DESCRIPTION OF GOVERNOR CONNALLY'S WOUNDS

(363) Governor Connally sustained an entrance wound in the right lateral back, with a corresponding exit wound on the right front chest below the right nipple; a reentry wound on the dorsum (back or top) of the right wrist, with a corresponding outshoot wound on the volar (palmar or lower surface) of the right wrist; and a superficial entrance wound in the left thigh. Documentation of these wounds is as follows:

Entrance (inshoot) wound of the right lateral back (thorax)

1. Clothing—suit jacket (back)

(364) The suit is of lightweight, black, closely woven fabric; the jacket is three-buttoned, single-breasted, size 42 tall. There is an irregularly shaped oval defect perforating all layers of the jacket on the right back, with its midpoint 19.5 centimeters to the right of the midline and 13.6 centimeters below the upper shoulder-seam, measuring approximately 1.7 by 1.2 centimeters. (See fig. 33, a photograph of the back of Governor Connally's jacket.) Further characterization of this and other defects in Governor Connally's clothing was not undertaken prior to the garments being cleaned. (The Connally clothing was cleaned, presumably to make it more presentable, before any members of the original investigative team determined that scientific examination might be of value.) There was never any attempt to preserve the chain of custody of this evidence, an essential procedure if it were to be used in a subsequent criminal proceeding.

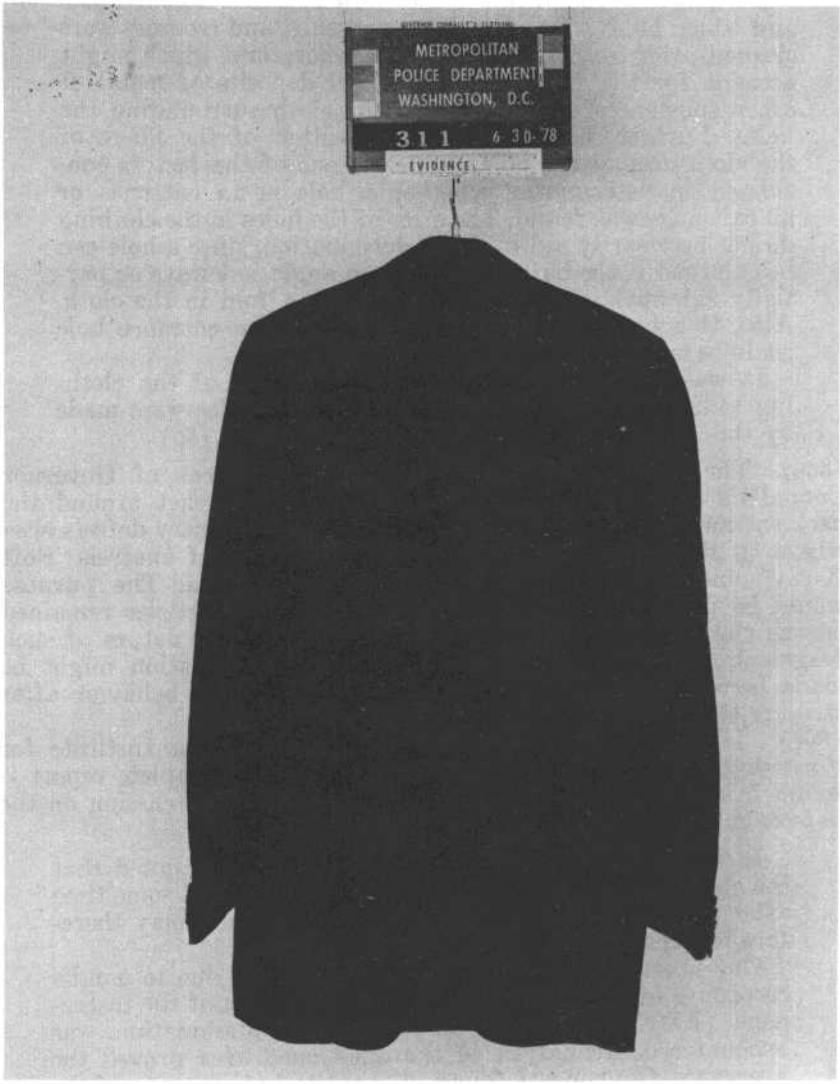

FIGURE 33.—Photograph of the back of Governor Connally's suit jacket, showing the posterior entry hole.

(365) This situation is explained in correspondence from Hoover to Rankin, dated April 16, 1964:

> Reference is made to your letter dated April 9, 1964, covering transmittal to the FBI laboratory of Gov. John Connally's coat, shirt, trousers and tie, and requesting an examination of these items. The results of the examination are set forth below.
>
> For your information the coat has been designated C311, the trousers C312, the shirt C313, and the tie C314.

Nothing was found to indicate which holes were entrances and which holes were exits. The coat, shirt and trousers were cleaned prior to their receipt in the laboratory, which might account for the fact that no foreign deposits of metal or other substances were found on the cloth surrounding the holes. Further, no characteristic position of the fibers of the cloth around the holes, which is one of the factors considered in determining whether a hole is an entrance or an exit hole, was found. The sizes of the holes in the clothing do not necessarily aid in this determination, since a hole can be enlarged if the bullet strikes at an angle, sideways or partially sideways, or if it passes through a fold in the cloth. Also, if a bullet is irregularly mutilated, an entrance hole could be larger than an exit hole.

It was not possible from an examination of the clothing to determine whether or not all of the holes were made by the same projectile or projectile fragments.(*56*)

(366) The panel suggested that appropriate areas of Governor Connally's clothing, including the area of the jacket around the back entrance defect and corresponding exit and reentry defects elsewhere on the clothing, be subjected to two types of analysis: Soft X-ray* and energy dispersive X-ray* examination. The purpose would be primarily to determine if any missile particles remained on the clothing, to analyze and define the elemental nature of such fragments, and, finally, to determine if any correlation might be made between the elements found and the missile's behavior after striking Governor Connally.

(367) The analysis was conducted at the Southwest Institute for Forensic Sciences in Dallas, Tex. (a copy of the complete report is found in addendum F). It contains the following discussion on the defects in Governor Connally's clothing:

In regard the J.B.C.'s clothing: It should be noted that the clothing had been subjected to dry cleaning at some time after the shootings. The validity of the results may therefore be questioned.

One aberrant result, unexplained, possibly due to a misrecording of data or a temporary malfunction of the instrument (EDX) or perhaps an ephemeral contamination, was encountered. Reanalysis of the questioned area proved the aberrance. Copper was found in quantity in the region of the defect in the right front. The results would indicate that the apparent borderline copper analysis is due to the lining containing some copper. Iron, apparently from blood, was still detectable near the right front defect in the coat, despite dry cleaning.

The analytical results are of interest, because there is proof of very little fragmentation of the missile (missiles) as it (they) passed through the person(s) of J.F.K. and J.B.C. Indeed, the only indication of copper in any quantity was in the region of the front defect of the coat of J.B.C. The term "in quantity" means only that copper was found in clearly detectable amounts by the use of the EDX [energy-

dispersive X-ray] equipment. The actual amount is very small, and the absence of particulate material on the SC [soft X-ray] film is not surprising. (*57*)

2. Clothing—Shirt (back)

(368) The shirt is long-sleeved, French-cuffed, white dress, size 16–35. A defect in the back measuring up to 0.8 centimeter in vertical diameter and 1.3 centimeters in transverse diameter is in a position corresponding to the defect in the jacket, with its upper margin 12 centimeters below the shoulder seam and 5 centimeters medial to the right shoulder seam (See fig. 34, a photograph of the back of Governor Connally's shirt)

