only at an instant which lies between frames 201 and 202. Corroboration for this analysis is noted, as Willis takes a forward step at 202 and seems to be lowering his camera from his eye in succeeding frames.

Study of the motion of the motorcade in the Zapruder frames will confirm the accuracy of the above analysis. FBI Agent Shaneyfelt, analyzing this same picture for the Warren Commission in Shaneyfelt Exhibit 25, used a triangulation of the positions on a map of Dealey Plaza. He concluded that the Willis picture:

*See the attached diagrams of Dealey Plaza.

"...was taken in the vicinity of the time that frame 210 of the Zapruder picture was taken...generally during the period that the President was behind the signboard." (15H697)

Although this testimony agrees perfectly with the Warren Commission hypotheses on the first shot, Shaneyfelt may have committed an error of some significance in placing Willis' position about seven or eight feet too far back from the curb relative to the actual position as shown in the Zapruder frames. Thus his triangulation calculated too high a frame number and placed the car too far down Elm Street. The testimony of Phil Willis and accurate analysis of his photograph actually give strong evidence that the first shot may have been fired in the early frames prior to number 201.

(2) Mrs. Kennedy

Mrs. Kennedy was seated to the left of the President in the rear seat of the limousine. Regarding the first shot, she testified:

"...I was looking this way, to the left, and I heard these terrible noises. You know. And my husband never made any sound. So I turned to the right. And all I remember is seeing my husband, he had this sort of quizzical look on his face, and his hand was up...". (5H180)

Three witnesses mention Mrs. Kennedy's actions at the time of the first shot. Phil Willis, very near the car, testified:

"Mrs. Kennedy was like-wise smiling and facing more to my side of the street. When the first shot was fired, her head seemed to just snap in that direction, and he more or less faced the other side of the street and leaned forward, which caused me to wonder...". (7H496)

S. M. Holland viewed the motorcade from the Triple Underpass directly ahead of the car on Elm Street. He testified that prior to the shots Mrs. Kennedy had been looking off:

"...In the southern direction...about that time he went over like that and put his hand up, and she was still looking off, as well as I could tell...that was the first report that I heard...she turned around facing the President and Governor Connally. In other words, she realized what was happening...". (6H243)

Kenneth O'Donnell, riding in the follow-up car, commented similarly:

"She appeared to be immediately aware that something had happened. She turned toward him." (7H449)

The Zapruder film lends evidential value to the above observations. In the beginning frames of the film Mrs. Kennedy is indeed looking off into the crowd on the left side of the street. The point at which she suddenly snaps her head around to the right is extremely striking in the film. Study of the individual frames show that this turn occurs at the frames 195-197. After that point Mrs. Kennedy seems to be looking directly into the President's face.

Mrs. Kennedy's actions, corroborated by several witnesses and the film, are a strong indication that the President may have been struck by an early shot.

(3) Agent George Hickey

Secret Service Agent Hickey was seated in the left rear seat of the follow-up car. He is easily located in the still photographs of Phil Willis and Hugh Betzner, as well as the Zapruder frames, where his head and shoulders are visible above the windshield of the follow-up car. Agent Hickey is the man who handled the AR-15 rifle just after the assassination shots were fired.

Discussing his reaction to the first shot, Hickey stated:

"...I heard a loud report which sounded like a firecracker. It appeared to come from the right and rear and seemed to me to be at ground level. I stood up and looked to my right in an attempt to identify it...". (18H762)

The beginning Zapruder frames shows Agent Hickey watching the crowd on the left side of the street, up until frame 194. At frame 195, however, he can be seen to begin turning about to the right. Half-standing in the rear seat, Hickey continues turning to the right for as long as he can be seen in the frames; i.e., up to frame 207, at which point he is looking off to the right of the motorcade. A still photograph, taken by James Altgens and identified by the Commission as having been taken at frame 255 (R112), shows Hickey and several other agents twisted around and looking back in the direction of the Depository building.

Agent Hickey seems to be a good witness; his actions are another indication that an early shot was fired.

(4) President Kennedy

It is clear that the actions of President Kennedy in the early Zapruder frames are of interest. Agent Shaneyfelt testified about these frames:

"...in some frames it is obvious that he is smiling...His arm is up on the side of the car and his hand is in a wave...I see nothing in the frames to arouse my suspicion about his movements...as he disappears behind the signboard...". (5H151)

Frame 183 shows the essential features described by Shaneyfelt. The President is apparently relaxed in that he is sitting back against the seat at the extreme right end of the rear seat. His right elbow extends well down below the chrome strip on the outside of the car as he waves to the crowd on the right. His head is turned almost directly to the right.

