

JFK

62-109060

SERIAL 4199 EBF

PART 3

WORK  
COPY

Tix film: \_\_\_\_\_

Hill hands on car - 28 fr. 1.5 sec

.. on car 64 fr - 3.46 sec

Zapruder film: \_\_\_\_\_

Hill hands on car - fr. 343 -

30 fr. after head shot - 1.6 sec

Hill on car - fr. 380 -

67 fr. after head shot - 3.7 sec.

(Zapruder is estimated since  
does not show as well as Tix  
film because Hill not in picture  
at all times)

#### ZAPRUDER CAMERA AND FILM

Mr. Abraham Zapruder, Dallas, Texas, made photographs of the presidential motorcade in an area on Elm Street just west of the intersection of Elm and Houston Streets, using a Bell & Howell 8 millimeter Zoom lens camera loaded with color film. He started photographing the motorcade after it made the turn onto Elm Street. He started taking pictures prior to the first shot that was fired and continued making pictures until the motorcade disappeared to his right.

He took the film to Jamieson Film Company in Dallas for processing and stayed with it during the processing. From the original print he had three copies made. He subsequently turned over two copies to the Secret Service and sold the original and one copy to Life Magazine.

Mr. Zapruder's camera was examined in the Laboratory and found to operate at an average speed of 18.3 frames per second.

#### LIFE MAGAZINE SLIDES

On 2/25/64 Mr. Herbert G. Orth, Assistant Chief of Life Magazine's Photographic Laboratory, provided the original of the Zapruder film for review at The President's Commission by representatives of the Commission, Secret Service and FBI. As a result of this conference, Mr. Orth offered to make 35 mm slides of pertinent frames (171 through 343). Three sets of these slides were prepared and one copy provided to the Commission, one copy to Secret Service and one copy to FBI.

#### NIX CAMERA AND FILM

Mr. Orville O. Nix made a series of 8 mm color motion pictures at the corner of Elm and Houston Streets as the motorcade turned north on Houston. He was in a position near the curb on the southwest corner of the intersection and made pictures of the left side of the presidential car. After the car went by he proceeded to a point about 20 feet on the south side of Main Street and made a series of pictures using the zoom lens completely open.

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Mr. Nix's camera was a Keystone Auto-Zoom 8 mm movie camera and was examined by the Laboratory and found to operate at an average speed of 18.5 frames per second.

#### MUCHMORE CAMERA AND FILM

Mrs. Marie Muchmore made 8 mm color motion pictures from a position on the northwest corner of the intersection of Main and Houston Streets where she had a view of the motorcade as it turned west from Houston into Elm Street. She stated that after hearing the first shot fired she panicked and did not take any other pictures.

From a review of the UPI book "Four Days," representatives of the Bureau determined that reproductions of photographs from motion picture film in this book were other than those from the Nix and Zapruder films. On the basis of this information, a copy of a roll of film exposed by Mrs. Muchmore was obtained from United Press International in New York City. Mrs. Muchmore's camera was obtained and is a Keystone X7 8 mm motion picture camera. This camera was examined in the Laboratory and found to operate at an average speed of 18.5 frames per second.

#### SPEED OF CAR AND ELAPSED TIME BETWEEN SPECIFIC FRAMES

The speed of the presidential car was calculated for the area between frames 161 and 313, which is a distance of 136.1 feet. This represents 152 frames which are exposed at the rate of 18.3 frames per second totaling 8.3 seconds. Based on this, it has been calculated that the presidential car was traveling at an average speed of 11.2 miles per hour from position 161 to 313.

The following is the listing of the elapsed time between the various frame numbers established during the re-enactment:

## FILM REVIEW

The amateur assassination films taken by Mr. Abraham Zapruder, Mr. Orville Nix and Mrs. Marie Muchmore, including 35 mm color slides made by Life Magazine from the original Zapruder film, were reviewed extensively at the Commission by representatives of the Commission, Secret Service and FBI. Doctors who attended the President and Governor Connally, wound ballistics experts and Governor and Mrs. Connally also reviewed the films on occasions. The film reviews were made to establish the location on the film where the shots occurred that struck the President and Governor. It is noted that only the shot that struck the President in the head can be definitely established on all three films. Extensive background material was developed, such as the speed of the 8 mm cameras used in making the films. To assist in the recording of the material developed, each individual frame of each motion picture film was assigned a number. The frames of the Zapruder film were numbered beginning with 1 at the point of the film where the presidential motorcade pictures actually begin. This same system was used in numbering the Nix and Muchmore films. The 35 mm slides were numbered to conform to the frame numbers of the Zapruder film. During the film review, all aspects of the films were studied for any evidence that would contribute to the location of the shots, other than the head shot. Such things as visual observations of the reaction of the President and Governor Connally, as well as other occupants in the car, were considered. Action of Secret Service Agents riding in the follow-up car and motorcycle policemen riding behind the presidential car were checked for possible evidence.

