

MULTIPLE MINUTE FRAGMENTS OF METAL IN THE
FRONT OF PRESIDENT KENNEDY'S HEAD: EVIDENCE
THAT A SHOT WAS FIRED FROM THE FRONT

by

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1970

1. Certain items of evidence pertaining to the assassination of President John F. Kennedy disclose the occurrence of a phenomenon which establishes that President Kennedy was wounded in the right-front part of his head by a bullet fired from a location forward of the President and to his right. Notwithstanding indications that the President was also wounded by a bullet that struck him in the back of the head, the phenomenon in question can have been caused only by a bullet which struck him in the front; no other reasonable interpretation of the phenomenon seems possible.

2. The officially recorded observations of several persons who examined X-ray films of the murdered President's head reveal that fragments of metal, numerous in quantity and exceedingly small in size, were situated compactly in the right-front part of the President's head, and that few, if any, were located far in the back of his head.

3. The quantity and minuteness of the fragments necessarily imply that they were formed from a bullet which burst very severely when it struck the President in the head. The location of the fragments in the right-front part of the President's head necessarily implies that the bursting bullet struck in that area.

4. For reasons which will be discussed below, minute fragments that are formed from bursted bullets invariably come to rest in an area immediately adjacent to the point where the bullet burst; extreme minuteness in projectiles inhibits their penetration deeply into solids.

Wounds of the President's head *

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5. President Kennedy suffered gunshot wounds to the scalp and skull in the right-rear of his head and in the right-front part of his head. The President's brain was severely damaged throughout the right side. Injury to scalp, skull, and brain was immensely greater in the right-front part of his head than at the rear.

6. According to medical records dealing with the President's wounds, there occurred in the scalp and skull at the back of the head a small elliptical hole displaying certain features which establish that a bullet entered the head at that point. The hole was situated about one inch to the right of the midline of the skull, and about four inches above the external occipital protuberance (the bony lump at the base of the skull in the rear).

7. The other wound in the scalp and skull appears to have changed both in form and in dimensions between the time of the shooting and the time when the wound was examined. The medical records describe a massive hole in the upper right side of the President's head. When examined, this hole was roughly circular in shape, with jagged and irregular edges, and measured about five inches in maximum diameter. This hole encompassed the area just behind the right ear, the top of the head on the right side, some of the frontal bone on the right side, and the region of the right temple. Scalp, skull bone, and brain matter had been detached from this area of the head both at the time when the President was wounded and subsequently when he was moved from place to place.

8. The rearmost portion of the large hole appears to have been created between the time when the shooting occurred and the time when the wound was examined. A color movie by Abraham Zapruder vividly depicts the rear and right sides of the President's head during the few seconds instantly after the head wounding. As depicted in Zapruder's film, the area of the President's head behind the right ear appears to be intact and undisturbed. Forward of the ear, however, there is considerable damage.

9. The President's brain was lacerated and otherwise severely disrupted on the right side, especially in the area adjacent to the large hole in the right-front part of the head. Extending longitudinally through the right side of the brain was the torn and distorted base of a broad canal, the top of which had been detached from the head before the brain was examined. From the margins of this canal there emanated additional lacerations in varying directions and for varying distances. Much of the brain matter underlying the skull in the right-front part of the head was missing: some had been torn from the head and cast asunder when the President was wounded; the rest had leaked from the large hole while the President was being borne to hospital, while he was lying on the hospital operating table, and during the autopsy examination.

The causes of President Kennedy's wounds

10. I believe that President Kennedy was wounded twice in the head by separate bullets, one of which struck and entered the back of his head, the other of which burst when it struck him in the right-front part of his head.* The quantity, size, and location of minute metallic fragments embedded in the President's brain constitute the evidence establishing that a bullet struck him in the right-front part of the head. < m. —

The official record of the minute fragments

11. The official documents which deal with minute metallic fragments in the President's head record actual observations as described by several persons who carefully examined X-rays of the President's head: Dr. James J. Humes (then Commander, U.S. Navy), the medical pathologist who was assigned to supervise the performance of an autopsy on the body of the President and to examine the wounds that the President had suffered; Roy H. Kellerman, a Secret Service agent of long and distinguished experience who witnessed the autopsy examination; James W. Sibert and Francis X. O'Neill, two agents of the Federal Bureau of Investigation who reported what they saw and heard during

the autopsy examination; Dr. Russell S. Fisher, Dr. William H. Carnes, Dr. Alan R. Moriz, and Dr. Russell H. Morgan, respectively three forensic pathologists and a radiologist who, early in 1968, constituted a secret panel assigned by then Attorney General Ramsey Clark to examine (among other things) X-rays of the President's head, and to report the contents of those X-rays. (Henceforth this group of four doctors is referred to as the Panel; their report is referred to as the Panel Report.)