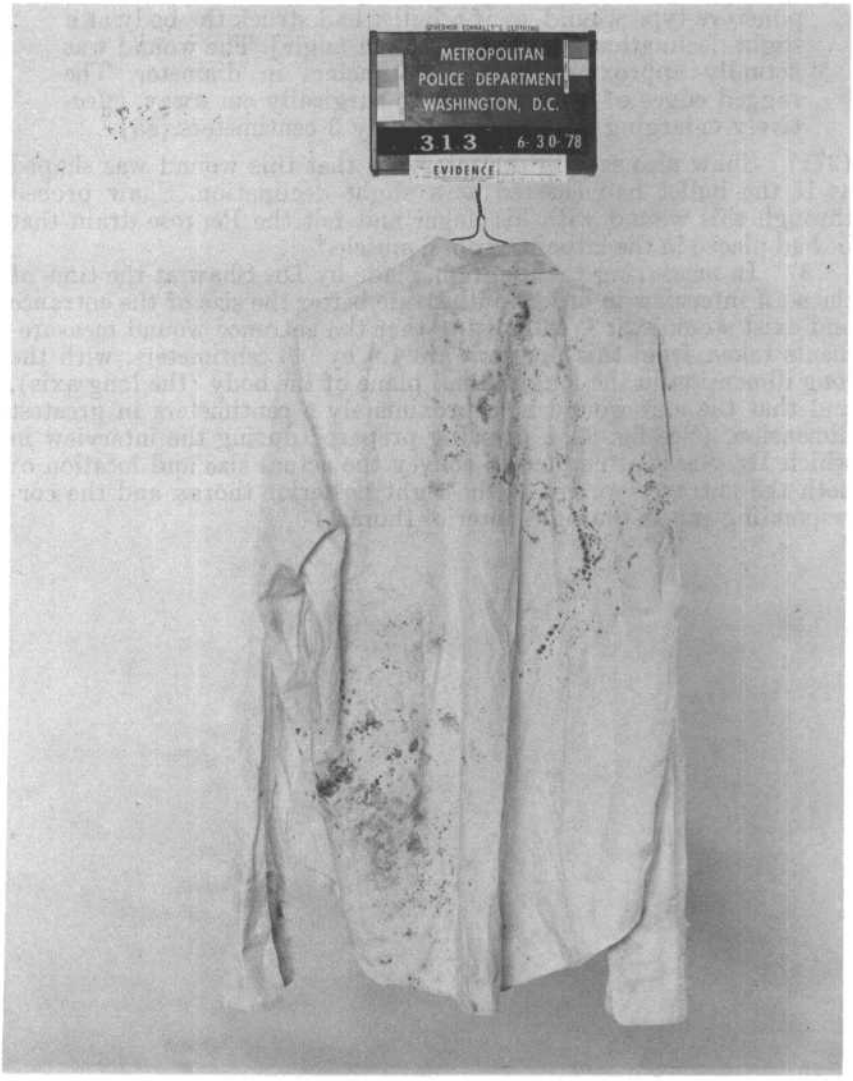

FIGURE 34.—Photograph of the back of Governor Connally's shirt.

3. Surgical report and interview with the surgeon

(369) Dr. Robert Shaw's operative record characterizes the posterior wound of entrance as follows:

> It was found that the wound of entrance was just lateral to the right scapula close [to] the axilla yet had passed through the latysmus [latissimus] dorsi muscle * * * the wound of entrance was approximately three centimeters in its longest diameter * * * (*58*)

(370) A report on a committee interview with Dr. Shaw included the following:

> The rear entrance wound was not 3 centimeters [in diameter] as indicated in one of the operative notes. It was a puncture-type wound, as if a bullet had struck the body at a slight declination [i.e., not at a right angle]. The wound was actually approximately 1.5 centimeters in diameter. The ragged edges of the wound were surgically cut away, effectively enlarging it to approximately 3 centimeters.(*59*)

(371) Shaw also said in the interview that this wound was shaped as if the bullet had entered at a slight declination. Shaw probed through this wound with his finger and felt the Penrose drain that he had placed in the latissimus dorsi muscle.*

(372) In measuring the diagram, made by Dr. Shaw at the time of the staff interview in order to illustrate better the size of the entrance and exist wounds, it is interesting that the entrance wound measurements taken from this diagram are 1.5 by 0.8 centimeters, with the long dimension in the longitudinal plane of the body (the long axis), and that the exit wound is approximately 5 centimeters in greatest dimension. (See fig. 35, a drawing prepared during the interview in which Dr. Shaw attempted to convey the actual size and location of both the entrance wound in the right posterior thorax and the corresponding exit in the right anterior thorax.)

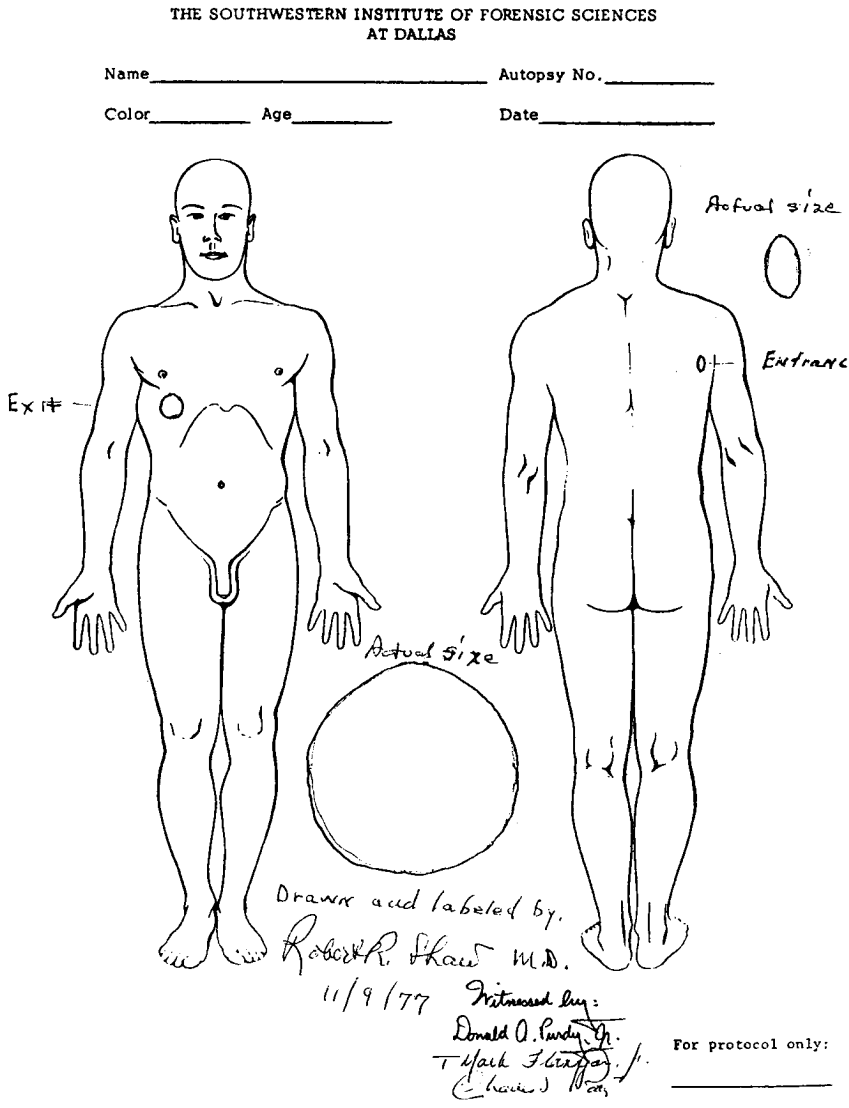

FIGURE 35—Reproduction of a drawing prepared during a staff interview with Dr. Robert R. Shaw, in which Dr. Shaw attempted to convey the actual size and location of both the entrance hole in the posterior thorax and the corresponding exit in the right anterior thorax.

(373) In September 1978, Dr. Baden conducted a physical examination on Governor Connally to see the scars resulting from his wounds (see addendum G for the complete report on this examination). Dr. Baden localized these wounds as follows:

> [A]t the site of gunshot perforation of the right upper back there is now a 1⅛ inches long horizontal pale, well

healed scar that is up to three-eights inch wide centrally, with a lateral border slightly lower than the medial border (about 5 inches). The medial margin is one-half inch superior to and five-eights inch medial to the apex of the right posterior axilla. The lateral border is 6 inches to the right of the midline of the back and 4¾ inches below the shoulder line. (*60*)

(374) The panel believes that the ovoid characterization of this wound requires interpretation. The examination of the clothing, had it been conducted immediately after the wounding, might have been of assistance. One possible interpretation is that the ovoid entrance wound, as described, could have resulted from the missile striking the skin surface on a tangential plane, causing an abrasion most pronounced on the margin adjacent to the acute angle of the trajectory that would create the illusion that the wound was more ovoid than it actually was. The undermining of the contralateral margin, when the wound itself is looked into, would accentuate the out-of-round character of the wound inself. Dr. Shaw, in his original description and subsequent interview, did not note any significant undermining or abrasion by the missile which would have been produced by a non-tumbling,* tangential impact.

