sine would be multiplied by the fraction 0.38, and the corresponding distance measured along the line from Zapruder. The smallest value places the head in the center of the sidewalk.

(346) There are possible sources of error in these calculations, but it is important to note that any errors would have to be substantial to place the head in the bush. For example, the ratio of head sizes that would place the larger head within the bush would have to be approximately 0.20; that is, nearly 50 percent smaller than recorded for the smallest estimate of the Secret Service agent's head. It is believed that the probability of errors of this magnitude is virtually zero. The placement of the head beyond the bush is a certainty. The placement of the head beyond the retaining wall is almost as certain, since the corner of the retaining wall would correspond to a ratio of head sizes of approximately 0.25.



FIGURE B-1.—Head Size Calculation (Zapruder 413).

B. Photograph Authentication

1. THE OSWALD BACKYARD PHOTOGRAPHS*

(a) Introduction**

(347) One of the most publicized questions to emerge in relation to the Kennedy assassination involves the authenticity of photographs showing Lee Harvey Oswald standing in his backyard, with a holstered pistol strapped to his waist, holding a Mannlicher-Carcano rifle

^{*}This section prepared under the direction of C. S. McCamy and Cecil Kirk. with the assistance of David Eisendrath. For related public hearing testimony of McCamy and Kirk, Sept. 14, 1978, see HSCA-JFK Hearings, vol. II, pp. 349. 397.

^{**}A glossary of terms is available in App. A of "The Backyard Pictures," Report to the House Select Committee on Assassinations by Dr. Leslie Stroebel, Mr. Andrew Davidlazy, and Dr. Ronald Francis, October 1978 (JFK Document No. 12902 [Hereinafter referred to as RIT Technical Report]). See par. 445 infra.

and two newspapers. These have become known as the backyard photographs.

(348) Oswald himself, when shown the pictures at Dallas police headquarters after his arrest, insisted they were fakes. Through the years, many critics have argued the same thing. In part, the controversy was stimulated by a 1964 Life magazine cover of a copy of one picture, retouched to enhance its quality.

(349) If the backyard photographs are valid, they are highly incriminating of Oswald because they apparently link him with the murder weapon. If they are fakes, how they were produced poses farreaching questions in the area of conspiracy. "Faked" backyard photographs would indicate a degree of conspiratorial sophistication that would almost necessarily raise the possibility that a highly organized group had conspired to kill the President and make Oswald a "patsy."

(1) History of the Backyard Photographs

(350) In the early afternoon of November 23, 1963, Dallas detectives obtained a warrant to search the Paine residence in Irving, Tex., where Marina Oswald had been living. (125) The search concentrated primarily on a garage in which possessions of the Oswalds were stored. Among the belongings, Dallas police officials found a brown cardboard box containing personal papers and photographs, including two snapshots and two negatives of Oswald holding a rifle. (126) (Only one negative was made available to the Warren Commission; the other has never been accounted for.) (127)

(351) On the evening of November 23, 1963, Lee Harvey Oswald was shown an enlargement of one of the pictures. (That photograph was later designated by the Warren Commission as CE 133–A.) According to officers present, Oswald denied that he had ever seen the photograph and claimed that someone has superimposed his head on another person's body. Oswald was then shown the print (later designated as CE 133–B), which he also claimed was a trick photograph. (128)

(352) Marina Oswald was later questioned by the FBI about the photographs. She said that she had taken them in the backyard of the Oswald residence on Neeley Street in Dallas. (129) She gave, however, two different versions of when the pictures were taken. She first told the FBI it was in late February or early March 1963. (130) Her testimony to the Warren Commission reflected the same thing. (131) In an FBI interview made after her initial appearance before the Warren Commission, however, she said that the first time she saw the rifle was toward the end of March; she recalled having taken the photographs 7 to 10 days thereafter, in late March or early April. (132)

(353) Other evidence available to the Warren Commission supports her later version. A rifle and a revolver were shipped to Oswald from different mail order houses on March 20. (133) The left-wing newspapers Oswald is holding were dated March 11 and March 24 and were mailed on March 7 and March 21, respectively, both by second-class mail. According to postal authorities, both newspapers would have arrived in Dallas by March 28. (134) In addition, Marina claimed she remembered taking the photographs on a Sunday, about 2 weeks before Oswald allegedly shot at Gen. Edwin Walker on April 10. (135) From this information, the Commission deduced the likely date on which the photographs were taken to be Sunday, March 31, 1963. (136) (354) In connection with the Warren Commission's investigation, Lyndal L. Shaneyfelt, an FBI photographic expert, performed an analysis on the two backyard prints designated CE 133–A and B, a negative, designated CE 749 (the original negative of CE 133–B), the Imperial Reflex duo lens camera (designated CE 750) that Marina Oswald testified she had used to take the pictures, (137) and the alleged assassination weapon (designated CE 139). His analysis and conclusions are as follows:

(355) (1) The photographs CE 133-A and B were taken with Oswald's Imperial Reflex Duo Lens camera. (138) Every camera has unique irregularities that are reflected on the margins of negatives made by it. Shaneyfelt determined that the margin irregularities of the original 133-B negative were identical to those of a negative that he exposed in the camera.

(356) Although he could not document absolutely the origin of CE 133–A because its negative was not available, Shaneyfelt concluded that both prints were taken with the same camera since they showed virtually identical background and lighting conditions. (139)

(357) (2) The backyard photographs CE 133-A and B are authentic. Shaneyfelt examined them under magnification and found no characteristics of compositing or retouching. (140) Initial public controversy regarding the authenticity of the backyard photographs arose after copies of CE 133-A, which appeared to differ in detail from the original photograph as well as from each other, particularly with respect to the configuration of the rifle, were published in Life, Newsweek and other news publications. (141) He testified that the apparent variations in the magazine versions were caused by retouching, a common practice in the reproduction of photographs for publication. (142)

(358) (3) The rifle in the backyard photographs is probably the rifle found in the Texas School Book Depository. Shaneyfelt photographed the rifle, attempting to duplicate the lighting and rifle's position in CE 133-A, and found the configurations matched those of the rifle in the backyard photograph. Although he found a notch in the stock of the rifle that appeared faintly on the rifle in the backyard photographs, he did not find enough peculiarities to state categorically that the rifles were identical. (143)

(359) Despite the Warren Commission's efforts to show that the backyard photographs were genuine, critics have persisted in doubting their authenticity. In general, the critics base their allegations of fakery on their observations of shadow inconsistencies, an indication of a grafting line between the mouth and chin, inconsistent head and body proportions, or a disparate square-shaped chin. (144)

(360) This position has received support from scientists who had not previously been associated with Warren Commission critics. For example, Malcolm Thompson, a British forensic photography expert, questioned in public the authenticity of the photographs in a 1978 British Broadcasting Corp. (BBC) television documentary. (145) At the request of the BBC, he had examined copies of the backyard photographs and concluded they were fakes.* Similarly, a photographic analyst with the Canadian Department of Defense reached the conclusion that these photographs were composites. (146)

^{*}The text of a statement by Mr. Thompson is available in app. B to RIT Technical Report. See par. 445 infra.

(2) Additional photographic evidence recovered by the House Select Committee on Assassinations

(361) Marina Oswald, in addition to giving two different versions as to when the backyard pictures were taken, gave different versions of the number of pictures taken. At first, she testified she had taken one picture; (147) later she said it was two. (148) In addition, Marguerite Oswald testified that soon after the assassination she and Marina destroyed yet another picture in which Oswald was shown holding the rifle over his head with both hands. (149)

(362) The committee obtained an 8 x 10 print of an additional view of Oswald holding the rifle in a pose different from CE 133–A or B. This photograph, a first generation print, * was given to the committee on December 30, 1976 by Mrs. Geneva Dees of Paris, Tex. According to Mrs. Dees, it had been acquired by her former husband, Roscoe White, now deceased, while employed with the Dallas Police at the time of the assassination. (150) The panel designated this recently discovered photograph as 133–C (Dees).

(363) The committee obtained another first generation print of CE 133-A on April 1, 1977 from the widow of George de Mohrenschildt. (151) In the manuscript of his book, which he was writing at the time of his death in 1977, he stated that he and his wife had found the photograph in February 1967 among personal belongings they had stored in Dallas before departing for Haiti in May 1963. (152)

(364) Two additional first generation prints, one of 133- Λ and one of 133-C, where obtained from former Dallas Police Detective Richard S. Stovall on April 14, 1978. (153) Stovall was among the police officers who discovered the backyard photographs during the search of the Paine premises. (154)

(b) Issue

(365) Is there any evidence of fakery in the photographs of Lee Harvey Oswald that show him standing in a backyard holding a rifle in one hand and two left-wing newspapers in the other?

(c) Materials and Procedures

(366) The Photographic Evidence Panel examined Warren Commission exhibits CE 133-A and 133-B, the two backyard pictures seized from the Oswald residence by Dallas Police in 1963; CE 749, the original negative to CE 133-B, and CE 134, an enlargement of CE 133-A.** In addition to these Warren Commission exhibits, the Panel analyzed the four photographs recently discovered by the committee: (367) (1) A photograph designated as 133A-de Mohrenschildt recovered from the estate of the late George de Mohrenschildt; (155) (368) (2) A photograph designated as 133C-Dees, obtained from

the Dees' widow; (156)

(369) (3) Photographs designated as 133A-Stovall and 133C-Stovall, obtained from Stovall. (157) (See fig. IV-15, JFK exhibit F-178, for a display of all of these photographic materials except CE-134, which is shown in fig. IV-22.)