## REVIEWS OF ASSASSINATION FILMS AT THE COMMISSION

On January 23, 1964, Commission members Joseph Ball, David Belan, Melvin Eisenberg and Norman Redlich and Secret Service Inspector Thomas Kelley met with Inspector Leo J. Gauthier of the FBI at the Commission for review of the visual aids that had been prepared by the FBI.

On January 27 and 28, 1964, the following individuals attended the initial review of a copy of the Zapruder film: Representatives of the Commission; Inspector Leo J. Gauthier and staff and SA Lyndal L. Shaneyfelt of the FBI; and Inspector Thomas Kelley and Special Agent John Joe Hawlett of Secret Service. *Edl, Belin, Rob. E. G. + Assoc. Rankin*

On January 29, 1964, representatives of the Commission met with Inspector J. R. Malley (FBI) and Inspector Leo J. Gauthier and aids (FBI) for a further review of the Zapruder film and the initial review of the Nix film.

On February 25, 1964, Commission representatives met with Secret Service Inspector Thomas Kelley and FBI representatives J. R. Malley, Leo J. Gauthier and Lyndal L. Shaneyfelt for a further review of the Zapruder and Nix films and an initial review of the Muchmore film. Mr. Herbert G. Orth from Life Magazine made available the original of the Zapruder film which was reviewed. On this occasion, Mr. Orth volunteered to make 35 mm slides of each of the pertinent frames of the Zapruder film.

On April 14, 1964, representatives of the Commission met with FBI representatives Malley, Gauthier and Shaneyfelt for a review of the slides made by Life Magazine from the Zapruder film, as well as the Zapruder, Nix and Muchmore films. The following individuals were also present: Commander James J. Humes, U. S. Navy Hospital, Bethesda, Maryland; Commander J. Thornton Boswell, U. S. Navy Medical School, Bethesda, Maryland; Colonel Pierre A. Finck, Chief of Wound Ballistics Pathology of the Armed Forces Institute of Pathology; Dr. A. G. Olivier, Chief of Wound Ballistics Branch, Edgewood Arsenal; Dr. P. W. Light, Jr., Deputy Chief of Biochemistry and Chief of Wound Assessment Branch, Edgewood Arsenal. The purpose of this review was to relate the knowledge of the doctors to the events depicted in the films.

On April 21, 1964, representatives of the Commission met with FBI representatives Malley, Gauthier and Shaneyfelt for a further review of the Zapruder, Nix and Muchmore films, as well as the 35 mm slides of the Zapruder film. The following individuals were also present at this review: Dr. Gregory and Dr. Shaw, who examined Governor Connally at Parkland Hospital in Dallas; Dr. Light and Dr. Olivier from the Wound Assessment and Wound Ballistics Sections of Edgewood Arsenal; Dr. Joseph Dolce, Consultant to the Biochemistry Division of Edgewood Arsenal; and Governor and Mrs. Connally. The purpose of this review was to relate the knowledge of the doctors and the recollection of the Connallys to the events depicted in the films.

*J. McCloy*

RE-ENACTMENT IN DALLAS, TEXAS, ON MAY 24, 1964

On May 23 and 24, 1964, a survey was made of the assassination site in Dallas, Texas, including a detailed re-enactment. SA Lyndal L. Shaneyfelt, Laboratory Photographer R. E. Triplett and Mr. Roy Rose of the Exhibits Section made a preliminary survey on 5/23/64 at which time plans were formulated for the method to be followed in re-enacting the assassination at which time preliminary information was developed. Since the amateur films made by Mr. Zapruder, Mr. Nix and Mrs. Muchmore were to be the primary basis on which the re-enactment was to be made, it was essential that their exact camera positions be developed. The position of Mr. Zapruder was known, since he was on a specific projection of a nearby structure. Since the positions of Mr. Nix and Mrs. Muchmore during the filming of their pictures were not known, these positions were re-established through use of their cameras and photographs made from their films.

On Sunday, May 24, 1964, the re-enactment was started at approximately 6:00 AM. The Commission was represented by General Counsel J. Lee Rankin, Norman Redlich and Arlen Specter. SA Lyndal L. Shaneyfelt, SA R. A. Frazier and Laboratory Photographer R. E. Triplett were present from the FBI Laboratory. Inspector Leo J. Gauthier and Mr. Roy Rose were present from the Administrative Division and Inspector James R. Malley was present from the Investigative Division. Inspector Thomas Kelley and Agent John Joe Howlett of Secret Service were present. A sufficient number of Dallas Agents were also present to assist the above individuals and two-way radio communications were in effect from all essential points.

The Dallas Police Department completely blocked off the portion of Elm Street where the assassination occurred. Secret Service representatives had available a car closely approximating that in which the President was riding and the variations between the car used for the re-enactment and the President's car were known and taken into account. Agents of the Dallas Office, who were the approximate sizes of President Kennedy and Governor Connally were used in the car to re-establish as accurately as possible the films of the assassination, including positions of the car in the street

and the positions of the individuals in the car. SA J. Doyle Williams was used in Governor Connally's position and SA James W. Anderton occupied the position of President Kennedy in the car.