There is room for difference of opinion on Shaneyfelt's conclusions, however, for in the frames immediately following number 193 the President's body seems to undergo a short sharp lurch forward and to the left. This

motion, which can be visually approximated to be on the order of six or seven inches, seems to begin in frame 194 and continues through about frame 200. The President seems to move away from the seat back and to tilt to the left, away from the window ledge. The witness statement of Kenneth O'Donnell may again be noted:

"He was leaning out waving. He may have just been withdrawing his hand. And the shot hit him, and threw him to the left...looking at the manner of the President's movement, I would think you would have to feel the thrust of the shot was from the right rear." (7H449)

Study of the frames reveals further information. On the interval 193-200 the President's body is seen to narrow somewhat to the view, indicating that he not only leans to the left front, but also is rotated to the left. The rotation of the shoulders begins in frame 194. By frame 204 the President is facing almost directly forward.

As the President moves and rotates to the left, his right arm is pulled back into the car. While his elbow had been resting outside the car, it comes up noticeably in frames 195-199, the motion becoming very irregular at frames 201-203, perhaps because the President's arm is striking against parts of the window ledge. As Kennedy disappears from view behind the sign, his right arm seems to be in a particularly unusual position--the clearly visible gray of his suit coat indicating that his right arm and elbow have been raised at least to the level of his chin.

These motions are mentioned in such detail for purposes of comparison with three of the most detailed witness descriptions:

"Mr. Holland. And the motorcade was coming down in this fashion, and the President was waving to the people on this side (indicating).

Mr. Holland. And about that time he went over like that (indicating), and put his hand up, and she was still looking off, as well as I could tell.

Mr. Stern. Now, when you say, 'he went like that,' you leaned forward and raised your right hand?

Mr. Holland. Pulled forward and hand just stood like that momentarily.

Mr. Stern. With his right hand?

Mr. Holland. His right hand; and that was the first report that I heard." (6H243)

David Powers: "President Kennedy was sitting on the extreme righthand side of his automobile, with his arm extending as much as two feet beyond the right edge of the car...the first shot went off and it sounded to me as if it were a firecracker. I noticed then that the President moved quite far to his left after the shot from the extreme right hand side where he had been sitting." (7H473)

William Newman: "We were looking back up the street to see if the motorcade was coming and the first two shots were fired, and of course the first shot, boom, the President threw his arms up like that, spun around sort of...and then it looked like he was looking in the crowd, you know, like he was looking for something, just kind of a wild expression."⁸

Of course, these witnesses are describing exactly what can be observed in the Zapruder frames 193-206: the lurch forward and left, the spinning to the left, and the abnormal motion of the right arm. While reaction times and physical responses to bullet wounds are speculative areas at best for forensic science, the above testimony is certainly suggestive. Given the previous analyses of the Willis picture and the actions of Mrs. Kennedy and Agent Hickey, the observations of this section provide good evidence that the first wounding of the President was not blocked from the record by the road sign but is in fact occurring in the "early frames" of the Zapruder film.

Further evidence will be given in the following sections.

(5) Linda Willis

Witness Linda Willis, a daughter of the witness whose photographs were mentioned above, can be located in Zapruder frame 183, in which she is dressed in a red dress and white scarf and is at the extreme right of the frame. She described for the Warren Commission:

"...well, I followed along the street with the car...I was directly across when the first shot hit him...I was right in line with the sign and the car, and I wasn't very far away from him...When the first one hit, well, the President turned from waving to the people, and he grabbed his throat, and he kind of slumped forward... I stayed there...where the Stemmons sign is...". (7H498)

In all the Zapruder frames up to 199 Linda Willis can be observed as she runs along the grass on the south side of Elm Street, following the Presidential limousine. At frame 200, however, she abruptly stops running. In succeeding frames (200-204) she turns sharply and looks back to the right and rear of the motorcade. At this point the car is indeed directly between her and the Stemmons Freeway sign. Linda Willis remains frozen to the same spot for as long as she is visible, i.e., up to frame 222.

It is reasonable to suggest that these frames are showing Linda Willis reacting to the sound of an early first shot.

⁸Private interview of Josiah Thompson, Six Seconds in Dallas, Bernard Geis Associates, New York, 1967, p. 37.