^{*}A first generation print is one made from the original negative.

^{**}CE 134 was examined by two panel members after the final panel conference in July 1978.



FIGURE IV-15.—Oswald "Backyard Pictures"—First generation prints and negatives examined by photographic evidence panel.

(370) These items were selected because of the Panel's policy of working just with first generation prints and original negatives. (158) Only these types of materials contain the most reliable photographic information; subsequent generation materials tend to lose detail in highlight and shadow areas, suffer deterioration of tonal quality, and are prone to include new defects that may impair the accurate representation of the photographic image. CE 133–A, CE 133–B, 133A–de Mohrenschildt, 133C–Dees, 133C–Stovall and CE 134 were identified by the Panel as first generation prints. CE 749, the original negative to CE 133-B, was the only negative recovered from the possession of the Dallas Police Department; consequently, it was the only original negative available to the Panel for analysis. There is no official record explaining why the Dallas Police Department failed to give the Warren Commission the other original negative. (159)

In addition to studying the various backyard picture materials, (371)the panel examined CE 750, which was alleged to be Lee Harvey Oswald's camera (160) to determine whether it was used to take the backyard photographs. Next, the negatives and photographs were both visually inspected and compared with known photographs of Oswald. The panel's visual inspection included the use of magnifiers and microscopes. As an aid in this process, a series of enlargements at varying exposures and contrast ranges was made of CE 133-A and 133-B, thereby producing prints which ranged from very light to very dark. (See figs. IV-16 and IV-17, JFK exhibits F-192 and F-193.) The detail in the darkest parts of the pictures could be most clearly seen in the lighter prints. The details in the lightest areas could be most clearly seen in the darker prints. In this way, the panel had the best opportunity of detecting any evidence of falsification anywhere in the pictures.



FIGURE IV-16.-CE 133-A printed at varying exposures and contrast ranges.



FIGURE IV-17.-CE 133-B printed at varying exposures and contrast ranges.

(372) In a further effort to locate unnatural edges or lines, as well as differences in grain structure and contrast variations, the panel used digital image processing.* The negative of CE 133–B was placed on a microdensity scanner so that light passing through the film could be measured. Such measurements were made on microscopic square areas that were positioned in a square-by-square pattern, but the actual squares were smaller than the silver grains on the negative. The meas-

*See pars. 16-34, supra.

uring instrument determined how light or dark each microscopic square area was and expressed this as a number in a scale of 1,024 grades of density. As the film was scanned, the number for each square area was stored in the memory of a computer. The computer could subsequently recall the numbers, and cause a beam of light to expose a tiny spot on a piece of unexposed photographic film. Each small area was exposed to a magnitude corresponding to the relative lightness or darkness of the area on the original negative. When the exposed film was developed, it provided an enhanced copy of the original image.

(373) The computer was also programed to manipulate the data stored in its memory. It could produce a copy different from the original in some specified way: It could vary the contrasts; it could enlarge the image; or it could produce a more complicated derivation. It could be programed to search for edges between dark and light areas and to print a line on the copy at the place corresponding to the edge on the original.

The backyard pictures were also visually inspected with (374)stereoscopic techniques that permitted the prints to be viewed in three dimensions.* This was possible because the camera's movement between exposures 133–B and 133–A resulted in two views, only a short distance apart, of a single scene. When these two pictures are viewed together in a stereo viewer, they give rise to a three-dimensional image. (161) This analytic technique is useful in the detection of fakery (375)because photographs of prints (i.e., a photographic copy of a photograph), when viewed in stereo, will not project a three-dimensional image unless made from different viewpoints along one axis.** Further, any retouching of an original photograph of a scene can be detected because when two photographs of that scene are viewed in stereo, the retouched item will appear to lie either in front of, or behind the plane in which it should be lying. It is virtually impossible to retouch one or both images of a stereo pair with enough skill to escape detection when viewed stereoscopically.

(376) Finally, in addition to these methods of visual inspection, the materials were studied photogrammetrically. "Photogrammetry is the science of ascertaining the positions and dimensions of objects from measurements of photographs of these objects." (162) In the Oswald backyard pictures, photogrammetry was given particular emphasis in studying critical shadow areas.

(d) Conclusion

(377) The panel detects no evidence of fakery in any of the backyard picture materials.

^{*}This principle of stereoscopy is discussed in pars. 76-78 supra.

^{**}Identical photographs or photographs made from the same camera position will not generally exhibit stereoscopic characteristics. Nevertheless, if a camera is stationary and photographs of a subject that moves are viewed stereoscopically, the subject may exhibit three-dimensional properties, while the background will not.

(1) Production and development of prints

(378) The photographic prints examined by the panel were not of uniform size. These variations reflected differences in how each had been produced and developed. CE 133-A and 133-B were considered to be drugstore or photofinisher prints because they appeared to have been produced on the type of commercial photoprinting machine used by photofinishers for camera stores, drugstores and mass-produced prints.

(379) The photographs show a slight variation in the horizontal and vertical dimensions of the prints and borders that were caused by artifacts of masking position. On the back of each is the small graphite mark characteristic of automatic printing machines. It indicates to an electric eye scanner where the long continuous roll of prints should be cut into individual snapshots. (See figs. IV-18, IV-19, JFK exhibits F-179 and F-182.) As most drugstore prints, these were apparently cropped slightly for aesthetic purposes by placing a white border around their periphery. Finally, the panel noted that CE 749, the negative to CE 133-B, contained small emulsion tears, which indicated that it had been abused in processing, as well as water spots indicative of improper washing or drying.

(380) CE 133-A and 133-B were determined to be first generation because of the presence of very fine lines and marks that were occasioned either by scratches on the film, which were caused by the camera, or by torn or broken emulsion from the negative that occurred during development. Marks so fine and sharp would not have appeared with such definition on a second generation print.

(381) On review of 133A-de Mohrenschildt (see figs. IV-20 and IV-21, JFK exhibits F-382 (front) and F-383 (reverse)), the panel noted that it had been probably made in a high quality enlarger with a high quality lens. Nevertheless, the print has become yellowed with the passage of time, indicating that it was not adequately fixed or washed during the development process.

(382) The uncropped black border around the edge of this print indicates that it was projected in an enlarger with a negative carrier that was larger than the actual full size negative of CE 133-A. This type of equipment might be found in a graphic arts shop or photo printing shop that uses many sizes of negatives. It is also possible that the paper easel might not have had the capability of masking a print this size. As a result, the entire negative area is printed and the unexposed border area outside the full camera aperture has been recorded as black on the print. Because people normally like to have white borders on their pictures, this is an unusual way of presenting a photograph. The sharpness of the markings (from the film scratches) within this black border, as well as the presence of fine scratches and emulsion tears, indicates that this is a first generation print.



FIGURE IV-18.-CE 133-A and 133-B (front).

148

D-33-17 CE 133B CE 133A (ge 8/4/4) Q-33-16 CE 133 B (ye \$440) \$ P.q. 11.23.63. 11. 23.63 A. P.a. = # 47. 74 * 133-A 133-B 8-3-78

FIGURE IV-19.-CE 133-A and 133-B (back).

149



FIGURE IV-20.-133-A (de Mohrenschildt) (front).



FIGURE IV-21.-133-A (de Mohrenschildt) (reverse).

(383) The 133A-Stovall print is approximately 5 by 8 inches. (See fig. IV-22, JFK exhibit F-185.) This is not a standard size for photographic paper. The person who made the print probably took a standard size sheet of 8- by 10-inch paper and cut it in half. Across the bottom border of the print is a black line. The lower right area of the white border above the black line bears a black circle. The black border at the bottom was caused by light spilling over the bottom border of the easel mark because the mask was not wide enough to cover it. Furthermore, since the mask contained a small rivet with a hole through it, the paper extending under this rivet hole allowed the light from the enlarger to print the image through the rivet hole. These markings are actually sharper than the photographic image. The Panel established that this print was also a first generation print, again because of well-defined markings and emulsion tears.



FIGURE IV-22.

(384) Since the original negative to CE 133-A was square shaped (see fig. IV-20, JFK exhibit F-382), and because 133A-Stovall is rectangular (see fig. IV-22, JFK exhibit No. F-185), it is apparent that the Stovall picture has been cropped with a standard white border for aesthetic reasons.

(385) The 133C-Stovall and 133C-Dees prints (see fig. IV-15) also appear to have been cropped for aesthetic reasons in a manner similar to 133A-Stovall. Moreover, because these two prints had the same well-defined emulsion tears and scratches on them as the other first generation prints, they are likewise considered to be first generation. Both are enlargements from the original negative.*



FIGURE IV-23.-CE-134 (front).

^{*}Dallas police officer R. L. Studebaker testified to the House Select Committee on Assassinations that in 1963, while working in the Dallas Police Department Photography Laboratory, he made numerous copies of the Kennedy photographic evidence for fellow Dallas police officers; included in the pictures distributed were prints of CE 133-A and CE 133-B as well as of the third pose not seen by the Warren Commission. Testimony of R. L. Studebaker, supra note 127.

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FIGURE IV-24.-CE-134 (back).



FIGURE IV-25.-CE-750. Imperial Reflex camera.