SA Frazier was stationed at the sixth floor window of the Texas School Book Depository (TSBD) Building with the rifle recovered from the building immediately after the assassination. It is noted that the presidential car proceeded down Main Street to Houston Street, turned right on Houston Street toward the TSBD Building and at the corner of the TSBD Building turned left into Elm Street. The assassination occurred along Elm Street. The view from the sixth floor window of the TSBD Building is partially blocked by a tree for a portion of the area of Elm Street.

The re-enactment was based primarily on the Zapruder film and for the purpose of restaging specific frames of the Zapruder film a book of black and white photographs of the pertinent frames was available. The first position established was the location of the car in the street at the point where the person aiming the rifle would have the last opportunity for a clear shot before the car passed under the tree. This location was established through the Zapruder film and through advice from SA Frazier in the sixth floor window. It has been determined that this was frame 161 of the Zapruder film. The next location was at a point in the street where there was a clear shot through an opening in the tree. This position was found to be frame 185 of the Zapruder film. The next position located was at a point where there was the first clear shot after the car emerged from under the tree and this was frame 207. Other frames established were based on pertinent frames developed during the numerous film reviews that had been made at the Commission and they were frames 222, 225, 231, 235, 240, 248, 255 and 313. Frame 313 is the frame depicting the shot that hit President Kennedy in the head. All of the re-establishment of frame numbers after frame 207 were made on the basis of the Zapruder film, using known reference points in the background of the photographs, except frame 313. This frame in the Zapruder film does not have any fixed reference points for the establishment of the location. Frame 24 of the



Nix film and frame 42 of the Muchmore film both depict the shot that hit the President in the head and both have fixed reference points on which this frame could be re-established. As each of the positions was fixed along Elm Street, SA Frazier made studies of the possible bullet path at each frame. Measurements were also taken and a surveyor calculated the distances from the point of the wound in Kennedy's back to the window and to a fixed reference point in the street, as well as the angle to the window. In addition, photographs were made first with 4" by 5" Polaroid film to check the accuracy against the Zapruder photographs, then with 4" by 5" black and white film for permanent record after which the position was photographed on 35 mm black and white film, 35 mm color film, and with Zapruder's 8 mm motion picture camera on 8 mm color film. After frame 313 was established, the car was returned to the corner of Houston and Elm Streets where it was located in a position where there would be the first clear shot after the car turned the corner at Houston and Elm Streets. This point was recorded photographically with measurements and is referred to as point "A". The Zapruder assassination films do not include this portion of the actual assassination route.

After the fixed positions were determined, the car was driven along the route at the previously estimated speed of 11 miles per hour of the presidential motorcade and while being followed through the rifle scope by SA Frazier was photographed from the camera positions of Zapruder, Nix and Muchmore, using their cameras. This run was re-enacted two times.

Following the above portion of the re-enactment, SA Sweeney and Photographer Triplett went to the sixth floor window of the TSBD Building and mounted an Arriflex 16 mm motion picture camera behind the telescopic sight of the assassination rifle. This was mounted on a tripod and positioned approximately in the position believed to have been used by the assassin. The car was then returned to the corner of Houston and Elm Streets and relocated in the previously determined fixed position and motion pictures were made at each of the points through the telescopic sight of the rifle. Inspector Leo J. Gauthier handled the re-establishment of the car and individuals in the

car as related to the Zapruder film during this portion of the re-enactment. In addition, SA Frazier observed the car from the triple overpass under which the presidential car traveled immediately after the assassination. SA Frazier found that a shot could be fired from the triple overpass at President Kennedy without going through the windshield. After the motion pictures were made through the rifle scope of the fixed positions on Elm Street, black and white motion pictures were made of the car traveling at the estimated 11 miles per hour on the assassination route with the scope of the rifle and the camera following the car. This was then repeated and filmed on color film.

This concluded the on-sight survey of the assassination and the street was again opened to traffic at approximately 1:00 PM.

In the afternoon of 5/24/64, studies were made in a garage at the assassination site. These studies were made to determine the approximate angle of a bullet traveling through the President's neck and through Connally's chest to determine whether or not there was any basis for the theory that one shot could have gone through both individuals. This angle was re-established based on the Zapruder photographs and the known location of the wounds on both Kennedy and Connally and was found to be approximately 17°. It is noted that the angle from the rifle to the wound in the President's back in the area near frame 222 is also approximately 17°. Photographs were made at the garage of the alignment of the wounds using a rod to show the wound alignment and a string along the wall in the background that had been placed by the surveyor at 17°. This concluded the survey in Dallas.

*End of 530*

# Stamps

5/24/64

Photos taken from 3rd pos.

