Photographic Evidence and the Assassination of President John F. Kennedy

Don Olson, M.S. and Ralph F. Turner, M.S.

Introduction

The assassination of John F. Kennedy in 1963 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 some 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. The assassination of John F. Kennedy is an example of the application of forensic science and technology to the study of photographs, which has led to the development of a number of techniques and methods applicable to the analysis of photographic evidence. The senior author has been concerned with the interpretation of some facets of the evidence in the assassination of President Kennedy for several years. The considerable study and collection of information in respect to this evidence has led to the following conclusions.


**Don Olson, M.S. and Ralph F. Turner, M.S.

*John F. Kennedy: Assassination of President and the Evidence.
simple hypothesis, namely, that the first shot to strike the President was fired at a time earlier than that reported by the Warren Commission. This paper presents the information and evidence supporting the hypothesis.

The common photographic techniques of criminal investigation are generally called into use only after a crime has been committed. However, it occasionally happens that in the course of an investigation, video recordings or other photographic evidence may be obtained. For example, in the McKinley assassination case, video recordings were taken of the crime scene. After the crime, the crowd was dispersed, and the video recordings show the crowd moving away from the scene.

The assassination of President Kennedy was a particularly well-photographed event. Over 25 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 raised wide controversies which show little signs of easy resolution. Some 70 books have been written, defending interpretations of the abundant photographic evidence—particularly the 8-mm color film of Abraham Zapruder, which is well known through the publication of selected frames in Life magazine.

This paper will show how the photographic evidence was used to analyze the timing of assassination shots and will examine some of the problems raised by the Warren Commission. Specific details, will be developed regarding the first shot to strike President Kennedy.

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 November 22, 1963, in Dallas, Texas, will be recounted briefly. The Warren Commission determined that during the interval of frames 166-170, 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. Therefore, it was concluded that under the lone-assassin theory, an assassin in the southeast window of the 6th floor could have had a shot at the President clear of the tree foliage.

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 take into account the time that the President spent in the stretch of film between frames 166 and 170.

The interval of frames 166-170 corresponds to a period of about 2-3 seconds for the firing of the two shots. Under the lone-assassin theory, if an assassin fired at 166-170, the President could have received a second shot at 180-184. The Warren Commission determined that during the interval of frames 166-170, 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. Therefore, it was concluded that under the lone-assassin theory, an assassin in the southeast window of the 6th floor could have had a shot at the President clear of the tree foliage.

Unfortunately, the video recording of the event, which was produced by the Dallas Police Department, did not capture the President's reaction to the shots. However, the video recording does show the crowd dispersing after the shots were fired. The video recording also shows a man running across the plaza, which may be the alleged assassin. The video recording is an important piece of evidence in the investigation of the Kennedy assassination.
This section will briefly summarize the Warren Commission hypothesis regarding the first shot to strike the President. 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." (6)

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 left quadrant of his shirt. The wound seemed to undergo no change until frame 234, at which point he slumps suddenly; he appears to be in strong reaction to a wound by frame 242. On these grounds, the commission was led to formulate the "single-bullet theory," in order to avoid the conclusion that a second rifleman was firing at the motorcade." (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 undergo no change until frame 234, at which point he slumps suddenly; he appears to be in strong reaction to a wound by frame 242. On these grounds, the commission was led to formulate the "single-bullet theory," in order to avoid the conclusion that a second rifleman was firing at the motorcade.

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 chosen a position where he would have a clear view of the President. If he had chosen such a position, we would expect that he would try to avoid a clear path. If he chose a position where he would have a clear view, we would expect him to use a rifle or a shotgun, not a rifle or a shotgun. The commission can 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 there I was, the President, and I jumped to the car, and looked around and to the left. The noise was quite loud, and I was concerned about the President. I immediately looked to my right. I heard a noise from my right rear, and to the President's leg."