12. Information pertaining to the minute fragments became publicly available in three stages. First, documents describing the fragments of metal in the President's brain occurred among the records of the Warren Commission which were issued at the end of November, 1964; these records include the official autopsy report written by Dr. Humes, and the testimonies of Dr. Humes and Mr. Kellerman before the Warren Commission. Second, FBI reports describing the observations of agents Sibert and O'Neill were published in October, 1966, as an appendix to a book about the Warren Commission; these reports were not issued with other records of the Warren Commission. Third, in 1969 the public received the secret 1968 Panel Report which furnished the most explicit account of the minute fragments that is currently available to the public.

Knowledge of the minute fragments before 1969:
quantity and size

13. Before the issuance of the Panel Report in 1969, wherein the Panel doctors specifically delineated the patterns of bullet fragmentation in the President's brain, and precisely specified that the minute fragments were located compactly in the front part of the head, it was possible to know reliable data only about the quantity and size of metallic fragments in the head. In retrospect it is clear that statements describing or strongly implying that the fragments were distributed more or less evenly in a "path" throughout the areas of damage were erroneous and misleading.

a) Autopsy report

14.

Referring to X-rays, Dr. Humes' autopsy report describes fragments of metal as multiple, minute, and situated in the brain "along a line corresponding with a line joining" the wound at the back of the head and the area immediately above the right eye (16 H 980):

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[Handwritten initials]
(16 H 980)

← m. —

Roentgenograms of the skull reveal multiple minute metallic fragments along a line corresponding with a line joining the...small occipital wound and the right supra-orbital ridge.

15.

The autopsy report delineates this conclusion regarding the metallic fragments in the President's head (ibid.):

A portion of the projectile traversed the cranial cavity in a posterior-anterior direction...depositing minute particles along its path.

b) Dr. Humes' testimony

16.

Dr. Humes' testimony before the Warren Commission provides somewhat more precise and elaborate descriptions of the quantity and size of the metallic fragments than are available elsewhere in the records of the Warren Commission. In testimony Dr. Humes stated that the fragments were "minute...less than 1 mm. in size for the most part...tiny...dustlike...small, dust, of the size of dust particles," and he estimated that there were between 30 and 40 of them visible on X-rays:

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[Handwritten initials]
(16 H 980)

(X-rays)* had disclosed to us multiple minute fragments of radio opaque material traversing a line from the wound in the occiput to just above the right eye. These tiny fragments that were seen dispersed through the substance of the brain in between were, in fact, just that extremely minute, less than 1 mm. in size for the most part.

← m. *[Handwritten initials]*
 All parentheses in quoted passages are those of the author.

17. Explaining why he failed in attempts to find and recover examples of these "dustlike" fragments when he searched for them in the brain, Dr. Humes suggested that the fragments might have been somewhat smaller than they appeared on the X-ray films (ibid.):

...the X-rays pictures which were made would have a tendency to magnify these minute fragments somewhat in size and we were not too surprised in not being able to find the tiny fragments depicted in the X-ray.

18. Of the quantity of "dustlike" fragments that were visible in X-rays Dr. Humes said (ibid):

(There were) between 30 and 40 dustlike particle fragments of radio opaque material.

19. In his final reference to the fragments Dr. Humes asserted (ibid., 359):

...they were so small as to be essentially unrecoverable...they were small, dust, of the size of dust particles.

20. In the X-rays Dr. Humes located two small fragments which appeared conspicuously larger than the "dustlike" fragments; measuring 7 x 2 mm. and 3 x 1 mm. respectively, these two fragments were situated in the brain slightly behind and above the President's right eye. Dr. Humes recovered them and transferred them to FBI agents Sibert and O'Neill.*

c) Mr. Kellerman's testimony

21. Mr. Kellerman's reference to fragments in the President's head does not add materially to the descriptions contained in the autopsy report and in the testimony of Dr. Humes. Mr. Kellerman characterized the X-ray depictions as "little stars", and described Dr. Humes' fruitless efforts to recover examples of the minute fragments from the brain. Referring to the X-rays, Mr. Kellerman then stated (24100):

...when you placed the X-ray up against the light the whole head looked like a little mass of stars.

d) FBI reports

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22.

An FBI report written by agents Sibert and O'Neill also describes fragments visible in X-rays of the President's head. The agents' report emphasizes the apparent "path" of fragments:

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X-rays of the brain area...disclosed a path of a missile which appeared to enter the back of the skull and the path of disintegrated fragments could be observed along the right side of the skull...the Chief Pathologist (Dr. Humes) advised approximately 40 particles of disintegrated bullet and smudges indicated that the projectile had fragmented while passing through the skull region.

< m. —

23.