189  
199  
225  
231  
240  
313

	Frame No.	Time	
1	168 (161)	7 $\frac{21}{2}$	
2	171 (166)	7 $\frac{40}{2}$	
3	185	7 $\frac{51}{2}$	
4	185 adjusted or 186	8 $\frac{03}{2}$	
5	207	8 $\frac{13}{2}$	
6	208 (210)	8 $\frac{27}{2}$	
7	222	8 $\frac{33}{2}$	
8	225	8 $\frac{50}{2}$	
9	231	9 $\frac{03}{2}$	
10	235	9 $\frac{10}{2}$	
11	240	9 $\frac{17}{2}$	
12	249	9 $\frac{35}{2}$	

#21) 255 (AP Photo) 9 $\frac{50}{2}$   
21 313 10 $\frac{03}{2}$

A final clear shot after corner.  
Movies from Curwalks pos. - 11 $\frac{40}{2}$

Blank space in movie film  
between 208 - 222

90

Apr 27/64 -

Page Two

R. bank space in <sup>movie</sup> after 235

Just before 3rd space in film -  
we reshot 2nd exposure  
due to position change by Pres.

(All exposures these people are  
plus X-film -

1st of each pair at f 11

2nd " " at f 16.)

Apr 28/64 - exposures reversed.

Turn film pack. at 255 (12:17 PM)

arr. on 255

at 313 - aim at head.

Space after filed photo.

1st Run at almost f 22 - car 11 mph

Space between 1st & 2nd runs

1st Run at f 22 " " "

Space between 2nd & 3rd runs

3rd Run at f 22

4th Run in color at 25 - between f 8 & f 11. (25 to f 11)

V8

Dr 4/16

3 exposures

1 Roll of film - 1st portion exposed at  
such location with car stopped at  
designated point.

2nd portion contains moving car (11 mi. p. h.)  
on route.

196

5/24/64

Muckmore Film

Shot - exposed by SA C. Ray Hall,  
of car on route at 11 m.p.h.,  
on night.

Jo

5/24/64

Net film

Shot by R. E. Triplett with Nitro camera  
of 2 men of car at 11 m.p.h., on sight.

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P 5

*Mr. Rankin  
Shaneyfelt*

MEMORANDUM

May 12, 1964

TO: Mr. J. Lee Rankin  
FROM: Arlen Specter  
SUBJECT: Agenda for On-The-Site Tests at Dallas

I. Objectives

- A. The precise positions on Elm Street of President Kennedy and Governor Connally should be determined where they were when:
  - 189
  - 1. Frame 199 was photographed by Zapruder;
  - 2. Frame 225 was photographed by Zapruder;
  - 231
  - 3. Frame 240 was photographed by Zapruder;
  - 4. Frame 313 was photographed by Zapruder.
  
- B. The precise positions on Elm Street of President Kennedy and Governor Connally should be determined and the corresponding frame number on the Zapruder film should be ascertained where:
  - 1. Oswald would have had his first clear shot at President Kennedy after President Kennedy emerged from behind the tree.
  - 2. Oswald would have had his first clear shot at Governor Connally after Governor Connally emerged from behind the tree.
  - 3. Oswald would have had any clear shot through the tree.
  - 4. Oswald would have had his last clear shot at President Kennedy before President Kennedy went behind the tree.
  
- C. A determination should be made whether the wounds on President Kennedy or Governor Connally could have been caused by a shot fired from the Triple Underpass.

*check w/ Surveyor Sat*



## II. Preparatory Steps Before Departing for Dallas

A. Arrange to simulate the car to be used so that its dimensions correspond with the President's car. To that end, Inspector Kelley has been requested to ascertain the following measurements:

1. The height from the ground to the seat of the President's car without any automatic elevation of the seat which corresponds to the positioning of the seat at the time of the assassination.
2. The height of the back rest on the President's seat so that we may determine how much of the President's back was exposed.
3. The dimensions of the jump seat, including:
  - a. the distance between the right edge of the right jump seat to the right door.
  - b. the distance between the back of the right jump seat and the front of the President's seat.
  - c. the height of the jump seat from the floor.
  - d. the height of the jump seat on the President's automobile from the ground.
- B. Construct a dummy with the measurements of the President's body so that it may be positioned in the precise location where President Kennedy sat. Inspector Malley of the FBI is arranging to have such a dummy prepared. I suggest that Commander Humes mark the points of entry and exit of the neck wound and the point of entrance of the head wound when he reviews the x-rays and photographs of the autopsy.

## III. Proposed Measurements, Calculations and Photography

- A. The precise location of President Kennedy should be ascertained at each position itemized in I above, with linear measurements from the center of the intersection of Elm and Houston Streets.
- B. The precise location of Governor Connally should be ascertained at each position itemized in I above, with linear measurements from the center of the intersection of Elm and Houston Streets.

- C. The angle of declination should be calculated from the position where we believe Oswald held the rifle to the points of entry on President Kennedy's back and head at the positions specified in I.
- D. The angle of declination should be calculated from the position where we believe Oswald held the rifle to the points of entry on Governor Connally at the positions specified in I.
- E. The distances should be ascertained of all the possible shots considered in C. and D. above.
- F. Motion pictures and still photographs should be taken of all the positions specified in I. from
  - 1. the view through the Oswald rifle.
  - 2. the place where Zapruder stood.