The above scenario is consistent with the evidence presented by the Warren Commission: a single bullet, Commission Exhibit 399, 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 tested positive for lead in 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 Warren Commission strongly hinted that such was not the case, on the reasonable grounds that there was no motivation for such a blind shot:
As a first step in analysis, one may consider the direct line joining the two cameras of Willis and Zapruder. In the Willis slide, this line is seen to pass just north of the Stemmons Freeway sign (Figs. 1 and 2). 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. Thus, at the time of the Willis picture, Agent Hill was directly between Zapruder and Willis.

The timing of the Willis slide can now be found by watching the motion of the follow-up car in the Zapruder film. Study of the frames reveals that the corresponding view over Hill's shoulder was direct only during the interval of frames 186-190 in 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. . . ." (7H1493)

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? [Willis slide 6]

Mr. Willis: Absolutely. (7H495)
Fig. 2—Lines of View for the Willis and Betzner Pictures. Again, the four numbered dots in Elm Street mark the location ... the intersection of the Betzner-Zapruder two-camera line with the path of the motorcade. The Betzner photograph shows Agent Hill at point "B", as does Zapruder frame number 186.

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, stated:

"After positioning the triangulation, Shapleigh calculated that the Willis picture was taken in the vicinity of the time that frame 210 of the Zapruder picture was taken. This is not an accurate determination because the exact location of Mr. Willis is unknown. This would allow for some variation, but the determination is based on the exact location of Mr. Willis is of the motorcade picture. The time frame of the Warren Commission's triangulation would vary from around frame 205 to frame 225. (1511697)"

Although this testimony agrees perfectly with the Warren Commission's hypotheses on the first shot, Shaneyfelt may have committed an error of significance in placing Willis' location. Shaneyfelt's triangulation technique is carried out again, using the actual position of Willis, a value of frame 202 is obtained, in agreement with the previous analysis of this section. Thus, the testimony of Phil Willie 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 202.

Fig. 3—"W" marks the actual position of Phil Willis as shown in the relevant Zapruder frames. "9" marks the position given Willis by Agent Shaneyfelt. Had Agent Shaneyfelt placed Willis forward nearer to the curb, his triangulation would have been shifted upward and would have passed through the motorcade curve at the correct frame 202.
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 ... was up... . I used to think if I only had been looking to the right I would have seen the first shot hit him. (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 likewise 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:

- "... in the southern direction... about that time he went over like that and put his hand up, and she was still looking in that direction. And then 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. As the shots are fired, however, her face twist... "

October 1971

ERROR IN INTERPRETATION OF WARREN COMMISSION

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.

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 Betz, as well as the Zapruder frame, 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 show 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 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... 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 and his actions are another indication that an early shot was fired.

President Kennedy. It is clear that the actions of President Kennedy in the early Zapruder frames are of interest. FBI Agent Shaneyfelt testified before the Warren Commission 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 contact with the back of his neck... . I see nothing in the frames to arouse my suspicion about his movements... . as he disappears behind the signboard... . (5H151)

Vol. 16 • No. 1
Frame 183 shows the essential features described by Shaneyfelt. The President is sitting on the extreme right side of the car and is leaning back against the rear seat. His head is up, and his right arm can be seen over the side of the car, and his right elbow can be seen well below a chrome strip visible on the outside of the car.

A very marked change is apparent by frames 225-230, as the President emerges from behind the signboard. As has been mentioned previously, the President seems to be in strong excited emotions. Also, his arms are in an extremely unusual position, with both elbows raised very high, almost to the level of his chin.

The Warren Commission believed that frames 225-230 represented the President's reactions to a shot fired somewhere in the interval of Zapruder frames 210-224, while the frames 183 and 230 (described above) in fact seems to begin with certain reactions in the interval of frames 194-206.

First, a general trend in the frames 194-206 may be noted. Beginning as early as frame 194, the President's body seems to undergo a motion forward and to the left. This motion, as has been noted, is repeated in frame 196 and continues in frame 198. The President turns his head and shoulders toward the left, and the body is seen to move back and to tilt to the left, away from the window ledge. The witness statement of Kenneth O'Donnell may be noted:

"He was leaning out waving. He may have just been withdrawing his hand. And the shot hit him and threw him."

