

Warren Commission testimony and his earlier statement to the forensic pathology subpanel.) In addition, an examination of the remains would probably permit determination of both the nature and extent of the bony injury and skull defects, thus enabling, through reconstruction, a more precise determination of the location of the exit wound from the skull. Further, it might be possible to pinpoint the entrance wound in the upper back and the exit wound in the anterior neck with reference to fixed body landmarks and thus enable more precise determination of the angle of the bullet track through the thorax\* (back) relative to the body's axis. The majority of the panel concurs, however, that in the absence of photographic documentation of the body's precise position at the moment the missile struck the back, more accurate wound locations would be of limited value in determining the bullet's point of origin.

(231) Dr. Wecht, in disagreeing, points out that in the Zapruder film, the Stemmons Freeway sign obstructed the President from view for an interval of only approximately 0.9 second, during which Wecht assumes the shooting occurred. In his opinion, this interval was too short for there to have been sufficient movement to result in an alinement consistent with one bullet passing through both men.

(232) Neither the autopsy pathologists nor the panel, at this time, can determine the exact pathway and angle of this missile track in the President for reasons discussed subsequently in this report.

(233) 12. The panel strongly suggested that the committee undertake a vigorous effort to determine the fate of the missing microscopic slides, paraffin blocks,\* tissues from which they were prepared, and brain, and make these available to the panel for review. (A search was conducted, as described in an attached staff report.)

### PART III: OBSERVATIONS AND CONCLUSIONS DERIVED FROM THE EXAMINATION OF THE AVAILABLE EVIDENCE, INTERVIEWS, SPECIFICALLY REQUESTED ANCILLARY PROCEDURES, AND CONSULTATIONS

(234) The following is the consensus of the panel as to the medical facts of this homicide, based on the evidence available, listed in addenda A and B and developed from interviews and examinations.

#### DESCRIPTION OF PRESIDENT KENNEDY'S WOUNDS

(235) The President sustained two wounds from behind, caused by two missiles, one entering the upper right back and exiting the anterior (front) neck, the second entering high on the back of the head, partially fragmenting in the head, and exiting from the right side, front-parietal\* region, of the head. Documentation of these wounds is as follows:

##### *Entrance (inshoot) wound of the upper back and neck*

##### *1. Clothing—Suit jacket (back)*

(236) The suit is made of a lightweight, gray fabric that resembles a tropical worsted in a sack weave. The jacket collar, back and upper sleeves are stiff and stained with a dark brown substance resembling dried blood. The sleeves are slit, as are the front panels across the nipple line; this was done to facilitate rapid removal in the Parkland emergency room.

(237) Two defects are noted in the back of the jacket. The defect caused by the missile is described in an FBI report as follows:

Examination of the President's clothing revealed the presence of a small hole in the back of the coat and shirt. The hole in the back of the coat is positioned approximately  $5\frac{3}{8}$ -inches below the top of the collar and  $1\frac{3}{4}$ -inches to the right of the middle seam. (1) (See figs. 1 and 2, photographs of the suit jacket.)

That report goes on to describe the defects of the shirt and then states "[t]hese holes are typical of bullet entrance holes." (2)

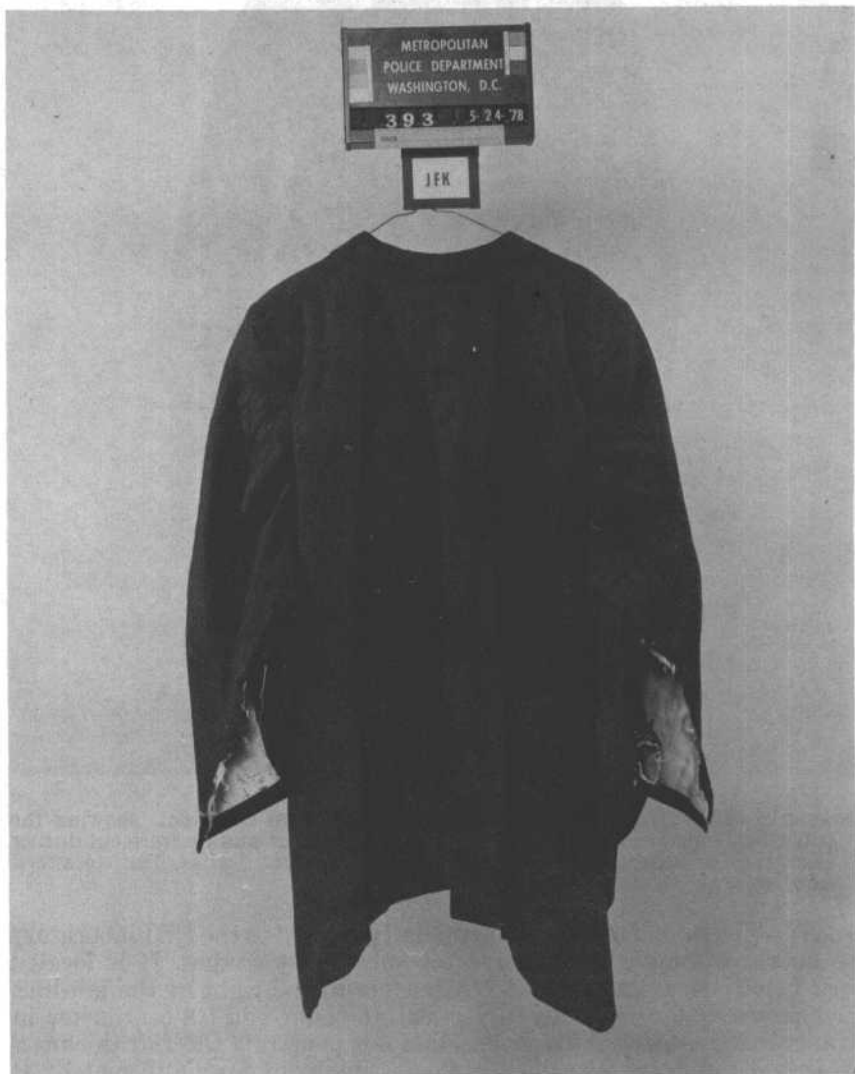


FIGURE 1.—Photograph of the suit jacket, taken from the back, showing the bullet hole entrance.

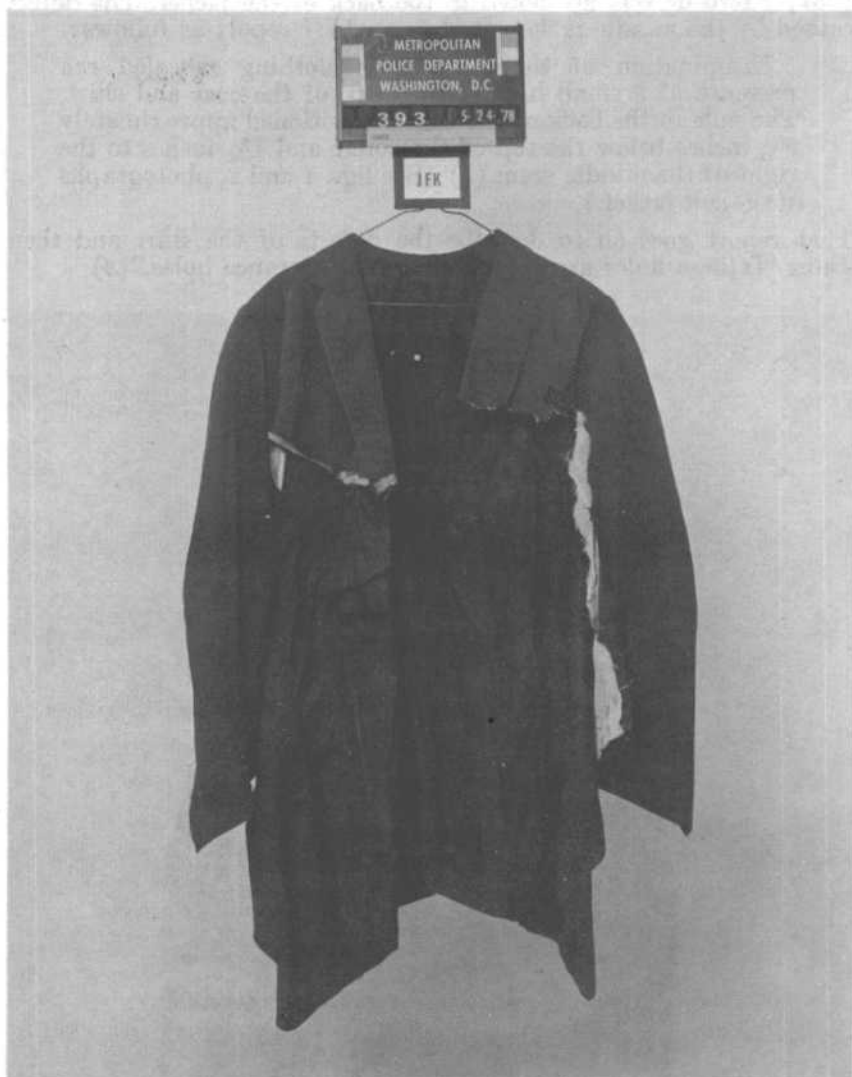


FIGURE 2.—Photograph of the suit jacket taken from the front, showing the bullet hole entrance in the back. The suit jacket, shirt and tie were cut during emergency procedures at Parkland Memorial Hospital, Dallas, Tex., to afford easy removal.

(238) The second defect was artificially created in the FBI laboratory to obtain a sample of material for subsequent studies. It is located just below the collar and 3.3 centimeters to the right of the midline. It measures 0.9 centimeter in vertical diameter and 0.8 centimeter in transverse diameter. This defect does not penetrate the full thickness of the coat and was identified in the testimony of Special Agent R. A. Frazier of the FBI laboratory as the site of a control cloth sample removed and analyzed by the laboratory.

(239) The panel locates the defect created by the missile at 5 centimeters (approximately 2 inches) to the right of the middle of the coat and 13.5 centimeters (5.3 inches) below the top margin of the collar and identifies it as a gunshot defect measuring 1.5 centimeters in vertical diameter and 1 centimeter in transverse diameter and passing through all layers of cloth.

(240) Correspondence from J. Edgar Hoover, Director of the FBI, to J. Lee Rankin, General Counsel, Warren Commission, characterized the posterior holes in the clothing as follows:

The hole in the back of the coat and the hole in the back of the shirt were, in general, circular in shape and the ends of the torn threads around the hole were bent inward. These characteristics are typical of bullet entrance holes.(3)

The panel concurred that such a description of the undisturbed clothing would characterize entrance defects. No earlier reports indicated the dimensions of the defect in the coat, nor of that in the shirt. The intervening handling of the clothing prevents the panel from drawing any independent conclusions based on its own observations of the defect and surrounding fibers.

(241) The panel had access to the results of an earlier spectrographic analysis\* detailed within the above-referenced FBI report that states:

The evidence bullets submitted in this case are clad with copper metal. Spectrographic examination of the fabric surrounding the holes in the back of the coat and shirt revealed minute traces of copper.(4)

## *2. Clothing—shirt (back)*

(242) The shirt is white with a thin triple gray stripe alternating with a thin triple brown stripe. The back, collar and upper sleeves are stiff and stained with a dark brown substance resembling dried blood.

(243) There is a defect in the shirt measuring 1.2 centimeters in vertical diameter and 0.8 centimeter in transverse diameter. It is in a location corresponding to the defect in the jacket, with its upper margin 14 centimeters (5.5 inches) below the upper margin of the shirt collar and 2.5 centimeters (approximately 1 inch) to the right of the midline of the shirt. This defect is also described in the FBI report:

The hole in the shirt back is located in the same relative area, being  $5\frac{3}{4}$  inches below the top of the collar and  $1\frac{1}{3}$  inches to the right of the middle.(5)

(244) A second defect was created in the shirt in order to obtain control cloth for FBI spectrographic analysis,\* as described in the above-referenced report. This manmade defect measures 1.7 centimeters (approximately 0.7 inch) in vertical diameter and 0.3 centimeter in horizontal diameter, and is located 14 centimeters below the upper collar border and 2.5 centimeters to the right of the midline of the shirt. (See fig. 3, a photograph of the missile defect in the back of the shirt.)

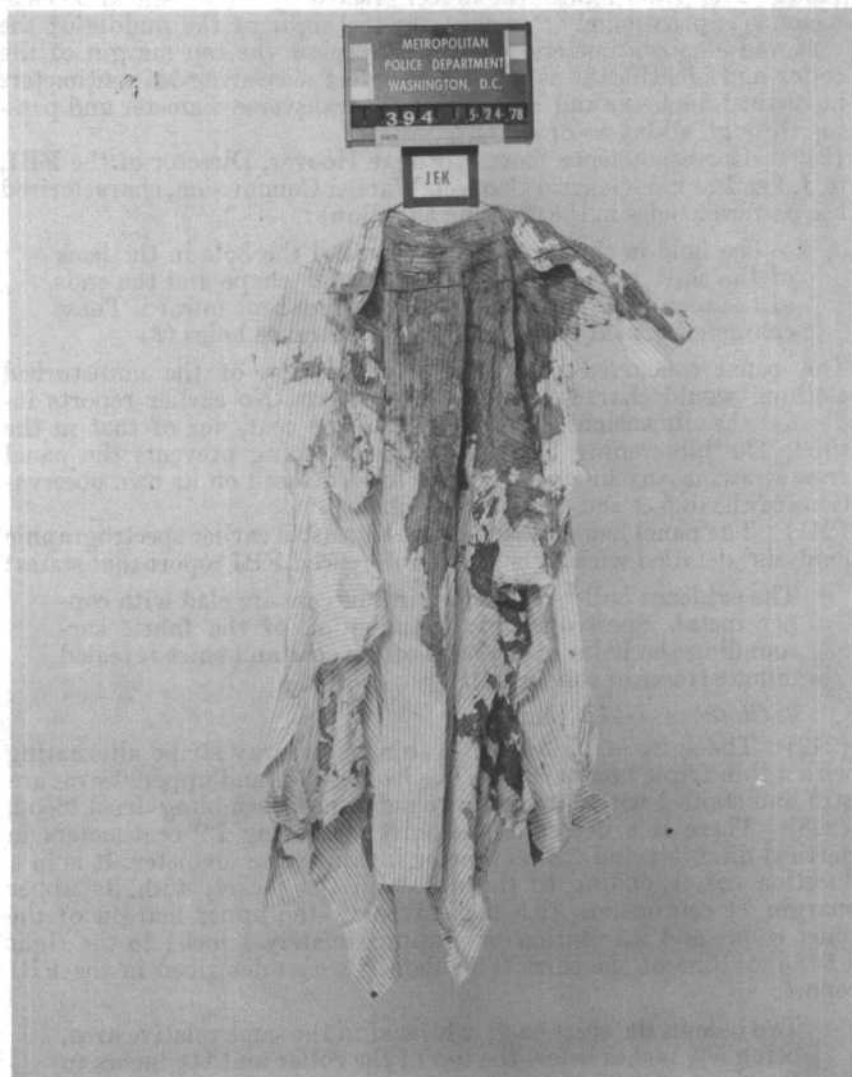


FIGURE 3.—Photograph of the shirt, taken from the front, showing bullet hole entrance in the back.

### *3. Photographs*

(245) The Panel examined photographs of the upper right back with the body on its left side; these included 8 inch by 10 inch black and white negatives and prints Nos. 11 and 12 and 4 inch by 5 inch positive color transparencies and prints, Nos. 38 and 39. (All photographs and X-rays were examined with and without the aid of a 10X magnifying lens.) Stereoscopic visualization\* of paired photographs\* Nos. 38 and 39 revealed a slight change in the position of the camera between the two exposures. Essentially the photographs con-

sist of a view of the right upper posterior thorax (back), with the camera in a position such that it would be approximately horizontal to the body if the body were erect, or at right angles to the skin surface and parallel to a sagittal plane \* of the body. Within each photograph is a centimeter ruler which overlies the midline of the back, extending approximately 2.5 centimeters above the upper wound margin and 2 centimeters below the lower wound margin, with its edge approximately 2.5 centimeters medial to the wound margin. The ruler is in the plane of focus of the wound, enabling reasonably accurate measurement of the wound, which is oval, with one end of the long axis between 2 o'clock and 3 o'clock and the opposite end between 8 o'clock and 9 o'clock. The maximum wound diameter, determined by interpolation from the photos, is 0.9 by 0.9 centimeter. The midpoint is estimated to be 13.5 centimeters below the right mastoid process\*, with the head and neck, as positioned within the photograph, 6 centimeters below the most prominent neck crease and 5 centimeters below the upper shoulder margin. (See fig. 4, a drawing of this wound, and fig. 5, a close-up photograph of it.)