A subsequent FBI report, evidently based in part on the report by agents Sibert and O'Neill, states:

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(Dr. Humes) had advised that the projectile which had entered the President's skull region had disintegrated into at least 40 particles of bullet fragments as shown by the number located (on X-ray film).

24.

In summary, the official records of the Warren Commission furnish the following information about the minute fragments of metal in the President's brain: they were about 40 in number; they were exceedingly small, most of them less than 1 mm. in maximum dimension; and (both by explicit statement and by strong implication) they were distributed throughout the right side of the head in a "line" or "path" extending between the small hole in the rear of the head and a margin of the large hole in the front of the head.

25.

*out of
place
here*

The Panel Report discloses that the "line" or "path" of fragments is largely imaginary; indeed, it may be wholly imaginary. Therefore, notwithstanding implications to the contrary, the official records of the Warren Commission do not properly answer an essential question: Where in the head were the fragments located? The answer to that question leads to the conclusion that the President was fired upon from the front.

Knowledge of the minute fragments currently: two groups of fragments; quantity, size, and location

26.

In February of 1968, Drs. Fisher, Carnes, Moriz, and Morgan examined three X-ray films of the President's head that were made on the evening of the assassination. By late March of that year the Panel completed their report, wherein they describe what they observed in the X-rays. The Panel Report was not made publicly available until early 1969.

27.

In their report the Panel doctors describe two groups of minute fragments which were distinct from one another both in size and in distribution. One group was composed of "relatively large" fragments (less than 1 mm. in size), the majority of which were distributed randomly in the front part of the head on the upper right side. The other group consisted of discernibly smaller fragments concentrated in a single compact formation only in the area of the President's right temple; on one lateral X-ray this formation of fragments appeared elongated in shape, with its long axis pointing in the direction of the hole at the back of the President's head. The Panel Report states:*

← m. 5

28.

Distributed through the right cerebral hemisphere are numerous small, irregular metallic fragments, most of which are less than 1 mm. in maximum dimension. The majority of these fragments lie anteriorly and superiorly... The metallic fragments visualized within the right cerebral hemisphere fall into two groups. One group consists of relatively large fragments, more or less randomly distributed.