#### IV. Necessary Personnel, Equipment and Facilities

- A. Under your supervision, this project should be handled by the same people who worked on these problems during the numerous viewings of the films and slides:
  - 1. Inspector James R. Malley, Inspector Tom Kelley, Inspector Leo Gauthier, SA Lyndal L. Shaneyfelt and SA John Joe Howlett should be present.
  - 2. Norman Redlich and I should be stationed interchangeably at the window and on the street.
- B. We should have a surveyor available to make the calculations and measurements and provide the necessary trigonometric readings. To that end I have asked Inspector Malley to obtain the services of Robert Jones who has worked with the Secret Service on this project before.
- C. We should have a 6-foot, 2-inch man available to simulate Governor Connally.
- D. Governor Connally's clothing should be taken to be worn by the man sitting in his position.
- E. We should have available at the Texas School Book Depository Building a room for showing the movies and slides. Inspector Malley advised that it can be arranged without difficulty.

*Oak Park*

*- 4 -  
Conversion equip was not  
per Malley*

- F. Radio communications should be available at the site. Inspector Malley advised that four walkie-talkie radios will be available.
- G. The Zapruder, the Nix and the Muchmore cameras (if each is available) should be present. We should also have a polaroid camera. Inspector Malley advised that there may be difficulty in obtaining the Zapruder camera but that the effort is being undertaken.
- H. A moving picture camera, focused through the telescopic sight, should be attached to Oswald's rifle. Inspector Malley and SA Shaneyfelt advise that the FBI will do so, if possible.
- I. Photographs should be made from the slides so that they may be available for reference at the site. Inspector Malley advised this will be done.
- J. All still photographs, including the album prepared by the Secret Service, should be available.

PRESIDENT'S COMMISSION  
ON THE  
ASSASSINATION OF PRESIDENT KENNEDY

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Washington, D.C. 20002  
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J. LEE RANKIN,  
General Counsel

MAY 7 1964

Mr. J. Edgar Hoover  
Director, Federal Bureau of Investigation  
Department of Justice  
Washington, D. C. 20535

Dear Mr. Hoover:

This Commission has been making a careful study of the various motion picture films taken at the scene of the assassination. In this project, we have had the valuable assistance of members of your Bureau, particularly Inspector James R. Malley, Inspector Leo Gardner and Special Agent Lyndal A. Shaneyfelt. As a result of the information obtained from these films the Commission would like the cooperation of your Bureau in the performance of certain additional investigation at the scene of the assassination.

I will personally be available to supervise this work and will have such other staff members present as may be deemed necessary. We would hope to be able to perform this work in Dallas on May 18 and May 19. The purpose of this letter is to set forth the steps which we feel are necessary to properly complete this project.

I. PROBABLE RANGE WITHIN WHICH THE FIRST TWO SHOTS OCCURRED

Our examination of the Zapruder films indicates that Governor Connally was hit at some point prior to frame 240. (All references to frames in the Zapruder films are on the basis of a numbering system worked out with FBI personnel who have been working on this project.) Doctors familiar with the Governor's wounds concluded that after frame 236 his body was not in a position to have received the wound from a projectile fired from the sixth floor southeast corner window of the Texas School Book Depository Building. The Governor feels he was hit at approximately frame 230; some members of our staff feel that it could have been as late as 240. There is general consensus, however, that it could not have been later than 240. Governor and Mrs. Connally also testified that the Governor was hit by the second shot.

The FBI laboratory examination of the Zapruder camera establishes that it operates at a speed of 18-1/3 frames per second. Weapons experts have testified that the minimum time required to operate the assassination weapon is 2-1/4 seconds. It would appear, therefore, that a minimum of 41 frames would have to elapse between the first and second shots (18-1/3 X 2-1/4).

The Commission is aware that it is impossible to determine the exact point at which the first two shots were fired. We request the following on-site investigatory steps, however, in order to determine whether it was possible for a person located in the sixth floor southeast corner window of the TSED building to fire two shots at the Presidential car, the second of which occurred no later than frame 240:

(1) A point should be marked on the road corresponding to frame 199 on the Zapruder film, which is the last point at which the assassin could have fired from the window and still have been able to fire again by frame 240. A car should be photographed on this spot from the point where Zapruder was standing so that this photograph can be compared with frame 199 to make certain that the location is accurate. This should be done with the Zapruder camera, which has been retained for this purpose. A Polaroid should also be used for immediate comparison.

(2) After a car has been placed at this point on the road it should be photographed from the assassination window to determine whether the assassin had a clear shot at the occupants of the rear seat, with particular reference to the tree which at some point blocks the view from this window.

(3) If the car had not passed the tree at frame 199, when viewed from the window, the car should be moved forward to the point at which there is a first clear view from the window and photographed at this point from both the window and from the place where Zapruder was standing so that we may determine what frame in the Zapruder film corresponds with this location.

(4) If the car has in fact passed beyond the tree at frame 199, it should be moved back to the point where it first cleared the tree and photographed from the window and the Zapruder location to establish the corresponding frame reference.