Study of the frames reveals further information. Recalling the descriptions above, it is clear that between frames 183 and 230, two specific changes occurred in the President's position. First, the President turned his head and shoulders back from the crowd until he was facing forward. Also, the President's right arm moved from a position with the elbow below a chrome strip on the outside of the car, into a position with the elbow raised very high, almost to the level of his chin.

The Warren Commission believed that frames 225-230 represented the President's reactions to a shot fired somewhere in the interval of Zapruder frames 210-224, while the frames 183 and 230 (described above) in fact seems to begin with certain reactions in the interval of frames 194-206.

In this context, it happens that frame 204 is very important. On the interval 194-200 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 President's body is also noted in frame 195. His head comes around at 200-202. 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 has been resting outside the car, it comes up noticeably at frame 195. The President turns his head and shoulders toward the left, and the body is seen to move back and to tilt to the left, away from the window ledge. As President Kennedy disappears from view behind the road 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.

At this point, three of the most detailed witness descriptions may be quoted:

"David Powers: President Kennedy was sitting on the extreme right-hand side of his automobile, with his arm extending as much as two feet beyond the right side of the car..."

"The President was sitting on the extreme right-hand side of the car..."

"The President was sitting on the extreme right-hand side of the car..."
Mr. Holland: His right hand; and that was the first report that I heard. (6H243) William Newman: We were looking back up at the President when he turned and started to walk away from us. Then he looked back at us, and of course the first shot, boom, the President threw his arms up like that, spun around sort of. (7)

These witness statements compare favorably with the actions of President Kennedy noted in the frames 194-206. The following seems clear: the actions of President Kennedy in the frames 194-206 are inconsistent with the hypothesis that the President was first struck in these early frames. prior to frame number 195.

(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 with white scarf and is at the extreme right of the frame. She described for the Warren Commission:

"...I followed along the street with the car...I was directly across when the first shot hit. I...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..." (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, ...the car is indeed directly between her and the Stemmons Freeway sign. Linda Willis then remains fixed in 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.

(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 bullet that hit me, is quite vivid. It is almost like a pause. And I know that that bullet struck me in three parts: first, the back of my neck, the side of my neck, and my right shoulder. I believe that the President was struck first, and the bullet that struck me was an entirely separate shot, of a different gun. The President was hit first, and the shots that hit me were separate." (8)

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 hit any earlier. In Zapruder frame 195, in which the President is depressed to the ground, and the bullet penetrate the skin, the President was conscious and able to respond to what was happening around him. At this point, Connally had already been hit by the second shot and was not aware of it. It is reasonable to review Zapruder frames 195-200 and to determine that Governor Connally was correct in his observations.

412

(7) Chapter 9: Where the Zapruder film begins. This is a compilation of the film's contents and images, which provide a comprehensive view of the assassination and its aftermath. The film begins with a shot of the assassin firing a rifle. The bullet strikes President Kennedy, and he slumps forward. The bullet also strikes Governor Connally, who is in the presidential limousine. The film then shows the aftermath of the assassination, including the temporary government and the search for the assassin.

(8) October 1971

Vol. 16 • No. 4
JOURNAL OF FORENSIC SCIENCES

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.

Study of the Zapruder frames immediately reveals that some of the frames are much more blurred than others. For example, highlights in the wind-shield are underexposed in frame 186, while they become horizontal streaks in frame 188. The above memorandum was not introduced into evidence and thus did not become a part of the commission's published record.

Without going into the details we can see how this can be related to the analysis of the Zapruder frames that we have done. A very pronounced chain of blur occurs over the entire interval of frames 190-207. This can be interpreted as a possible reaction of Zapruder to the sound of an early first shot.

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 picture was taken a minute after the first shot was fired. In an 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. (19467)

To calculate the time of exposure of the Betzner picture, one can use the same method that was described in detail for the Willis slide in part I.