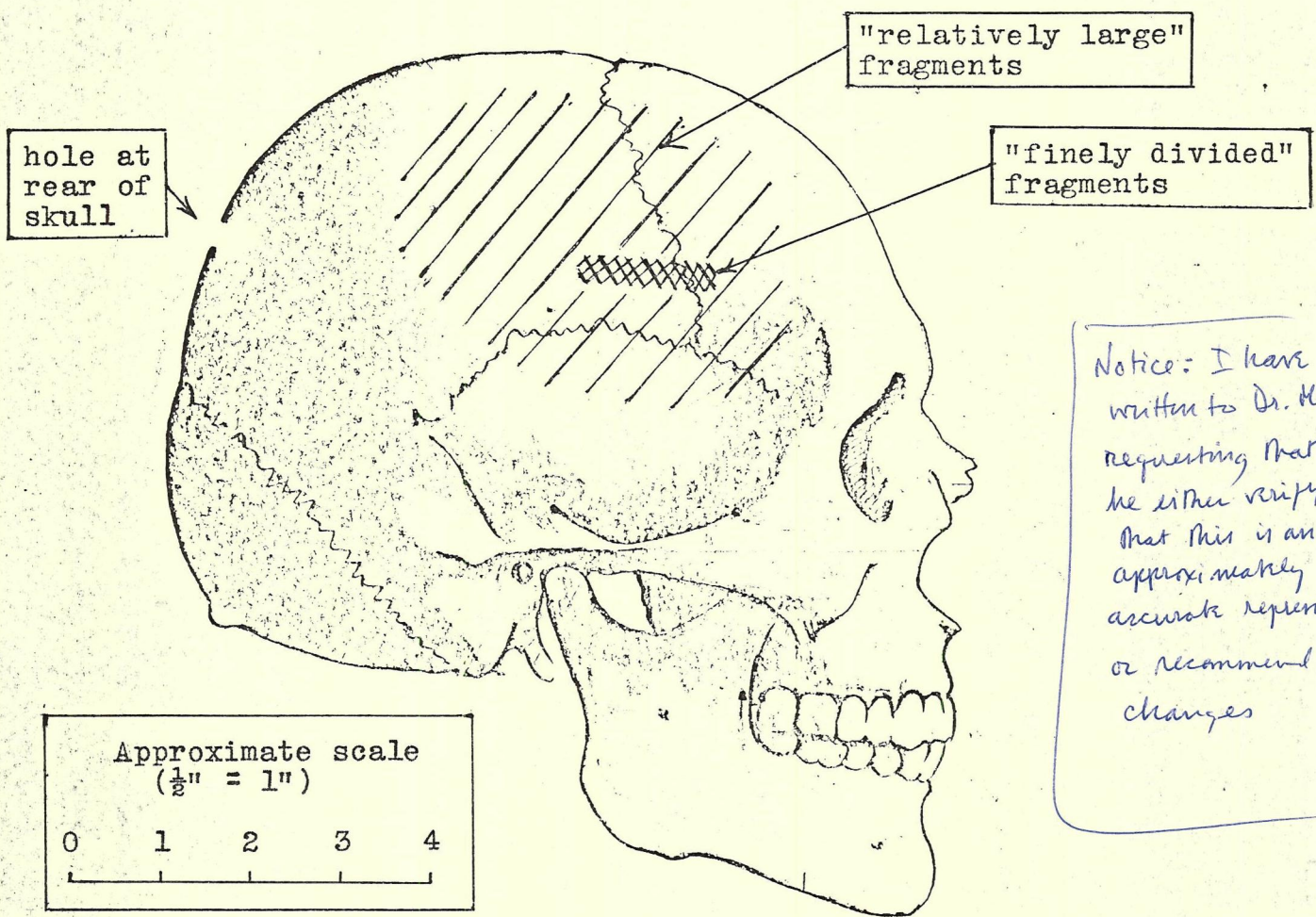
29

The second group consists of finely divided fragments, distributed in a postero-anterior direction in a region 45 mm. long and 8 mm. wide. As seen in lateral film # 2 this formation overlies the position of the coronal suture; its long axis if extended posteriorly passes through the above-mentioned hole (in the rear of the skull). It appears to end anteriorly immediately below the badly fragmented frontal and parietal bones just anterior to the region of the coronal suture.

< m —

30.

The following drawing depicts approximately the location of the two groups of metallic fragments in the President's head:



Notice: I have written to Dr. Morgan requesting that he either verify that this is an approximately accurate representation, or recommend changes

30. The mere presence of numerous minute fragments concentrated compactly in the right-front part of the President's brain conclusively establishes that the President was wounded by a bullet which burst when it struck him in that area, a bullet which was fired from a location directly accessible to the right-front part of the President's head.

32. The principles governing the penetration of projectiles in solids dictate that minute projectiles must come to rest in an area very near to the place where they were formed into minute projectiles.

Physical principles governing the penetration of minute projectiles

33. The multiple minute fragments which penetrated President Kennedy's brain reached his head as components of a whole bullet that burst when it struck him. The trajectory of the bullet as a whole began in the rifle barrel and ended at the target, when it ceased to be a bullet and became many "bullets", many minute projectiles, some of which began and ended their brief trajectory in the President's head. x

34. The physical principles governing the penetration of projectiles are explained succinctly by E.H. Harrison in the National Rifle Association's NRA Firearms and Ammunition Fact Book.* In his explanation Mr. Harrison refers specifically to the penetrating ability of spherical shotgun pellets of different sizes, but his remarks apply generally to all projectiles of all weights, sizes, and velocities:

The only force carrying a projectile through its target arises from its own velocity and weight. Assuming like velocities, then the only factors making for different penetrations by non-deforming round shot will be weight and area.* The weights of spheres of the same material will be to each other as the cubes of their diameters. With the available force varying as the diameter cubed, and the resistance varying only as the diameter squared, it

is obvious that the penetration will be as D^3 divided by D^2 , which equals D itself. That is, penetration goes up strictly in accordance with the diameter of the shot.

This amply-confirmed fact applies to penetration both in solid substances and in air.

35. In other words, all other factors being equal, the larger the particles, the more deeply they penetrate; conversely, the smaller the particles, the less deeply they penetrate. With very small particles, there is very slight penetration.

36. Referring to the penetrating ability specifically of very minute fragments, "dustlike" in size, Mr. Shelley Braverman, a firearms consultant who lives in Athens, N.Y., explained: ^x

Other things being equal, halving the diameter of a ball-projectile results in only 1/8 energy remaining. Thus, if a bullet had a portion of itself reduced to "dustlike" fragments...the particles would be so bereft of energy that they could not be expected to achieve any substantial penetration beyond the point of genesis.

37. The photographs in the Appendix (attached) vividly disclose the phenomenon in question with reference to frangible bullets. Each picture shows the penetration of fragments formed from bullets that burst when they struck solid materials, hard and soft. In each instance depicted in the photographs, as in all instances when bullets burst into numerous minute particles, the tiny fragments came to rest in an area immediately adjoining the point where the bullet struck. As is readily perceived both from ~~the~~ knowledge of the physical principles governing missile penetration, and from the experience of those who have witnessed this phenomenon occurring with invariable regularity, the results cannot have been other than those depicted in the photographs. Minute fragments regularly come to rest in solids near the place where the bursting bullet strikes; they do not appear elsewhere without also appearing there.