(6) Governor Connally

It is well known that the Governor and his wife believe that the President was struck with the first shot and that the Governor was hit by the second shot. The Governor has stated:

"My recollection of that time gap, the distinct separation between the shot that hit the President and the impact of the one that hit me, is as clear today as it was then. They talk about the 'one bullet' or 'two bullet theory,' but as far as I'm concerned, there is no 'theory.' There is my absolute knowledge, and Nellie's too, that one bullet caused the President's first wound, and that an entirely separate shot struck me."⁹

After hours of study of the clear Life magazine enlargements, Connally chose frame 234 as the point where he was hit by the second shot. No record is found indicating that he was asked when he thought the first shot had come, even though he claimed a clear recollection of the time gap. Fortunately, he had volunteered his opinion on this point during an earlier session with the Zapruder pictures, on April 21, 1964. At this Commission screening of 35-mm slides prepared from the frames, Connally's opinion was recorded in a Memorandum For The Record:

"...He felt the President might have been hit by frame 190. He heard only two shots and felt sure that the shots he heard were the first and third shots. He is positive that he was hit after he heard the first shot, i.e., by the second shot, and by that shot only."¹⁰

Governor Connally's estimate for the time of the President's reaction to the first shot is striking corroboration for the previous analysis of this report. The above Memorandum was not introduced into evidence and thus did not become a part of the Commission's published record.

(7) Blurred Frames

In connection with the analysis of the first shot it may be noted that frames 195 and 196 are both more blurred than most frames in this section of the film, and that 197 in particular is violently blurred in a horizontal direction. Observation of the street sign and the tree on the edge of the frames seems to indicate that Zapruder's camera swung to the right at 197 and back to the left at 199. The tree entering the picture at 198 goes off-camera and returns only at 203-204.

Interpretation of these "movements" is speculative. It is possible that Zapruder is reacting to the sound of the first shot. It is also possible that these are just the normal instabilities in panning the camera as the

⁹Life, November 25, 1966, p. 48.

¹⁰National Archives, Commission Administrative File (unnumbered)

road sign begins to confuse the view. Some reason for labelling 195-197 the beginning of a nervous reaction is the similarity of this area of the film to 318-320, which three blurred frames almost certainly start the reaction to the head wounding visible at frame number 313. Mr. Zapruder only recalls the first shot and the head wounding and did not hear the second shot.
(7H571)

Other apparently random blurred frames could have been caused merely by imperfections in the alignment of the camera mechanism, where the film did not seat perfectly on the sprockets which advance it through the camera gate. For example, the top portions of frames 221 and 227 are extremely sharp and detailed, much more so than most of the frames in the Zapruder sequence. However, the pattern of blurring, streaking, and distortion of street in the lower portions of the frames indicate that the lower sprocket holes may have seated improperly and bent the bottom of the frames forward and away from the focal plane of the camera lens.

With such difficulties in the business of identifying blurs as possible reactions to shots, the blurring of the film frames is inconclusive in itself. It can, of course, be said to be certainly consistent with a first shot fired near frame 193.

(8) Hugh Betzner, Jr.

Witness Hugh Betzner, Jr., took the last of a series of three black-and-white still photographs from a vantage point on the south curb of Elm Street. His location can be established from his photograph and the Zapruder frames; frame 183 shows Betzner at the curb, with his camera raised to his eye. He is dressed in white and is some 20 to 25 feet down from the corner of Elm and Houston Streets.

In a carefully stated affidavit of November 22, 1963, Betzner reported that the first shot came just after he took his last picture:

"I took another picture as the President's car was going down the hill on Elm Street. I started to wind my film again and I heard a loud noise. I thought that this noise was either a firecracker or a car had backfired." (19H467)

The same method can be used here that was used for the Willis slide to calculate the time of exposure. In Betzner's case the two-camera line passes over the fifth lady standing east of the Stemmons Freeway sign and by a curious coincidence with the Willis picture also passes over the left shoulder of Agent Clint Hill.* Comparison shows that the corresponding Zapruder frame can only be number 186.

*See the attached diagrams of Dealey Plaza.

This result is of some interest, for it is in perfect agreement with the previous analysis that the first shot came near frame 193, just after the Betzner picture was taken. This result further serves as a strong indication that the first shot did not come before the Presidential car went under the tree at frame 166; no witness places a shot that early, moreover.