(375) Another possible interpretation of this ovoid wound is that the missile itself, just prior to striking the body, was out of alinement with its trajectory (due to striking an intervening object). That is to say, it had tumbled * slightly before entering the body, thereby creating an elongated defect.

(376) The panel, in its evaluation, also considers it important that the shape of the defect in the clothing would have been a more uniformly round hole if the bullet had struck on a tangential plane with the missile alined with its trajectory. The panel (except for Dr. Wecht) concludes, therefore, that the wound in Governor Connally was probably inflicted by a missile which was not alined with its trajectory but had yawed* or tumbled* prior to entry into the Governor. This conclusion incorporates consideration of the testimony of relatively inexperienced, somewhat hurried observers, not fully aware of the subsequent implications of their findings.

Exit (outshoot) wound of the right anterior chest

1. Clothing—Suit jacket (front)

(377) There is an irregularly round defect, measuring 1 by 1 centimeters in maximum diameter, penetrating all layers of the coat on its right front side. The midpoint of the defect in the jacket is 34.5 centimeters below the upper border of the collar, 49 centimeters above the lower margin of the coat, and 15 centimeters to the right of the midline. (See fig. 36, a photograph of the front of Governor Connally's coat, illustrating the location of the anterior exit bullet hole.)

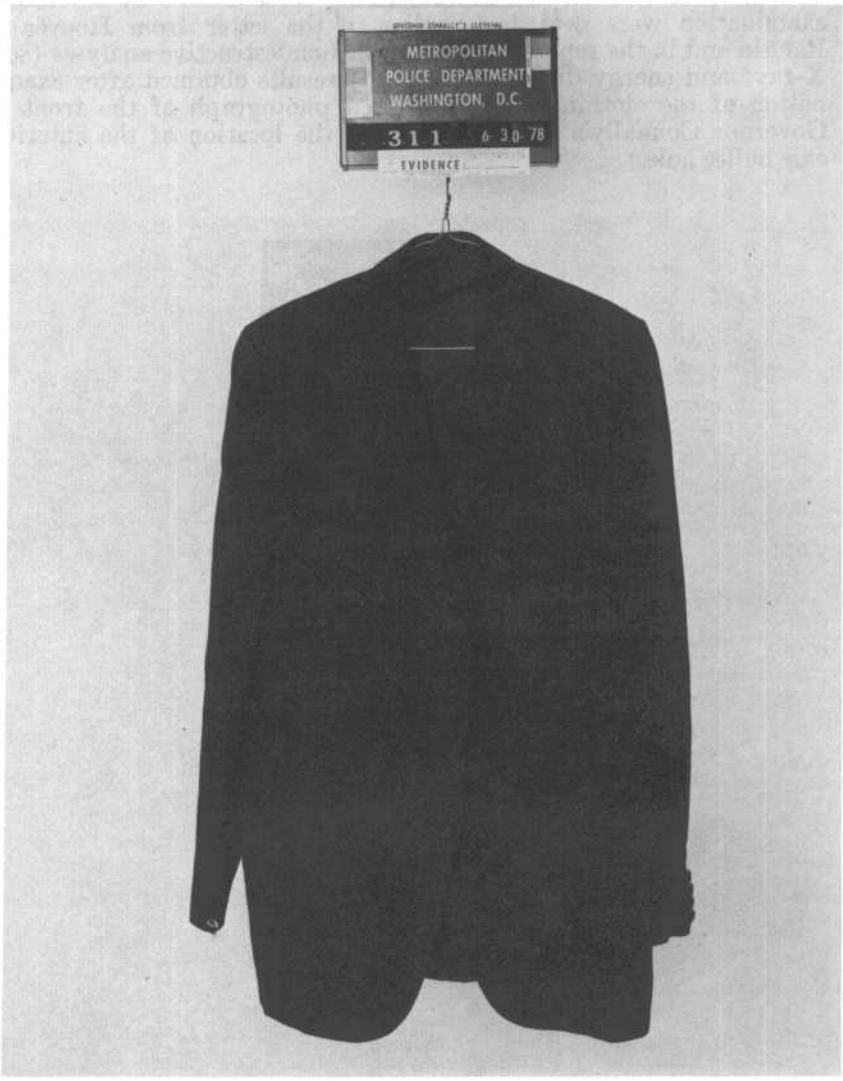

FIGURE 36.—Photograph of the front of Governor Connally's suit jacket, showing the location of the anterior exit bullet hole.

2. Clothing—Shirt (front)

(378) There is a slit-like defect in the front of the shirt, measuring 3.8 centimeters in length and varying from 0.1 to 0.2 centimeter in width. The midpoint of the defect is 15.7 centimeters to the right of the midline and 27.9 centimeters below the shoulder seam. The long axis extends inferiorly and medially at an angle of approximately 60° from the vertical axis of the shirt. This joins medially a vertical linear tear measuring 3.1 by 0.1 to 0.2 centimeters and is paralleled by another vertical linear tear measuring 4.8 by 0.1 to 0.2 centimeters.

The difficulties of further characterizing these defects by laboratory examination were described earlier in the letter from Hoover to Rankin and in the report describing the nondestructive analyses (soft X-ray* and energy dispersive X-ray*) results obtained after examination of the clothing. (See fig. 37, a photograph of the front of Governor Connally's shirt, illustrating the location of the anterior, exit bullet hole.)

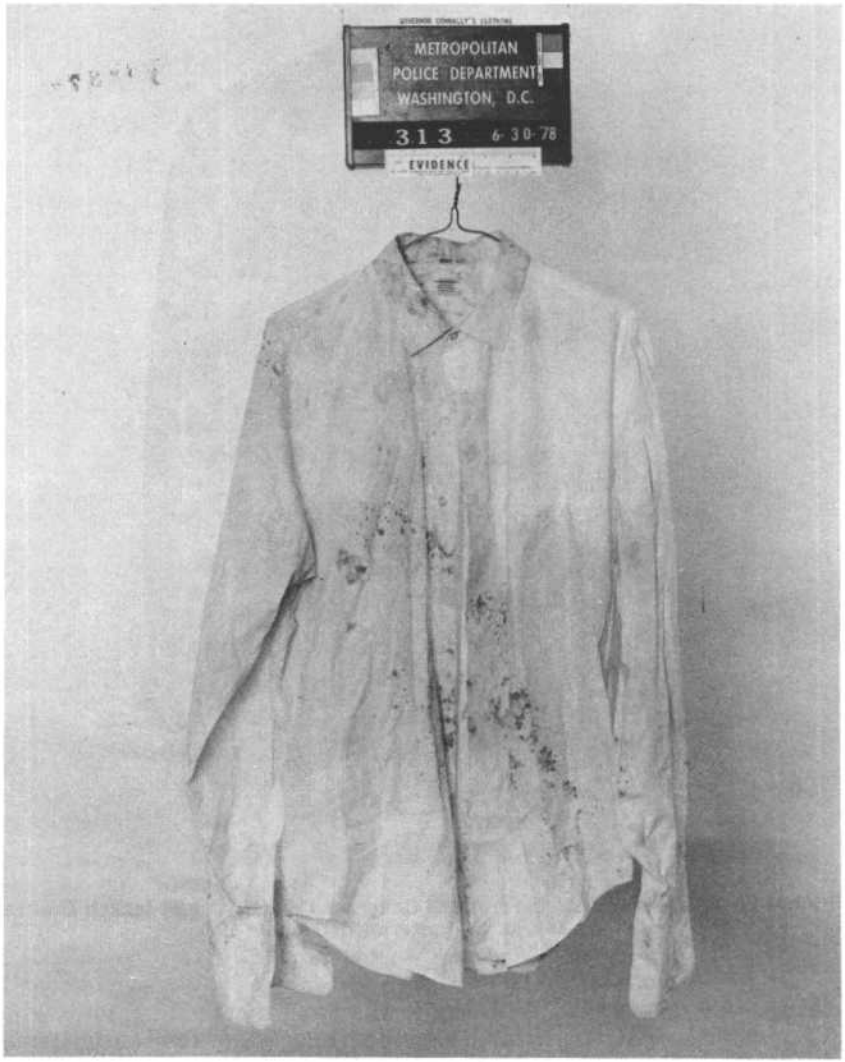

FIGURE 37.—Photograph of the front of Governor Connally's shirt, showing the location of the anterior exit bullet hole.