NOTICE:
I am in the process of gathering relevant photos

The answer to the question whether President Kennedy was fired upon from the front

38.

We now know these pertinent things about the condition of minute metallic fragments in the President's head: that they were numerous in quantity (with about 40 visible in X-rays); that they were exceedingly small in size (which implies minuscule weight); that they were concentrated compactly in the right-front part of the President's head; that they formed two groups of particles distinguishable from one another both in size and in distribution; that the group of "relatively large" fragments (mostly less than 1 mm. in size) was located mostly in the right-front part of the head; and that the group of "finely divided" fragments (discernibly less than 1 mm. in size) was located only in the right-front part of the head.

39.

Moreover, we know that exceedingly minute fragments which are formed from bursted bullets do not have the ability to penetrate deeply into solids. In light of that knowledge, the significance of data pertaining to the minute fragments in the President's brain is clear: President Kennedy was wounded in the right-front part of his head by a bullet which burst when it struck him there; the bursting bullet was fired from a location directly accessible to the right-front part of the President's head. If the bullet had burst elsewhere than at the right-front, minute fragments of that bullet would have been concentrated elsewhere than at the right-front.

40.

Similarly, regarding the conclusion of the Warren Report that the President was wounded in the head only by a bullet fired from behind, we may now readily perceive the significance of the information that "finely divided" fragments were absent from the right-rear part of the President's head (not to mention the likelihood that there were no "relatively large" fragments in the vicinity of the hole at the rear of the head). From the quantity and size of the fragments we know that the bullet from which they were formed burst very severely when it struck the President in the head. Can a bullet which burst in that fashion at the back of the President's head have deposited all those many fragments at the front of the head without leaving any behind-- not one? Not one "finely divided" fragment in the place where we would reasonably expect them all of them to be located. Common sense, experience, and knowledge of basic physical principles tell us that it cannot happen-- not ever.

41.

With all that-- with common sense, experience, and knowledge of physics dictating the answer-- ask now whether the official version of the President's head wounding, as that version is embodied in the Warren Report and in the records of the Warren Commission, bears the least credence. Ask now whether this is what happened: that the bullet which produced those "relatively large" fragments mostly in the front of the President's head, and those "finely divided" fragments only in the front of the President's head, burst at the back of his head. Assuredly it did not; it burst in the front, on the right side, where it struck him.

42.

In light of what the fragments reveal, it is possible to know that there was more than one person firing upon the President. The person who fired upon him from the front blew out his brains and killed him.

The "path" of minute fragments: a non-path

43.

According to the Panel Report, the conglomerate of "relatively large" fragments was indefinite in outline, and the group of "finely divided" fragments was a scant 1 3/4 inches long. These descriptions establish that the official records of the Warren Commission misrepresent the distribution of minute fragments in the President's brain. The fragments were not distributed in a "line" or "path" throughout the brain, as the Warren Commission's records state or strongly imply.

44.

The question remains, however, whether the Panel's description of the elongated formation of "finely divided" particles represents a "path"-- that is, whether the elongated group can properly be represented as having been caused by a projectile that moved longitudinally through the 45 x 8 mm. area that was occupied by the fragments in question.

45. I believe that, in the present state of public knowledge respecting the "finely divided" fragments, the elongated formation cannot responsibly be represented as a path, for the Panel Report does not disclose whether the formation displays any features indicating passage of a projectile longitudinally through that area. It may be that the "finely divided" fragments were formed before they settled in the area of the elongated formation, that they arrived there as a fine spray of fragments after the bullet from which they evolved had burst. As long as there is more than one method which may have caused the elongated formation, we are obliged to regard it as undetermined whether a large projectile passed through there.

46. Even if there was longitudinal passage of a missile through the area of the elongated formation, the orientation of fragments in the direction of the hole at the back of the head does not in itself imply that the projectile originally passed through that hole. In the hypothetical circumstance that there was passage of a projectile longitudinally through the formation, the orientation of the fragments does not indicate whether the projectile was moving forward from the rear or rearward from the front.

47. Moreover, irrespective of their orientation in any line whatever, the mere presence of exceedingly minute fragments in the front of the head and their absence from the rear of the head imply that they evolved from a bullet that burst at the front. If indeed the formation was created by the longitudinal passage of a projectile, then the location of the fragments only at the front of the head indicates that the projectile was moving rearward from the front; if the projectile had passed through the back of the head before it passed through the front, it would have deposited remnants of itself both at the back and at the front.

48. By these remarks I do not wish to suggest that the elongated formation of "finely divided" fragments was caused by a projectile passing rearward from the front. I wish merely to indicate that the state of our knowledge is such that we cannot responsibly infer anything from the way in which that formation is oriented. The orientation of that group of fragments is irrelevant to the question whether the President was fired upon from the front. It is the presence of such minute fragments in such a compact formation only in the front of the head that bears essentially on the question.