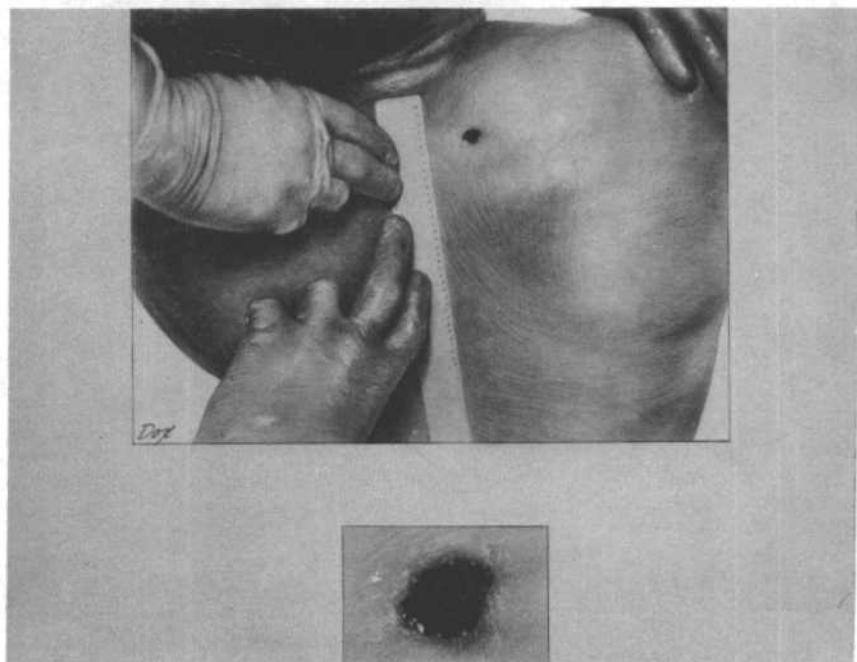


FIGURE 4.—Drawing of the posterior thorax of President John F. Kennedy, revealing the general location and appearance of the entrance wound in the upper back.

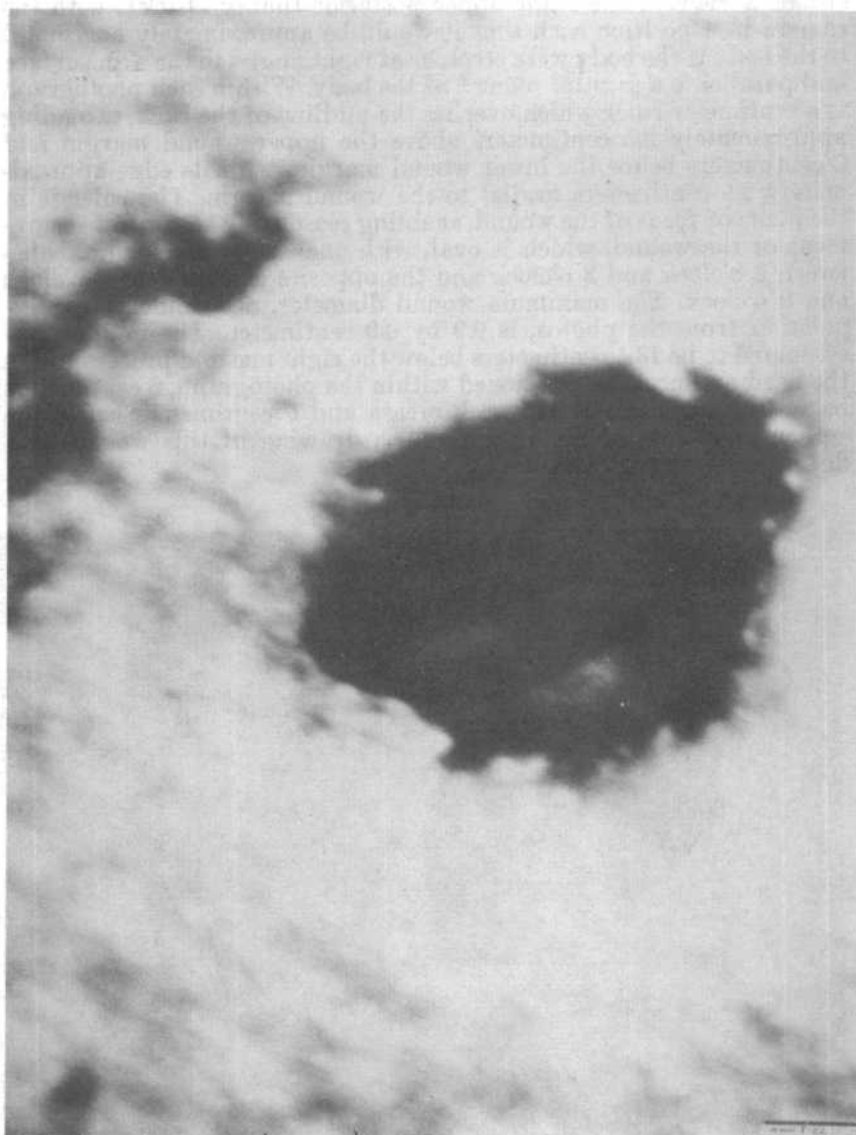


FIGURE 5.—Close-up photograph of the entrance wound in the upper back.

(246) There is a sharply outlined area of red-brown to black around the wound in which there is dried, superficial denudation of the skin, representing a typical abrasion collar\* resulting from the bullet's scraping the margins of the skin at the moment of penetration. This is characteristic of gunshot wounds of entrance and not typical of exit wounds. This abrasion extends around the entire circumference, but is most prominent between 1 o'clock and 7 o'clock about the defect (with the head at 12 o'clock). In addition, there are several small lin-

ear, superficial lacerations or tears of the skin extending radically from the margins of the wound at 10 o'clock, 12 o'clock and 1 o'clock. These measure 0.1, 0.2 and 0.1 centimeter respectively. Photographically enhanced\* prints of photographs Nos. 38 and 39 reveal much more sharply contrasted color determination and, to some degree, more sharply outlined detail of the abrasion collar described above.

(247) Several members of the panel believe, based on an examination of these enhancements, that when the body is repositioned in the anatomic position\* (not the position at the moment of shooting) the direction of the missile in the body on initial penetration was slightly upward, inasmuch as the lower margin of the skin is abraded in an upward direction. Furthermore, the wound beneath the skin appears to be tunneled from below upward.

(248) The panel concurs with the assessment that the color photographs made during the autopsy of President Kennedy are authentic, as described in correspondence of Frank Scott of the photographic evidence panel, dated June 13, 1978.(6)

#### 4. *X-rays*

(249) As is detailed in a late section, "Course of the Missile Through the Body," the X-rays demonstrate that the missile did not strike the scapula\* (wing bone) or ribs and did not remain in the body. This evidence, coupled with the photographs, indicates that the entrance perforation is medial to the scapula and superior to the ribs.

#### 5. *Autopsy report*

(250) The autopsy report, known technically as the autopsy protocol, submitted by Drs. James J. Humes, J. Thornton Boswell, and Pierre A. Finck, localized and characterized the wound in the right upper back:

Situated on the upper right posterior thorax, just above the upper border of the scapula there is a 7 millimeter by 4 millimeter oval wound. This wound is measured to be 14 centimeters from the tip of the right acromion process\* and 14 centimeters below the tip of the right mastoid process.\*(7)

The original pathologists' localization of this wound by measurement to body landmarks which change with different body positions, and their failure to localize this wound relative to the usually accepted fixed body landmarks such as the heel, preclude reconstruction of the exact entrance point.

(251) An attempt to localize this wound more accurately is further frustrated by its designation on a drawing contained within the "autopsy descriptive sheet," which was prepared during the autopsy. In this drawing (see fig. 6, a reproduction of the drawing), a small





sheet primarily to assist in the preparation of the final report and was not necessarily an exact representation of the wound. The majority of the panel agrees that if the wound were located as low as represented on the worksheet, it probably would have penetrated and collapsed the right lung, an effect that would have been apparent on the initial chest X-ray.

*Exit (outshoot) wound of the anterior (front) neck*

*1. Clothing—shirt (front)*

(252) Examination of the shirt reveals a slit-like defect in the upper left front portion, 1.4 centimeters below the topmost buttonhole. This defect measures 1.4 centimeters in length, with its long axis parallel to the long axis of the body. There is a corresponding slit-like defect 1.5 centimeters below the center of the button on the right. This defect measures 1.5 centimeters in length and is also parallel to the long axis of the body (See fig. 3, a photograph of the shirt.)

*2. Clothing—Necktie*

(253) Examination of the necktie in the normal knotted position reveals a linear defect along the left lateral margin of the knot. This defect measures 0.7 by 0.4 centimeter and involves only the outer facing of the tie. The lining is not altered.

(254) These clothing changes were characterized in initial examination by the FBI laboratory:

A ragged, slit-like hole approximately one-half inch in length is located in the front of the shirt seven-eighths inch below the collar button. This hole is through both the button and buttonhole portions of the shirt due to the overlap. This hole has the characteristics of an exit hole for a projectile. No bullet metal was found in the fabric surrounding the hole in the front of the shirt. A small elongated nick was located in the left side of the knot of the tie, Q24 [FBI designation], which may have been caused by the projectile after it had passed through the front of the shirt.(9) (See fig. 7, a photo-

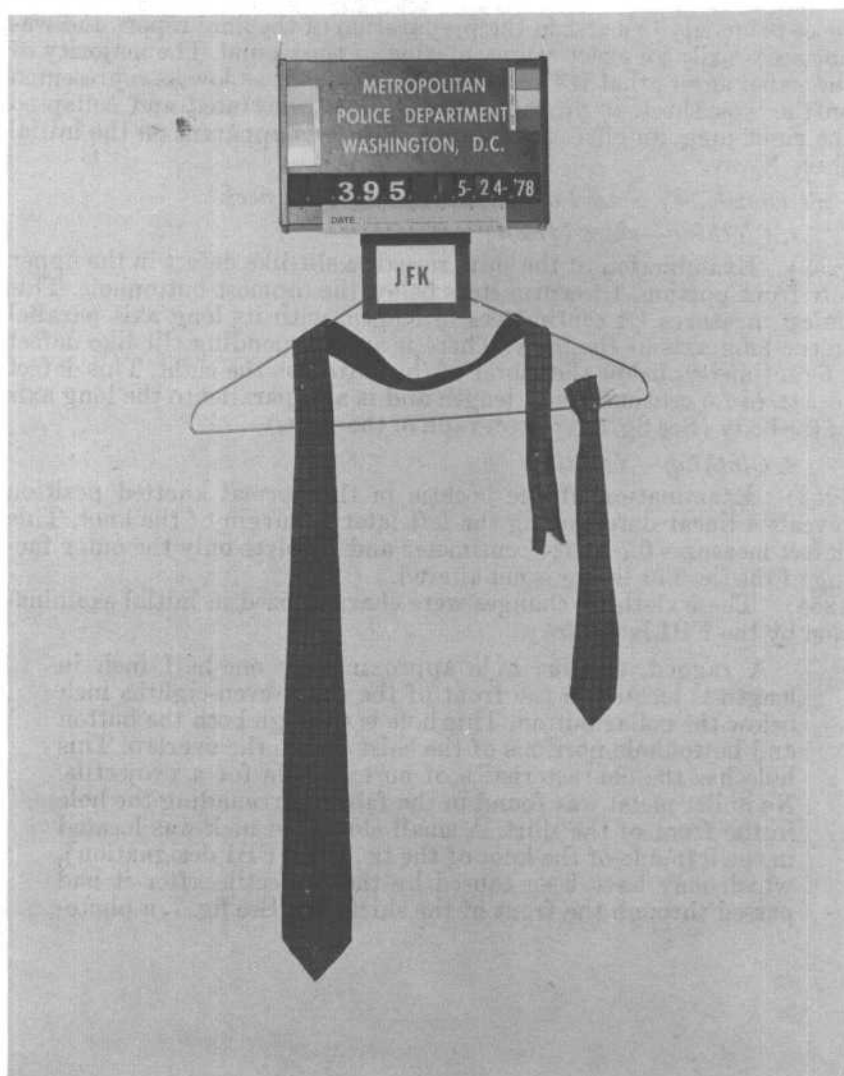


FIGURE 7.—Photograph of the necktie, showing the bullet defects

graph of the tie.) X-ray and other examinations of the clothing revealed no additional evidence of value.

(255) In the correspondence from Hoover to Rankin, referred to earlier, Hoover further characterized the defect in the shirt:

The hole in the front of the shirt was a ragged, slit-like hole and the ends of the torn threads around the hole were bent outward. These characteristics are typical of an exit hole for a projectile. A small elongated nick was present in the left

side of the knot of the tie. This nick may have been caused by the projectile after it passed through the front of the shirt. No additional observations relative to the nick could be made due to the characteristics of the nick.(10).

(256) While the FBI laboratory's initial description did not offer evidence concerning the direction of the fibers, the observations in this letter were substantive evidence of the direction of the penetration, provided that the position of the threads had not changed in the interim. As stated previously, the panel itself cannot assess evidentiary significance to the fiber direction because of the numerous intervening examinations.

(257) Careful attention was paid to the possible presence of any contaminant visible at the margins of any of these defects. The panel suggested examination of appropriate portions of the clothing of the President and the Governor by soft X-ray\* and energy dispersive X-ray\* and, if warranted thereafter, by neutron activation analysis.\* The first two types of nondestructive examinations were concluded, but there was insufficient metal present for neutron activation analysis. (The report of the tests is contained in addendum F.)

(258) The tests were undertaken to:

1. Determine if any particles of missile still remained on the clothing.
2. Analyze the missile fragments, if any, and define the elemental nature of them.
3. See if any correlation might be made between the elements found and missile behavior after striking J.F.K. and J.B.C.(11)

(259) The soft X-ray\* examination revealed the presence of some very tiny particles of foreign material in the back of the shirt at the margins of the defect, but no copper or lead was found by energy dispersive X-ray analysis.\* The energy dispersive X-ray analysis\* yielded a borderline count for copper in the area of the back defect on the President's jacket and in the area of the right front defect on his shirt. Iron, apparently from the bloodstain, was detected about the defect in the jacket.

(260) The panel considers that at this time the appearance of the upper back skin wound, particularly its abrasion collar, is more significant in determining the direction of the missile's passage than examination of the clothing. The limited amount of foreign material demonstrated by soft X-ray and energy dispersive X-ray analysis\* was considered insufficient for further characterization by neutron activation analysis\* by Vincent P. Guinn, Ph. D., of the University of California at Irvine, the committee's consultant in this area. The panel agrees that slit-like defects in clothing are common and typical at missile exit sites.

### *3. Photographs*

(261) The panel examined photographs of the President's face, neck, and upper torso taken from above and to the right which reveal the scalp lacerations in the right frontal and temporal\* regions and a tracheotomy incision in the neck. The photographs included: Black and white 8- by 10-inch prints No. 13 and 14; 4- by 5-inch positive color

transparencies and prints Nos. 40 and 41; and correspondingly numbered 8- by 10-inch color prints. There is no ruler in the photographs, so measurements are approximate. The maximum transverse diameter of the incision in the neck is approximately 5 centimeters, while the maximum vertical diameter is approximately 1.5 to 2 centimeters; it is approximately 4 centimeters below the shoulder line and 3 centimeters above the suprasternal notch.\* (See fig. 8, a drawing of the tracheotomy incision and fig. 9, a closeup photograph of the tracheotomy incision.)

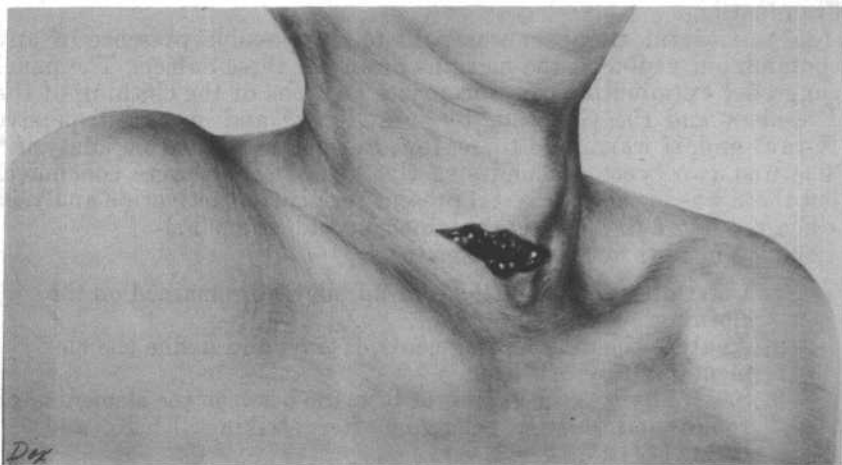


FIGURE 8.—Drawing of the anterior neck and thorax, showing the general location and appearance of the tracheotomy incision.