3. Surgical report and interview with the surgeon

(379) Dr. Shaw's operative record characterizes the exit wound as follows:

> [The missile] emerged below the right nipple * * * [T]he wound of exit was a ragged wound approximately 5 centimeters in its longest diameter. (*61*)

(380) Subsequently within his report, Dr. Shaw described his operative procedure: "An elliptical incision was made around the wound of exit removing the torn edges of the skin and the damaged subcutaneous tissue." In a committee interview, Dr. Shaw further localized and characterized the exit wound in a drawing in which he attempted to reproduce the actual size of the exit defect (see fig. 35).

(381) In Dr. Baden's report of his recent examination of Governor Connally, he localizes the residua of this wound as follows:

> The exit wound scar is in the right front chest 1 inch below the central nipple line and has been incorporated in a surgical scar that is 9½ inches long that extends from 3 inches to the right of the midline, 1 inch beneath the nipple line, and proceeds superiorly to the right upper posterior axillary area. (*62*)

Course of the missile through the back (thorax)

1. X-rays

(382) Dr. J. Reynolds' X-ray report includes the following which is relevant to the missile's path through the thorax:

> Anterior-posterior film of the chest was obtained on November 22, 1963. There is marked soft tissue swelling of the lateral aspect of the right thorax and free air is seen in the soft tissues at this site and in the region of the axilla.* The right fifth rib is fractured in several places. The right lung base shows a dense confluent infiltration presumed to be the result of pulmonary contusion.* No free pleural fluid* or pneumothorax* is identified at this time but the shadow of a safety pin is superimposed on the right hemithorax, perhaps marking the site of a chest tube. (*63*)

(See fig. 38, a reproduction of the anterior-posterior* X-ray film of the chest of Governor Connally, illustrating the multiple fractures of the right fifth rib and the contusion of the right lung.)

(383) The report states further:

> A subsequent film on November 23, 1963 was taken in posterior-anterior projection. Again, it shows that the right base is obscured by a homogeneous density which probably represents pulmonary contusion.* The heart and mediastinum* the study of the previous day. (*64*)

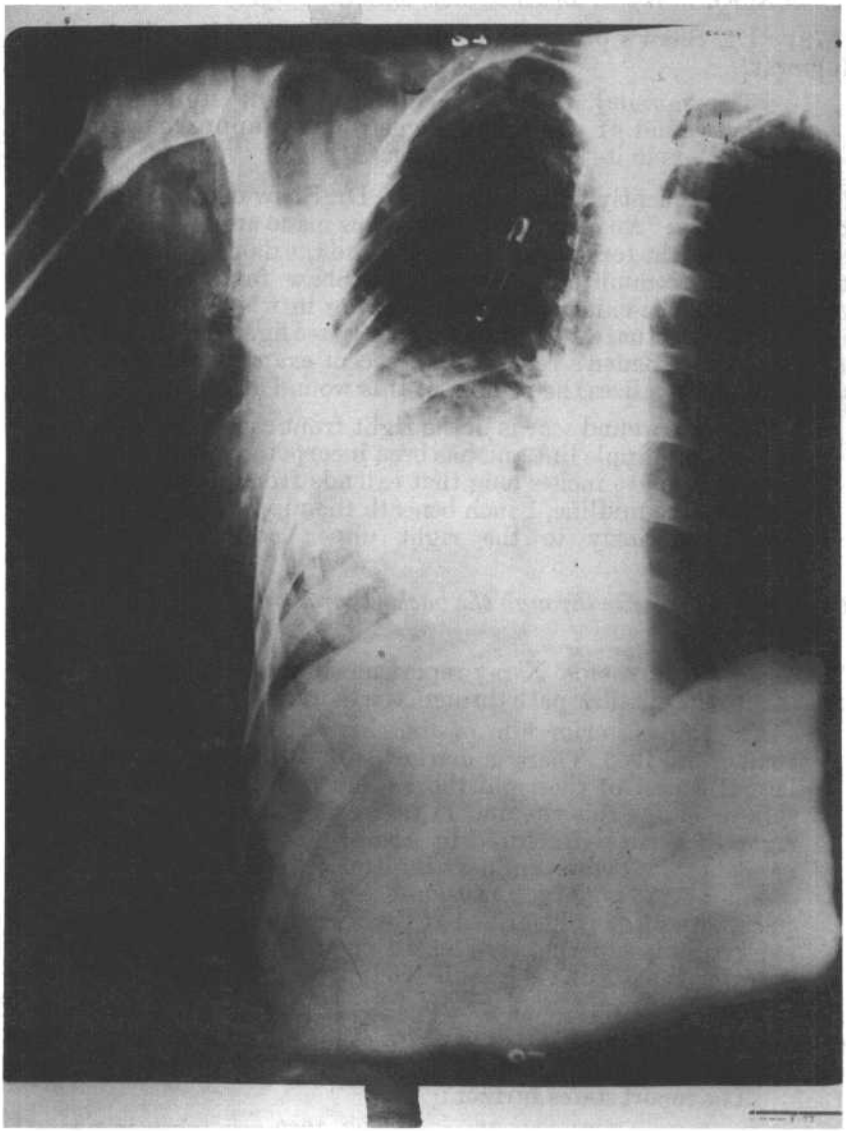

FIGURE 38.—Photograph of the anterior-posterior X-Ray film of the chest of Governor Connally, showing the multiple fractures of the right fifth rib and the contusion of the right lung.

2. Surgical report and interview with the surgeons

(384) Dr. Shaw's operative record characterizes the pathway of the missile and its effects as follows:

> The incision was then carried in a downward curve up toward the right axilla* so as to not have the skin incision over

the actual path of the missile through the chest wall. This incision was carried down through the subcutaneous tissue to expose the serratus anterior muscle* and the anterior border of the latissimus dorsi muscle.* The fragmented and damaged portions of the serratus anterior muscle were excised. Small rib fragments that were adhering to the periosteal tags were carefully removed preserving as much periosteum* as possible. The fourth intercostal muscle bundle and fifth intercostal muscle bundle were not appreciably damaged. The ragged ends of the damaged fifth rib were cleaned out with the rongeur. The pleura had been torn open by the secondary missiles created by the fragmented fifth rib. The wound was opened widely and exposure was obtained with a self retaining retractor. The right plural [pleural] cavity was then carefully inspected. Approximately 200 cubic centimeters of clot and liquid blood was removed from the plural [pleural] cavity. The middle lobe had a linear rent starting at its peripheral edge going down toward its hilum and separating the lobe into two segments. There was an open bronchus in the depth of this wound. Since the vascularity and the bronchial connections to the lobe were intact it was decided to repair the lobe rather than to remove it * * * This laceration had undoubtedly been caused by a rib fragment * * * There was no evidence of injury of the mediastinum and its contents * * * The upper lobe was found to be uninjured * * * It was found that the latissimus dorsi muscle although lacerated was not badly damaged * * *(*65*)

(385) Dr. Shaw's recent committee interview report contains this recharacterization of the findings of his procedure:

There was a smaller tunneling wound in the back/chest. The bullet struck the fifth rib in a tangential way pushing it out, causing a fracture at a point farther up the rib (like a tree limb breaking from pressure exerted near its end). Bullet and rib fragments exited out the front of the Governor causing the larger exit hole.