The official account of how the President was wounded

49. The official version of the ballistics pertaining to the President's head wounding is this: All of the minute fragments in the brain were formed from a bullet which struck the President in the back of the head. After entering the skull from the rear, the bullet (and parts of it which may have been detached from a major portion of the bullet) passed through the head and emerged from the right side, where it produced the large hole in the skull. In the course of traversing the head, the core of the bullet separated from its jacket, burst to pieces, and left minute particles of itself embedded in the brain.

50. The bullet which allegedly accomplished these effects is designated 6.5 mm. Mannlicher-Carcano. The characteristics of this bullet, as they pertain to its ability to form numerous minute particles located only at a distance from its point of impact on bone, are these: its cross-sectional diameter is 6.5 mm.; it weighs 160 grains; it is composed of a lead alloy core surrounded at the nose and on all sides by a copper jacket, except at the base, where the core is exposed (This construction is commonly referred to as full metal cased or fully jacketed.); finally, the bullet was moving at a velocity of about 1800 feet per second when allegedly it struck the President.

51. As was previously indicated, it is indisputable that fragments as minute as those appearing in the front of President Kennedy's head do not penetrate far into solid material; they come to rest near the place where they were formed. Moreover, such fragments deposit remnants of themselves throughout their brief trajectory, with the result that they appear in the entire area immediately adjoining the place where they were formed. It is clear, therefore, that the bullet which allegedly struck at the back of the head did not burst at the back of the head.

52.

In order to reconcile the compact concentration of minute fragments in the front of the brain with a bullet that initially struck at the back of the skull, it is necessary to suppose that somehow a portion of the bullet, unprotected by copper jacketing material, burst in mid-brain after it had penetrated a certain distance through the brain without bursting; there were no "finely divided" fragments in the rear of the brain, and apparently few, if any, "relatively large" fragments were situated far back in the head.

53.

Reducing the matter to but one essential question, we need ask only this: Does a lead projectile have the ability to burst in the course of passage through soft material at a velocity of 1800 feet per second or less? If the bullet did not burst near the rear of the brain, and if no part of the bullet had the ability to burst in mid-brain, then the supposition that the fragments were formed from a bullet that struck at the rear of the President's head is not tenable.

54-57

99 54-57

A few paragraphs are forthcoming for this place. I am awaiting the collection of authoritative references and the completion of physical tests.

Here is an outline of the contents of forthcoming paragraphs:

- references to authorities
- results of tests with lead slugs of about 1800 fps. velocity
 - a) in soft material
 - b) through masonite into soft material
(effort forcibly to induce fragmentation so as to observe size of fragments)
- conclusion

(currently I am confident that authorities and tests will establish that lead projectiles would not burst in passage through soft solid at 1800 fps. - R)

58

One more consideration may be noted by way of refuting the assertion that a lead projectile might have burst in mid-brain if the bullet which entered the back of the President's head was not a 6.5 Mannlicher-Carcano, but a bullet of far swifter velocity than that of the Mannlicher-Carcano.

59. Here we should recall something that the Panel reports about the "relatively large" fragments: the majority of them were located in the front of the head. That information implies that some of these "relatively large" fragments were situated in the brain at a certain distance backward from the area where all of the "finely divided" fragments were located.

60. How may we explain the presence of the "relatively large" fragments in an area farther back than mid-brain (where presumably the supposed bullet burst), while the smallest fragments, the "finely divided" fragments appear only in the front of the brain?

61. In the context of the assertion that all of the fragments evolved from a projectile that burst before it reached mid-brain, these phenomena seem inexplicable by any rational means, for the energy of the "finely divided" fragments was less than the energy of the "relatively large" fragments. The smaller fragments ought, therefore, to have penetrated less deeply toward the front of the brain than the larger fragments. In this instance, however, are we to suppose, contrary to physical principles and to experience, that the smaller fragments penetrated more deeply than the larger fragments? That supposition surely is unjustified; projectiles as minute as the "finely divided" fragments should come to rest in an area adjoining the place where they were formed, not a few inches away from there.

62. Equally unwarranted is the supposition that the fragments were formed from a forward-moving projectile that burst when it struck the inner surface of the skull at the right-front part of the head. In this circumstance, the projectile and fragments that evolved from it would be expected simply to continue their forward motion and pass out of the head through the hole that they created. Moreover, it would be impossible rationally to explain the presence of minute fragments in an area farther back than mid-brain. One would have to suppose not only that the fragments reversed their direction (an event that would entail considerable loss of energy), but even that they penetrated four or five inches of solid brain matter after reversing their direction. For these reasons, the supposition that the fragments were formed from a forward-moving projectile that burst on the inner surface of the skull is untenable.