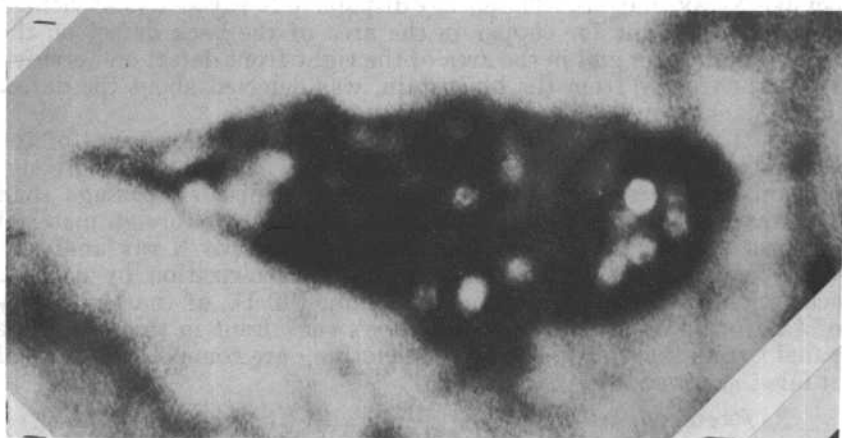


FIGURE 9.—Closeup photograph of the tracheotomy incision.

(262) There is a semicircular missile defect near the center of the lower margin of the tracheotomy incision, approximately in the midline of the neck, with margins which are slightly denuded and reddish-brown.

(263) Although the black and white prints are more sharply focused than the color photographs, none are clear. Figure 19 shows the wound approximately in the midline of the anterior neck. The panel suggested photographic\* or computer-assisted enhancement\* of either one or both of black and white photographs Nos. 13 and 14, inasmuch as they were in sharper focus and the results might better delineate the margins of the exit defect in the anterior neck which was not properly identified and documented at the time of autopsy.

#### 4. X-rays

(264) As is detailed in a later section ("Course of the Missile Through the Body"), the X-rays indicate that the missile track proceeds toward the midline of the body. This analysis is based on the fracture of the transverse process of T-1 and the air in the soft tissues, which probably resulted from the laceration of the trachea. The air could have been caused by either a bullet laceration of the trachea or the surgeon's tracheotomy. The X-rays show that no missile is present and therefore that the bullet exited the body without causing any fracture other than of the lateral transverse process.

#### 5. Autopsy Report

(265) The autopsy report characterized the anterior neck wound as:

Situated in the low anterior neck at approximately the level of the third and fourth tracheal rings is a 6.5-centimeter long transverse wound with widely gaping irregular edges.(12)

The appearance of this wound was further characterized by Dr. Humes in his report as follows:

The wound presumably of exit was that described by Dr. Malcolm Perry of Dallas in the low anterior cervical\* region. When observed by Dr. Perry, "the wound measured" a few mm in diameter, however it was extended as a tracheotomy incision and thus its character is distorted at the time of autopsy. However, there is considerable ecchymosis of the strap muscles of the right side of the neck and of the fascia\* about the trachea adjacent to the line of the tracheotomy wound.(13)

(266) This wound is further depicted in the Autopsy Descriptive Sheet, in which the anterior view, showing a semicircular line with its convex border pointing inferiorly below the lower crease of the neck, bears the legend "6.5 centimeter." (See fig. 6.) It is conspicuously unclear from the autopsy report alone that during autopsy, the pathologists were unaware and failed to recognize that there was a missile perforation in the anterior neck. This may account for the fact that the neck, trachea, strap muscles, and spine were not dissected and examined.

*6. Statements of the surgeons*

(267) Dr. Perry testified before the Warren Commission that:

In the lower part of the neck below the Adams Apple was a small, roughly circular wound of perhaps 5 mm. in diameter from which blood was exuding slowly. (14).

In a committee interview, Dr. Perry further characterized the wound:

Dr. Perry began by stating that one of the wounds that JFK had suffered was "about  $\frac{1}{3}$  of the way" up on the anterior aspect of the neck. Dark blood (a sign of insufficient oxygen) was oozing from the wound when Dr. Perry first observed JFK. Dr. Perry believes that the wound measured approximately 6-7 millimeters in size and was roughly round, although he couldn't state for sure since combating the two primary medical emergencies of restoring breathing and stopping bleeding prevented him from even taking the time to wipe the blood from the wound. (15)

The report on the interview continued:

Dr. Perry said that Dr. Jones, who was already treating JFK when Perry arrived, had inserted a tube down the trachea to facilitate breathing but that the air passage still seemed blocked. Due to this dilemma, Dr. Perry determined that a tracheotomy was necessary "then or never" and therefore made a transverse incision straight through the bullet wound on the anterior aspect of the neck at approximately the second or third tracheal ring. (16)

(268) Dr. Perry declined to express an opinion to the Warren Commission on the origin of the missiles that caused the damage. He explained:

I didn't clearly identify either an entrance or an exit wound. In the press conference I indicated that the neck wound appeared like an entrance wound, and I based this mainly on its size and the fact that exit wounds in general tend to be somewhat ragged and somewhat different from entrance wounds. Now, this doesn't pertain, of course, in bullets that are tumblers,\* and many bullets, especially fired from the hand guns and this sort of thing, tend to tumble, and as a result, they make keyhole injuries and various things. But, in general, full-jacketed bullets make pretty small entrance holes. And so I don't really know. I thought it looked like an entrance wound because it was small, but I didn't look for any others, and so that was just a guess. (17)

(269) Dr. C. James Carrico characterized the wound in the anterior neck as: "One small penetrating wound of the ant. (anterior) neck in lower third." (18) Dr. Carrico further characterized this wound in a Select Committee staff interview:

My total recollection of that wound, it was, a small, fairly circular wound, with material issuing from it. And that's really my total recollection. (19)

When asked whether he was able to draw any conclusions about the direction in which the missile had been passing, Dr. Carrico said "not for sure." (20)

(270) The panel considered the appearance of the wound in the anterior neck as initially described and subsequently altered. It is of the opinion that such a wound, uniformly regular in shape and small in size, might be anticipated from an intermediate or even high velocity missile if the tissues through which the missile exited were shored, buttressed or otherwise reinforced by clothing or other external objects that would minimize the outward displacement of the skin and underlying superficial tissue and consequent tearing and distortion of these tissues. The similarity between entrance and shored exit wounds may extend to the production of clothing abrasion patterns, that is, the imprint of the fabric of the clothing on the skin, because the missile, prior to exiting through the skin, forces the skin against the overlying restraining clothing.

(271) The panel members agree that the fabric of the shirt and tie and their anatomic relationship to the underlying missile wound might have served as sufficient reinforcement to diminish distortion of the skin. Several panel members are also of the opinion that an unshored exit wound of a missile of comparable size and velocity might be similar if the missile were not misshapen by striking a substantial bone within the body. The panel believes that it would be reasonable for a surgeon not to appreciate or even consider the significance of the clothing in terms of the wound shape produced, especially if the clothing had been removed prior to his initial examination, as was described within the above-referenced exhibits and interviews. The panel further notes that the shoring or buttressing effect of the wound by the clothing might serve to seal the defect in the President's trachea if he rotated his head, thus permitting him to speak after this wound was inflicted.

### *Course of the missile through the body*

#### *1. Photographs*

(272) There is no photographic evidence available that shows any of the internal injuries described by the pathologists within the trunk of the body. Dr. Humes recalled directing that a single photograph of the upper interior aspect of the right thoracic (chest) cavity be taken to illustrate the hemorrhage\* just exterior to the pleura (lining) of this cavity, adjacent to the missile track (21). There is, however, no such photograph among those in the collection, although there is one 4 by 5 inch positive color transparency on which there is no image.

#### *2. X-rays*

(273) The panel examined X-rays of the anterior-posterior\* view of the thoracolumbar\* region (No. 7); the anterior-posterior\* view of the right neck, thorax (chest) and upper arm (No. 8); the anterior-posterior\* view of the chest (No. 9); the anterior-posterior view of the left neck, thorax (chest) and upper arm (No. 10); and the anterior-posterior\* view of the thoracolumbar\* region (No. 11). X-ray No. 9 had been taken before the start of the autopsy; X-rays (Nos. 7, 8, 10,



11, and 14) were taken after removal of the internal organs. (See addendum J for a statement regarding the authenticity and description of the X-rays.)

(274) The panel noted a general haziness and poorly defined decrease in radiodensity\* in the neck tissues just above the right chest cavity in films 8 and 9, and attributed this to interstitial emphysema.\* This was probably related to the surgical tracheotomy or missile injury to the trachea, followed by positive pressure insufflation\*, with a slight escape of air into the adjacent tissues. Continued breathing by the President, possible even after the trachea had been perforated by the missile because the overlying defect was more or less sealed by the shirt and necktie, could also have caused air to leak into the adjacent soft tissues.

(275) The panel noted a number of small, radiopaque densities apparent in the No. 8 film and not apparent in No. 9. With one exception, these densities measured less than 0.1 centimeter in diameter and appeared to be more densely aggregated in the area immediately lateral to the right transverse processes of the seventh cervical (C-1) and first thoracic vertebrae (T-1). The panel took special note of a slightly larger shadow immediately lateral to the right transverse process of the seventh cervical vertebra. (See figs. 10 and 11, photographs of X-rays 8 and 9.)



FIGURE 10.—Photograph of an anterior-posterior X-ray of the neck and chest (from autopsy X-ray No. 8), showing small radiopaque densities adjacent to the transverse process of C-6 and C-7.



FIGURE 11.—Photograph of the anterior-posterior X-ray of the neck and chest (from film No. 9), showing small radiopaque densities adjacent to the transverse process of C-6 and C-7.

(276) The forensic pathology panel requested that consultant radiologists review these opacities. Dr. G. M. McDonnel of Los Angeles indicated that the smaller shadows were randomly distributed on the X-rays in other locations far removed from this portion of the body. They were found even in films that did not overlie the trunk itself, such as in X-ray film No. 13 of the President's pelvis and upper thighs. Dr. McDonnel, who had served as an X-ray consultant to the coroner/medical examiner in Los Angeles and had had experience in such analysis, interpreted the shadows as artifacts not uncommonly caused by foreign materials on the film or in the developing solutions.

(277) Dr. McDonnel further noted that the larger shadow was not present in the initial films of the thorax (film No. 9), but only in subsequent films taken after removal of the thoracic organs, suggesting again that this shadow was an artifact. Dr. McDonnel's complete report, which also authenticates the X-rays by comparison with films taken while the President was living, is contained in a letter dated August 4, 1978, addressed to the select committee, and is incorporated in its entirety into this report as addendum C.

(278) The panel noted an interruption in the continuity of the right transverse process of the 1st thoracic vertebra, much more clearly delineated in the computer-assisted enhancement\* of film No. 8. Dr. David O. Davis, M.D., professor and chairman of the department of radiology at the George Washington University Hospital and Medical School, Washington, D.C., also observed these same findings, both on

the original X-ray films and on the computer-assisted enhancement\* of these films. Dr. Davis' complete report is contained in a memorandum to the committee dated August 23, 1978. (This letter, in its entirety, is incorporated in this report as addendum D.)

(279) Increased radiolucency,\* most probably caused by the interstitial emphysema\* noted earlier, rendered it virtually impossible to ascertain whether or not there was a similar fracture of the right transverse process of the seventh cervical vertebra. Norman Chase, M.D., professor and chairman of the department of radiology of New York University School of Medicine—Bellevue Hospital Medical Center, also examined the X-rays and their computers-assisted enhancements\* on Feb. 27, 1978. He noted the presence of a metal fragment or artifact in the area of the transverse process that was definitely not a bone fragment. He observed air in the subcutaneous tissue in the same region, which he concluded was caused by the passage of a missile or air or both entering the region due to the tracheotomy incision. He said the 1 by 2.5 millimeter object was too small and dense to be bone; rather, the little trail of dots near the fragment was indicative of artifacts. Dr. Chase said that if a fracture was present in T-1, it was peculiar in that there was no displacement of the bone. He suggested that enhancement of X-ray No. 9 might provide additional information.

(280) William B. Seaman, M.D., professor and chairman of radiology of Columbia Presbyterian Hospital and Physicians and Surgeons Medical School in New York City, also examined the X-rays:

Regarding the neck X-ray, Dr. Seaman said there was a fragment-like object present near the transverse process which was too dense to be bone ('fairly confident'). He said the transverse process appears normal with air present (possibly byproduct of tracheotomy), calling it " \* \* highly suspicious compared with the other side." He thinks he can " \* \* see the fragment separate (also in No. 9) and concludes there is a possible fracture in C-7.(22)"

### *3. Autopsy report*

(281) The autopsy report characterized the internal injuries and missile path:

2. The second wound presumably of entry is that described above in the upper right posterior thorax. Beneath the skin there is ecchymosis\* of subcutaneous tissue and musculature.\* The missile path through the fascia and musculature cannot be easily probed. The wound presumably of exit was that described by Dr. Malcolm Perry of Dallas in the low anterior cervical region \* \* \*. However, there is considerable ecchymosis\* of the strap muscles of the right side of the neck and of the fascia\* about the trachea adjacent to the line of the tracheotomy wound. The third point of reference in connecting these two wounds is in the apex (supra-clavicular portion)\* of the right pleural cavity. In this region there is contusion\* of the parietal pleura and of the extreme apical portion of the right upper lobe of the lung. In both instances the diameter of contusion\* and ecchymosis\* at the point of

maximal involvement measures 5 centimeters. Both the visceral and parietal pleura are intact overlying these areas of trauma. (23)

(282) See figure 12, a drawing of these anatomic structures, injuries to them, and possible trajectories on the position of the body.

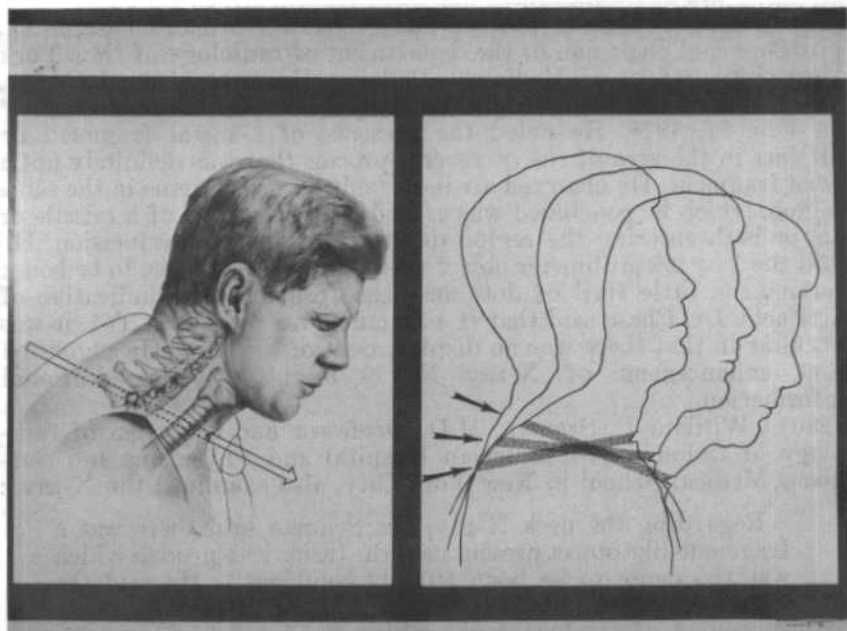


FIGURE 12.—Drawing of the lateral cross-section of the chest, depicting the visceral and parietal pleura, lower neck and right lung, with the injuries described to them. Also depicted is a drawing demonstrating the possible trajectories through the neck of President Kennedy, depending on the position of the body.

(283) Further evidence of internal injury in the thorax is reflected in the autopsy pathologists' description of the lungs:

The lungs are of essentially similar appearance the right weighing 320 grams, the left 290 grams. The lungs are well aerated with smooth glistening pleural surfaces and grey-pink color. A 5-centimeter diameter area of purplish red discoloration and increased firmness to palpation is situated in the apical portion of the upper right lobe. This corresponds to a similar area described in the overlying parietal pleura. Incision in this region reveals recent hemorrhage into pulmonary parenchyma.\* (24)

(284) The autopsy report makes no reference to any defect in the trachea, although this was described by the attending surgeons. Of particular interest relative to the location of the missile wound in the right neck is the description of the thoracic cavity within the report:

The bony cage is unremarkable. The thoracic organs are in their normal positions and relationships and there is no increase in free pleural fluid. The above described area of contusion\* in the apical portion of the right pleural cavity is noted. (25)

(285) Again, had the wound of entrance been below the uppermost extension of the right lung, this lung would have collapsed and blood would have been present within the cavity.