Shaw said the lower two-thirds of the Governor's lower lung lobe was like liver, full of blood and holes caused by secondary (bone) missile fragments. There was a rent in the latissimu dorsi.(*66*)

(386) Dr. Petty, also present at Dr. Shaw's interview, summarized Dr. Shaw's observations concerning the course of the missile:

There was a tunnel made by the missile in passing through the chest wall.

The bullet struck the fifth rib in a tangential manner and shattered approximately 10 centimeters of the posterior and lateral aspect of the fifth rib. The serratus anterior muscle was torn and the fifth and sixth intercoastal muscles were intact and the periosteum of the rib was nearly intact.

Shaw removed more of the fifth rib to enter the chest wall. There was damage of the middle lobe of the right lung due to

> the impact upon the chest. It actually was ripped into two segments and there was a leak in the bronchus. The lower two-thirds of the lower lobe of the right lung looked just like liver, "just a bag of blood."
>
> Shaw repaired the right middle lobe. It inflated well. There was no need to touch the lower lobe of the right lung except for a 1 centimeter long rent in it. This was oversewn. (*67*)

(387) In his summary of the interview, Dr. Petty suggested that the missile tunneled around the chest wall and did not proceed in a straight line from entrance to exit.

(388) The majority of the panel members, however, disagree. They would have expected a comparable missile, which was slowed only by passage through the President's neck and by striking only a relatively thin and readily shattered rib, to pass from entrance to exit in a fairly straight line and to perforate the lung. They are not certain that the surgeon could have known whether the injury to the lung was caused by the missile or by rib fragments only. They cannot conclude solely from the findings on the internal injuries whether the missile which injured Governor Connally had struck an intervening target. They note, however, that the findings are entirely consistent with such a path. The relatively large back entrance perforation is indicative of the missile having first struck an intermediate target, and the relative lack of damage to the bullet is believed by some panel members and Larry M. Sturdivan, the wound ballistics expert, to indicate that the missile had passed through other tissue, slowing it down, before it hit the Governor, striking his rib and wrist.

(389) Dr. Baden's report comments on the angle of the trajectory:

> Positioning the Governor while erect in the anatomic posture shows the missile track to proceed from back to front, downwards at approximately a 10 degree angle, for a distance of 12½ inches through the body. (*68*)

Reentry wound into the dorsum (top or back) of the right wrist

1. Clothing—Suit jacket

(390) There is an irregular defect through all layers of the medial edge of the right sleeve of the coat, located 1.9 centimeters from the medial sleeve seam posteriorly; it measures 1.6 by 0.9 centimeters and involves both anterior and posterior (front and back) surfaces, representing the defect of both entry and exist in the coat sleeve.

2. Clothing—shirt

(391) There is a defect which passes through both layers of the French cuff of the right shirt sleeve. The defect on the outer layer of the cuff measures 1.6 by 0.9 centimeters, that on the inner layer of the cuff 1.8 by 0.5 centimeters. These two defects approximate each other and are 10.0 centimeters from the cuff margin and 10.6 centimeters medial to its anterior corner.

3. Medical record review

(392) Dr. Charles Gregory's operative record describes the wound of entry on the Governor's wrist:

> The wound of entry on the dorsal aspect* of the right wrist over the junction of the right distal fourth of the radius and shaft was approximately 2 centimeters in length and rather oblique with the loss of tissue with some considerable contusion at the margins of it. (*69*)

This enlarged entrance perforation is suggestive of a reentrance wound.

(393) Dr. Vernie A. Stembridge's surgical pathology report includes a characterization of the wound to the dorsal surface of the wrist:

> Specimen (A) consists of an ellipse of skin which is white and hairy measuring 30 millimeters by 10 millimeters by 6 millimeters. In the middle of the epidermal* portion of the specimen is a ragged laceration extending into the dermis* and measuring 10 millimeters by 2 millimeters by 2 millimeters. A small amount of hemorrhage is present in the subcutaneous tissue and dermis.*
>
> Microscopic examination of skin from the right wrist reveals a focal absence of epithelium* with hemorrhage and disruption of the underlying dermis and soft tissue. (*70*)

(394) The panel considers this histologic description to be consistent with the defect being an entrance wound.

Exit wound on the volar (lower) surface of the right wrist

1. Clothing—Suit jacket (see above)

2. Clothing—Shirt

(395) The defect passes through both layers of the French cuff of the right shirt sleeve on the under surface. It measures 1.9 by 1.3 centimeters in the outer layer and 2 by 1.5 centimeters in the inner layer. It is 2.8 centimeters from the cuff margin and 11.3 centimeters medial to its posterior corner.

3. Medical record review

(396) Dr. Gregory's operative record characterizes the exit wound on Governor Connally's wrist as follows: "There was a wound of exit along the volar* surface of the wrist about 2 centimeters above the flexion crease of the wrist and in the midline." (*71*)

Course of the missile through the right wrist

1. Medical record review

(397) Dr. Gregory's operative record describes the course of the missile through the wrist:

> It was noted that the tendon of the abductor palmaris brevis was transected, only two small fragments of bone were removed, one approximately 1 centimeter in length and consisted of lateral cortex which lay free in the wound and had no soft tissue connections, another much smaller fragment perhaps 3 millimeters in length was subsequently removed. Small bits of metal were encountered at various levels throughout the wound and wherever they were identified and could be picked up were picked up and have been submitted to the pathology department for identification and

examination. Throughout the wound and especially in the superficial layers and to some extent in the tendon and tendon sheaths on the radial side of the arm are small fine bits of cloth consistent with fine bits of Mohair. It is our understanding that the patient was wearing a Mohair suit at the time of the injury and this accounts for the deposition of such organic material within the wound.(*72*)

(398) Dr. Stembridge's report characterizes the tissue removed from the right wrist:

Specimen (C) is labeled bone and debridement from right wrist and consists of several small pieces of tissue. Two small fragments each 3 mm. in greatest dimension appeared to be pieces of cotton and/or wool. Two other small pieces, the largest of which measured 8 millimeters by 3 millimeters by 2 millimeters and the smallest of which measured 3 millimeters by 3 millimeters by 2 millimeters appear to be soft tissue. The other portion of the specimen consists of three irregular fragments of bone, the largest of which measures 1 centimeter by 5 millimeters by 3 millimeters and is composed of both cortical and cancellous bone and the other two measuring 6 millimeters by 2 millimeters by less than 1 millimeter and appearing to be composed of cortical bone only. The soft tissue fragments are submitted for microscopic examination.

Microscopic examination of debridement from the right wrist reveals multiple fragments of bone, and small amounts of fibrofatty connective tissue. Embedded within the fibrofatty tissue is a small segment of fragmented peripheral nerve.(*73*)

The panel concludes that its findings further indicated that the missile had passed through Governor Connally's suit jacket and wrist and had remained intact.

(399) Dr. Baden, in his recent examination of Governor Connally, localizes the residua of these wounds:

Examination of the right wrist shows the gunshot wound of entrance to be incorporated into a well healed surgical dorsally and extending to the wrist; there are well healed fine surgical scars on the ventral aspect (undersurface) of the wrist, horizontally and longitudinally.(*74*)

2. X-Rays

(400) Dr. J. Reynolds' X-ray report describes the wound in the wrist:

Films of the wrist were obtained on November 22, 1963, and they show a comminuted fracture * of the distal portion of the radial shaft. In this area, in the volar aspect of the distal forearm, a few small metallic fragments are seen in the soft tissue. The alignment of the bone at the fracture appears good.(*75*)

(See figs. 39, 40, and 41 and reproductions of the X-rays.)