(386) Finally, CE 134 is an 8- by 10-inch enlargement of the CE 133-A negative. (See fig. IV-23.) It apparently was reproduced by the Dallas Police Department by enlargement from the original negative with an easel set that accommodated 8- by 10-inch enlarging paper. The back of the photograph contains an impression from a rubber stamp identifying the Dallas Police Department. (See fig. IV-24.) The emulsion scratches and tears are again evidence that this is a first generation print.

(2) The Imperial Reflex Camera

(387) Marina Oswald testified to the Warren Commission that CE 750, an Imperial Reflex camera (see fig. IV-25) was used to take the backyard pictures. (163) In order both to test the credibility of her testimony and to establish the conditions under which fakery might have occurred, the panel conducted a series of tests to determine whether this camera had, in fact, been used to take the backyard pictures. (164) The tests sought to establish whether any of the unique identifying marks of the camera could be found on the backyard picture materials.

(388)Most cameras, particularly inexpensive ones which have been manufactured by injection molding of plastic, have certain imperfections in them such as bumps, notches, nicks, scratches, edge irregularities, et cetera. These imperfections frequently are located on the film plane aperture against which the film lies when it is exposed. As a result of the contact between the film plane aperture and the film, some of these imperfections may be recorded on the border of the film's image area. These imperfections are known as frame edge markings. They are not of concern to camera manufacturers because most customers who use such cameras will have photofinisher prints made which have white borders that crop off the frame edge marking irregularities. (389)Such markings, however, will remain on the negative and any uncropped prints. Because these markings on inexpensive cameras tend to be distributed in a random pattern unique to each camera, they serve as identifiers for determining whether a particular negative or uncropped photograph was originally exposed in any particular camera.

(390) Another type of camera signature may occur in inexpensive cameras when the film is dragged across the edge of the plastic as it is moved from the supply chamber to the film plane aperture and then to the take-up chamber. This process often causes fine scratches on the emulsion side of the film that may then appear on the actual photographic image. These scratches may coincide with the particular pattern of the plastic molding of the camera. They can serve as unique marks for camera identification.

(391) In order to determine the pattern of these camera signatures in the case of CE 750, Oswald's Imperial Reflex camera, test photographs were made with it and then intentionally underexposed in development to show the frame edge markings better. (No special development method was necessary to bring out the camera scratch mark pattern.) (See fig. IV-26, JFK exhibit No. F-190). Each time the film was run through the camera, the camera signature created by the frame edge markings and scratch marks was found to be the same. (165)



FIGURE IV-26.—Test photograph exposed in Oswald Imperial Reflex camera (CE-750).



FIGURE IV-29.—Frame edge markings and camera scratch marks on the de Mohrenschildt print of CE-133-A.



FIGURE IV-27.-Test photograph exposed in another Imperial Reflex camera.



FIGURE IV-28.—Frame edge markings and camera scratch marks on negative of CE-133-B (CE-749).



FIGURE IV-30.—Oswald family photograph with same frame edge markings and camera scratch marks as others exposed in CE-750.

(392) The next step was to verify that this frame edge mark pattern and the scratch marks were unique to CE 750. This was done by comparing the test pictures with photographs that had been exposed in two duplicate Imperial Reflex cameras obtained from the Eastman Kodak House in Rochester, N.Y. In each case, the camera signatures were markedly different. (166) The comparison thus confirmed that CE-750 had unique frame edge markings and scratch marks. (See fig. IV-27, JFK exhibit F-191.) (167) (393) Because only the 133-B negative (CE-749) and the uncropped 133-A de Mohrenschildt print contained a full image area showing the frame edge markings, only these were compared for frame edge markings with the test photograph. In the case of the 133-B negative, 11 unique identifying frame edge marks were found which corresponded with the test photography. (See fig. IV-28, JFK exhibit F-188.) These identifiers were also present in the 133-A de Mohrenschildt print, although the panel notes that in this case, a light box and magnifier were necessary to detect all of the marks. (See fig. IV-29, JFK exhibit F-397.) (168)

(394) These results were confirmed by the panel's scratch-mark analysis. Here, all the backyard picture materials could be reviewed because the scratch marks that were the subject of the analysis had not been cropped out by any of the prints' white borders. The analysis clearly indicated that the scratch marks were located in precisely the same location in each photograph. (See figs. IV-26, 28, and 29.) (169) (395) This analysis established that the Oswald backyard pictures had been exposed in Oswald's Imperial Reflex camera.*

3. ALLEGATIONS OF FAKERY

(a) Unnatural lines in the vicinity of Oswald's chin

(396) It has been alleged that there is a line that runs directly across Oswald's chin and is evidence of compositing. No unnatural line indicative of fakery could be discerned by the panel on either the original negative or first-generation prints when these materials were visually inspected using magnifying and microscopic equipment, varying density exposures, and digital image processing. (171)

^{*}In regard to the allegation that this camera had been used only to take the incriminating backyard pictures of Lee Harvey Oswald, the panel examined all of the photographic material in the National Archives that was listed as having been taken from the effects of Lee and Marina Oswald during the execution of postassassination searches by the Dallas Police Department. Most of these were family-type snapshots, including scenes of an older child and baby in a crib, Marina Oswald playing with a child, and Lee Oswald holding an infant. The frame edge markings appearing on the negatives to these photographs and the camera scratch marks appearing directly on the pictures were studied and found to be entirely consistent with both the original test materials and the Oswald backyard pictures which were exposed in the Oswald Imperial Reflex camera. For example, figure IV-30 (JFK exhibit F-189) is a photograph which has been identified by Marina Oswald Porter as depicting one of the two children that she had by Lee Harvey Oswald. (170) The negative of figure IV-30 was found to contain the same camera identifiers and scratches as the other first generation prints and original negative made in the Oswald camera. It is, therefore, apparent that this photograph was also taken by Oswald's Imperial Reflex camera.



FIGURE IV-31.—Grain structure analysis of CE 133-B utilizing digital image processing.

(397) As noted earlier, photographic images such as the backyard pictures are composed of very small, irregular shaped grains of silver suspended in a gelatin layer. On a given photograph, a uniformly exposed area has a generally uniform distribution of such grains. In contrast, on composited photographs, the grain distribution may be noticeably different. When the panel microscopically examined the area above and below the horizontal chin cleft in the backyard pictures, no difference in grain structure could be found. (172) (See fig. B-16, JFK exhibit F-197.)

(398) The 133-B negative (CE 749) was digitally processed at the Aerospace Corp. and the University of California Image Processing Institute using several different image-processing techniques. This process confirmed that the grain distribution was uniform. (173) (See fig. IV-31, JFK exhibit 197.) Under very carefully adjusted display conditions, the scanned image of the Oswald backyard negative did exhibit irregular, very fine lines in the chin area. The lines appeared, however, only with the Aerospace gradient-enhancement process, where the technique was applied at a much higher resolution (i.e., the image area scanned was magnified since only a small portion of the picture was being subjected to the computations). (399) Although the cause of these lines has not been definitely established, there is no evidence to indicate that they are the result of an attempt to fake the photograph. This is because similar, although less pronounced, lines were found using the same digital enhancement technique on a known authentic photographic negative. Therefore, those lines may have been a product of the enhancement process.

(400) Supporting evidence for this conclusion is that the fine lines were not observed in photo-optical photochemical enhancements or in phase-contrast microscopic inspection of the chin area. In addition, the lines are disconnected; they do not cross the entire chin and are extremely fine, roughly equal in width to the size of the grain clumps in the emulsion.

(401) Three other possible causes for the lines are suggested:

(402) (1) They could be due to the presence of very fine scratches on the glass plate used to support the film while it was being scanned; (403) (2) They could have been introduced during the film drying process. Particulate and dissolved material in the film wash water can leave a so-called water stain on film. As the water evaporates, the particulate and dissolved material is deposited on the emulsion, usually in thin, irregularly shaped lines. The probability of the lines being caused by very faint water stains is heightened by the observation of very noticeable stains in the neck and ear area, as discussed below.* These marks are found in the work of photographers who pay inadequate attention to the washing and drying steps in the processing of film;

(404) (3) Changes in emulsion temperature during processing can cause silver grains in the emulsion to clump together in fine linear patterns, an effect known as reticulation.

While subsequent generation prints of the backyard pictures (405)appear to show a line running across Oswald's chin, (174) this phenomenon is not surprising because copy prints often have higher contrasts than originals. If an object or an original photograph of the object has a rather diffuse band that is dark at the center but becomes progressively lighter at the edges, a photographic or printed ink copy very often will show that band as a distinct line with sharp edges. In generating a copy photograph, the photographic or printing process may not be able to depict the entire tone range of the original object or photograph. In that case, a range of lighter tones will all appear as a single light tone and a range of darker tones will all appear as one dark tone. It is in this way that a broad smooth tone scale becomes a sharp transition from dark to light. This apparently happened in copies of the Oswald photographs, causing the shadow across the chin to appear to be a sharp line. Accordingly, no probative value can be attributed to such materials.

^{*}See pars. 406-407 infra.



FIGURE IV-32.-Water spot analysis of 133-A Stovall.

(406)The Panel did note a very fine line on an enlargement of CE 133-A. It ran from the edge of Oswald's left ear into the chin area and continued downward and around to form an irregularly shaped, closed ring. If this were a photographic image of a line where parts of a picture had been pasted together, the image of the line would be composed of photographic silver grains. Here, however, the line was actually finer than the silver grains and was continuous rather than beaded and broken as it would have been had it been composed of silver grains. Experienced photographic technicians recognize this type of line as the edge of a water spot. (See fig. IV-32, JFK exhibit F-196.) (407)When the negative was developed, fixed, and washed, a spot of water was left on the film surface. As it dried, it left a mineral residue and/or microscopic distortion of the gelatin surface surrounding the area where the drop had been located. Because very similar configurations were seen on more than one of the 133-A prints, the defect must have been on the original negative. Images of similar water spots were found on the image of the shirt at the left shoulder and on the image of the stock of the rifle. Similar water spots were observed as well as on the negative of CE 133-B (CE 749) on prints made from that negative, and on 133-C.