63. It would seem, then, that no explanation is compatible with the disposition of the fragments except this: The fragments were formed from a bullet which burst when it struck the President in the right-front part of the head.

Corroboration in various items and forms of evidence
that a shot was fired from the right-front; the grassy
knoll*

64. Although it is possible to consider the multiple minute fragments irrespective of other matters, and thereby to conclude that they alone establish that President Kennedy was wounded by a bullet fired from a location directly accessible to the right-front part of his head, nevertheless the conclusion pertaining to the fragments ought properly to be regarded as corroboration for other forms of evidence which indicate that an assailant fired upon the President from a location forward of him and to his right.

65. Herein I refer to numerous witnesses of the assassination who reported that they heard shooting originating from a place forward and rightward of the President's location. I refer further to the sudden swift movement of the President's head backward and leftward intantly after a bullet wounded him in the head. These and other important matters draw attention to an area of the assassination site that has come to be known as the grassy knoll.

66. A low grassy hill topped by trees, by shrubbery, by a concrete wall, by large decorative structures, and by a long wooden fence behind which was concealed a parking lot filled with empty cars, the grassy knoll was situated forward of the President and to his right at the time when he was fired upon.

67. The statements of the so-called earwitnesses at the scene of the assassination are contained chiefly in the published records of the Warren Commission; these may be augmented somewhat by newspaper reports of interviews with witnesses to whom no reference is made in the Warren Commission's records, by inferences drawn from the observation of photographs depicting the activities of people at the scene during the first several minutes after the shooting, and by other means. Herein it is sufficient merely to cite those whose statements are preserved in the Warren Commission's records.

68. At the scene of the assassination there were not less than fifty earwitnesses who reported that they heard shooting originating from the area of the grassy knoll.* These witnesses were situated at various distances from the knoll and on all sides of the knoll when the shooting occurred; near and far, they were stationed north, south, east, and west of the knoll. < m. ~~est~~

69. Although it is true that individual earwitnesses normally furnish a form of evidence that inherently is less reliable than other forms of evidence, nevertheless, taken together, fifty is an impressive number of witnesses, especially in light of the knowledge that they were distributed widely throughout the scene when they heard the shooting. Quantity is not, however, the most impressive aspect of this particular set of earwitness accounts. The quality and reliability of their statements are evident in the realization that these fifty earwitnesses not merely corroborate one another in their own sort of evidence, but also corroborate evidence of a different sort establishing that President Kennedy was fired upon from the grassy knoll.

70. Three motion pictures vividly depicting the movement of President Kennedy's head at the time of the wounding provide further evidence that the President was fired upon from the direction of the grassy knoll. Abraham Zapruder filmed the wounding directly from the right side of the President; Orville Nix filmed directly from the left side; and Marie Muchmore filmed from a location to the left of the President and somewhat behind him. Taken together, these three films set forth important information relevant to the question whether the President was fired upon from the right-front.

71. Observation of the films discloses these events: Momentarily appearing and disappearing near the right-front part of the President's head, a large crimson spray of impact debris blown from the head identifies the time when the wounding occurred. Instantly after the spray of debris appears, the President's head reels backward and leftward with enormous rapidity. Whereas before the wounding the President was faced more or less toward the front of the car in which he was riding, immediately after the wounding his head and body pivot completely to the left. The course of this swift movement backward and leftward is checked only when the President's body rams forcibly against the back of the car seat. Films of the wounding and statements by persons who were very close witnesses of the wounding indicate that brain matter and skull bone, detached from the head by bullet impact, were scattered widely to the left of the President's head.

72. Interpreting the significance of President Kennedy's movement is a simple matter requiring no more than ordinary good sense and the honesty to acknowledge what is obvious. Such swift and violent movement of the President's head backward and leftward is the natural, predictable outcome of an impacting force delivered from forward and rightward by a bullet that brought immense pressure to bear on the right-front part of the President's head.

73. In citing factors other than the disposition of metallic fragments in the President's brain, mention has been made of the evidence furnished by fifty earwitnesses and by the motion pictures recording the movement of the President's head and body instantly after the head wounding. Although these are perhaps the most reliable, the most cogent, and the most easily interpreted elements of the evidence establishing that the President was fired upon from the grassy knoll, they are by no means the only elements of such evidence.

74. At least seven eyewitnesses on the scene reported that they saw a puff of white smoke on the grassy knoll when the President was shot. That a puff of smoke appeared on the knoll at the time of the shooting can hardly be denied; what caused the puff of smoke may reasonably be inferred from the nature of the events that were taking place when the puff of smoke was seen.