The exposure times of both the Betzner and Willis pictures are now known. Given the average speeds of the Presidential limousine as 11.2 miles per hour (R49) and of Zapruder camera as 18.3 frames per second (R97), it is possible to estimate the distance travelled by the car between the two pictures. Two alternate methods of this calculation are based on the FBI survey measurements of Dealey Plaza (17H902) and the known dimensions of the car (17H867). The three figures derived are 14, 15, and 14 feet respectively.

While the Betzner photograph was not used by the Warren Commission, it was printed in Life magazine. Part of the text there mentioned an analysis by Itek Corporation, a company which is a recognized expert in photoanalysis:

"Itek, using a technique called resectioning to determine the time of exposures, computed the President's car to be five feet farther along Elm Street in Willis' picture than in Betzner's. Similar analysis places the time of the Willis picture as just before the first shot."¹¹

Both of these statements are contradicted by the analysis of the present report. In fact, Howard Sprague, Jr., Vice President of Itek, has acknowledged by letter the error in the first statement, for reasons similar to Agent Shaneyfelt's erroneous triangulation:

"We have analyzed the distance question since November of 1967... and have found the distance to be 13.5 feet with one method using single frame resections, and 15.5 feet with a second method in which the two photographs were positioned by synchronization with a Zapruder frame...Our discrepancy occurred because we lacked reliable information concerning the exact locations of Betzner and Willis."¹²

Regarding the second "Itek" statement above, Mr. Sprague said that the Itek Report contained "no insinuated relationship with the sequence of gunshots."¹³ Thus the second sentence quoted above is exclusively a Life conclusion and has no scientific support from Itek.

In summary, the Betzner and Willis pictures, while similar in view, provide an interesting contrast of the beginning and the end of a period of particular interest in the Zapruder film.

¹¹Life, November 24, 1967, p. 93.

¹²Author's correspondence from Howard Sprague, Jr., February 12, 1969.

¹³The full report mentioned is the "Life-Itek Kennedy Assassination Film Analysis," Itek Corporation, Lexington, Massachusetts 02173.

(9) Secret Service Reconstruction

This final point consists more in corroboration of the above points than in further evidence. Surprisingly, documents in the National Archives show that an agent of the Secret Service made observations of President Kennedy in the Zapruder film very similar to those of section (4) of this report. An FBI document, filed on November 29, 1963, includes:

"SA JOHN JOE HOWLETT, U.S. Secret Service, Dallas, advised that with the aid of a surveyor and through the use of 8 millimeter movie films depicting President John F. Kennedy being struck by assassin's bullets on November 22, 1963, Howlett was able to ascertain that the distance from the window ledge of the farthest window to the east in the sixth floor of the Texas School Book Depository Building, 411 Elm Street, to where the President was struck the first time in the neck was approximately 170 feet. He stated this distance would be accurate within two or three feet... SA Howlett advised that it had been ascertained from the movies that President Kennedy was struck with the first and third shots fired by the assassin, while Gov. Connally was struck with the second shot."¹⁴

A map was included, which showed a point "A" at 170 feet from the window, with the notation: "President struck with first bullet."

The reference to distance of firing clearly indicates that Agent Howlett meant neither the "blind" period behind the sign (indeterminate to about 12 feet) nor the frames of obvious reaction after 225 (all further than 191 feet from the window). (18H90) Indeed, Howlett's figure of 170 feet corresponds to about frame 199 or 200. It can be recalled from section (4) that at that point of the film the reaction of President Kennedy first becomes particularly noticeable.

The above document, filed within a week after the assassination (on the same day that the Warren Commission was formed), clearly represents the original Secret Service analysis of the assassination, before the permutations of rifle speed and the single-bullet theory had been added. One other relevant Archives document concerns a screening of the 35-mm slides for which Howlett was present in Washington on April 14, 1964. A Memorandum For The Record contains remarks which may be attributable to Agent Howlett:

"(b) The reaction shown in frames 224-225 may have started at an earlier point--possibly as early as frame 199 (when there appears to be some jerkiness in his movement) or, with a higher degree of possibility, at frames 204-06 (where his right elbow appears to be raised to an artificially high position)."¹⁵

¹⁴National Archives, Commission File 5, p. 117.

¹⁵National Archives, Commission Administrative File (unnumbered).

After the detailed FBI reconstruction of May 24, 1964, which established the obstruction by the oak tree prior to frame 210, there is no indication that the Commission investigators gave serious consideration to the clues given by Howlett's report and later comments.