(408) Moreover, on comparing the backyard prints with known photographs of Oswald, the Panel observed that he quite clearly had a natural line running across his chin. (See fig. IV-33, JFK exhibit No. F-194.) It appears in the photographs as an indentation.





FIGURE IV-33.—Oswald photographs depicting chin characteristics.

(409) The chin area of the backyard pictures has also generated controversy because of the allegation that the chin appears rather flat across the bottom, whereas in other photographs it is more pointed, or at least rounded, with a vertical cleft at the bottom. It has been asserted that the chin in the backyard prints actually belongs to another man.

(410) A profile photograph taken by the Dallas Police Department, shows that the lower half of Oswald's chin had a roughly cylindrical protrusion with a horizontal axis. (See fig. IV-33, JFK exhibit No. F-194.) When the chin was lighted by direct sunlight coming from nearly overhead, the protrusion cast a shadow over the bottom part of the chin. The upper edge of the shadow was a nearly straight horizontal line. The bottom of his chin, like his eyes and neck, is in such deep shadow that it is not visable. Thus, the shape of Oswald's chin and the type and direction of his chin.

(b) Unnatural and inconsistent shadows

(411) An argument has been advanced that some of the shadows cast by Oswald and other objects in the backyard prints contain no detail and consequently must have been painted on a montage. (175) In addition, the directional consistency of the shadows both in terms of the objects casting them and with respect to each other has been challenged. (176)

(412) The first of these claims was found to be false simply by studying the prints of CE 133–A and CE 133–B that had been made at varying exposures to facilitate examination for detail. The prints of normal and greater than normal lightness revealed great detail in the shadow areas. (See figs. IV–16, IV–17, JFK exhibit Nos. F–192–193.) Grass, a small branch, what appear to be stones, clods or parts of leaves, and a newspaper can be seen. Blades of grass are silhouetted against the edge of the newspaper.

(413) This aspect of the photographs appears normal. The shadows are illuminated by light reflected from the white or light-colored picket fence and wall in the background. For this reason, the shadows on the ground are not as dark as the shadows over the eyes and throat that did not receive such illumination. The detail within the shadows and the variations in density between them preclude the possibility that they were painted onto a montage. (177)

(414) The consistency of the shadows was also evaluated by application of the vanishing point principle. The concept of "vanishing point" perspective is widely known with respect to artists and applies to photography as well. (178) This concept simply means that parallel lines in object space are depicted as converging lines on the image which will eventually meet at a point. Because the Sun's distance from Earth is so great that it may be considered infinitely distant, it follows that, in any sunlit scene, lines from objects to their shadows are parallel. When these parallel lines are pictured, the corresponding lines on the picture converge at a point known as the vanishing point. A picture of parallel railroad tracks provides a good illustration; the tracks are seen to converge to a point at the horizon. (415) In the case of the railroad tracks, the vanishing point is in the picture. This may not always occur. If the lines are perpendicular to the camera axis (the line from the center of the lens to the center of the film), the images of the lines will not appear to converge at a point on the picture. The vanishing point may then be considered to be at infinity. In other cases, where the parallel lines are not perpendicular to the camera axis, the vanishing point is either in the picture or some finite distance outside it.

(416) When this is the case, the directional consistency of shadows may be tested by drawing lines from images of objects to the corresponding points on the images of their shadows, and then extending these lines (beyond the actual picture if necessary) to see if they all meet at one point. If the lines do meet at one point, they are parallel and therefore consistent. If they do not meet at one point, they are not parallel and consequently are not consistent.

(417) When this analysis was applied to the backyard prints by drawing lines from a part of the stairway, the butt of Oswald's pistol, the muzzle of the rifle, Oswald's nose, et cetera, to the corresponding points on the shadows cast by these objects, the lines all met at the vanishing point. (See figs. IV-34 and IV-35, JFK exhibits Nos. F-387 and F-388.) Accordingly, the shadows were determined to be directionally consistent. A vanishing point analysis on 133C(Stovall) also yielded consistent results.

(418) While the vanishing point analysis settles this issue, comparisons between shadows depicted in different backyard pictures cannot be validly made unless the illumination, precise geometry of the head and the exact location of the camera are considered. It is for this reason that the allegation of fakery, based on the observation that a shadow has not moved between pictures despite movement of the object casting it, is fundamentally misconceived. The argument fails to account for the compensating effect of movement by the camera. (179) This principle is illustrated in the RIT Technical Report, pars. 470–74 infra.



FIGURE IV-34.-Vanishing point shadow analysis.



FIGURE IV-35.-Vanishing point shadow analysis.



FIGURE IV-36.-Third backyard picture pose "133-C."

(419) Finally, the shadows in these pictures were also analyzed to determine the sequence in which the photographs were taken. A visit to the Neeley Street site of the backyard photographs established that a person walking up the steps would be walking almost straight east. (180) Given the view shown in the backyard photographs, it is possible to estimate that the camera was aimed about 70° east of north. The shadows in the photographs indicate that the Sun was

behind and to the right of the camera. Since this would place the Sun in the southwestern sky, it was afternoon, and the Sun was going down.

(420) In the photographs, three horizontal linear shadows may be seen crossing the post in the foreground of the pictures and continuing along the ground behind the subject. These may have been shadows of power cables or some similar object. There is a knot in the post between the lower two shadows that may be used as a visual reference point. The shadows are lowest relative to the knot on 133–C, highest on CE 133–A, and in an intermediate position on CE 133–B. The Sun position would cause the shadows in the backyard pictures to move upward on the post with the passage of time. Therefore, since the shadows were moving upward, 133–C was taken first, followed by CE 133–B, and then CE 133–A. (See figs. IV–18, IV–20, and IV–36.) (The possibility of additional intervening photographs cannot be discounted.)

(421) The photographic technique improved appreciably during the sequence. For 133–C, the camera was not held level and the subject was not centered. The camera was rotated slightly as the shutter release was pressed. This caused the detail to be fairly sharp in the vicinity of the bush shown at the right, corresponding to the axis of rotation, while there is rotational blur elsewhere, such as in the area of the steps. In CE 133–B, the camera was held level and steady, but the subject's feet were not in the field of view. For CE 133–A, the camera was held reasonably level and steady, and the subject was well centered.

(c) Evidence of retouching

(422) Each of the backyard pictures, as well as the only original negative, was examined microscopically for evidence of retouching. No such evidence could be detected. Particular attention was given to the area to Oswald's left in CE 133-B, where it has been alleged that a retoucher painted on a montage but carelessly allowed the color material to spread onto the front of a nearby vertical post, thereby giving the appearance of an indentation on the post that does not appear in either of the other two backyard pictures. (181)

(423) Close examination of the original print revealed that the apparent indentation is a shadow, most likely of a leaf or leaves. The straight edge of the post is still visible in this shaded area. This straight edge was detected and indicated by a computer programed to seek such edges. (See fig. IV-37, JFK exhibit F-198.) (182)

FIGURE IV-37.--Edge analysis of CE 133-B utilizing digital image processing.


(424) The other two pictures, CE 133–A and 133–C, show that the post casts a shadow on the white surface behind it. The shadow is wide enough to fill the image area between Oswald's neck and post. Consequently, since the darker area to the left of the post is the shadow of the post on a white surface, a shadow falling on the white post itself would be similar in tone to the background and could be mistaken as part of the background rather than as a shadow on the post.

(425) Finally, careful inspection detects a crooked linear image of what appears to be a thin branch or a wire clothesline in this picture. The image of this line runs continuously through the area in question between Oswald's neck and the post. It is unlikely that a retoucher who would faithfully preserve detail as fine as this wire would fail to follow the straight edge on the post. (183)

(d) Oswald's identical heads and inconsistent body proportions

(426) Allegations have been made that Oswald's head appears to be absolutely identical in each of the backyard pictures examined by the Warren Commission and that this is evidence of a single head being used for the compositing of CE 133-A and B. (184) Further support for this argument has been advanced by Warren Commission critics who have maintained that in each of the pictures Oswald's head is the same size, even though the length of his body varies considerably. (185)

(427) There is no support for the statement that Oswald's head is identical in each of the backyard pictures. If anything, the photographs showed a marked variation in facial expression. For example, in CE 133-A Oswald is smiling, whereas in CE 133-B he appears to be frowning. (See figs. IV-18 and IV-20.)

(428) The panel was aware that various techniques involving the use of transparency overlays have been used in an effort to demonstrate that the three different heads are really one. (186) When soft-edged images such as pictures of the spherical human head are the subject of analysis, the absence of a sharp demarcation for comparison precludes such methods from serving as an accurate basis for making comparisons. Even so, when the transparency overlay method of analysis was undertaken by the committee's contractors, the differences in the shape and size of Oswald's head became readily apparent. (187)

(429) The argument that there is evidence of fakery because Oswald's head size is the same in each of these pictures, although his body size changes, was found to be erroneous for several reasons. First, any measurements of Oswald must take into consideration variations attributable to his degree of tilt. (188) Second, even when the tilt factor is ignored, Oswald's head length measures differently in each of the photographs.* Finally, there is nothing unusual about a series of photographs in which head length appears to remain the same even though the subject's body length seems to vary. Because of its rigid structure, the head when photographed (even with a marked change of expression) is subject to considerably less variation in length than

^{*}For Oswald head length measurements taken from CE 133-A and B, see table I, "Comparison of Oswald Photographs," par. 732, infra.

the rest of the body, which tends to be affected more by variations in posture. (See fig. IV-38.)