(286) Correspondence of Dr. Finck, dated February 1, 1965, and addressed to Brig. Gen. J. M. Blumberg, contained these observations concerning the pathway of the missile in the neck:

This wound cannot be probed with the soft probe available. There is subpleural hemorrhage in the right apical mesial region. The apex of the right lung is hemorrhagic, without laceration of the pleura. On the basis that there is a wound possibly of entrance, which cannot be probed through the body, I suggest X-ray films be taken, anteroposterior and lateral, of the entire body, before going any further with the autopsy. This radiologic survey does not reveal any major missile in the President's cadaver. There is a recent tracheotomy wound (transversal incision) with moderate hemorrhage in the subcutaneous tissue. Thanks to a telephone call from commander Humes to Dallas, I found out later that the surgeon in Dallas had extended the exit wound in the anterior aspect of the neck to make his tracheotomy. The tracheotomy wound was examined by the three prosecutors. None of us noticed a bullet wound along its course. The organs of the neck were not removed: The President's family insisted to have only the head examined. Later, the permission was extended to the chest. (26)

(287) The summary in the autopsy report includes additional reference to the pathway of this missile:

\* \* \* entered the right superior posterior thorax above the scapula and traversed the soft tissues of the supra-scapular and supra-clavicular portions of the base of the right side of the neck. This missile produced contusions\* of the right apical parietal pleura and of the apical portion of the right upper lobe of the lung. The missile contused the strap muscles of the right side of the neck, damaged the trachea and made its exit through the anterior surface of the neck. As far as can be ascertained, this missile struck no bony structures in its path through the body. (27)

(288) The autopsy report makes no further reference to the wound in the front of the neck.

#### *4. Interviews with the surgeons*

(289) In his interview with the committee, Dr. Perry described a laceration on the right lateral side of the trachea. He did not recall precisely how he initially characterized it, but in his interview said, "\* \* \* it was on the right side of the trachea \* \* \* it was incomplete \* \* \*." Further,

I don't remember whether it was a third or a quarter of the circumference \* \* \* I can't remember exactly. There was a laceration. The bruising I mentioned was in the apical pleural and the strap muscles. The trachea was clearly lacerated.(28)

(290) Dr. Perry's interview was also of interest relative to the possibility of the wound being low enough to have penetrated the right thoracic cavity. He said that he had placed a chest tube in the right thoracic cavity. Specifically:

I surmised there might be a hemothorax (blood within the thoracic cavity) or pneumothorax (air within the thoracic cavity) because, not knowing the trajectory of the missile, and when I saw the bruised apical pleural and there was some bubbly blood in that area. \* \* \* I didn't know whether that blood had been frothed a little bit as a result of air coming out of the trachea in our attempt to breathe for him or whether it was coming out of a lung. And as a result, since a tension pneumothorax or serious chest injury could have obviously been a serious problem, why we elected to put in a chest tube. But the chest tube, I later learned, was not necessary because the chest cavity was not violated.(29)

(291) He later explained that he did not become aware that the chest cavity had not been violated until he reviewed the autopsy report.

(292) Dr. Perry further indicated in this interview that there was "essentially very little bleeding." (30) Asked if he believed that a major arterial injury had been inflicted, particularly to the adjacent common carotid artery, he said that:

Even if he had had a major arterial injury, why he might have bled out and there wouldn't have been much (blood); but there was no evidence of a major arterial injury. And the artery, of course that's closely applied to the trachea, is the common carotid artery at that level. But it was not injured.(31)

(293) Description of the autopsy procedure makes no reference to removal or dissection of the neck organs nor of examination of the arteries of the neck. Dr. Finck testified on February 24, 1969:

I was interested in the track and I had observed the conditions of bruising between the point of entry in the back of the neck and the point of exit at the front of the neck, which is entirely compatible with the bullet's path.

When asked, "But you were told not to go into the area of the neck, is that your testimony?", his answer was, "From what I recall, yes, but I don't remember by whom." Queried further, "Did you attempt to probe this wound in the back of the neck?", his answer was, "I did." Counsel, on learning of his difficulty in attempting to probe the missile pathway, asked: "Isn't this good enough reason to you as a pathologist to go further and dissect this area in an attempt to ascertain whether or not there is a passageway here as a result of a bullet?" Dr. Finck's answer was, "I did not consider a dissection of the path." (32)

*Entrance (inshoot) wound of the back of the head**1. Clothing*

(294) The bullet perforated no clothing prior to its penetration into the skin of the posterior scalp.

*2. Photographs*

(295) The panel examined photographs of the back of the head, including: Black and white negatives and prints Nos. 15 and 16; color transparencies Nos. 42 and 43; and correspondingly numbered color prints of the back of the head. These were studied with both the naked eye and 10X magnification. The photographs again all appear to have been taken from approximately the same position, and stereoscopic visualization\* of the two 4 by 5 inch color transparencies enables three-dimensional perception. In the center of the photographs is a vertical centimeter ruler, which, by stereoscopic visualization,\* is demonstrated to be slightly closer to the camera than the adjacent skin surface. The upper portion of the ruler, which is in sharpest focus, is adjacent to a slightly oval scalp defect located in the "cowlick" area of the scalp just above or superior to a line drawn between the superior or upper margins of the area. (See fig. 13, a drawing of the back of the President's head.) This defect is partially covered by hair and dried blood. This wound is located considerably above the occipital protuberance,\* slightly to the right of the midline, and approximately 13 centimeters above the most prominent neck crease. It has a maximum vertical diameter in the photograph of approximately 1.5 to 2 centimeters, and a maximum transverse diameter of approximately 0.9 centimeter.



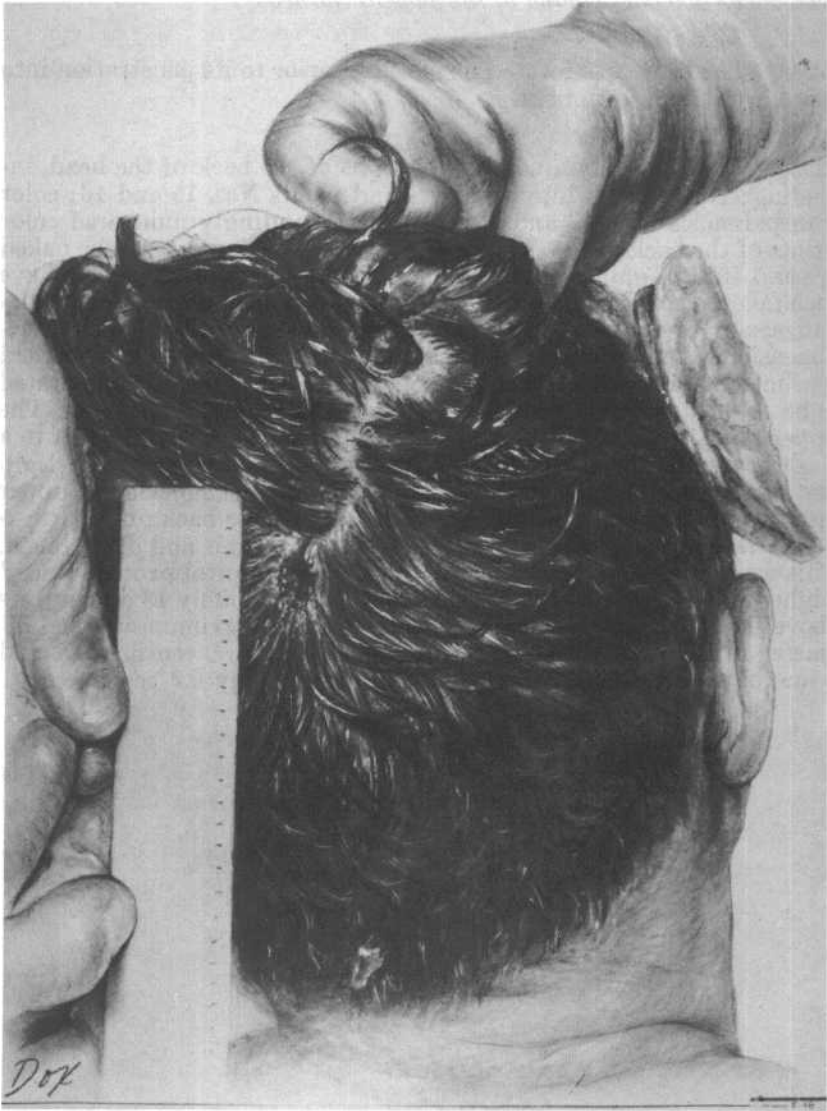


FIGURE 13.—Drawing depicting the posterior head wound. Note also the position "white mass," described later.

(296) Accurate reconstruction of the exact dimensions of the wound is difficult because the ruler and wound are in different planes of focus. The long axis of the wound more closely approximates a vertical angle than that depicted within the "Autopsy Descriptive Sheet." (See fig. 6.) The inferior margin of this wound, from 3 to 10 o'clock, is surrounded by a crescent-shaped reddish-black area of denudation, again presenting the appearance of an abrasion collar, resulting from the rubbing of the skin by the bullet at the time of penetration. From 12

to 3 o'clock, there is a suggestion of undermining, that is, tunneling of the tissue between the skin surface and the skull. Three small linear lacerations or tears of the skin, measuring less than 0.2 centimeter, in length, extend radially from the margins of the defect at 11 o'clock, 12 o'clock, and 3 o'clock. (See fig. 14, a close-up photograph of this wound.)

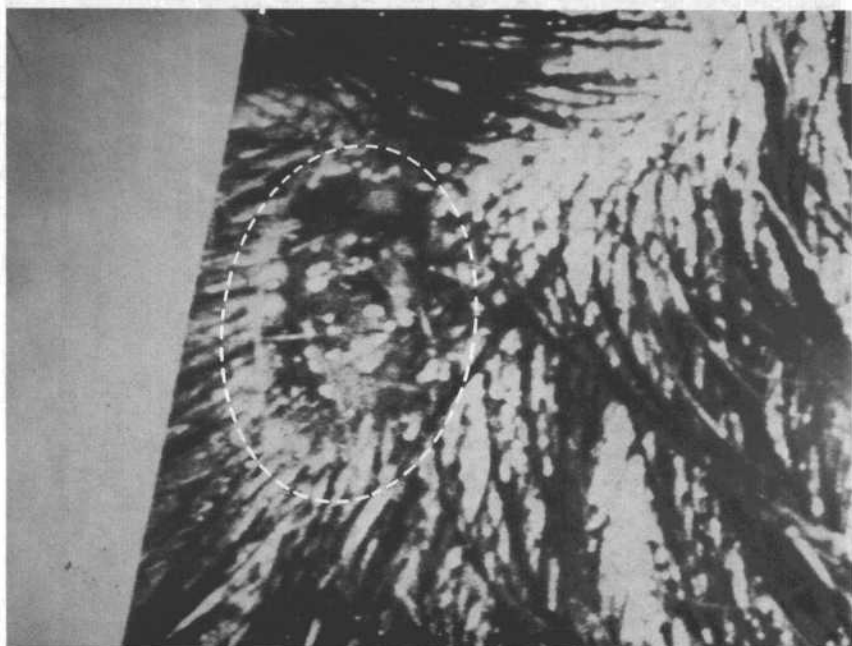


FIGURE 14.—Close-up photograph of the posterior head wound.

(297) An irregular, somewhat rectangular white object is also seen in these photographs, near the lower margin at the scalp hair at a point which most of the panel considers to be consistent with a localization slightly to the right of, and most likely below, the occipital protuberance.\* The panel agrees that the object is dried brain tissue.

(298) Examination of the enhanced photographs\* prepared from the 4 by 5 inch color transparency of the photograph of the back of the head (print No. 42) reveals more sharply contrasted detail of the wound described in the upper occipital region and the dried brain tissue in the lower occipital region. Stereoscopic visualization\* of this fragment indicates that it is adherent to and on the surface of the hair. Computer-assisted image enhancement\* of this photograph reveals a dark oval shadow within the margins of the scalp perforation in the cowlick area which may be the perforation of the underlying skull. The hole in the scalp lines up with the hole in the skull. The X-rays also locate the skull defect at this point.



FIGURE 15.—Close-up photograph of the "white mass," dried brain tissue, situated in the lower occipital region.

(299) Examination of the dried brain tissue in the lower occipital region\* by computer-assisted image enhancement\* also clearly demonstrates that it is on the surface of the hair. Such enhancement further provides some three-dimensional characterization. (See fig. 15, a close-up photograph of the dried brain tissue.) All members of the panel agree that the upper scalp wound, the location of which is identified by X-rays as approximately 10 centimeters (as measured on the

X-ray) above the external occipital protuberance,\* is a typical entrance wound. All concur in its striking similarity to the entrance wound in the upper back. All agree that the white material is a piece of brain tissue and that it has no relationship to the location of the entrance wound, despite the interpretations of the autopsy pathologists in their Warren Commission testimony and interviews.

(300) Stereoscopic visualization\* of the inside of the cranial cavity at its depth, after removal of the brain, reveals a semicircular beveled\* defect of the inner table in the posterior parietal area to the right of the midline, from which fracture lines radiate corresponding to the entrance perforation indicated in the skull X-rays.

### *3. X-rays*

(301) Skull X-ray No. 2, a lateral view of the head, reveals rather marked disruption of the smooth contour of the skull on the right side in the temporal-parietal region, with multiple fractures through other portions of the skull. There is sharp disruption of the normal smooth contour of the skull 10 centimeters (as measured in the X-ray) above the external occipital protuberance,\* with suggested beveling\* of the inner table and with fracture lines radiating superiorly and inferiorly. (See fig. 16, showing the beveling process.) At this point

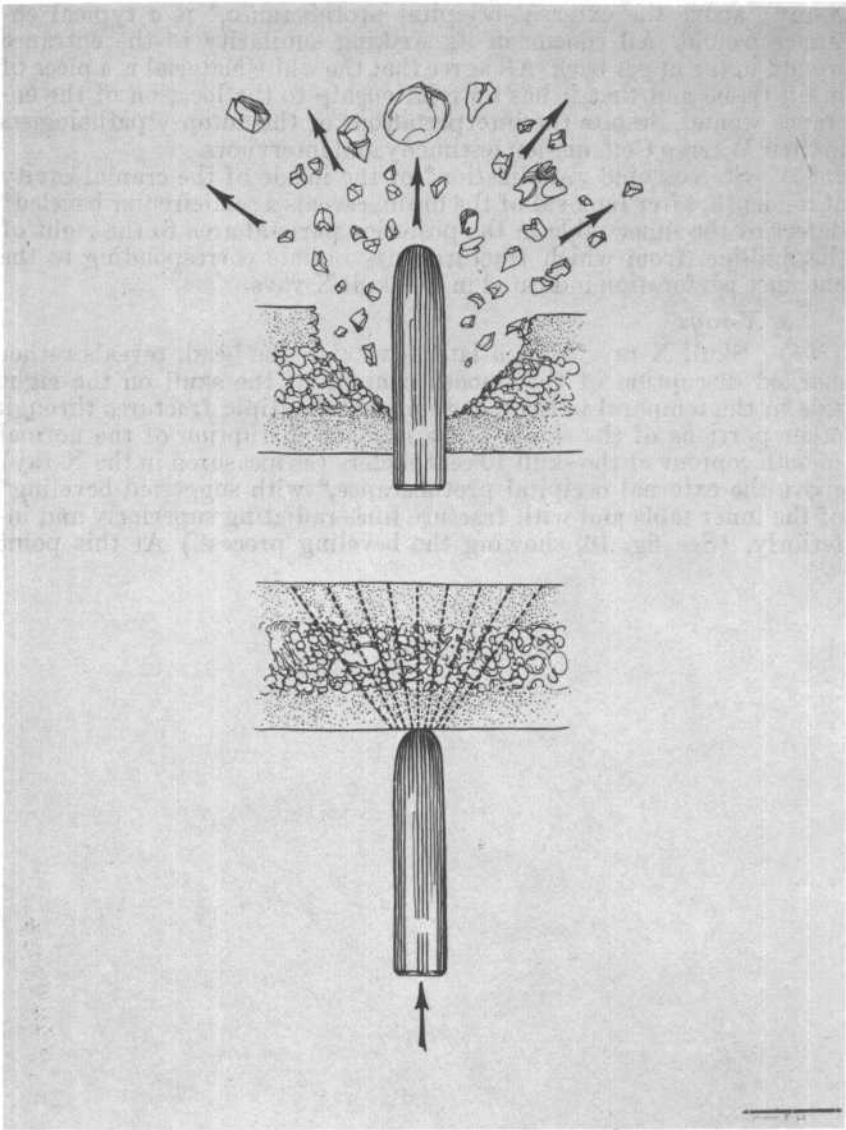


FIGURE 16.—Diagram depicting beveling which occurs on the interior surface to the site of entrance and exterior surface at the site of exit when a missile perforates the skull.

there is an irregular, radiopaque, sharply outlined bullet fragment. The skull defect, apart from its location, corresponds with the description within the autopsy report, in which it characterized as follows:

In the underlying bone is a corresponding wound through the skull which exhibits beveling\* of the margins of the bone when viewed from the inner aspect of the skull.(33)

(302) The location of the missile fragment and transverse fractures of the occipital region of the skull is also apparent in the anterior-posterior\* X-ray view of the skull (No. 1). It shows the missile fragment to be slightly to the right of the midline and in approximately the same vertical plane as in the above-described lateral view. (See figs. 17 and 18, photographs of X-rays Nos. 1 and 2 respectively.)