Neither of the two documents mentioned was introduced into evidence or the published record.

CONCLUSIONS

The Warren Commission conclusion of a first wounding of both Kennedy and Connally occurring at the frames 210-224 used to some extent the process of elimination, based on the blocking by the road sign, the conviction that the first shot was fired clear of the tree foliage, and the ignorance of evidence in the early Zapruder frames. The evidence developed in this report supports the conclusion that President Kennedy was first wounded at a point near the frame 193 of the Zapruder film. Even if the first shot came at the earliest possible consistent frame--186, with the gap in the oak tree--the shot would have been an extremely difficult one if fired from the alleged position at the south-east end of the Depository sixth floor. The Commission published pictures of this narrow gap taken on December 5, 1963 (17H883) and on May 24, 1964 (18H88). Furthermore, several witness statements mention that a strong wind was blowing on the day of the assassination. The moving branches may have made the gap constantly vary in shape and size--even when steady it provided only about 1/10 second of clear view. As the Commission acknowledged:

"It is also doubtful that even the most proficient marksman would have hit him through the oak tree." (R105)

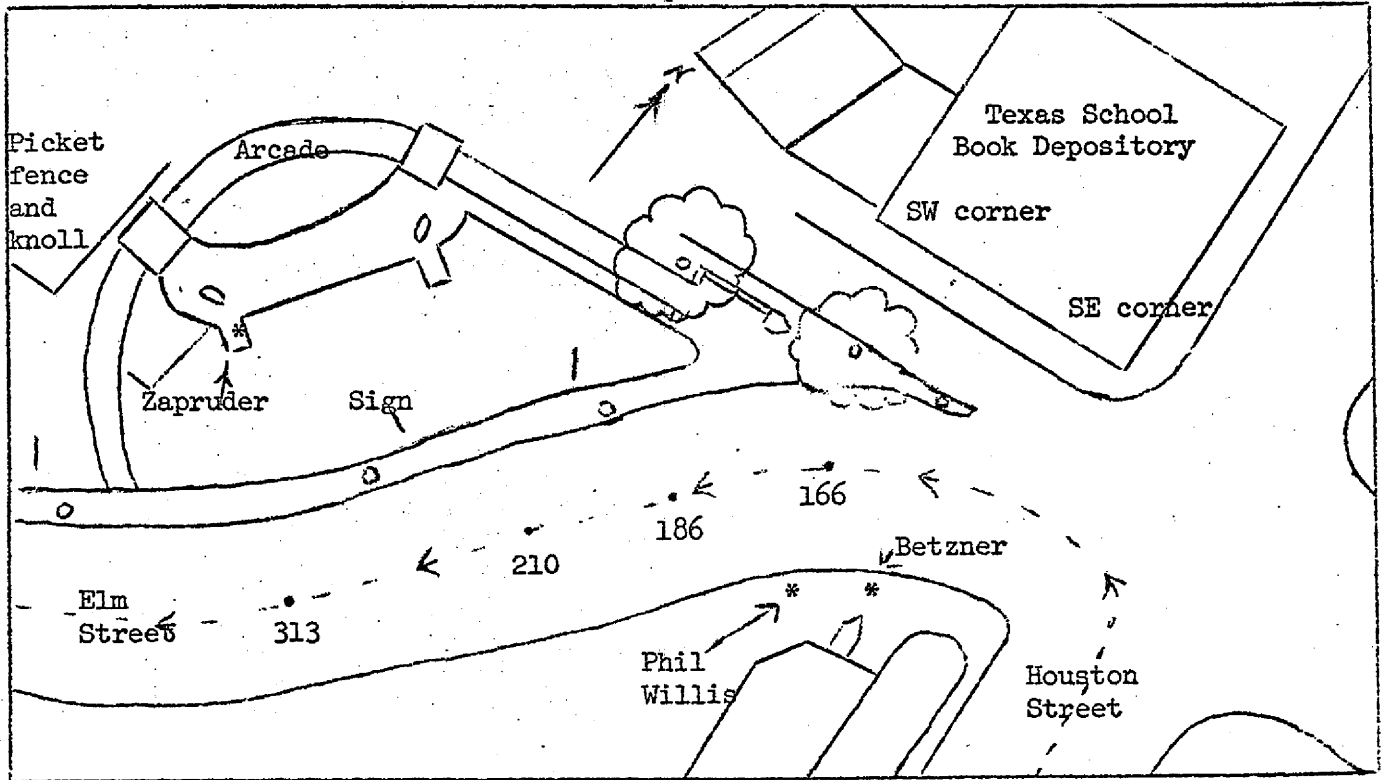
It can be recalled that Governor Connally believed himself struck by a second shot at frame 234. Evidence could be given to show that his statement is very likely an accurate one and that this shot may have come from the alleged position of the assassin. Thus this paper places the first two shots near frames 193 and 234, about 41 frames apart.