(430) When the panel reviewed previous studies analyzing the relative proportions of Oswald's body length to the length of the rifle depicted in the pictures, (189) it became apparent that these analyses had also failed to consider variations in posture and effect of tilt on the apparent length of a photographed image. Moreover, variations in Oswald's posture as depicted in these pictures make such an analysis meaningless.



FIGURE IV-38.—Effect of postural and facial expression variations on statural and facial measurements taken from photographs.

(e) The identical backgrounds

(431) The allegation has been made that the backgrounds in these pictures are identical and that three differently posed subjects had been superimposed on copies of one background picture. (190) The proponent of this theory, however, had never measured the distance between any relevant reference points in these pictures to determine whether there had been camera movement between the taking of each photograph. (191) Had this been attempted, the analysis would have revealed both horizontal and vertical movement between pictures. (432) The panel determined that there had been horizontal camera

movement. It measured the difference in alinement between pictures of particular foreground and background objects. For example, the prominent post in the foreground of each picture has a picket fence on both sides of it. The term "a" was designated as the distance from the left edge of the image of the post to the left edge of the left-hand picket at the end of the fence, "b" as the distance from the right edge of the image of the post to the right edge of the image of the righthand picket. If the camera had moved between exposures, the ratio of "b" to "a" should differ between viewpoints in different pictures.

(433) This ratio was measured at three different heights on corresponding places on CE 133-A and B, and in all three instances a measurable difference was found. A similar technique was used with similar results to determine that there had also been vertical camera movement between pictures.*

(434) In addition, the panel observed, as noted above, that the backgrounds in these pictures contained such different shadow patterns that the time sequence in which these photographs were taken could be determined. Shadows of leaves on the wall behind Oswald also differ noticeably in these pictures.

(435) Finally, because of the movement of the camera between exposures, these photographs could be viewed three-dimensionally in stereo pairs. When this is done, the post properly appears to stand out in front of the fence, while the fence in front of the buildings is positioned further back. Many of the dark areas that look like leaves on the bush on the right (and consequently make the foliage appear to be unseasonably thick) are found to be shadows of these leaves on the wall behind the bush; the bush and its leaves stand out from the wall, whereas the shadows lie flat against it. If a single photograph of the backyard had been taken and several copies of it then made, the photographs when viewed together stereoscopically would have exhibited no difference in alinement between foreground and background objects. It would be obvious that it had been a flat photograph that had been rephotographed, rather than the real, three-dimensional backyard.

(436) The finding that the backgrounds of these two photographs can be viewed stereoscopically has an important bearing on the question of authenticity. The falsification of stereo pairs would require extremely precise positioning of all points in one image relative to the points in the other. An error in the relative positions would be readily detected because, when the pair is viewed together, erroneously placed points would appear to lie either in front of or behind the plane in which they should be lying. It is unlikely that a sophisticated conspirator would attempt to falsify images by producing a stereo pair, since one picture would obviously be sufficient, easier to produce, and less susceptible to detection.

4. PRACTICAL CONSIDERATIONS

(437) Beyond the evidence produced by the use of the various photographic analyses, which did not detect any evidence of fakery in the backyard pictures, several practical considerations reinforce these conclusions. For example, the FBI established that the newspapers that appear in the photographs did not reach Oswald until March 27, or 28, 1963, and the committee determined that by April 5, 1963, Oswald had already autographed the back of one of the pictures (133A-DeM). (192) Aside from the obvious

^{*}See addendum A, pars. 440-445 infra, for horizontal and vertical parallax measurements.

question of whether Oswald would place his signature on a fake picture, for the photograph to have been faked would have required access, within just a 10-day period, to Oswald's backyard, his camera, rifle (knowing that this would be the assassination weapon), and newspapers.

(438) While such access without Oswald's knowledge would theoretically have been possible, it is regarded as unlikely. Moreover, a fundamental question is whether a sophisticated conspirator would expose himself to unnecessary risks of detection by making three fake photographs, when just one would suffice. Using stereoscopic analysis, any inconsistent evidence of fakery would be detected, as literally floating in the image space of the photograph.

Another important consideration mitigating against fakery is (439)the obvious improvement in quality as the sequence of photographs progressed-133C, CE 133-B, and CE 133-A. Quite clearly a learning process was taking place, as the photographer determined, among other things, how the subject could best be centered in the field of view. Finally, the presence of graphite marks on CE 133-A and CE 133-B strongly suggests that the prints were routinely developed by a drugstore or camera store photofinisher's laboratory. It is unlikely that a sophisticated conspirator would have given the end product of his doctoring efforts to a drugstore for printing. Malcolm Thomson, the British forensic photography expert who publicly questioned the authenticity of the backvard picture, was shown a preliminary summary of the panel's report and asked to comment. He was also offered an opportunity to appear before the committee to express his views. After studying the reports. Thomson deferred to the panel's conclusions that the photographs revealed no evidence of fakery. He noted the thoroughness of the panel's investigation and emphasized that his earlier comments were based upon examination of copies of the photographs rather than the original material. Thomson did, however, reserve his opinion that the chin in the backyard pictures was suspiciously different from the chin that he had observed in the Dallas arrest photographs of Oswald. He also remained skeptical as to the ability of a computer to detect a photocopied composite photograph. (193)

The photographic analyst with the Canadian Department of Defense who had stated that there was evidence of fakery in these photographs was also contacted by the committee. He indicated that he had performed no scientific tests on the photographs and had spent less than an hour examining the "very poor copies" that were submitted to him. (194)

ADDENDUM A

MEASUREMENTS OF HORIZONTAL AND VERTICAL PARALLAX*

(440) Both the horizontal and vertical parallax between the two Oswald backyard photographs CE 133-A and 133-B were measured. This was done by measuring the difference in alinement between particular objects in the foreground and background. The post, prominent in the foreground of each picture, has a picket fence behind it

^{*} Parallax is "[t]he apparent shift in relative position (or shape) of an object when it is viewed from different positions." L. Stroebel and H. N. Todd, Dictionary of Contemporary Photography (1974).

and extending to both sides. The post and fence provided clearly delineated and easily identifiable corresponding points for measurement of horizontal movement (i.e., horizontal parallax) of the camera between exposures. A horizontal part of the fence and the lower edge of the screen of a screen door in the background provided points for measurement of the vertical parallax.

(441)Horizontal parallax was measured at three different heights on the picket fence: the lower level was just above the top edge of the lower horizontal member of the gate; the middle level was in line with the lower edge of the middle horizontal member of the gate; the upper level was in line with the lower edge of the top horizontal member of the gate. (The four pickets and the three horizontal members give the appearance of a gate because they are evenly spaced, but actually they stand at an angle to the vertical member seen alongside the post in the foreground.) At the lower and middle levels, the distance "a" from the left edge of the foreground post to the left edge of the picket to the left of it was measured, and the distance "b" from the right edge of the foreground post to the right edge of the picket to the right of it was measured. At the upper level, because the right edge of the right-hand picket falls into shadow and is not clearly delineated, the distance between the right edge of the foreground post and the right edge of the second picket, which appears to be the first picket of the gate, was measured. The results of the measurements and computations are as follows:

	a equals (mm)	b equals (mm)	b/a equals
Lower level:			
133A	6.8	9.0	1. 32
133B	6.0	9.5	1.58 1.32/1.58 = 0.84
Middle:			
133A	6.5	9.3	1.43
133B	6.4	10,0	$1.56 \ 1.43/1.56 = 0.92$
Upper:			
133A	7.0	22.7	3.24
133B	5.9	23.6	4.00 3.24/4.00=0.81

(442) In all cases, more of the background is shown to the right and less to the left on CE 133–B as compared to CE 133–A. Since the shadow analysis indicated that CE 133–B was taken before CE 133–A, the parallax indicates that the camera was moved slightly to the left between these two exposures. The ratios shown at the far right of the table of values differ for two reasons. The sharpness of the edges to which measurements were made was quite poor, so that the difference between the measurements at the lower and middle levels is probably largely experimental error. The measurement of the upper level, as noted, was actually a measurement that used a different reference point and, therefore, would not be expected to result in the same ratio.

(443) Vertical parallax was calculated by measuring the vertical distance from the center of the dark horizontal object, which looks like it might be a gate bolt or latch, to the bottom edge of the screen of the screen door in the background. To establish scale, that is to take into account differences in magnification, these measurements were related to the distance from the left edge of one picket to the left edge of the next, measured in a horizontal direction. This scaling distance was measured on the two center pickets of the four that appear to constitute the gate at the level of the lower edge of the top horizontal member. The results are as follows:

> 133A : gate bolt to screen=30.4 mm, scaling dist.=15.5 mm 30.4/15.5=1.96 133B : gate bolt to screen=32.1 mm, scaling dist.=15.2 mm 32.1/15.2=2.11

Since less background appeared above the gate bolt on 133A (444)than on 133B, the camera was moved slightly downward between these two exposures. Less certainty can be attached to this determination than to the determination of horizontal parallax for two reasons. Only one. rather than three determinations, was made. Second, in the horizontal case, the determination was made more sensitive to parallax because, as the camera moved, the picket to the right became narrower, while at the same time the picket to the left became wider. Thus, in the ratio b/a, the numerator was diminishing as the denominator grew. This double effect was not present in the determination of vertical parallax. Nevertheless, there is additional evidence of vertical parallax. Between the first and second pickets from the left in the gate, just below the bottom edge of the upper horizontal member, a small black rectangle appears. It appears more elongated in the vertical direction on CE 133-A, as one would expect if the camera were moved down between exposures, exposing more of the dark area in the background.