FIGURE 17.—Photograph of the anterior-posterior X-ray of the skull (autopsy X-ray No. 1), showing the occipital defect and adjacent missile fragment.

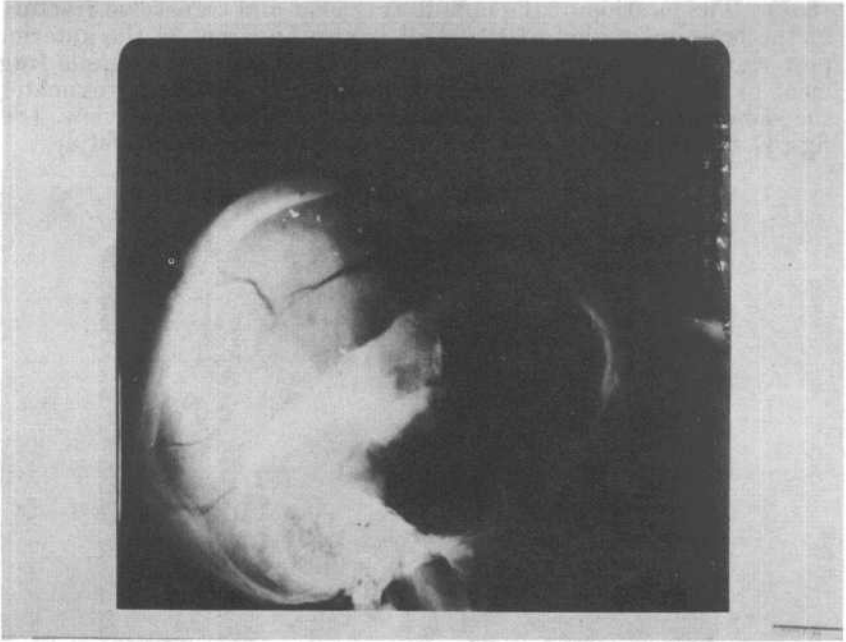


FIGURE 18.—Photograph of the lateral X-ray of the skull (autopsy X-ray No. 2) showing the occipital defect with beveling and adjacent missile fragment.

(303) Computer-assisted image enhancement\* of this film more sharply delineates the fracture lines and bone fragments, as well as the missile fragment in the occipital region. The defect in the skull and the inward beveling\* thereof provide definite evidence of an entrance wound of the head at a point corresponding to that noted by the panel in the upper back of the scalp, rather than "slightly above" the external occipital protuberance\* as indicated in the autopsy report, or in the lower part of the head near the hairline, as stated by the autopsy pathologists in their interviews with the panel. (See figs. 19 and 20, and computer-assisted enhancements\* of X-rays 1 and 2 respectively. See also fig. 21, a photograph of a premortem X-ray of the skull of the President, against which to compare the damage shown in autopsy X-rays Nos. 1 and 2.)

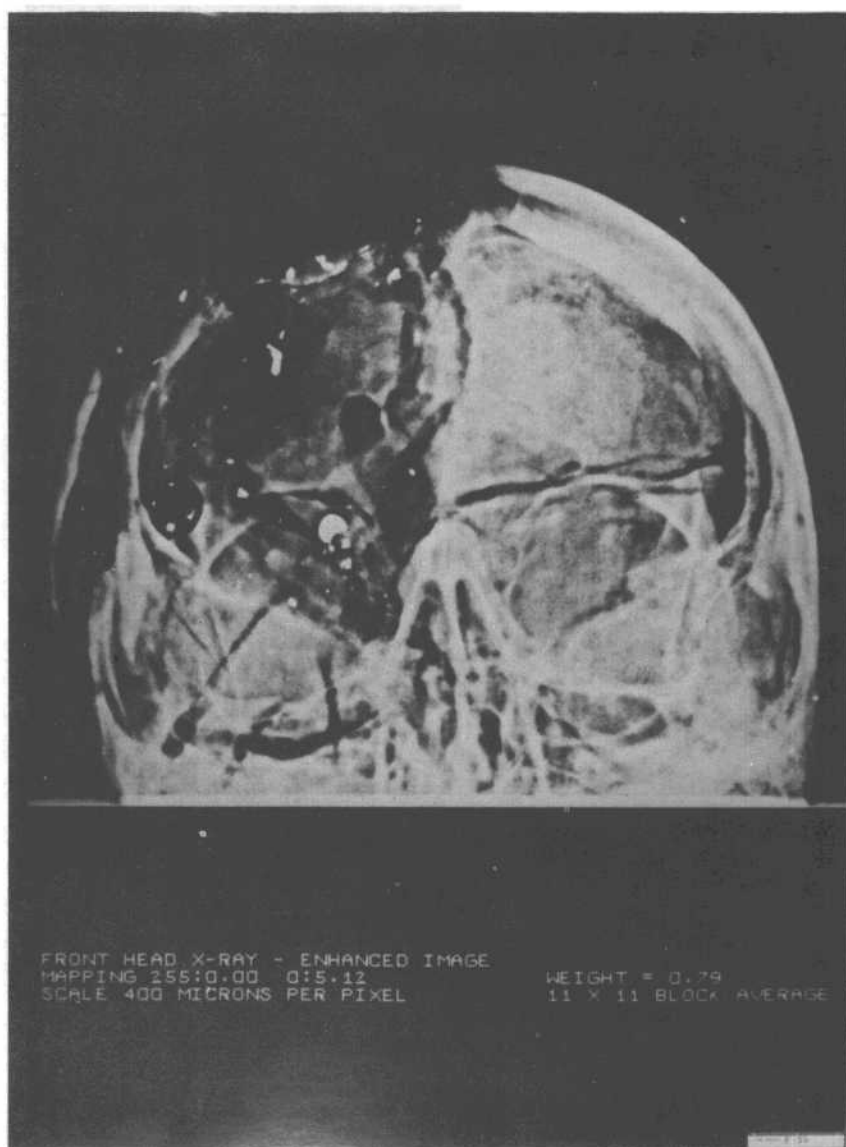


FIGURE 19.—Photograph of a computer-assisted image enhancement of anterior-posterior X-ray of the skull (autopsy X-ray No. 1).





FIGURE 20.—Photograph of a computer-assisted image enhancement of a lateral X-ray of the skull (autopsy X-ray No. 2).

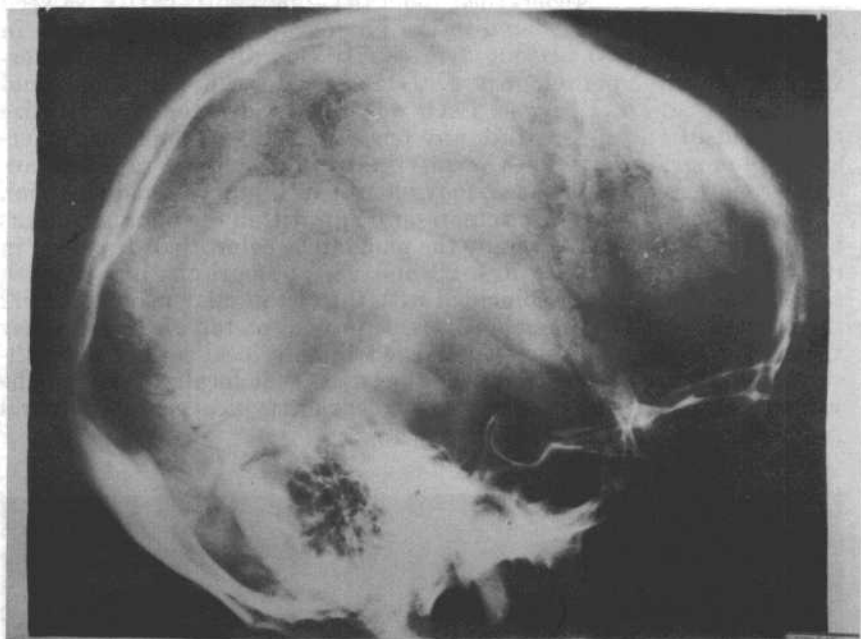


FIGURE 21.—Photograph of a pre-mortem lateral X-ray of the skull of President John F. Kennedy, against which to compare the damage shown in the autopsy X-rays Nos. 1 and 2.

#### 4. Autopsy Report

(304) The autopsy report localizes and characterizes the posterior head wound as follows:

Situated in the posterior scalp approximately 2.5 centimeters laterally to the right and slightly above the external occipital protuberance\* is a lacerated wound measuring 15 x 6 millimeters. In the underlying bone is a corresponding wound through the skull which exhibits beveling\* of the margins of the bone when viewed from the inner aspect of the skull. (34)

The "Autopsy Descriptive Sheet" shows a round circle overlying the occipital protuberance,\* with an arrow extending superiorly and to the left at approximately 11 o'clock and the notation "ragged, slanting, 15 by 6 millimeters." (See fig. 6.) Conspicuous by its absence is any descriptive legend which localizes this wound relative to body landmarks.

(305) Dr. Finck, in his correspondence to Brigadier General Blumberg, made this observation concerning the entrance wound:

I also noticed another scalp wound, possibly of entrance, in the right occipital region, lacerated and transversal, 15 by 6 millimeters. Corresponding to that wound, the skull shows a portion of a crater, the beveling\* of which is obvious on the internal aspect of the bone; on that basis, I told the prosecutors and Admiral Galloway that this occipital wound is a wound of entrance. (35)

(306) The panel was concerned about the apparent disparity between the localization of the wound in the photographs and X-rays and in the autopsy report, and sought to clarify this discrepancy by interviewing the three pathologists, Drs. Humes, Boswell, and Finck, and the radiologist, Dr. Ebersole. Each was asked individually to localize the wound of entrance within any one of several of the above-referenced photographs after reviewing the photographs, X-rays and autopsy report. In each instance, they identified the approximate location of the entrance wound on a human skull and within the photographs as being in a position perceived by the panel to be below that described in the autopsy report. (See figs. 22 and 23, photographs of a human skull.) They also said it coincided with the rectangular white material interpreted by the panel as brain tissue present on top of the hair near the hairline. Each physician persisted in this localization, notwithstanding the apparent discrepancy between that localization and the wound characterized by the panel members as a typical entrance wound in the more superior "cowlick" area.

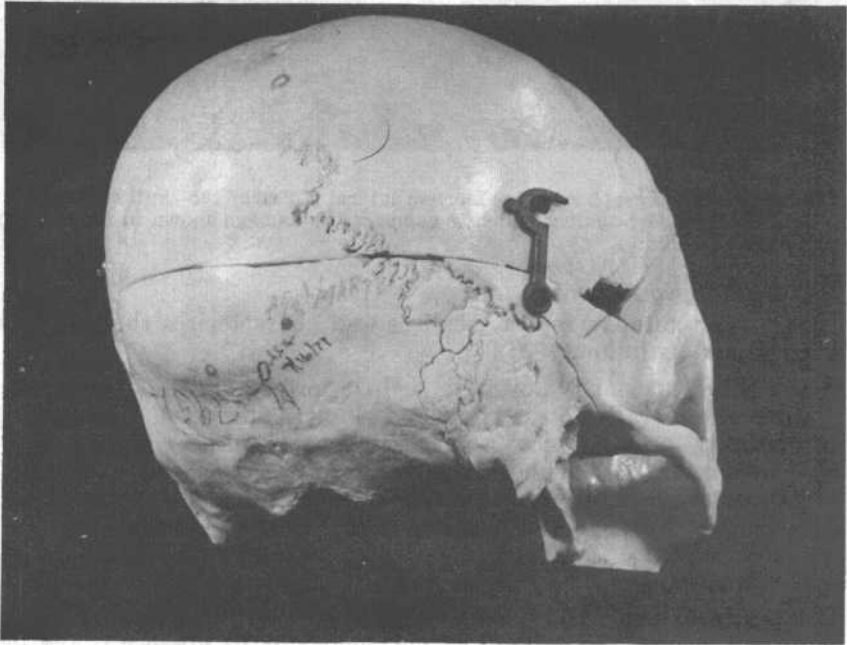


FIGURE 22.—Photograph of the posterior view of a human skull on which the autopsy pathologists, Drs. Humes, Boswell, and Finck, identified the approximate location of the entrance wound. The two initialed circles on the lower portion of the skull and to the right of the midline represent the general area where the autopsy doctors believe the entrance wound to be. (There are two circles because Dr. Finck marked the skull independent of Drs. Humes and Boswell, and without knowing where Drs. Humes and Boswell had placed their circle.) The circle on the top portion of the skull and to the right of the midline represents the general area where the forensic pathology panel believes the entrance to be. (The fourth circle on the lower portion of the skull and approximately on the midline represents the location of the external occipital protuberance.)

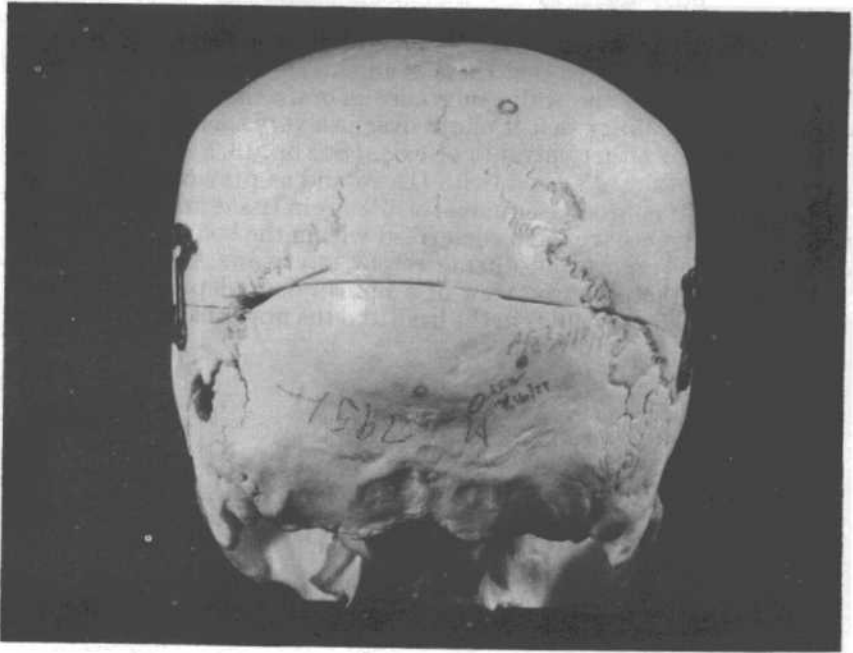


FIGURE 23.—Photograph of the posterior-lateral view of the skull on which the autopsy pathologists identified the approximate location of the entrance wound. (See caption fig. 22.)

(307) Drs. Ebersole, Finck, and Boswell offered no explanation for the upper wound, while Dr. Humes first suggested that it might represent an extension of a more anterior scalp laceration, incident to the exit wound, in spite of the fact that within the photograph the margins of the wound appear to be intact around the entire circumference. Dr. Finck believed strongly that the observations of the autopsy pathologist were more valid than those of individuals who might subsequently examine photographs.

(308) The panel continued to be concerned about the persistent disparity between its findings and those of the autopsy pathologists and the rigid tenacity with which the prosecutors maintained that the entrance wound was at or near the external occipital protuberance.\* Subsequently, however, in his testimony before the select committee, Dr. Humes agreed that the defect was in fact in the "cowlick" area and not in the area of the brain tissue.

(309) The photographs of the brain, described later, also support the panel's conclusions.

(310) One panel member, Dr. Rose, wishes to emphasize the view of the majority of the panel (all except Dr. Wecht) that the absence of injury on the inferior surface of the brain offers incontrovertible evidence that the wound in the President's head is not in the location described in the autopsy report.

(311) All members of the panel except Dr. Wecht concur that there is one and only one wound of entrance in the head and that it is located

in the "cowlick" area of the back of the head, and that the white substance referred to by the original prosecutors is a fragment of brain tissue. Dr. Wecht agrees that there is an entrance wound in the "cowlick" area and that the white substance is brain tissue, but he cannot exclude the possibility that it might overlie a very small skin and bone perforation of either entrance or exit. (See fig. 13, a drawing of the back of the President's head, with the wound as previously identified by the panel. It shows the adherent white brain tissue and the localization of the entrance wound as described within the body of the pathologists' autopsy report and during recent interviews. See also fig. 24, a drawing of the posterior view of a human body depicting the location of the entrance wounds in the head and the upper back.)