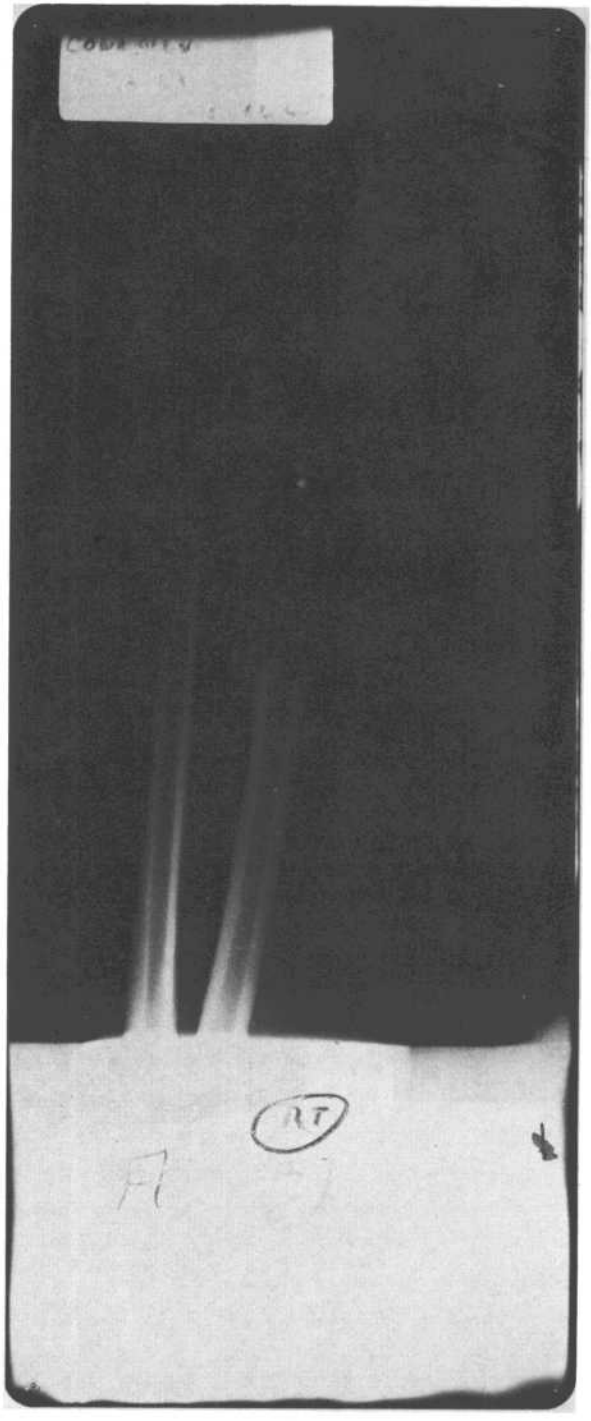

FIGURE 39.—Photograph of an X-ray of the wrist, showing the extent of the fracture and missile fragmentation.

FIGURE 40.—Photograph of an X-ray of the wrist, showing the extent of the fracture and missile fragmentation.

FIGURE 41.—Photograph of a LogEtronic enhancement of a wrist X-ray, showing more clearly the extent of the fractures and missile fragmentation.

3. Disposition of the missile fragments from the wrist

(401) An FBI report by Special Agent J. Doyle Williams, dated November 30, 1963, describes the disposition of the missile fragments, about which there are some confusion:

> Doctor Charles Francis Gregory, Parkland Hospital, stated he and Doctor Tom Shires and other staff physicians per-

formed surgery on Governor John Connally on November 22, 1963. He states surgery performed by him was done on the Governor's right arm, and that he removed from the arm a small fragment of metal. He stated the metal fragment was placed into a transparent container for preservation, and that during the operation, he recalled no other pieces or bits of metal being removed from the Governor's body.

Doctor Gregory was asked whether or not he removed or saw another doctor remove a small fragment of metal from the left thigh of Governor Connally, and he states that although X-rays indicated the possibility of a small fragment of metal embedded in the left thigh that no surgery was performed to remove same.

Doctor Gregory stated Surgery Supervisor Audrey Bell took custody of the fragment of metal removed from the Governor's arm, and that the ultimate disposition of the metal which was considered to be of possible evidentiary value, could best be explained by Miss Bell. He stated he did not on his own knowledge know, however, but he had been advised [that] Miss Bell obtained a receipt from State Trooper Bob Nolan [a State of Texas highway patrol officer] and transferred the metal fragment to him in accordance with instructions from the Governor's office at Parkland Hospital. (*76*)

In another FBI report, dated November 23, 1963, Special Agent Williams said:

Bobby M. Nolan, Texas highway patrolman, Tyler district, was interviewed relative to a bullet fragment removed from the left thigh of Governor Connally, which was turned over to him at Parkland Hospital in Dallas for delivery to the FBI.

Nolan stated his instructions were apparently not clear at the outset and that following contact with his superior officers while at the Dallas Police Department, he turned the bullet fragment over to Captain Will Fritz [Dallas Police Department] at approximately 7:50 p.m. He stated he had no further information concerning the matter and that his only participation in this series of events was the acceptance of the fragment and delivery of same to Captain Fritz. (*77*)

(402) All the panel members except Dr. Wecht agree, after a review of the notes of Drs. Gregory and Shires on the operation, that the missile fragment that Officer Nolan attributed to the thigh was probably the fragment recovered from the right wrist. This fragment is labeled "Q9 metal fragment from arm of Governor John Connally" in FBI report "DL 89–48" and in correspondence addressed to Dallas Police Chief Jesse E. Curry.

(403) All the panel members except Dr. Wecht would have expected a comparable rifle missile perforating the wrist, without being slowed by striking an intervening target, to have produced significantly greater soft tissue and bone injury and a smaller skin entrance perforation. They also agree that the method of labeling and handling this evidence was so poor that there might have been difficulty in having it admitted as evidence in a criminal proceeding.

Reentry wound in the left thigh

1. Clothing—Trousers

(404) There is a defect of the left pant leg 61.5 centimeters below the top of the trousers and 6.4 centimeters medial (inward) to the crease of the pants; it measures 0.7 by 0.9 centimeter and is rectangular in shape. (See fig. 42, a photograph of the defect in Governor Connally's trousers.)

2. Medical record review and interview of the surgeons

(405) Dr. Shires' operative record characterizes the thigh wound as follows:

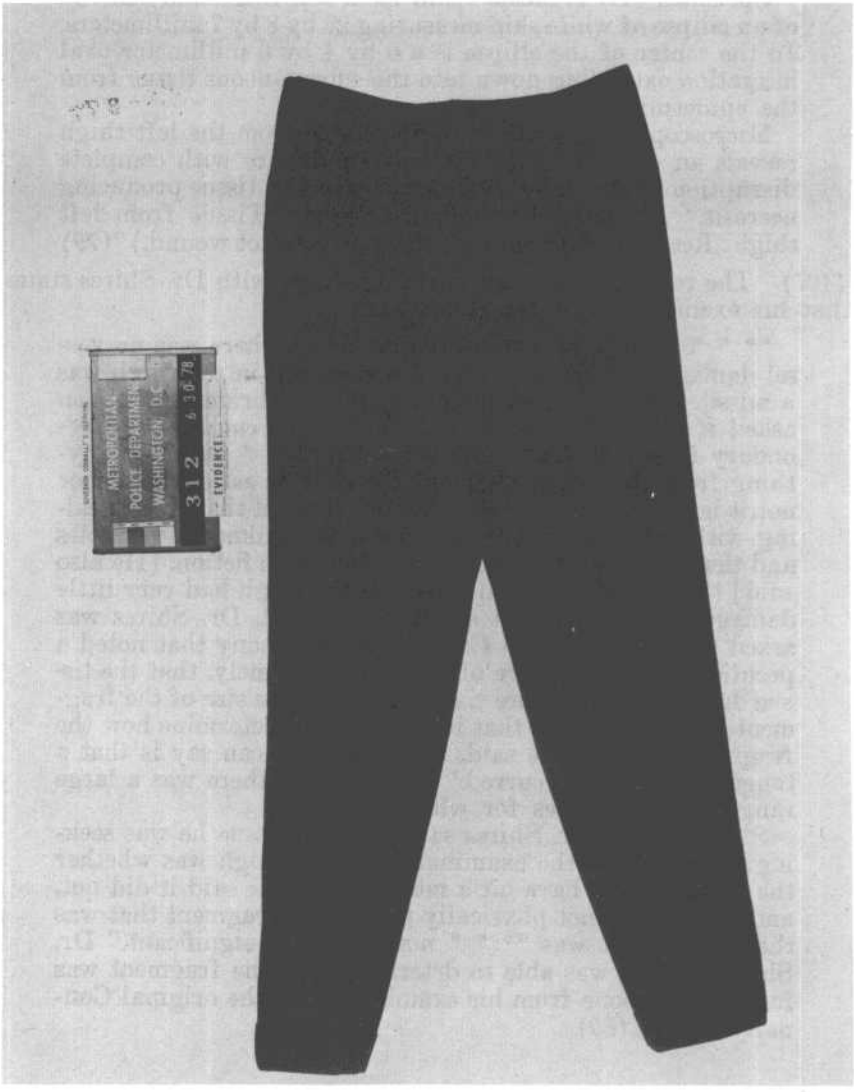

FIGURE 42.—Photograph of the suit trousers of Governor Connally, showing the location of the missile defect.