ADDENDUM B

REPORT TO THE HOUSE SELECT COMMITTEE ON ASSASSINATIONS U.S. CONGRESS—HOUSE OF REPRESENTATIVES

THE OSWALD BACKYARD PHOTOGRAPHS

(By Dr. Leslie Stroebel, Mr. Andrew Davidhazy, Dr. Ronald Francis)

The Oswald Backyard Photographs

INTRODUCTION

(445) This report deals with the authenticity of the photographs of Oswald in a backyard, including prints of three different views and a negative of one of these views. Twenty-two specific questions concerning the authenticity of these photographs were presented to the undersigned by the photographic panel. Most of the questions are related to claims made by various persons in the mass media that fakery was involved in the production of the photographs.

(446) The questions are numbered and a response, with a description of the test procedures used and our conclusions, follows each question. Illustrations are included with some of the responses. The first number in each illustration caption is the same as the number of the corresponding question. Three illustrations are also included as part of this introduction. Figure RIT 0-1 serves to identify the three different views of Oswald and the only negative that has been located. Figures RIT 0-2 and 0-3 are enlargements of two of the views which the reader may find useful for reference purposes. A glossary is included as an appendix for readers who are unfamiliar with any of the photographic terms used in this report.



FIGURE RIT 0-1.--Identification of the three different views of Oswald in a back-yard and the only negative recovered.



FIGURE RIT 0-2.-An enlarged copy print of original print CE-133B.



FIGURE RIT 0-3.—An enlarged copy print of original print CE-133A.

(447) 1. Was the negative of Oswald exposed in the Oswald camera? (The negative is identified by the Archives number CE-749, and it corresponds with the print identified by the number CE-133B. The Oswald camera is an Imperial Reflex duo lens camera that uses 620 size film.)

(448) When negatives that were exposed in the Oswald camera by the undersigned were compared with the negative of Oswald, similarities in the edge markings from irregularities in the film aperture and scratch patterns indicated that the negative of Oswald was exposed in the Oswald camera. In addition, variations in sharpness from the center to the edges, and pincushion distortion were similar on the original and comparison negatives.

(449) 2. Do the edge markings on the FBI print (made from a negative exposed in the Oswald camera by the FBI) agree with the edge markings on the negative of Oswald (CE-749)?

(450) We had intended to make a quantitative comparison of the edge markings on the various photographs, as suggested by a panel member, by alining pairs of edge markings, measuring the displacement at fixed intervals and calculating the standard deviation. Careful examination of a roll of film we exposed in the Oswald camera revealed that while the distinctive marks appeared consistently on each frame of film, the straightness of the lines varied considerably—apparently due to slight buckling of the film. Instead, we made prints that compare pairs of edges on all four sides of the picture frame.

(451) By combining positive and negative images, it was possible to show the comparison as the two edges of a single black line. Figure RIT 2–1 shows a comparison between a print made by the FBI from Archives negative CE-749 (outside edge) and a print made from the the same negative at RIT (inside edge). In order to show all four edges it is necessary to make the inner image slightly smaller than the outer image, resulting in a slight displacement of markings near the ends of each edge. The distinctive markings on the inner and outer edges of the black line agree closely as would be expected if the two prints were both made from the same negative.

(452) There are two obvious discrepancies that we consider to be insignificant. (1) When one edge of the two images is alined, there is a slight lack of parallelism on the other three edges. Since the two prints were made with two different enlargers, any deviation from exact parallelism of the negative and the easel on either enlarger, a not uncommon defect in enlargers, would produce this effect. (2) There is an obvious difference in the vertical to horizontal proportions of the two images. The dimensional stability of photographic paper during processing and drying is different in the direction of the paper grain as opposed to across the paper grain. The difference in proportions is consistent with expectations if the paper grain were oriented vertically on one print and horizontally on the other.

(453) Figure RIT 2-2 shows a comparison between a print of an unidentified man on a roof made from a negative exposed in the Oswald camera by the FBI (outside edge) and a print of Oswald made from Archives negative CE-749 by the FBI. The similarities of the markings indicate that both were made with the Oswald camera. Figure RIT 2–3 shows a comparison between film exposed in the Oswald camera at RIT (outside edge) and the Archives negative of Oswald, CE–749. Again, the distinctive markings are in close agreement indicating both negatives were made in the same camera.

(454) 3. Are the edge markings produced by the Oswald camera unique or are they similar to markings produced by other samples of the same brand of camera?

(455)When two other samples of Imperial Reflex duo lens cameras, obtained from the International Museum of Photography at the George Eastman House (IMP-GEH), were compared with the Oswald camera, it was found that all of the bodies were produced by injection molding of plastic. This produced three circular indentations on each side of the film aperture that tended to distort the otherwise essentially straight edge. The details of the distortions in these areas, however, were distinctively different on the three cameras. These differences in shape can be seen by examining the images through a low power $(5-10\mathbf{X})$ magnifier. The most distinctive differences, however, are the two projections, one on each side, near the bottom of the Oswald camera image which are missing on the two IMP-GEH cameras. Figure RIT 3-1 shows a comparison between one of the IMP-GEH cameras (inside edge) and a negative exposed in the Oswald camera at RIT.

(456) 4. Does the image sharpness at the center and edges of the negative of Oswald (CE-749) appear to be consistent with that of other negatives made with the Oswald camera?

(457)Yes. Photographs taken with the Oswald camera by the undersigned revealed strong curvature of field, which accounts for much of the falloff in sharpness toward the edges. Photographs made with the two IMP-GEH Imperial Reflex duo lens cameras also revealed strong curvature of field. These cameras have no focusing adjustment and no aperture adjustment to control depth of field. With curvature of field the camera focuses on nearer objects at the edges of the picture than in the center. At the distance Oswald was standing from the camera, he appears sharper than objects near the edges at approximately the same distance. If the camera had been moved somewhat closer to Oswald, however, curvature of field would cause him to appear less sharp than objects at the edges which were at the same distance. Thus, the relative sharpness at the center and edges of photographs made with these cameras varies with the object distance. In figure RIT 4-1, the curved plane of sharp focus in object space is behind the wall in the center causing unsharpness in this area, is at the wall in a circular area midway between the center and the edges producing a sharp image, and is in front of the wall at the edges again causing unsharpness.



FIGURE RIT 2-1.—Comparison of edge markings on a print made by the FBI from Archives negative CE-749 (outside edge of black line) and a print made from the same negative at RIT (inside edge).



FIGURE RIT 2-2.—Comparison of edge markings on a print made by the FBI from a negative exposed in the Oswald camera by the FBI (outside edge) and a print of Oswald made from Archives negative CE-749 by the FBI (inside edge).



FIGURE RIT 2-3.—Comparison of edge markings on a negative exposed in the Oswald camera at RIT (outside edge) and the Archives negative of Oswald, CE-749, (inside edge).



FIGURE RIT 3-1.—Comparison of edge markings on a negative exposed in an Imperial Reflex duo lens camera owned by the International Museum of Photography at the George Eastman House (inside edge) and a negative exposed in the Oswald camera at RIT (outside edge).



FIGURE RIT 4-1.—Photograph made in the Oswald camera at RIT illustrating curvature of field of the camera lens. The camera is focused behind the wall in the center and in front of the wall at the edges. The sharpest focus at the wall is in a circular area midway between the center and the edges.

(458) 5. Could the scratches on the negative of Oswald have been produced by the Oswald camera?

(459) Film exposed in the Oswald camera by the undersigned revealed scratches similar to those on the original negative of Oswald. Some scratches did not extend the full length of the film, but when 8 x 8 inch prints made from the original negative and one of the above comparison negatives were carefully alined, four prominent scratches were in the same locations on both prints-at 36, 45, 52, and 112 mm from the left edge of the picture area (fig. RIT 5-1). Scratches were detected on both the emulsion side and the base side of the negative of Oswald (CE-749), but the scratch lines that are evident on the prints correspond to those on the emulsion side of the negative. The fact that four prominent scratches were in the same locations on a print made from the negative of Oswald and a print made from a negative we exposed in the Oswald camera completely satisfied us that the scratches on the negative of Oswald were produced by the Oswald camera. 6. Do other samples of the same brand of camera produce (460)similar or identical scratches?

(461) Obvious scratches were produced by one of the two Imperial Reflex duo lens cameras obtained from IMP-GEH but not by the other (figs. RIT 6–1 A and B). The camera that produced the obvious scratches had a badly warped back that put excessive pressure on the film and made it difficult to advance the film. The scratch pattern produced by this camera was not at all similar to that produced by the Oswald camera. We conclude that film scratching with this brand of camera is not the result of a manufacturing defect, in which case similar scratch patterns could occur with different cameras, but rather is the result of changes that may occur on an individual basis as the cameras are used over an extended period. It seems that the plastic used in the camera body and back can soften and be deformed when subjected to elevated temperatures, as was evident on one of the two IMP-GEH cameras, placing excessive pressure on the film as it is advanced in the camera.