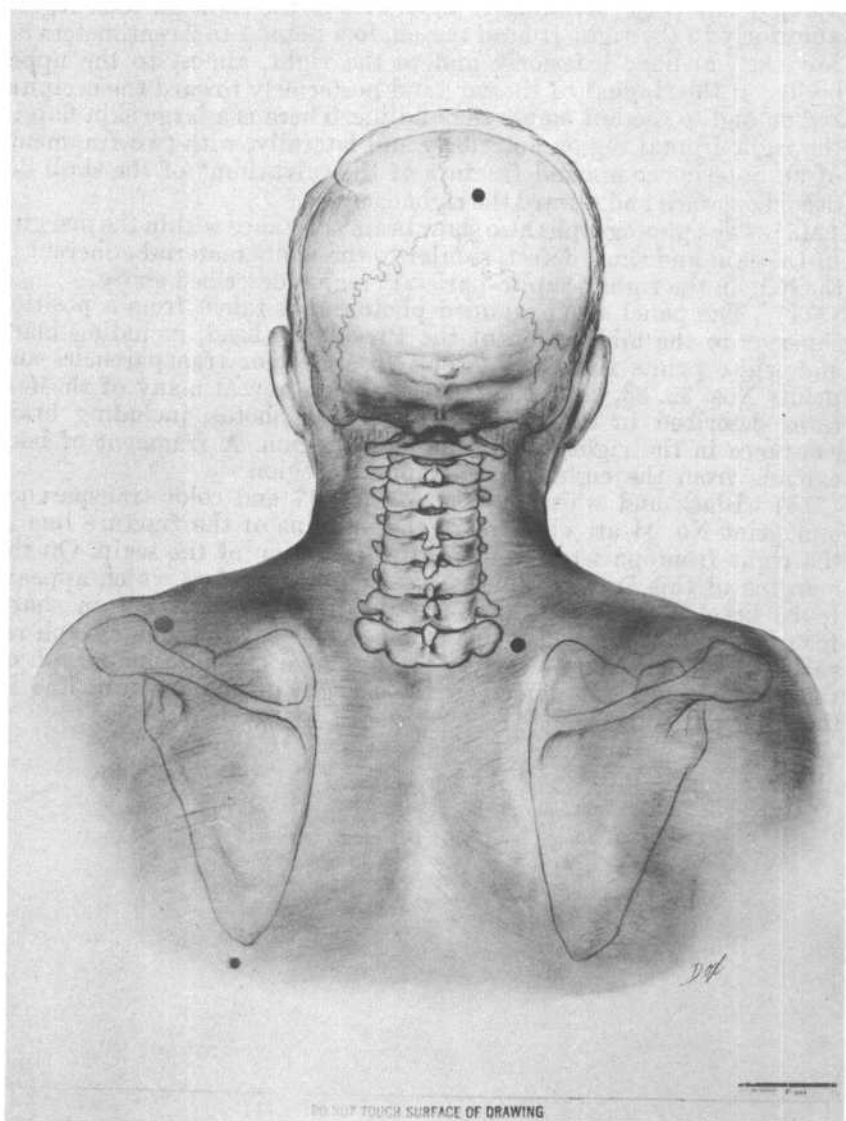


FIGURE 24.—A drawing of the posterior view of a human body depicting the location of the entrance wounds in the head and the upper back.

*Exit (outshoot) wound of the side of the head*

#### 1. Photographs

(312) The panel examined photographs of the face and head of President Kennedy, taken from the front and to the right, including black and white prints No. 5 and 6 and color transparencies and prints Nos. 26, 27, and 28. These reveal a series of lacerations, described within the

autopsy report as extending from an area in the right parietal region, anteriorly to the right frontal region, to a point 1 to 2 centimeters below the hairline; inferiorly and to the right, almost to the upper border of the tragus\* of the ear; and posteriorly toward the occipital region and to the left across the midline. There is a large skin flap in the right frontal region anteriorly and laterally, with two fragments of an anterior compound fracture of the calvarium\* of the skull deflected outward and toward the right ear.

(313) The photographs also show brain substance within the margins of the skin and skull defect, similar to the white material adherent to the hair in the right occipito-parietal\* region described above.

(314) The panel also examined photographs taken from a position superior to the midportion of the President's head, including black and white prints Nos. 7, 8, 9, and 10 and color transparencies and prints Nos. 32, 33, 34, 35, 36, and 37. These reveal many of the features described in the preceding series of photos, including brain substance in the right temporoparietal\* region. A fragment of bone extends from the right frontotemporal\* region.

(315) Black and white photograph No. 17 and color transparency and print No. 44 are closeups of the margins of the fracture line in the right frontoparietal\* region after reflection of the scalp. On the margins of this fracture line is a semicircular defect which appears to be beveled\* outward, although the photograph is not in sharp focus. Computer-assisted image enhancement\* of this photograph revealed the defect more clearly. (See fig. 25, a closeup photograph of the semicircular exit defect on the margin of the fracture line in the right parietal region.)

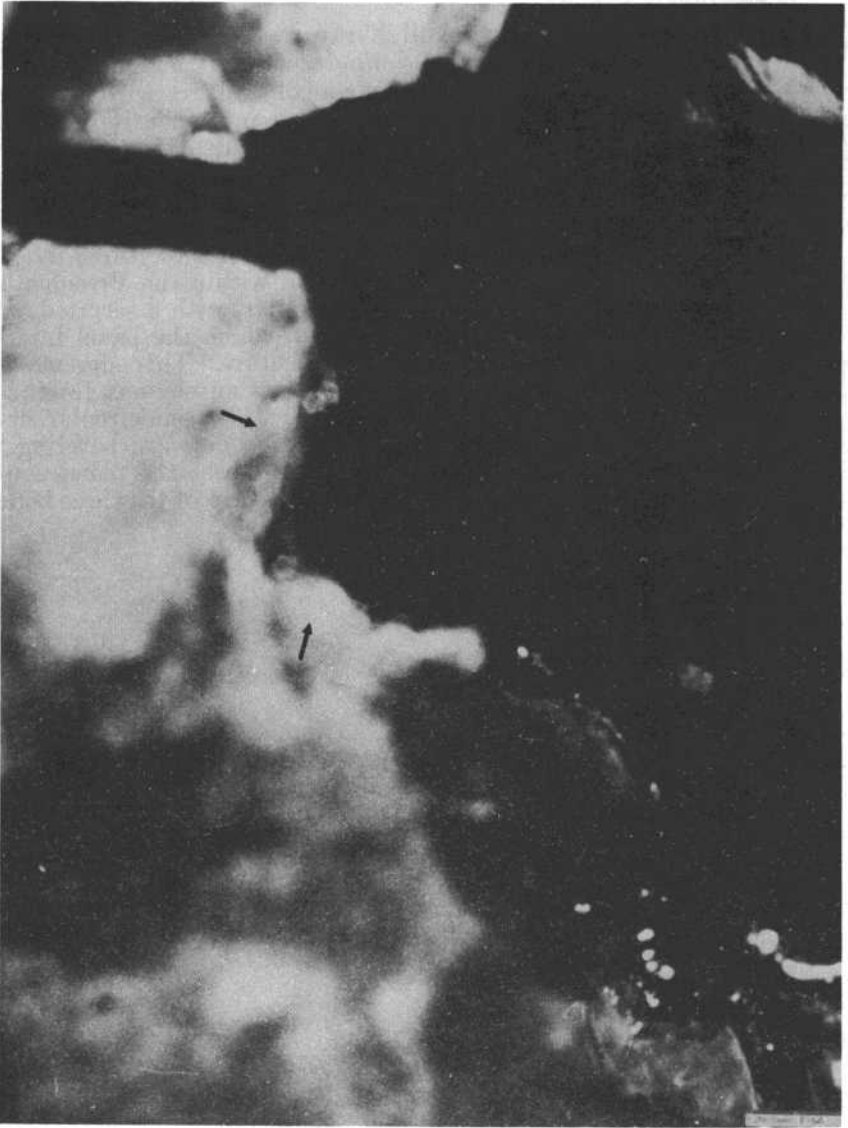


FIGURE. 25.—Closeup photograph of the semicircular exit defect in the margin of the fracture fragment in the right parietal region.

(316) Anthropologist Dr. Angel's evaluation of the "Harper bone fragment" (see below) indicates that it may include a portion of the sagittal suture\* which is probably in apposition (corresponds) to this exit defect.



## 2. *X-rays*

(317) Left and right lateral skull X-rays Nos. 2 and 3, partly described above, when subjected to computer-assisted image enhancement,\* more clearly revealed the extent of the fractures of the temporoparietal\* region and their extensions into the fronto\* and occipital\* portions of the skull bilaterally. The displacement of the residual fracture fragments in the right temporoparietal region, with consequent overriding of several margins of the residual bony defect is also apparent. (See fig. 20.)

(318) Three additional X-rays, Nos. 4, 5, and 6, show three irregularly shaped pieces of skull recovered from within the President's limousine. The largest piece is almost triangular, with a serrated, or zigzag, edge on the longest straight margin, which the panel interprets as to be a portion of the right coronal suture.\* This edge meets a much sharper straight edge which represents an obvious fracture margin. At the junction of these two margins is a semicircular defect, described in the autopsy report as showing outward beveling,\* with small particles of radiopaque materials. These the panel considers to be missile fragments. (See fig. 26, an X-ray of the three bone fragments.)



FIGURE 26.—Photograph of an X-ray of the three bone fragments recovered from the limousine. These are depicted in X-ray films Nos. 4, 5, and 6. On the triangular fragment is the semicircular defect with outwardly beveled margins and radiopaque shadows which have the appearance of tiny missile fragments.

### *3. Autopsy Report*

(319) The autopsy report characterized the exit defect as follows:

1. There is a large irregular defect of the scalp and skull on the right involving chiefly the parietal bone,\* but extending somewhat into the temporal\* and occipital\* regions.

In this region there is an actual absence of scalp and bone producing a defect which measures approximately 13 centimeters in greatest diameter. From the irregular margins of the above scalp defect tears extend in stellate fashion into the more or less intact scalp as follows:

- a. From the right inferior temporoparietal\* region anterior to the right ear to a point slightly above the tragus.
- b. From the anterior parietal margin anteriorly on the forehead to approximately 4 centimeters above the right orbital ridge.\*
- c. From the left margin of the main defect across the midline antero-laterally, for a distance of approximately 8 centimeters.
- d. From the same starting point as 10 centimeters postero-laterally. (36)

(320) This description does little except locate the general area of convergence of the scalp lacerations. It is probably misleading in the sense that it describes "an actual absence of scalp and bone." The scalp was probably virtually all present, but torn and displaced; probably only the separately recovered bone fragments (described below) were absent. The description of the bone fails to recognize either the semi-circular defect or any beveling\* in the bone fragments still attached to the head.

(321) The note prepared by Dr. Finck for presentation to Brigadier General Blumberg, dated February 1, 1965, states, with respect to the exit wound:

No exit wound is identifiable at this time in the skull, but close to midnight, portions of cranial vault are received from Dallas, Tex. X-ray [sic] films of these bone specimens reveal numerous metallic fragments. Two of the bone specimens, 50 millimeters in diameter, reveal beveling\* when viewed from the external aspect, thus indicating a wound of exit. Most probably, these bone specimens are part of the very large right skull wound, 130 millimeter in diameter and mentioned above. This right fronto-parieto-occipital wound is therefore an exit. (37)

#### 4. *"Harper bone fragment"*

(322) The "Harper bone fragment" is a fragment of bone found near the scene of the assassination at 5:30 p.m. on November 23, 1963, by Billy A. Harper, then a premedical student. He was taking photographs of the assassination scene and, on finding the fragment, took it to his uncle, Jack C. Harper, M.D., who, in cooperation with A. B. Cairns, M.D., chief pathologist at the Methodist Hospital in Dallas, had photographs taken on November 25, 1963, by M. Wayne Balleter, chief medical photographer at that hospital. Two 35 millimeter color transparencies of the convex and concave surfaces of the fragment, with an inch ruler in place, were picked up from Mrs. Jack C. Harper on July 10, 1964, by Special Agent Robert P. Gemberling of the FBI. The panel examined both these photographs and 8- by 10-inch black and white and color prints prepared from them.

(323) Dr. J. Lawrence Angel, in a written memorandum addressed to the panel, dated October 24, 1977, characterized this fragment as follows (see addendum E for full text) :

The Harper fragment photographs show it as a roughly trapezoidal piece, 7 centimeters by 5.5 centimeters in size, coming mainly from the upper middle third of the right parietal\* bone. Near its short upper edge vascular foramina\* on the inside and a faint irregular line on the outside indicate sagittal suture.\* Its posterior inferior pointed edge appears to fit the crack in the posterior section of the right parietal [bone] and its slightly wavy lower border can fit the upper edge of the loose lower section of right parietal [bone]. Its upper short border, on the left of the midline near vertex, may meet the left margin of the gap. Behind it there appears to be a large gap and in front a narrow one. (38)

(See figs. 27 and 28, photographs of both the interior and exterior surfaces of the "Harper bone fragment.")

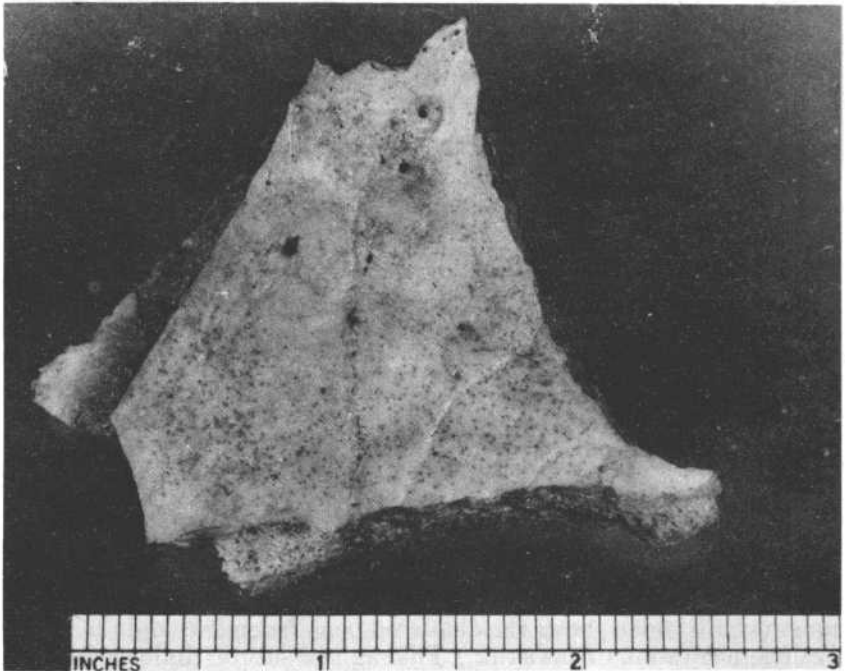


FIGURE 27.—Photograph of the interior surface of the Harper bone fragment.

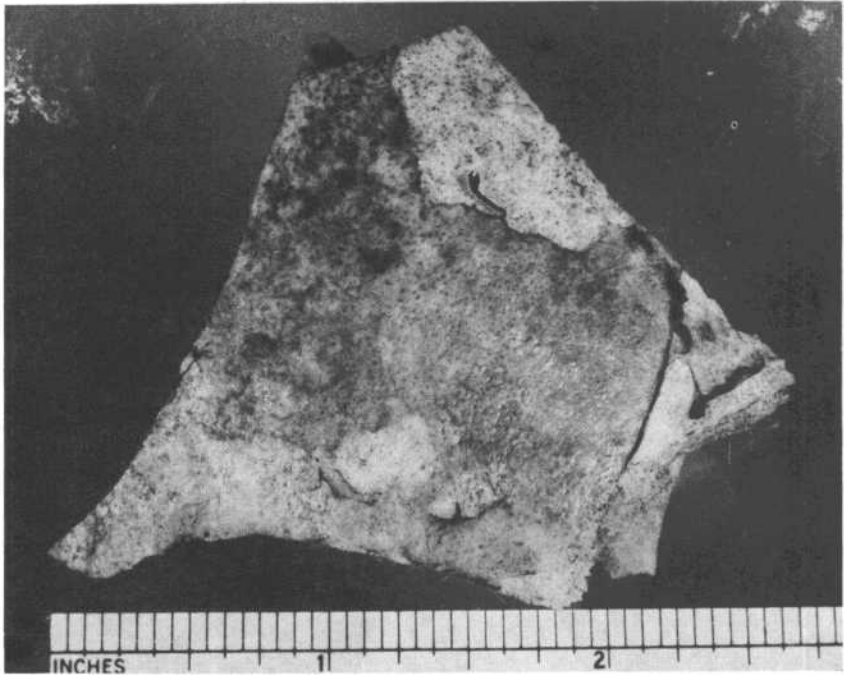


FIGURE 28.—Photograph of the exterior surface of the Harper bone fragment.