There was a 1 centimeter punctuate missile wound over the juncture of the middle and lower third, medial aspect, of the left thigh. X-rays of the thigh and leg revealed a bullet fragment which was embedded in the body of the femur* in the distal third. The missile wound was seen to course through the subcutaneous fat and into the vastus medialist.* The direction of the missile wound was judged not to be in the course of the femoral vessel, since the wound was distal and anterior to Hunter's canal. (*78*)

(406) Dr. Stembridge's report characterizes the tissue removed from the left thigh as follows:

Specimen (B) is labeled skin from left thigh and consists of an ellipse of white skin measuring 22 by 8 by 7 millimeters. In the center of the ellipse is a 6 by 4 by 3 millimeter oval laceration extending down into the subcutaneous tissue from the epidermis.*

Microscopic examination of the tissue from the left thigh reveals an area from the epithelial puncture with complete disruption of the underlying dermis and soft tissue producing necrosis.* PP/md Pathologic diagnosis: "Tissue from left thigh: Recent hemorrhage (history of gunshot wound.)" (*79*)

(407) The report on the committee interview with Dr. Shires states that his examination of the thigh was:

"* * * largely an exploration to insure there was no vessel damage." [T]he only significant wound in the thigh was a missile track. He says he merely did a debridement. When asked if the thigh wound could have been caused by a secondary fragment, Dr. Shires said, you "* * * can't tell anything from the size or shape of the wounds as to whether or not it is an entrance or exit wound." He said that when dealing with fragments, there are too many unknown variables and that it is hard to differentiate fact from fiction. [He also said] the wound was small and that the thigh had very little damage and did contain a metal fragment. Dr. Shires was asked about his Warren Commission testimony that noted a peculiarity in the nature of the wound; namely, that the tissue damage seemed more significant than the size of the fragment present. He said that it is difficult to determine how the fragment entered. He said, "* * * all you can say is that a tangential wound occurred." He said that there was a large range of possibilities for what happened.

Significantly, Dr. Shires said the main issue he was seeking to resolve by the examination of the thigh was whether the missile could have hit a major vessel. He said it did not, and that he did not physically pursue the fragment that was there because it was "* * * not medically significant." Dr. Shires said he was able to determine that the fragment was in the thigh bone from his examination of the original Connally X-rays. (*80*)

(408) After reviewing the three original thigh X-rays and the enhancement (LogEtronics*) of these X-rays, Dr. Shires indicated:

> [I]t doesn't make any difference whether the metal fragment is in the femur* or just under the skin with regard to the issue of whether there was a full bullet striking the thigh or a fragment of a bullet. He said the wounds were probably caused by a tangential hit. He said a tangential wound could have sent the fragment anywhere into the thigh. Dr. Shires noted that on the enhancement of the thigh (LogEtronics*) the item in the bone looks more like an artifact than when he examined the original. He was openminded about the possibility that the fragment could have been just under the skin, but preferred to reiterate his initial impression that the fragment was in the thigh bone. Dr. Shires said that while they explored the entire track of the missile, they were not "* * * exploring it as a track * * *," rather they were "* * * exploring the wound looking for a big missile injury." Dr. Shires found little hemorrhage, though he thought it was likely that a high velocity missile did not pass through the skin causing the wound.(*81*)

(See figs. 43 and 44, enhanced X-rays of Governor Connally's thigh.)

3. X-rays

(409) Dr. Reynolds' report on Governor Connally's X-rays describes the X-ray of the left femur and left lower leg:

> Film of the shaft of the left femur and of the left lower leg reveals no fracture in this area. A tiny metallic fragment is seen in the lower medial aspect of the thigh, in the subcutaneous fat.(*82*)

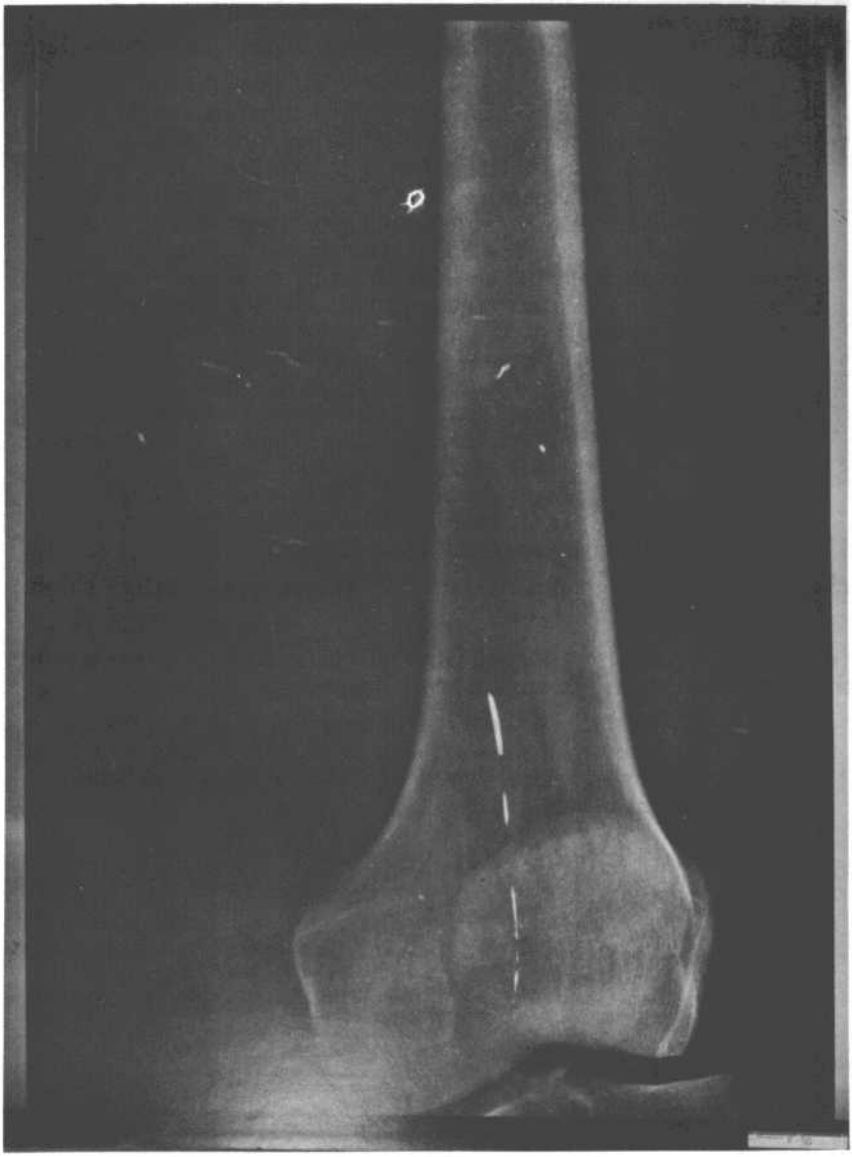

FIGURE 43.—Photograph of a LogEtronic enhancement of a thigh X-ray, showing the location of the missile fragment in the subcutaneous fat.