The minimum rifle-speed figure adopted by the Commission was 42 frames, although this was based on the fastest performance of an FBI expert firing at a stationary target. The Warren Commission, of course, also believed that Kennedy was hit by a clear shot only after frame 210 and that Connally was hit by at least 240. Thus this paper concludes that the Commission, even on its own grounds of rifle-speed, had an inaccurate base of photographic analysis in its construction of the single-bullet theory to account for two "hits" seemingly within 30 frames of film.

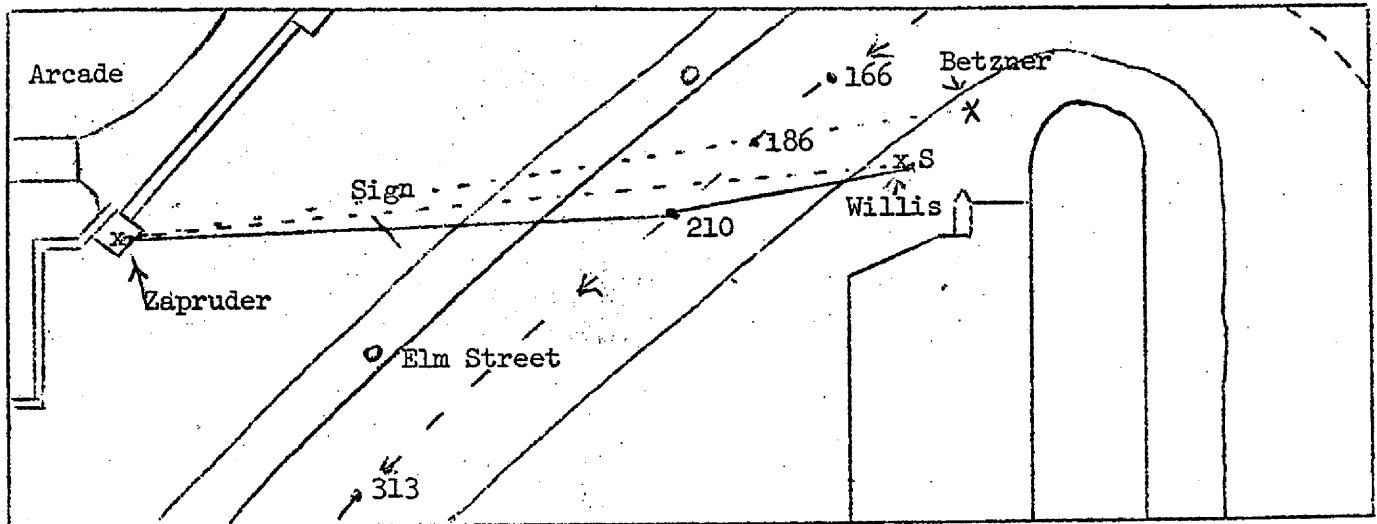
While the single-bullet theory has long been recognized a major weakness of the Commission reconstruction, its removal as done in this paper does not strengthen the lone-assassin theory of the Commission. As has been stressed, the FBI analysts judged an accurate first shot through the tree branches as beyond the ability of even an expert shot. In fact, the evidence in this report can be taken to suggest that this first shot near frame 193 may have originated at a spot other than that alleged by the Commission--for example,

a second assassin may have fired a short shot from a window at the west end of the sixth floor, with a clear view through the large space between two trees. In that case, the shot striking Connally would be taken as being the first one fired by an assassin the south-east window, after about 24 frames (or 1.3 seconds) of aiming time clear of the tree. Witness evidence could be presented to support this hypothesis.

For the present, one thing can be concluded with some certainty: the exact events of President Kennedy's assassination did not happen as described in the Warren Report.