FIGURE RIT 5-1A.—Print made from the negative of Oswald (CE-749) for scratch comparison with a negative exposed in the Oswald camera at RIT. Four prominent scratches were found to be in the same locations on both prints.



FIGURE RIT 5-1B.—Print made from a negative exposed in the Oswald camera at RIT, at the same scale of reproduction as the accompanying print made from the negative of Oswald.



FIGURE RIT 6-1A.—Print made from a negative exposed in the first of two Imperial Reflex duo lens cameras owned by IMP-GEH. This camera had a badly warped back. The scratches are in different locations than those on prints made from negatives exposed in the Oswald camera.



FIGURE RIT 6-1B.—Print made from a negative exposed in the second IMP-GEH camera. Only faint, transient scratches were produced by this camera.

(462) 7. Can the scratches on the negative of Oswald be enhanced? (463) There are procedures for enhancing scratches. Since it was felt that a positive identification had been made in the response to question 5 above, these procedures were not employed. Also, we noticed that the fine scratches on the film we exposed in the Oswald camera tended to be less continuous than the four obvious scratches we measured and therefore they would be less useful for identification purposes.

(464) 8. Are any scratches continuous on the body, head, and background on the negative of Oswald?

(465) Apparently there was concern about the scratches not only for the purpose of determining if the negative of Oswald had been exposed in the Oswald camera (discussed in 5 and 6 above) but also to provide information concerning the possibility that a composite image had been made—such as a head or figure from one photograph and the remaining parts from another. For this second purpose, a continuous scratch on the head, body, and background would limit the options by which a composite could have been made. If, for example, a scratch were detected running from the top edge to the bottom edge of a print but stopping abruptly at the head, there would be reason to suspect that a head had been transplanted from another photograph. Or, if such lines were detected on the negative of Oswald but they were evident only as light or dark streaks with no indication of physical damage to the film surface, there would be reason to suspect that the negative was a copy negative rather' than an original, and that some fakery was involved. No evidence of such scratch marks was detected. In the present case, since it could be seen that the scratches were actually on the surface of the negative of Oswald, they simply confirm these marks were caused by the camera and, as such, that the negative was indeed exposed in the Oswald camera. None of these scratch marks were suggestive of compositing. Similarly, the scratch marks on the prints were caused by the effect of the camera on these negatives, and thus are not evidence of fakery but rather serve to confirm that Oswald's camera was used to take these pictures.

(466) 9. Are there any differences in the grain pattern in the areas of the body, head, and background on the negative of Oswald?

(467) No inconsistencies could be detected between the areas mentioned with examination of the original negative through a 30X magnifier, on normal contrast enlarged prints, or on high contrast enlarged transparencies (figs. RIT 9-1 A and B).

(468) 10. Are the backgrounds identical in the three different views of Oswald in the backyard (CE-133A, CE-133B, and CE-133C)?

(469) The backgrounds are not identical on the three photographs, but the differences are those to be expected as a result of a change in the position or the angle of the camera with respect to the scene. We could not detect anything that would suggest the background itself (as distinct from the photographs of the background) had been changed in any way—as by the addition, removal. or alteration of any of the parts. Also, we could not detect any evidence of fakery either in the background areas of the photographs or in the figures. (Also see question 15 below.)

(470) 11. Are the nose shadows compatible with the other shadows in the scene?

(471) The positions of the shadows under the nose, eyebrows, and chin all appear to be consistent with the other shadows in the scene. In addition, the sharpness of the edges of the shadows and the contrast of the shadows with the surrounding areas appear to be consistent.

(472) We were subsequently asked to respond to the statement in the caption on page 191 of JFK: The Case for Conspiracy by F. Peter Model and Robert J. Groden, which compared CE 133-A and 133-B. "In the bottom photo [CE 133-B], Oswald's head is cocked slightly to his left, yet the shadow directly under his nose (see top closeup of CE 133-A) moves—not in relation to the light source but to the angle of his head."

(473) It is true that if the tilt of the head were the only change made between the two photographs, the nose shadow would point more toward the left side of Oswald's mouth (on the viewer's right) in CE 133-B where the head is tilted. However, turning the head from left to right (as distinct from tilting it) also alters the placement of the nose shadow. The authors understandably did not take this factor into account because Oswald's head seems to be facing directly toward the camera on both photographs. In actuality, however, the position of Oswald and/or the camera has changed slightly as evidenced by the change in the position of the post behind Oswald. If we assume that the camera was moved a short distance to the viewer's left for CE 133–B, Oswald would have to turn his head to his right in order to be facing the camera and this would move the shadow back toward the original position shown in CE 133–A. Also, moving the camera to the left or moving Oswald to the viewer's right would produce the observed change in the relative positions of the post and Oswald's head.



FIGURE RIT 9-1A.—Enlarged print on normal-contrast photographic paper from the negative of Oswald (CE-749), used to determine if there are any differences in the grain pattern in the areas of the body, head, and background. No inconsistencies were detected.



FIGURE RIT 9-1B.—Enlarged transparency on high-contrast photographic film for grain pattern check. No inconsistencies were detected. (The original transparency provides the best detail when viewed by transmitted light.)





1. Head vertical. Shadow points toward 2. Head tilted. Shadow points toward center of mouth. left side of mouth.

FIGURE RIT 11.—Four photographs made to demonstrate that the change in the position of the nose shadow produced by tilting the head can be nullified by rotating the head as an explanation for the similarity in the positions of Oswald's nose shadow in views CE-133A and CE-133B.





points toward center of mouth, but head is not facing camera.

3. Head tilted and rotated. Shadow 4. Moving camera to left restores full front view. Shadow points toward center of mouth with head tilted.

(474) Four photographs were made of a manikin head to illustrate the explanation given above:

Figure RIT 11-1. The nose shadow falls straight under the nose with the head in the vertical position.

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Figure RIT 11-2. Tilting the head to the viewer's right by placing a pencil under the opposite side causes the nose shadow to move noticeably toward the left side of the manikin's mouth.

Figure RIT 11-3. Rotating the head to its right returns the shadow to the original position, but the manikin is no longer facing the camera.

Figure RIT 11–4. Moving the camera to the left produces a full front view of the head with the shadow in the original position even though the head is tilted. Also, the background has moved to the left in comparison with the head, as in the photographs of Oswald.

(475) 12. Is there any evidence of a line in the chin and neck area that would suggest the picture is a composite?

(476) We found no evidence of a line suggesting a composite had been made in our examination of the only original negative available (CE-749) (without magnification and at 30X magnification) and of normal-contrast prints and high-contrast prints at either low or high magnification. We made a copy of the reproduction of a portrait of Oswald from page 192, "JFK: The Case for Conspiracy," by F. Model and R. Groden in which the authors claim the chin has been transplanted (fig. RIT 12-1). For comparison purposes we made enlargements at about the same scale from copy negatives of prints CE-133A, CE-133B, and CE-133C (fig. RIT 12-2). The enlargement of the head from CE-133C is less sharp than the other enlargements because when the original 8 x 10 inch print was made, the enlarger was not focused accurately, and the original negative has not been located.



The world's first chin transp head from CE-133A; the

FIGURE RIT 12-1.—Photographic copy of the reproduction of print of Oswald (CE-133A) in the book "JFK: The Case for Conspiracy" in which the authors claim the chin has been transplanted.







FIGURE RIT 12–2.—Enlarged copies of the three views of Oswald for comparison with the preceding illustration. Above is CE–133A.

(477) All three of these prints have light shadows on both sides of the dark shadow under the lower lip, but print CE-133A also has some irregular dark spots in the area where the line appears in the book illustration. Such spots could be caused by any of various natural factors, the most probable of which are shadows caused by the slight but obvious change in expression in the mouth area, random clumpings of silver grains which are evident at this magnification throughout the picture, and a slight change in the angle of the head with respect to the Sun. (478) In any event, the dark spots on our print do not conform to a smooth line which would be the effect with the conventional procedures used in making composite images. A line can also be seen on the fore-head of this photograph (CE-133A) which does not appear in CE-133B nor in the book illustration. The picture that appears in the book was made with high-contrast film or paper, an appropriate procedure for some purposes but it produces a misleading effect here in that it exaggerates some details and eliminates others. Observe that the laugh lines running down and out from the sides of the nose, which are plainly visible on our normal contrast print, have disappeared in the book illustration. We are convinced that there is no fakery associated with the spots on the chin.

13. Are there any pictorial inconsistencies that suggest faking? (479)(480)Careful examination of the photographs with respect to lighting, perspective, sharpness, distortion, grain pattern, density, and contrast revealed no evidence of fakery. Examples of evidence of fakery concerning the lighting would be shadows in the wrong position in relation to the position of the Sun and the object casting the shadow, shadows that do not correspond in shape to that expected when shadows are projected onto another surface, shadows that do not appear as sharp as expected with direct sunlight, shadows that do not appear as dark as expected with the approximately 1:8 lighting ratio between the shadow and highlight sides of objects obtained in sunlight on a clear day, and shadows that do not respond to nearby reflecting surfaces. No such discrepancies are seen in any of the three photographs of Oswald. The darkness, shape, sharpness, and placement of the shadows appear to be correct.