##### *5. Attempted reconstruction of the skull fractures*

(324) Paper cutouts were prepared to approximate the shape and size of the bone fragments demonstrated in X-rays Nos. 4, 5, and 6 and the photograph of the "Harper bone fragment." The panel attempted to locate the correct position of these fragments, and then, using the paper cutouts, to place these bone fragments on a human skull for the purposes of reconstruction. The largest of the X-ray fragments—that on which outer beveling and tiny metal fragments are evident—completes a portion of the exit perforation, with the suture line fitting into the coronal suture;\* the Harper bone fragment completes the circular perforation in the suture line immediately superior to the temporal\* bone. No other exit or entrance perforation is identified. (See fig. 29, a scale drawing of the frontal and right side of a human skull, which shows the displaced bone fragments and the extensive fragmentation of the skull.) The sagittal suture\* follows the midline in the anterior-posterior\* direction and is joined at approximately right angles by the coronal suture in front, which extends downward to the right and left sides, approximately midway between the outside margin of the orbit and the outer ear canal. (See also fig. 30, another scale drawing, showing the path of the bullet through the head, and fig. 31, a drawing of a profile view of President Kennedy, showing the internal anatomic structure and the location of the entrance and exit wounds to the head (the entrance wound is only partially visible).)

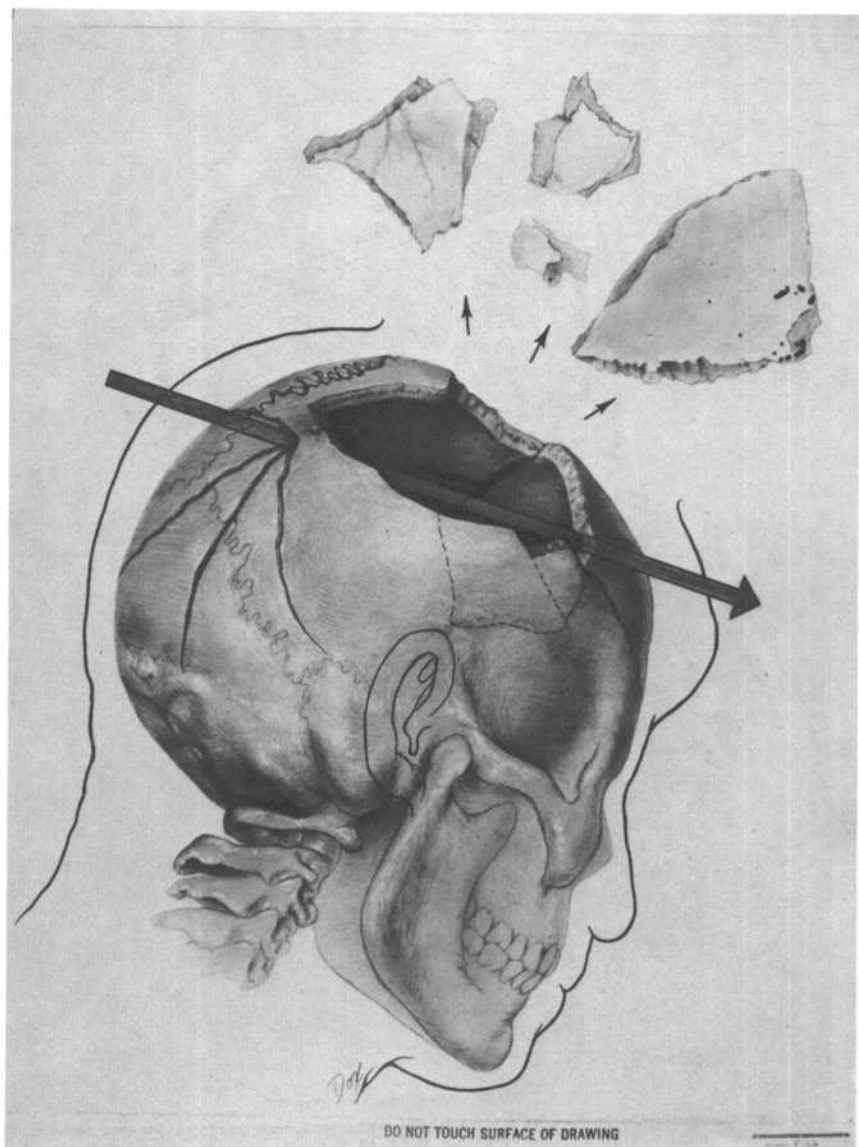


FIGURE 29.—Scale drawing of the frontal and right side of a human skull, which depicts the displaced bone fragments and the extensive fragmentation of the skull.

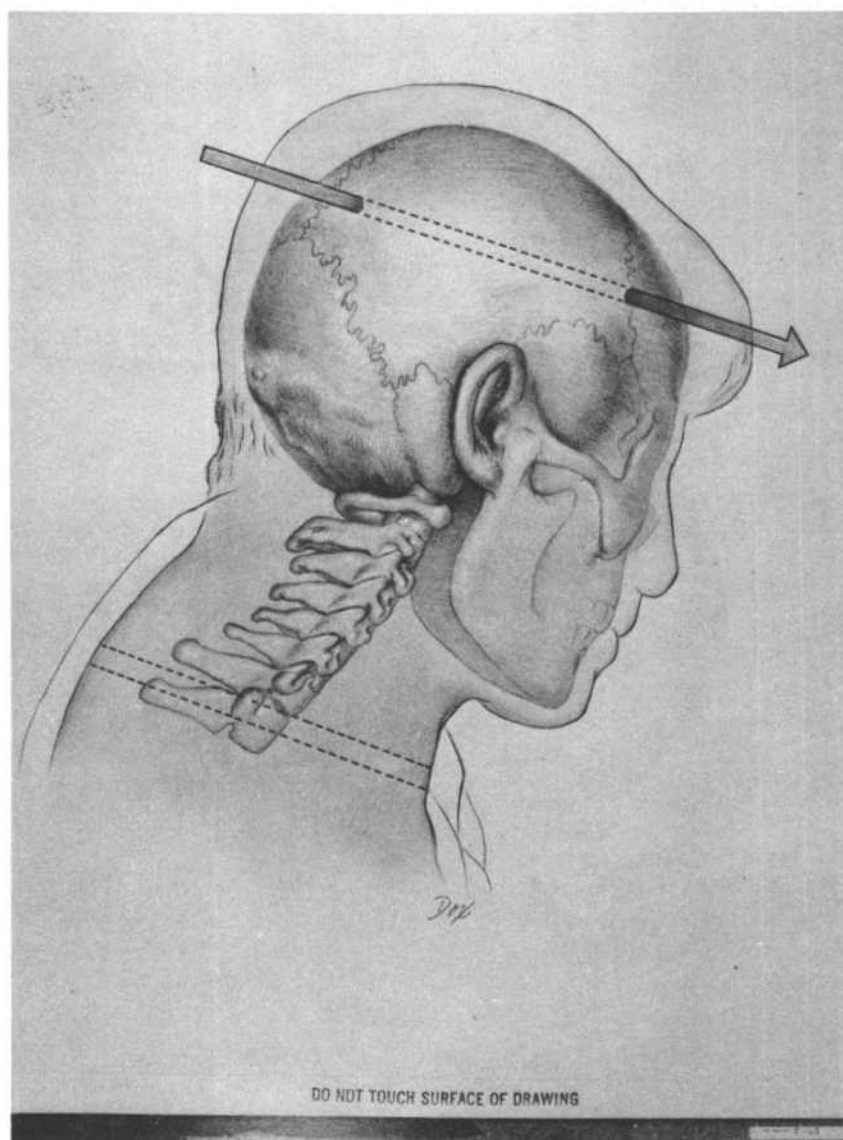
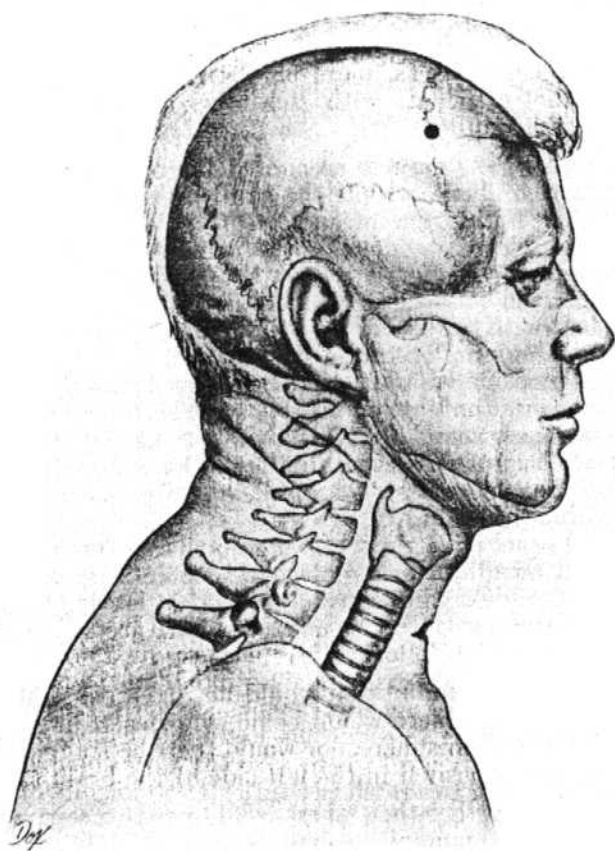


FIGURE 30.—Scale drawing which shows the path of the bullet through the head.



DO NOT TOUCH SURFACE OF DRAWING

FIGURE 31.—A drawing of a profile view of President Kennedy, showing the internal anatomic structures and the location of the entrance and exit wounds to the head (the entrance wound is only partially visible).

(325) The size of the exit defect is most accurately estimated from the X-rays of the largest separately received bone fragment, in which a segment of the circumference of the defect is demonstrated at one corner. Geometrically, by drawing a chord segment between the two extremities of this portion of the circumference and reconstructing



a perpendicular radius, the central extremity of which is equidistant from all portions of this curve, the diameter of the defect is estimated to be 2.5 centimeters. This is consistent with the size of the defect as seen in the photographs, but cannot be determined more precisely because no ruler was present in the same plane.

(326) According to Dr. Angel's report:

The two big loose fragments of skull vault, from upper frontal and parietal areas, more on the right than on the left side, do not articulate with each other and leave three appreciable gaps unfilled. (39)

Thus, the additional gaps may be accounted for by collapsed superimposed fragments of bone within the skull or there may still be fragments missing. Within one or several of these fragments, there might be an additional exit defect if the principal missile had divided into two major fragments within the skull, although in the experience of the members, the estimated size of the principal exit defect is consistent with the size of a single existing missile representing the mass of the two major fragments recovered outside the body. (327) The panel considered and rejected the possibility that if there were a residual defect, it might conceivably have been the location for an additional entrance wound. It did so because there was no radiographic evidence of such a missile within the skull, nor any observation or description of the effects of such a missile either on the skin, on the skull bones or within the brain.

(328) One panel member, Dr. Wecht, suggests there is a remote possibility that a "soft-nosed" or frangible bullet could have struck the right side of the President's head in the exit defect leaving no visible evidence of a separate entrance wound. Further, according to Dr. Wecht in his dissent (which follows this report):

[s]ince this kind of ammunition would not have penetrated deeply into the brain, there would be no evidence of damage to the left cerebral hemisphere, nor would there be fragments of such a missile deposited in the left side of the brain. (40)

Dr. Wecht points out further that "there would not be a separate exit wound if this kind of ammunition had been used." (41)

(329) All other members of the panel believe that such speculation about the timing and placement of separate wounds is without merit, and, further, they know of no soft-nosed or frangible missile that would disintegrate so completely on striking a surface as soft as the brain. There is no evidence of any such disintegration in the X-rays.

#### *Course of the missile through the head*

##### *1. Photographs*

(330) The panel examined photographs (including Nos. 17, 18, 44, and 45) they were taken from the front right side of the body, with the scalp reflected down and away from the fractured skull bones and with the brain removed. The lens was focused on the interior-posterior deepest portion of the wound, apparently in an attempt to depict the interior of the bullet perforation of the posterior region of the skull. In the photograph prepared from color transparency No. 45, the ex-

terior bone fragment with the semicircular defect is more in focus than the base of the skull in the depth of the picture which is out of focus. In the photographs prepared from positive color transparency No. 45, the exterior fragment is out of focus, but the depth of the photograph is in sharper focus. The photographs, also studied using the computer-assisted enhancement technique,\* show a possible portion of the beveled\* inner table corresponding to the semicircular margin of the entrance wound at the back of the head in the right posterior parietal bone. Color transparencies and prints Nos. 46, 47, 48, and 49 and black and white prints Nos. 19, 21, and 22 reveal the inferior aspect of the brain, with extensive fragmentation and laceration of the right inferior cerebral hemisphere, some loss of cerebral substance on the inferior surface of the left temporal lobe,\* and scattered areas of subarachnoid hemorrhage\* in the underlying cortex.\* The right Sylvian fissure\* shows dark red-brown to black discoloration suggestive of blood clot. The surface of the midtemporal region is lacerated and depressed. The cerebral peduncles\* are likewise lacerated. The panel notes that the posterior-inferior portion of the cerebellum\* virtually intact. It certainly does not demonstrate the degree of laceration, fragmentation, or contusion\* (as appears subsequently on the superior aspect of the brain) that would be expected in this location if the bullet wound of entrance were as described in the autopsy report. There is no damage in the area of the brain corresponding to the piece of brain tissue on the hair which the autopsy pathologists told the panel was the entrance wound.

(331) The panel examined the photographs of the superior aspect of the brain, including color transparencies and prints No. 50, No. 51 and No. 52 and black and white prints No. 20, No. 23, No. 24 and No. 25. The left cerebral hemisphere is covered by intact arachnoid\* beneath which dark brown to black subarachnoid hemorrhage\* is most prominent over the frontal and parietal gyri\* and within the adjacent sulci.\* On the right cerebral hemisphere is an anterior-posterior cylindrical groove in which the brain substance is fragmented or absent. This groove extends from the back of the brain to the right frontal area of the brain and contains within the depths of its central portion a grey-brown rectangular area. The majority of the panel considers this to be a blood vessel in the Sylvian fissure.\*

(332) The majority of the panel members agrees that examination of the brain itself even now would substantiate this opinion. One member, Dr. Wecht, can justify no such opinion without first examining the brain itself.

(333) Laceration of the corpus callosum within the deep margins of the wound of the right cortex is also evident (see fig. 32, a drawing of the superior surface of the brain).

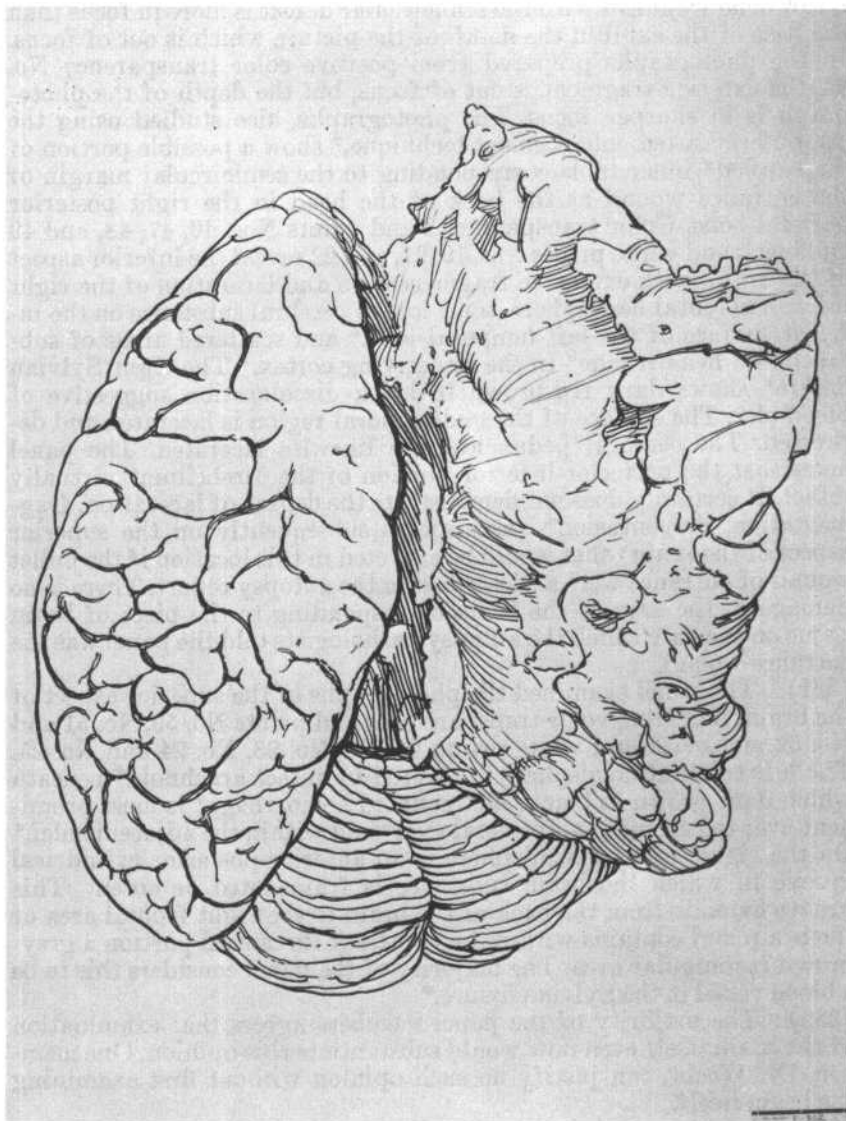


FIGURE 32.—Drawing of the superior surface of the brain, showing the extensive lacerations.