This map of Dealey Plaza locates most of the relevant landmarks. The numbers in Elm Street show the position of the President at four important frames of the Zapruder film. Also, the three photographers mentioned in the text are located. Just two of the many trees have been marked, and these two only roughly. The sign marked in the map is the "Stemmons Freeway Keep Right" sign which appears in the Zapruder film and which figured in certain testimony.



Details of the Lines of View for the Willis and Betzner Pictures (The four numbers in the street mark the President's position in certain Zapruder frames.)

1. The dotted straight line joins the positions of Zapruder and Betzner. President Kennedy crosses this line at about frame 180. The Betzner still shows Agent Hill's left shoulder even with the line, as does Zapruder frame 186.
2. The dashed straight line joins the positions of Phil Willis and Zapruder. Kennedy crosses this line at about frame 193. The Willis slide shows the edge of Agent Hill's left shoulder below the line; this corresponding view is realized at a point between Zapruder 201 and 202.
3. The letter S roughly marks the position given Willis by Agent Shaneyfelt. The solid straight lines trace out his triangulation, which yields a figure of frame 210. Had Agent Shaneyfelt placed Willis forward into the correct position nearer the curb, his triangle would be shifted upward and would pass through the motorcade curve at the correct figure between 201 and 202.

In summary:

The Betzner still was taken at the time of Zapruder frame 186.

The Willis slide was taken at a time between Zapruder frames 201 and 202.

The FBI figure was in error because of an inaccurate location for Willis.

ACKNOWLEDGMENTS

Many individuals have been of assistance in gathering information for this paper. Many of the points noted here were first observed by Ray Marcus, Lillian Castellano, and Harold Weisberg. Mike Farrell and Gary Schoener have been particularly helpful in their discussions, as have Professors James Harrington and Ralph Turner at Michigan State University. Senator John Sherman Cooper was kind enough to discuss the functioning of the Commission and its hearings. Finally, at the National Archives, Marion Johnson, Joe Fernandez, and John Swanson made possible study of the voluminous Warren Commission files, as well as hours of study of the excellent 35-mm color slides prepared from the Zaprudar frames.

To anyone familiar with the writings on the assassination, it is unnecessary to add that the conclusions of this report are not to be taken as necessarily representing the views of the persons mentioned here.

EPILOGUE

Having read the foregoing paper the precise question is, "Is the evidence as presented sufficient to establish the Olson hypothesis that the first shot was fired at a time earlier than concluded by the Warren Committee investigators." To this end, we invite your considered opinion. If the evidence as developed by Olson is weak, inconclusive, or erroneous we will appreciate learning of your criticisms. If you feel that the arguments presented are scientifically accurate and reasonable we will also appreciate an appropriate statement.

As far as I am concerned personally, I see one area that is open to criticism, namely, the subjective interpretation of the movements of various people involved as described by Olson. I have observed a third or fourth generation copy of the Zapruder film. Neither Mr. Olson nor I have had an opportunity to view the original Zapruder or a first copy thereof.

Regardless of how the reader may react to this report, I believe that the work described in this paper is useful from an academic viewpoint. Students of criminal investigation in the United States have never before had an opportunity to study a case that has been as publicly documented as the assassination of President Kennedy. This fact alone makes the Warren Commission Report a remarkable document. What makes it more interesting is the fact that despite the effort put into the preparation of the document and the stated purpose of the Commission, the interpretation of the evidence still remains clouded. To the best of my knowledge Mr. Olson has no ulterior motive in presenting his hypothesis. My only reason for encouraging his work is to aid in the expansion and understanding of the art and science of criminal investigation. It is our hope that students of this, and other cases, will be stimulated to pursue the interpretation of evidence in criminal cases so that the administration of justice as we know it can be enhanced and moved closer to its traditional goal, the search for the truth.

Ralph F. Turner
Professor
25 July 1969

More accurate copies of the diagrams on pages 16 and 17 may be obtained from Mr. Olson.

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Kennedy Assassination Truth Committee
Post Office Box 38524
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The Assassination Inquiry Committee
4718 Saratoga Avenue
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The documentary film Rush to Judgment, by Mark Lane and Emile de Antonio, is available through the Los Angeles address. Addresses of the individual Warren Commission critics are available through Mr. Schoener.

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Oswald in New Orleans and the three of the Whitewash series from: Harold Weisberg, Box 304, Route 8, Frederick, Maryland 21701.

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The Bastard Bullet, from: Raymond Marcus, 1249 Hi Point Street, Los Angeles, California 90035.