In Betzner's case the two-camera line passes over the fifth lady standing east of the Stemmons Freeway sign and by a curiosity coincidently with the Willis frame (Figs. 1 and 2). Comparison shows that the corresponding Zapruder frame can only be number 186. This result is of some interest, for it is in perfect agreement with the previous analysis that the first shot came in the early frames, prior to frame 195 (and possibly prior to frame 196). Another factor that could not be overlooked is the fact that the Secret Service follow-up car did not come before 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 to be frames 186 and 202, respectively. Given the average speeds of the presidential limousine as 11.2 feet per second, the President's car was 14 feet from the tree at frame 166. This result is again consistent with the analysis of this report.

We have analyzed the distance question since November of 1967, ... and have found the distance to be 13.5 feet from the President's car. This result is of some interest, for it is in perfect agreement with the previous analysis that the first shot came in the early frames, prior to frame 195 (and possibly prior to frame 196). Another factor that could not be overlooked is the fact that the Secret Service follow-up car did not come before the tree at frame 166; no witness places a shot that early, moreover.

Both of these statements are contradicted by Howard Syron and Mr. Mike_hot, who state that the President's car was set at 13 feet by the Zapruder team. However, the statements of both are contradicted by Howard Syron, who states that the error in the analysis of the Zapruder frames was due to the use of a technique called resectioning to determine the distance of the President's car from the camera.

We have analyzed the distance question since November of 1967, ... and have found the distance to be 13.5 feet...
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.

(9) Secret Service reconstruction. This final point consists more in corroboration of the above points than in further evidence. Surprisingly, a document in the National Archives included:

SA John Joe Howlett, United States Secret Service, Dallas, advised that with the aid of a surveyor and through the use of a map which showed a point 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 the reaction of President Kennedy first becomes particularly noticeable in frames 224-225, which are included in section 4 above, that at this 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 actual shooting of President Kennedy.

(10) The reaction shown in frames 224-225 may have started at an earlier point—possibly as early as frame 199 (when there appeared to be some reaction in the movie) or a little after frame 199 (when there was no evidence of reaction in the movie) (13).

Again, this agrees with the analysis in section 4 of the present report.

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 further 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 President Kennedy and Governor Connally (the "single wound" theory) was attacked with the second shot from the window with the notation: "President shot with second bullet."

With one method using single frame resections, and 15 feet with a second method in which the two photographs were taken after either of the shots fired by the assassin, while Governor Connally was struck with the second shot (14). 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.

(9) Secret Service reconstruction. This final point consists more in corroboration of the above points than in further evidence. Surprisingly, a document in the National Archives included:

SA John Joe Howlett, United States Secret Service, Dallas, advised that with the aid of a surveyor and through the use of a map which showed a point 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 the reaction of President Kennedy first becomes particularly noticeable in frames 224-225, which are included in section 4 above, that at this 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 actual shooting of President Kennedy.

(10) The reaction shown in frames 224-225 may have started at an earlier point—possibly as early as frame 199 (when there appeared to be some reaction in the movie) or a little after frame 199 (when there was no evidence of reaction in the movie) (13).

Again, this agrees with the analysis in section 4 of the present report.

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 further 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 President Kennedy and Governor Connally (the "single wound" theory) was attacked with the second shot from the window with the notation: "President shot with second bullet."

With one method using single frame resections, and 15 feet with a second method in which the two photographs were taken after either of the shots fired by the assassin, while Governor Connally was struck with the second shot (14). 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.
Journal of Forensic Sciences

bullet theory”) occurring during the frames 210-224 used to some extent the process of elimination, based on the... .

...the conclusion that President Kennedy was first wounded during the interval of frames 186-190 in the Zapruder film.

Such topics as the medical evidence or the detailed ballistic evidence clearly go beyond the photographic analysis of this report. For the present, however, 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.

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... Warren Commission files, as well as hours of study of the excellent 35-mm color slides prepared from the Zapruder 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 or those mentioned in the text of the report.

REFERENCES


4, 5. Shorthand 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 Kennedy, Part II, Volume 98. United States Government Printing Office, Washington, D.C. (1964); 1811140 indicates the Hearings Before the Warren Commission, 18th Congress, 1st Session, 114th Report. Washington, D.C., 1964.


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

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