(5) The car should also be placed at the point where there is the last clear shot before it goes behind the tree and photographed from the window and the Zapruder location to determine the frame reference at this point.

(6) All the above points should be mapped on a survey. Lineal distances should be measured on the ground between these various points. Trigonometric readings should be taken to determine the distances from these various points to the assassination window and the surveyor should also determine the angle with the horizontal which is made when a line is plotted from each of these points to the assassination window.

## II. PROBABLE LOCATION OF THE THIRD SHOT

Unlike shots one and two, the third shot has been fixed at a particular frame in the Zapruder films (frame 313), as well as a particular frame in two other films (frame 24 of the Rix film and frame 42 of the Muchmore film). A car should be placed at the point which we believe to be the approximate location corresponding to these frames and then photographed from the point where the three cameramen were standing to establish the accuracy of this location. Distances should be measured from this point to the various points described in part I and angles and distances established between this point and the assassination window. The car should also be photographed at this point from the assassination window to establish the view which the assassin had when he fired the third shot.

## III. PLOTTING TRAJECTORIES FROM THE RAILROAD OVERPASS

From each of the ground points established in parts I and II trigonometric readings should be taken from a point on either end of the overpass to chart the path which a bullet would travel if fired from those points on the overpass to the rear seat of the car. It should be determined whether a bullet could reach the rear seat without hitting the windshield, and the angle with the horizontal which would be made by a bullet fired from these points to a car located at each of the points on the ground as determined in parts I and II.

A copy of this letter has been sent to Chief Rowley of the Secret Service with a request that the Secret Service provide such assistance in this work as the Commission and your Bureau may require. The Secret Service has furnished the Commission with photographs, surveys and measurements which we have used in our examination of the films and which will no doubt be useful to your Bureau in completing this project.

We would like your Bureau to make all necessary arrangements for this project. Members of the Bureau assigned to this project should contact either Mr. Norman Redlich or Mr. Melvin Eisenberg of the Commission staff if additional information is required.

Sincerely,

SIGNED

J. Lee Rankin  
General Counsel

**VISUAL AIDS:**

1. ASSASSINATION SITE (photographs submitted for identification):

Technical data relating to the physical makeup of the site was gathered on location by the FBI on December 2-3-4, 1963. A scale model of this area, built to the scale of one-quarter inch equals one foot, showing in minute detail the physical features of the site, including reproductions of vehicles and occupants, was developed by the FBI. This model was delivered to the Commission's Exhibits Room along with large charts, maps and photographs of the site on January 20, 1964.

2. DALLAS POLICE DEPARTMENT GARAGE (photographs submitted for identification):

Technical data relating to the physical makeup of the garage was gathered on location by the FBI on December 2-3-4, 1963. A scale model of the garage space, built to the scale of one-half inch equals one foot, showing in minute detail the physical features of the ramps and jail office was developed by the FBI. Included are reproductions of armored vans, police squad cars, police personnel and press media. This model was delivered to the Commission's Exhibits Room along with large charts and photographs of the garage on January 20, 1964.

3. VISUAL AIDS BROCHURES (previously furnished Commission):

Brochures containing photographs and diagrams were prepared by the FBI for use of the Commission during the taking of testimony in the divers' phases of the hearings. Descriptions of brochures are set forth below:

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- a. The Texas School Book Depository, diagrammed and photographed from basement through 7th floor, including detail chart of the parking lots used by employees.
- b. The Paine and Randle Homes, Irving, Texas, photographically depict the route used and activity of Lee Harvey Oswald on the morning of November 22, 1963, between the Paine and Randle homes and his arrival at the Texas School Book Depository.
- c. Bus and taxi exhibits, showing the bus and the taxi used by Oswald on November 22, 1963.
- d. Killing of Dallas Patrolman J. D. Tippit, showing the killing site, the getaway route used by Oswald and locations of witnesses who observed his actions.

4. MANIKIN (photograph submitted for identification):

A life-size manikin was made by FBI at the request of the President's Commission, using the following physical characteristics furnished by Secret Service: height, 6' 1"; weight, 172 lbs.; coat, 40" long; shirt, 15½" neck - 34" sleeve; broad shoulders, narrow waist; shoes, size 10; hat 7 5/8"; tee shirt, 32-34. Manikin made available at Dallas on May 23-24, 1964.

5. SURVEY PLAT (exhibit submitted):

On May 24, 1964, field survey data was compiled by Robert H. West, County Surveyor, licensed State Land Surveyor, 160 County Court House, Dallas, Texas, of certain fixed points on the Elm Street roadway between Houston Street and the Triple Underpass in Dealey



Plaza. From data compiled, the surveyor caused to be prepared a plat, drawn to the scale of one inch equals ten feet, of a portion of Dealey Plaza. This plat area is bounded on the north by the Texas School Book Depository and railroad property, on the east by Houston Street, on the south by the Main Street roadway and on the west by the Triple Underpass.

Located on this plat are street lights, storm basin, trees, concrete pergola and reflecting pool, road signs, curb and traffic lane markings and the 6th floor window in the southeast corner of the Texas School Book Depository.