## 2. *X-rays*

(334) The panel examined X-ray films of the anterior-posterior view of the skull (No. 1) and left (No. 2), and right (No. 3) lateral views of the skull with the naked eye and with  $10\times$  magnification. Film No. 2 reveals the defect referred to above in the posterior parietal region,\* in a location corresponding to the previously described skin defect in the "cowlick" area of the scalp. Embedded in the skull in the lower

margin of this defect is a radiopaque shadow which, in the opinion of the panel, is a fragment of the missile. This shadow is 10 centimeters above the external occipital protuberance and 2.5 centimeters to the right of the midline in this film. One surface of this fragment, visualized in film No. 1, is round. The maximum diameter of the fragment measures 0.65 centimeter.

(335) Within the right side of the head are randomly distributed, irregularly shaped, radiopaque shadows which are missile fragments. These shadows, measuring from 0.2 to 0.6 centimeter in diameter, extend from the back to the front; the largest one is present beneath the skin in front. Another group of smaller, more uniform shadows, 0.1 centimeter or less in diameter, so-called "missile dust,"\* forms a cylindrical pattern, with the axis directed anterior-posterior,\* approximately paralleling the sagittal plane,\* and extending toward the large bony defect in the right temporal-parietal\* region on the right side of the head. The long axis of this grouping, if extended backward, approaches the entrance defect and missile fragment in the right side of the back of the head.

(336) The panel considered the location and grouping of the smaller missile fragments seen in films Nos. 2 and 3 and suggests that the extensive fragmentation and disruption of the skull bones, and the movement of the body after death, could have caused movement of the missile fragments in movable portions of skin, bone, and brain. The panel also noted the absence of any metal fragment within the left cerebral hemisphere, as demonstrated in film No. 1, although a number of extensive fractures involving the upper portion and base of the right skull extend across the midline.

(337) The panel also noted several artificially caused defects on these films. Two round, puckered areas on film No. 1 were apparently due to examination under a high intensity light that was too close. Dr. Ebersole advised the panel that he placed the converging pencil lines on film No. 2 after the autopsy, pursuant to an official White House request to obtain certain anthropometric measurements for a sculptor. None of these defects interfered with accurate interpretation of these films.

(338) In March 1978, Dr. McDonnel of Los Angeles, examined the skull films for the panel and reported:

My preliminary (prior to analysis of computer-assisted enhanced images of these X-rays) interpretation follow (sic):

1. A nearly complete loss of structure in the right frontal and parietal bone.
2. A metallic fragment on the outer table of the right occipital bone approximately 10 centimeters above the external occipital protuberance. In the same area is a depressed fracture. In the anterior-posterior projection, there appears to be fracture lines to the occipital, parietal and temporal bone, radiating from the area of the fracture and metallic fragments. The metallic fragment is nearly spherical in this projection.
3. There is elevation of the galea\* medial and lateral to the area of the fracture and metallic fragment in the occipital region. A small metallic fragment is located

medial to the location of the spherical metallic fragment and fracture between the galea lying and the outer cranial table.

4. There is a fracture line through the floor of the sella turcica\* with bony fragments in the sphenoid sinus.\*
5. There are fracture lines through the anterior and posterior aspects of the anterior ethmoid\* cells with air in the right side anterior ethmoid. (42)

(339) Dr. McDonnell further examined these films using computer-assisted enhancements\* of the anterior-posterior\* (fig. 19) and left lateral (fig. 20) views and submitted a more detailed report on August 4, 1978. Such separation of the galea\* from the outer skull bones often occurs as a result of the dislocation of adjacent bone fragments and is seen in an explosive-type injury to the skull. The location of the metallic fragment inside the galea\*, medial to the defect in the skull representing the initial penetration, suggests that this separation commenced on initial impact, allowing the tiny above-described missile fragment to be displaced medially within this space created by explosion (between the skull and its overlying galea). Dr. McDonnell also indicated that such dislocation of this and other missile fragments might have occurred as a consequence of manipulation of the head prior to, during or following transit, but prior to the X-ray examination of the skull, although such medial dislocation would not be expected as a consequence of gravity alone.

(340) Dr. Chase, during his examination, noted the presence of extensive comminuted fractures of the calvarium.\* He said that the extensive damage apparent from the X-ray precluded interpretation of exactly what happened to the top of the skull, based on radiographic examination alone. He indicated that he saw no evidence of any posterior missile perforation apart from one in the posterior parietal area. Stated more explicitly, there was no perforation in the area of the external occipital protuberance.\* He further indicated that the degree of damage to the skull and the fact that there was "little residual material" (relatively small amount of bullet fragments present) led him to believe that the missile was jacketed.\* He said further that there was no evidence in the X-rays of a shot coming from the front or of more than one bullet striking the skull. Dr. Chase indicated that for there to be a second entrance perforation, there would have to be another exit point in the skull or a bullet that was left behind, neither of which is present.

(341) Dr. Davis described the entrance wound visible in the X-rays as follows:

There is an extensive comminuted, open, explosive calvarial fracture which seems to radiate in various directions as described above from a central point which is located in the right parietal bone, 3 centimeters from the midline and about 9 or 10 centimeters from the external occipital protuberance.\* (43)

(342) The panel understands the vertical distance mentioned above to mean 9 or 10 centimeters above the horizontal plane through the external occipital protuberance.\*

### 3. Autopsy report

(343) The autopsy report describes the track of the missile through the head as follows:

Clearly visible in the above described large skull defect and exuding from it is lacerated brain tissue which on close inspection proves to represent the major portion of the right cerebral hemisphere. At this point it is noted that the *falx cerebri\** is extensively lacerated with disruption of the superior sagittal sinus.

Upon reflecting the scalp, multiple complete fracture lines are seen to radiate from both the large defect at the vertex and the smaller wound at the occiput. These vary greatly in length and direction, the longest measuring approximately 19 centimeters. These result in the production of numerous fragments which vary in size from a few millimeters to 10 centimeters in greatest diameter.

The complexity of these fractures and the fragments thus produced tax satisfactory verbal description and are better appreciated in photographs and roentgenograms\* which are prepared. (44)

(344) The panel acknowledges the difficulty of and necessity for describing the fractures and suggests that the autopsy examination at the very least should have noted evidence in the skull and scalp that would assist in localizing the exit wound. An appropriate examination would have included replacement of the bone fragments in approximate anatomic position and then description of the missile track from the entrance to the exit wound.

(345) The autopsy report states that: "The brain is removed and preserved for further study following formalin fixation." (45) The brain, which had been fixed in formalin, the chemical preservative normally used to prevent deterioration, was further examined. The results are described in the "Supplementary Report of Autopsy No. A63-272, President John F. Kennedy" (Commission Exhibit No. 391). This document observes:

Following formalin fixation the brain weighs 1500 grams. The right cerebral hemisphere is found to be markedly disrupted. There is longitudinal laceration of the right hemisphere which is a parasagittal in position approximately 2.5 centimeters to the right of the midline which extends from the tip of the occipital lobe\* posteriorly to the tip of the frontal lobe\* anteriorly. The base of the laceration is situated approximately 4.5 centimeters below the vertex\* in the white matter. There is considerable loss of cortical\* substance above the base of the laceration, particularly in the parietal lobe. The margins of this laceration are at all points jagged and irregular, with additional lacerations extending in varying directions and for varying distances from the main laceration. In addition, there is a laceration of the corpus callosum\* extending from the genu to the tail. Exposed in this latter laceration are the interiors of the right lateral and third ventricles.\*

When viewed from the vertex the left cerebral hemisphere is intact. There is marked engorgement of meningeal blood vessels of the left temporal and frontal regions with considerable associated subarachnoid hemorrhage.\* The gyri\* sulci\* over the left hemisphere are of essentially normal size and distribution. Those on the right are too fragmented and distorted for satisfactory description.

When viewed from the basilar aspect\* the disruption of the right cortex is again obvious. There is a longitudinal laceration of the midbrain through the floor of the third ventricle\* just behind the optic chiasm and mammillary bodies. This laceration partially communicates with an oblique 1.5 centimeter tear through the left cerebral peduncle.\* There are irregular superficial lacerations over the basilar aspects of the left temporal and frontal lobes.(46)

(346) The panel notes that the brain was not coronally sectioned, a standard pathological practice which permits examination of the inside of the brain. Rather, as evidenced in the autopsy report, supplemental report and Dr. Humes' testimony before the Warren Commission,(47) the brain was preserved intact without a complete examination. Only very limited microscopic sections were taken. The panel stresses that coronal sectioning\* is the most acceptable and accurate method of determining precisely the effects of a missile on the brain, as well as the angle of a bullet track in the head. The failure to section the brain also precluded collection of interior samples for microscopic study.

(347) The panel members do not concur with the rationale for having limited the examination in this way. The brain should have been scientifically examined, with sectioning and description of the interior injuries. Only those portions necessary to document the findings need have been retained as evidence for potential court proceedings or for other purposes.

(348) The autopsy report lists the outer brain areas from which sections were taken for microscopic examination:

- a. From the margin of the laceration in the right parietal lobe.\*
- b. From the margin of the laceration in the corpus callosum.\*
- c. From the anterior portion of the laceration in the right frontal lobe.\*
- d. From the contused left fronto-parietal cortex.\*
- e. From the line of transection of the spinal cord.
- f. From the right cerebellar cortex.\*
- g. From the superficial laceration of the basilar aspect of the left temporal lobe.\*(48)

(349) These sections are described as follows:

*Microscopic examination—Brain.*—Multiple sections from representative areas as noted above are examined. All sections examined are there significant abnormalities other brain tissue with associated hemorrhage. In none of the sections examined are there significant abnormalities other than those directly related to the recent trauma.(49)

(350) The summary within the autopsy report contains this statement concerning the missile pathway:

The fatal missile entered the skull above and to the right of the external occipital protuberance.\* A portion of the projectile transversed the cranial cavity in a posterior-anterior direction (see lateral skull roentgenogram) depositing minute particles along its path. A portion of the projectile made its exit through the parietal bone on the right carrying with it portions of cerebrum, skull and scalp. The two wounds of the skull combined with the force of the missile produced extensive fragmentation of the skull, laceration of the superior sagittal sinus, and of the right cerebral hemisphere. (50)

(351) The summary concludes:

In addition, it is our opinion that the wound of the skull produced such extensive damage to the brain as to preclude the possibility of the deceased surviving this injury.

(352) The panel concurs with this opinion.

(353) Dr. Finck, in his personal note to Brigadier General Blumberg dated February 1, 1965, added this additional information on the observation of the head wound:

The scalp of the vertex\* is lacerated. There is an open comminuted fracture of the cranial vault, many portions of which are missing. The autopsy had been in progress for 30 minutes when I arrived. Commander Humes told me that he only had to prolong the lacerations of the scalp before removing the brain. No sawing of the skull was necessary. The opening of the large head wound, in the right fronto-parieto-occipital region, is 130 millimeters in diameter. (51)

#### *Other Autopsy considerations*

##### *1. Other wounds*

(354) With the exception of Dr. Wecht, as noted earlier, the panel, having viewed all of the photographs, X-rays and other documentary information concerning the autopsy on President Kennedy, concurs that there is evidence of two, and only two, gunshot wounds, and that they both entered from behind. The panel notes that the autopsy pathologist did not know that the tracheotomy incision had been made through a bullet wound in the front of the neck until sometime after the autopsy and removal of the body from Bethesda Naval Hospital. They did indicate the other wounds on the body which resulted from surgical treatment. These were recorded in the autopsy report prepared by Drs. Humes, Finck and Boswell as follows:

Situated on the anterior chest wall in the nipple line are bilateral 2 centimeters long recent transverse surgical incisions into the subcutaneous tissue. The one on the left is situated 11 centimeters cephalad to the nipple and the one on the right 8 centimeters cephalad to the nipple. There is no hemorrhage or ecchymosis associated with these wounds. A similar clean wound measuring 2 centimeters in length is situated on the anterolateral aspect of the left mid arm. Situated on the



anterolateral aspect of each ankle is a recent 2 centimeters transverse incision into the subcutaneous tissue. (52)

(355) The panel also took note of a summary of the findings, prepared by the three original pathologists, at the time of their review of the photographs and X-rays on November 1, 1966, and signed on January 26, 1967. The following is from that document:

*No other wounds.*—The X-ray films established that there were small metallic fragments in the head. However, careful examination at the autopsy, and the photographs and X-rays taken during the autopsy, revealed no evidence of a bullet or of a major portion of a bullet in the body of the President and revealed no evidence of any missile wounds other than those described above. (53)

(356) The panel concurs with these observations.

2. *Examination of the Abdominal Organs*

(357) The panel took note of the observations recorded within the autopsy report prepared by the three pathologists in which the gross description\* is limited to the following statement:

*Abdominal Cavity.*—The abdominal organs are in their normal positions and relationships and there is no increase in free peritoneal fluid. The vermiform appendix is surgically absent and there are a few adhesions joining the region of the cecum\* to the ventral abdominal wall at the above described old abdominal incisional scar. (54)

(358) Microscopic examination of the abdominal organs was limited to the liver, spleen, and kidneys, described as follows:

*Liver.*—Sections show the normal hepatic architecture to be well preserved. The parenchymal cells exhibit markedly granular cytoplasm indicating high glycogen content which is characteristic of the "liver biopsy pattern" of sudden death.

*Spleen.*—Sections show no significant abnormalities.

*Kidneys.*—Sections show no significant abnormalities aside from dilatation and engorgement of blood vessels of all calibers. (55)

(359) The panel is concerned that the Autopsy Protocol and Supplemental Report do not include reference to, nor description of, the President's other organs, including the adrenal glands. The panel took note of several publications in the medical literature relevant to his adrenal glands:

1. Nichols, John, M.D., "President Kennedy's Adrenals," *Journal of the American Medical Association*, July 10, 1967, vol. 201, No. 2, pp. 115-116.
2. Nicholas, James A., M.D., Philip D. Wilson, M.D., and Charles J. Umberger, Ph. D., "Induced Hypoadrenalism in Patients Requiring Orthopedic Surgery," *Journal of the American Medical Association*, May 18, 1957, vol. 164, No. 3, pp. 261-265.
3. Nicholas, James A., M.D., Charles L. Burstein, M.D., Charles J. Umberger, Ph. D., and Philip D. Wilson, M.D., "Management of Adrenal Cortical Insufficiency During Surgery," *Archives of Surgery*, vol. 771, 1955, p. 737.

(360) The 1967 article persuasively presents correlation for the dates listed in the 1955 and 1957 articles, when then-Senator John Kennedy underwent spine surgery, specifically lumbar fusion, at a New York hospital, and describes the successful medical management of his hypoadrenalism (Addison's disease). Although Senator Kennedy's name is not mentioned in these reports, the majority of the panel is convinced that he could still definitely be identified, substantially earlier contentions that he did suffer from hypoadrenalism. That he suffered from this condition is further supported by the fact that the President's physician provided the attending surgeons at Parkland Hospital with steroids. The gunshot injuries clearly were fatal, however, and would have been fatal independent of the condition of his adrenal glands.

(361) Pathologists in courts of law are usually asked to provide evidence concerning the condition of organs other than those directly concerned with the immediate cause of death. All of the panel members are of the opinion that a medicolegal autopsy report should be complete, whether or not it is ultimately available to the public. In support of this position, the panel suggests that, were the injuries inflicted upon the President of such a nature that a preexisting disease might alter the prognosis, observations about such a condition would be essential to evaluating properly the interrelationship of the preexisting natural disease and the terminal injuries. The panel believes the autopsy should be complete, even though in many jurisdictions in the United States all of the information derived as a result of examination at public expense pursuant to statute may be made public on presentation of a request with reasonable cause.

### *3. Organs and histologic sections*

(362) All members of the panel acknowledge that, as a rule, when reviewing another pathologist's work, they should have access to all pertinent materials, including written reports, histologic slides, and any tissues or other evidence which was retained. In this instance, since no descriptions, photographs, or microscopic slides were available to document the condition of the inside of the brain, and since injuries to the brain were critical in evaluation aspects of the President's death, the panel urged to committee to search for the missing histologic slides, tissues, and the brain itself. The majority of the panel (all except Dr. Wecht) believes that a most reasonable and diligent search was undertaken at considerable expense and effort by the committee and that the missing materials are not available. The majority of the panel further believes that the documentation that is available—photographs of the body and the uncut brain, X-rays, and autopsy and physician reports—are sufficient to permit accurate evaluation of the gunshot injury to the head and brain, and that proper examination of the brain itself would only further confirm the panel's conclusion that one, and only one, bullet struck the President's head from behind. The panel believes that all of the histologic sections should also be reviewed, but that such review would not alter its conclusions, which are based on the extensive gross injuries described and documented and on the microscopic report available.