75. The Warren Commission's records contain the statements of eyewitnesses who reported that, during the first several seconds after the shooting, they observed persons running from atop the knoll toward unseen places behind the concrete structures on the knoll. That persons ran from the knoll immediately after the shooting can hardly be denied; why they ran may be inferred from the nature of the events that had taken place several seconds earlier.

76. Although it could be amplified considerably beyond what I have referred to in this cursory review, the list of mutually corroborating items and forms of evidence establishing that the President was fired upon from the grassy knoll is not, of course, endless. But need it be endless? Need it contain items and forms of increasingly more conclusive evidence? The evidence presently in hand-- statements by eyewitnesses and earwitnesses describing what was seen and heard at the assassination site, films depicting the President's movements, reports pertaining to the location of minute metallic fragments in the President's brain, and other things-- is sufficient and more than sufficient to prove beyond reasonable doubt that an assailant fired upon President Kennedy from atop the grassy knoll, and that that person killed the President.

77. The important question, then is not what is everything, but what is sufficient, what is sufficient to know that President Kennedy was assassinated by persons firing upon him not only from the rear, but also from the front.

Footnotes

(Some of these notes refer succinctly to what the finished notes will contain. Full notes will be written later.)

↙ (Paragraph reference)

- 5 n. The material contained in this section is derived chiefly from the official autopsy report and from Panel Report. See notes §14m. and §27m., below.
- 10 n. ref. to Thompson, Six Seconds
- 14 n. The designation "H" signifies "Hearings", and refers to the Hearings Before the President's Commission on the Assassination of President Kennedy (U.S. Government Printing Office, Washington, D.C.; 1964). The numerals before and after "H" refer respectively to the volume number in the Hearings and to the page number in that volume. Thus, 16 H 980 signifies volume 16 of the Hearings, page 980.
- 16 n. All parentheses in quoted passages are those of the author.
- 20 n. Dr. Humes, Mr. Kellerman, and the two FBI agents state or imply that these two fragments were the largest that were visible in X-rays of the President's head. The Panel Report (p.11; see §27m. for reference), however, identifies a metallic fragment, 6.5 mm. in diameter, located near the hole in the back of the ~~head~~ skull. The 6.5 mm. fragment is unreported in any of the Warren Commission's records. We do not know whether this large fragment was recovered for analysis, or why its existence was not reported. See below, n. §22A m.
- ref. to Weisberg, PM III.
- ref. to fragments visible in X-rays of a fragment of skull bone delivered from Dallas (Autopsy Report and Humes' testimony).
- 22 n. The text is printed in Edward Jay Epstein, Inquest (Bantam Books; N.Y.; 1966), p.168.

22A n. The passage that intervenes between here and the next quoted sentence of the FBI report defies explanation. The report states:

The largest section of this missile as portrayed by X-ray appeared to be behind the right front sinus.

This "largest section" evidently refers to the 7 x 2 mm. fragment that Dr. Humes ^{recovered} from the area behind and above the right eye. The report continues:

The next largest fragment appeared to be at the rear of the skull at the juncture of the skull bone.

According to Dr. Humes and Mr. Kellerman, the 3 x 1 mm. fragment (the second largest of the two that Dr. Humes recovered) was located close to the 7 x 2 mm. fragment, in the front of the brain behind and above the right eye.

The Panel discloses the presence of a 6.5 mm. fragment adjoining the hole in the skull at the rear, the place where agents Sibert and O'Neill say the "second largest" fragment was located.

Agents Sibert and O'Neill received two fragments from Dr. Humes: one measured 7 x 2 mm., the other 3 x 1 mm.

23 n. Epstein, op.cit., p. 162.

27 n. "1968 Panel Review of Photographs, X-ray Films, Documents and Other Evidence Pertaining to the Fatal Wounding of President John F. Kennedy on November 22, 1963 in Dallas, Texas", a mimeographed report distributed by the U.S. Department of Justice, Washington, D.C., pp. 10 f.

29 n. I understand the term "below" to mean "under the surface of", since otherwise the reference would contradict the information that the elongated formation overlies the position of the coronal suture.

- 33 n. ref. to the means whereby other portions of the missile probably terminated elsewhere than in the President's head.
34. n. NRA Firearms and Ammunition Fact Book, published by The National Rifle Association of America (Washington, D.C.; 1964), p. 193.
- 34A n. The metallic fragments in the President's head are described as "irregular" in shape (Panel Report, p. 10), but the minuscule size of the fragments renders their shape irrelevant as a factor governing their penetration into solids.
- 36 n. Personal correspondence from Shelley Braverman, Athens, N.Y., to the author, (date).
- 64.n. ref. to several ^{books} dealing with these matters in detail; e.g., Weisberg, Meagher, Thompson, et al.
- 68 n. ref to Feldman "Filipine Memoranda, etc."