Tabulations were made showing elevations, angles, sighting distances and measurements from fixed points along the roadway to the rifle in the 6th floor window and to the top of the handrail of the Triple Underpass. Each point was fixed on the roadway by observations made from the 6th floor window and from the Zapruder, Nix and Muchmore camera positions. The points were marked and identified on the road surface and on the right rear tire of the simulating car with white chalk.

Instrument fixes were made by the surveyor from a point 39 inches directly above each of the marked points on the roadway (39 inches above street level is the point of bullet entry). Each of these fixes were then "sighted in" on the rifle in the sixth floor window and also to the top handrail of the Triple Underpass directly above the center of the Elm Street roadway.

1013

~~From 207 - 313 = 106 frames = 5.8 sec~~

~~" 222 - 313 = 91 " = 4.97 "~~

~~" 207 - 222 = 15 " = .82 "~~

~~" 168 - 222 = 54 " = 2.95 "~~

- ① " 161 - 313 = 152 " = 8.3 "
- ② " 166 - 313 = 147 " = 8.03 "
- ③ " 185 - 313 = 128 " = 7.02 "
- ④ " 186 - 313 = 127 " = 6.99 "
- ⑤ " 207 - 313 = 106 " = 5.8 "
- ⑥ " 210 - 313 = 103 " = 5.6 "
- ⑦ " 222 - 313 = 91 " = 4.97 "
- ⑧ " 225 - 313 = 88 " = 4.8 "
- ⑨ " 231 - 313 = 82 " = 4.48 "
- ⑩ " 235 - 313 = 78 " = 4.26 "
- ⑪ " 240 - 313 = 73 " = 4.0 "
- ⑫ " 249 - 313 = 64 " = 3.5 "
- ⑬ " 255 - 313 = 58 " = 3.17 "

				<u>total</u>
Point zero to A			44'	
A	to	161	56'	100'
161	to	207	42'	142'
207	to	225	17.2'	159.2'
225	to	313	77.3'	236.5'

C O

$\frac{136.1}{152}$   $\frac{18.3}{528}$   $\frac{1 \text{ mile}}{5280 \text{ feet}}$   $\frac{3600 \text{ sec}}{1 \text{ hr.}}$

$\frac{(136.1)(18.3)(3600)}{(152)(5280)} = 11.1621 \text{ miles per hour}$

136.1  
x 18.3  
-----  
4083  
10888  
-----  
1361  
249063  
x 45  
-----  
1245315  
996252  
-----  
11207935

11.1621  
10032 | 112079.35  
-----  
11958  
10032  
-----  
17263  
10032  
-----  
92315  
60192  
-----  
21230  
20064  
-----  
11640

① 161

8,306  
183 1520,000  
1464

560

549

1,100

1098

92

② 166

8,032  
183 1470,000  
1464

600

549

510

366

144

③ 185

6,944  
183 1220,000  
1698

1820

1647

1730

1647

930

732

92

④ 186

6,939  
183 1220,000  
1698

1720

1647

930

549

1810

1647

163

5 207

6 210

$$\begin{array}{r} 5,792 \\ 183 \overline{) 1060,000} \\ \underline{915} \phantom{00} \\ 1450 \phantom{00} \\ \underline{1281} \phantom{00} \\ 1690 \phantom{00} \\ \underline{1647} \phantom{00} \\ 430 \phantom{00} \\ \underline{366} \phantom{00} \\ 64 \phantom{00} \end{array}$$

$$\begin{array}{r} 5,628 \\ 183 \overline{) 1030,000} \\ \underline{915} \phantom{00} \\ 1150 \phantom{00} \\ \underline{1098} \phantom{00} \\ 520 \phantom{00} \\ \underline{366} \phantom{00} \\ 1540 \phantom{00} \\ \underline{1464} \phantom{00} \\ 76 \phantom{00} \end{array}$$

7 222

8 225

$$\begin{array}{r} 4,972 \\ 183 \overline{) 910,000} \\ \underline{732} \phantom{00} \\ 1780 \phantom{00} \\ \underline{1647} \phantom{00} \\ 1330 \phantom{00} \\ \underline{1281} \phantom{00} \\ 490 \phantom{00} \\ \underline{366} \phantom{00} \\ 124 \phantom{00} \end{array}$$

$$\begin{array}{r} 4,808 \\ 183 \overline{) 880,000} \\ \underline{732} \phantom{00} \\ 1480 \phantom{00} \\ \underline{1464} \phantom{00} \\ 1600 \phantom{00} \\ \underline{1464} \phantom{00} \\ 136 \phantom{00} \end{array}$$

9 231

10 235

4480	4262
183 $\overline{) 820,000}$	183 $\overline{) 780,000}$
732	732
880	480
732	366
1480	1140
1464	1098
160	420
	366
	34