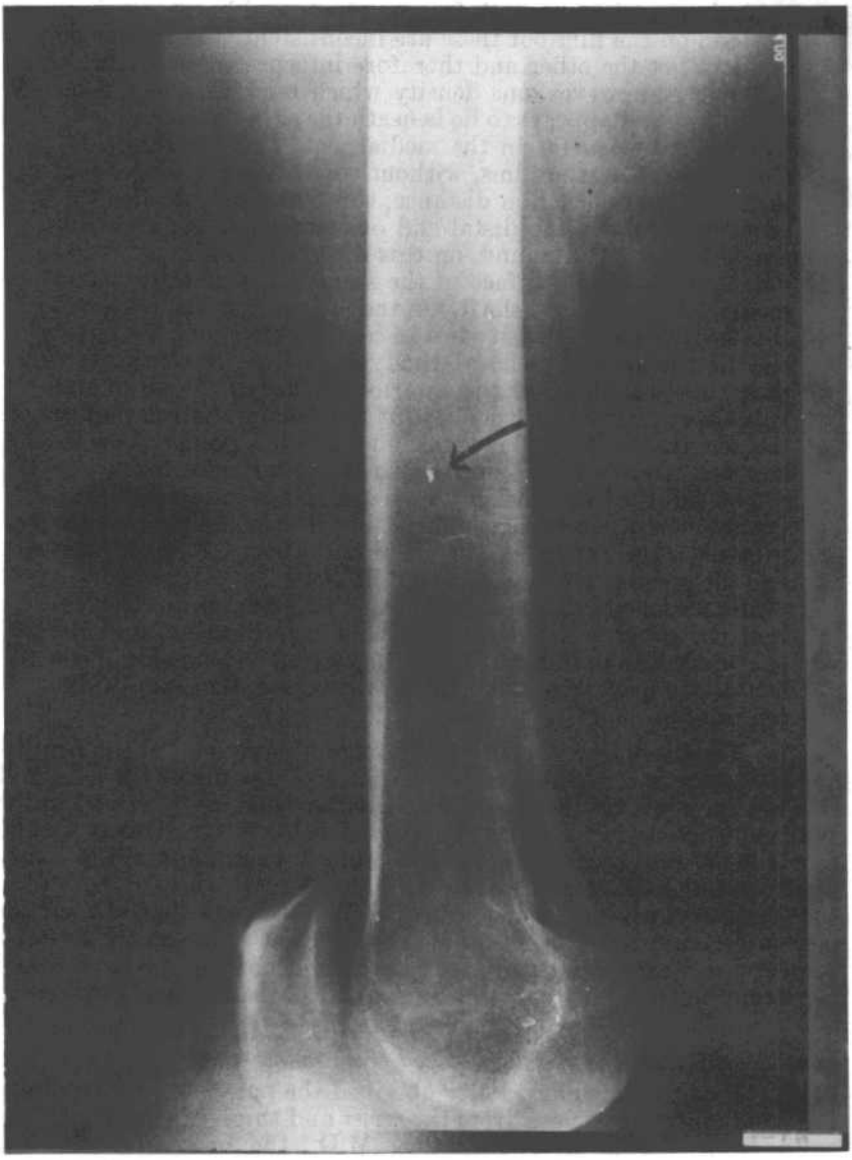

FIGURE 44.—Photograph of a LogEtronic enhancement of a thigh X-ray, showing the location of the missile fragment in the subcutaneous fat.

(410) On November 29, 1963, Dr. Reynolds prepared a supplementary X-ray report which further characterizes the shadows within the thigh:

> AP (anterior-posterior) and lateral films of the digital portion of the left thigh were obtained and include the distal portion of the shaft and the region of the knee. One film is in the AP projection and the other the lateral projection with the direction of the beam from medial to lateral and the film lying adjacent to the lateral aspect of the thigh.

No fractures are seen. A few punctuate and linear densities are seen on the film but these are inconsistent, and appear on one and not the other and therefore interpreted as artifacts.

There is, however, one density which remains constant on both films and appears to lie beneath the skin of the region of the subcutaneous fat in the medial aspect of the thigh. By measurement on the films, without correction for target film distance and object film distance, this small density lies 15.2 centimeters above the distal end of the medial femoral condyle* on the AP film and, on this film, lies 8 millimeters beneath the external surface of the skin. It is 6.25 centimeters medial to the femoral shaft. On the lateral film, the center of this small metallic density lies 15 centimeters above the distal end of the medial femoral condyle. It lies 4.9 centimeters posterior to the skin of the anterior surface of the thigh and it is superimposed on the shaft of the femur.* In relation to the femur, the density is superimposed on a point 1.5 centimeters posterior to the exterior of the anterior cortex.

The shape of this density is irregular but is roughly oval. Precise measurements are difficult but it is estimated that the greatest length in the AP projection is about 3.5 millimeters and the greatest width about 1.3 millimeters.

Measurements of the densities in the lateral projection reveal the greatest length to be about 2 millimeters and the greatest width to be about 1.5 millimeters. The long axis of the metallic object is oriented generally along the axis of the femur.(*83*)

(411) The panel concurs with Dr. Reynolds' opinion that the 2-millimeter density is a missile fragment that was just under the skin and was not deep within the thigh in the femur bone, as described in the Warren Commission Report. The panel believes the density in the femur bone was erroneously described and is an artifact in the X-ray film and not a bullet fragment.

(412) The panel members, except Dr. Wecht, agree that in their experience a comparable rifle missile that did not strike an intervening target would produce greater soft tissue and bone injury and would penetrate much deeper into the thigh and probably pass through it.

4. Nondestructive analysis of tissues from the right wrist and left thigh and of slides prepared from them

(413) Panel member Dr. Petty obtained the paraffin blocks containing residual tissue excised from the wrist and thigh of Governor Connally from Vernie A. Stembridge, M.D., the original examining surgical pathologist. Dr. Petty subjected the tissue to nondestructive analysis at the Southwestern Institute of Forensic Sciences in Dallas, using techniques which employ X-ray back scatter* with scanning electron microscopy* and energy dispersive X-ray*. The report of this examination states:

The three microscopic slides were examined and no evidence of metallic fragments was noted either by direct observation or by seeing evidences of tearing of the tissues which might have occurred as a result of the nicking of the microtome knife

due to contact with metallic fragments that would occur during preparation of the microscopic slides.

The paraffin blocks containing the tissues from the debridement were then subjected to energy dispersive X-ray analysis. No evidence of copper, lead, zinc, or nickel was found.

After preparation the paraffin blocks* containing the tissues removed at the time of debridement and still remaining following the preparation of microscopic slides were subjected to analysis using a scanning electron microscope fitted with a low angle detector for X-ray back scatter. No copper, lead, zinc, or nickel was found by means of this analysis. (*84*)

(See addendum H for the complete report.)

(414) The panel conclude that no metal fragments were present in the available tissues removed from the injured wrist and thigh for possible further analysis and comparison.

SUMMARY OF THE FORENSIC PATHOLOGISTS' PERSPECTIVE OF WOUND BALLISTICS

(415) To understand better the significance of the panel's observations and the bases for its conclusions, it is useful to review some of the terminology and basic concepts of wound ballistics and to indicate the limitations that certain variables impose on interpreting the findings. Some of these factors were considered and recorded in a reasonably accurate manner during the original autopsy and subsequent experimentation; others were not.

(416) The forensic pathologist is trained to observe the morphologic (structural) or physical effects of a missile or missiles on a body and to interpret these effects in order to provide an investigator with as much information as possible, as detailed in section V of this report, including: the distance or range of the weapon from the body; relationship of the weapon and trajectory of the missile to the body; approximate mass and velocity of the missile (which together characterize its kinetic energy); and the amount of this kinetic energy transferred from the missile to the body after striking, together with the results of such impact on, or perforation of, the tissues damaged and the body as a whole. These observations will be discussed separately, with particular emphasis on their relationship to specific evidentiary items examined.

Range of the weapon from the target

(417) A missile must have sufficient velocity (speed) to cause a particular wound. The velocity depends on the type of ammunition employed, including the type of powder and powder charge. Velocity drops off as the distance between the weapon and the target increases.

(418) The missile is not the only object that emanates from the firearm. Expanding gas produced by the burning of the powder, which actually pushes the missile out of the bore of the firearm, bursts forth from the muzzle with great velocity, causing the audible report associated with discharge. Powder grains are also blown out of the muzzle; these may be partially burned or completely unburned. Thus, gas,