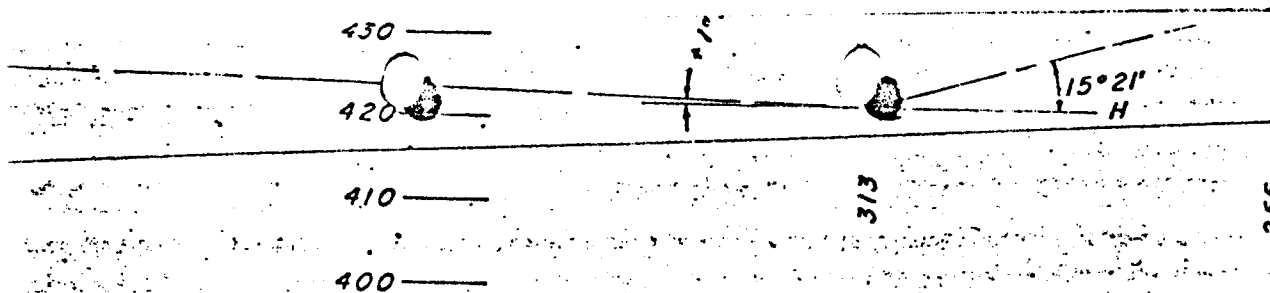
11 240

12 249

3989	3497
183 $\overline{) 730,000}$	183 $\overline{) 640,000}$
549	549
1810	910
1647	732
1630	1780
1464	1147
1660	1330
1647	1281
13	49

13 255

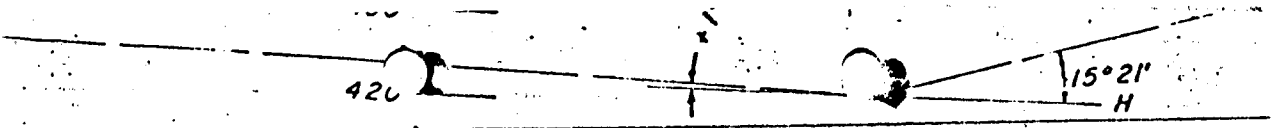
3169	
183 $\overline{) 590,000}$	
549	1270
310	1095
183	1720
129	117
	73



SCALE 1" = 20'

FRAME NO.	STATION NO.	ELEV.	RIFLE IN WINDOW		TOP BRIDGE HANDRAIL	
			ANGLE TO HORIZON R-K-H	LINE OF SIGHT DIST. K-R	ANGLE TO HORIZON B-K-H	LINE OF SIGHT DIST. K-B
A		431.97	40° 10'	91.6	-0° 27'	447.0
168	3+29.2	429.25	26° 58'	137.4	-0° 07'	392.4
166	3+30.1	429.20	26° 52'	138.2	-0° 07'	391.5
185	3+49.3	428.13	24° 14'	154.9	+0° 03'	372.5
186	3+50.8	428.05	24° 03'	156.3	+0° 03'	371.7
207	3+71.1	427.02	21° 50'	174.9	+0° 12'	350.9
210	3+73.4	426.80	21° 34'	176.9	+0° 22'	248.8
222	3+85.9	426.11	20° 23'	188.6	+0° 24'	336.4
225	3+88.3	425.98	20° 11'	190.8	+0° 26'	334.0
231	3+93.5	425.69	19° 47'	196.0	+0° 28'	329.0
235	3+96.8	425.52	19° 26'	199.0	+0° 30'	326.8
240	4+02.3	425.21	19° 01'	204.3	+0° 34'	320.4
249	4+10.0	424.79	18° 32'	211.9	+0° 40'	313.1
255	4+16.4	424.46	18° 03'	218.0	+0° 44'	307.1
313	4+65.3	421.75	15° 21'	265.3	+1° 28'	260.6





SCALE 1"=20'

FRAME NO.	STATION NO.	ELEV.	RIFLE IN WINDOW		TOP BRIDGE HANDRAIL	
			ANGLE TO HORIZON R-K-H	LINE OF SIGHT DIST. K-R	ANGLE TO HORIZON B-K-H	LINE OF SIGHT DIST. K-B
A		431.97	40° 10'	91.6	-0° 27'	447.0
168	3+29.2	429.25	26° 58'	137.4	-0° 07'	392.4
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231	3+93.5	425.69	19° 47'	196.0	+0° 28'	329.0
235	3+96.8	425.52	19° 26'	199.0	+0° 30'	326.8
240	4+02.3	425.21	19° 01'	204.3	+0° 34'	320.4
249	4+10.0	424.79	18° 32'	211.9	+0° 40'	313.1
255	4+16.4	424.46	18° 03'	218.0	+0° 44'	307.1
313	4+65.3	421.75	15° 21'	265.3	+1° 28'	260.6

7<sup>#</sup>2 - Taken from near church  
parking lot ~~at~~ down alley in  
rear of Walker house - looking SSW

#1 - break in edge of ~~drive~~ alley

2 - fence board format

3 - broken + slanting fence rail

4 - Telephone post

5 - fence format

6 - Telephone pole

7 - ..

8 - Tree

9 - patched driveway

10 - power line to house

11 - chimney at high rise format.

57<sup>564</sup>  
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