(481) The effect of light being reflected from the white surfaces on the left can be seen in the shadow on that side of Oswald's neck, and the shadow of Oswald on the ground moves appropriately as he changes his position between each of the photographs. Tilting the camera slightly downward for view CE-133A where Oswald is holding the paper under his chin, produces the expected higher placement of the figure in the picture and the divergence of the vertical subject lines toward the top of the picture.

(482) Composite photographs made using a pasteup or montage technique can usually be detected as such unless the component parts are made under identical conditions and with great skill. Clues that commonly reveal fakery are mismatches of the density, contrast, sharpness, graininess, perspective, and lighting, and imperfect blending of the edges between the parts. No such clues can be found in these photographs. Furthermore, there is no disruption of the grain pattern across the boundary between the head and the body or between the head and the background so that any composite photograph involving the head would require using large original negatives and prints and then copying the composite image with the Oswald camera. This possibility is discussed in the response to question 22, but nothing in the negative or the three prints of Oswald was detected that appears inconsistent or suggests fakery.

(483) Additional questions related to statements by Mr. Malcolm Thompson in a BBC film and a manuscript identified as "Panorama— Kennedy, Project number 5348/5506" that is included in the appendix : (484) 14. Does the apparent bulge in the left edge of the post to the right of Oswald's head appear to be due to retouching or other alteration of the image in photograph number CE-133B?

(485) What could be perceived as an indentation in the post in CE-133B is believed by the undersigned to be an illusion resulting from the location of a shadow of a branch or leaf along the left edge of the post. It follows that since the darker area to the left of the post is a shadow of the post on a white surface, a shadow falling on the white post would be similar in tone and could be seen as part of the background rather than as a shadow on the post. The shadows falling along the right edge of the post create a slight illusion that the right edge is not entirely straight either, even though the background to the right of the post is lighter in tone.

(486) Careful examination of this area on enlarged prints reveals a narrow object, that could be either a wire or a bush branch, running from the edge of the building on the right, in front of the post, across the area in question, and continuing through the shadow area between the neck and the post (fig. RIT 14–1). Anyone skillful enough to retouch the area between the neck and the post, as claimed by Mr. Thompson, and include the just-detectable wire or branch, would have no difficulty in producing a straight line on the post.



FIGURE RIT 14-1A.—Enlargement of a section of view CE-133B which shows what appears to be a wire or branch running through the shadow area to the right of Oswald's neck which Mr. Thompson claimed had been added to the photograph, producing an irregularity in the left edge of the post. [These overlaying transparencies can only be analyzed by studying them in a viewer. For this reason, they have been retained in committee files.]

FIGURE RIT 14-1B.—Enlarged transparency on high-contrast film for check of line running through shadow area to the right of Oswald's neck. (The original transparency provides the best detail when viewed by transmitted light.)

(487) 15. Are the backgrounds and shadows identical on any of the three different views (CE-133A, CE-133B, and CE-133C), thereby suggesting that different figures have been superimposed on different prints of a single background photograph?

(488) The speculation is either that someone started with a photograph of a backyard with no figure and added the three figures from other photographs, or that Oswald's head was added to three photographs of someone else standing in the backyard. The backgrounds are not identical, thereby ruling out the possibility that figures were added to three prints of a single photograph of the backyard. The differences include changes in the convergence of vertical subject lines (the posts, the boards in the fence, and the building on the right) with changes of camera tilt, changes in the area of the background included in the three views, and slight changes in the positions of shadows of some branches and leaves.

(489) 16. Is there evidence that part of the background could have been moved photographically to fill a gap created by adding a figure in a different pose to a background photograph?

(490) No such evidence can be detected. Since the figure moved to the viewer's left between views CE-133B and CE-133A, and moved closer to the fence between views CE-133A and CE-133C, major gaps would have been created around the entire periphery of the figures if the figures had been added as suggested. Even if it is assumed that photographs of Oswald's head have been added to photographs of someone else's body, the necessary retouching around the edges would be difficult to conceal from detection with high magnification.

(491) 17. Is there evidence that the shadows have been touched in? No. The shadows appear normal in shape, location, sharpness, and contrast. It would be especially difficult to maintain realistic detail in the shadows on the ground if the shadows were added. It is noted that the shadow moves an appropriate distance to the left as Oswald moves to the viewer's left from view CE-133B to view CE-133A, and when he moves closer to the fence in view CE-133C the shadow moves up onto the fence as expected. (The relative distances between Oswald and the fence can be determined by noting the position of his feet with respect to the shadows of the three overhead wires.)

(492) It is true that highly skilled artists can and have made paintings that appear photographic. There is no evidence, however, that this was done in this case. To add shadows having detail to a photograph requires not only darkening the appropriate area, but also changing the detail within the shadow so that it appears to be illuminated by diffuse illumination from the sky and surroundings rather than by the Sun. Therefore, the sharpness and position of the detailed shadows within the larger shadow area must be changed in sharpness and position. For example, there is a ridge at the top of the white wall behind Oswald that casts a shadow on the wall beneath it. Where the Sun hits the ridge the shadow is sharp and contrasty. Where the ridge is in the shadow of the post, the shadow has a less sharp edge and the contrast with the adjacent area is lower. A similar situation exists where Oswald's shadow falls on what appears to be a paper on the ground near the fence. The soft shadows on the paper within the head shadow on view CE-133B appear as would be appropriate if illuminated with diffuse light from the fence and sky.

(493) 18. Is the size or position of the shadow of the gun in Oswald's right hand (view CE-133B) inconsistent with the position of the gun?

(494) If the gun were held vertically with the butt on the hip, we would expect the shadow to be oriented in the same direction as the shadows of the legs. However, the barrel of the gun is tilted toward the left side of the picture and also toward the camera. Both of these changes have the effect of rotating the shadow of the gun in a counterclockwise direction. The positions of the gun and the shadow are therefore compatible.

(495) 19. Is there evidence that Oswald's left arm and hand have been stuck on to another photograph in a physiologically inconsistent manner (view CE-133B)?

(496) It is possible to experience an optical illusion whereby the small wedge of the bare upper arm that is visible between the bottom edge of the dark sleeve and the lower arm appears to be part of a horizontal limb attached to the rib cage. This is an illusion not unlike the illusion in view CE-133A that the post is sitting on or growing out of Oswald's head. It is just as easy to see the small wedge of the bare upper arm as being part of a vertical limb that is mostly enclosed in the shirt sleeve. Moreover, it is difficult to understand the purpose of making a composite image in this manner.

(497) 20. Is the area between Oswald's neck and the post to the viewer's right (view CE-133B) too wide to be filled by a shadow of the post, thereby indicating retouching?

(498) The ratio of the shadow width to the post width was calculated for view CE-133A, where both are clearly visible, and was found to be 1:1.07. Applying the same ratio to an enlarged print of view CE-133B, where the post is 24 millimeters wide, the calculated width of the partly concealed shadow is 22.4 millimeters. The measured distance between the neck and the post is 22 millimeters if the apparent indentation is included, and only 20 millimeters to the position of a straight left post edge. Therefore, the distance between the neck and the post is not too wide to be filled by a shadow of the post.

(499) 21. Are the heads on any two of the three different views (CE-133A, CE-133B, and CE-133C) from a single original photograph?

(500) One method of detecting differences between two photographs is to place them in a stereoscope so that the left eye sees one photograph and the right eye sees the other. If the two photographs are identical, the two images will fuse and the viewer will perceive a single image. If the photographs are not identical, the areas of disparity will not fuse and the viewer will perceive two separate images. When the three views of Oswald were viewed two at a time in a stereoscope, it became apparent that no two of the images were identical.

(501) The procedure used in the CBC film to demonstrate that the heads on two of the photographs of Oswald were identical was to superimpose enlarged monochrome color transparencies having different colors. The viewer was thereby led to believe that the transparencies registered exactly. In an effort to duplicate this demonstration, we made closeup copy negatives of the head areas in the three prints identified as CE-133A, CE-133B, and CE-133C. These negatives were enlarged to 8 x 10 inches to produce diapositive images on normal-contrast film and also on high-contrast film. Green and magenta positive images were then produced by contact printing. Superimposing the normal-contrast color images from the (502)pairs of photographs as was done in the CBC film revealed that while this appears to be an elegant test, it is not very discriminating. The registration between the two images could be altered considerably before any color fringing became apparent in the facial features. An explanation for this registration tolerance is that the facial details that appear sharp on a small print are revealed to have unsharp edges when enlarged to this size due to the granular composition of the photographic image. A close examination of the superimposed images revealed a difference in the grain structure, but color differences were obvious at a normal viewing distance only in the large areas of disparity in the background and under the head (fig. RIT 21-1).

[These overlaying transparencies can only be analyzed by studying them in a viewer. For this reason, they have been retained in committee files.]

FIGURE RIT 21-1A.—Superimposed normal-contrast green and magenta transparencies of pairs of the three views of Oswald reveal obvious color differences only in the large areas of disparity in the background and under the head. This is the procedure used in a CBC film to demonstrate that the heads on the photographs are identical. Above, CE-133A and CE-133B. (The original transparencies should be viewed by transmitted light. They are on file in the National Archives.)

FIGURE RIT 21-1B.-CE-133B and CE-133C.

FIGURE RIT 21-1C.-CE-133A and CE-133C.

FIGURE RIT 21-1D.—Both the green and the magenta transparencies were made from CE-133A to demonstrate that no color differences are seen even in the background with identical images.

(503) Two additional procedures were then used in an effort to verify and then provide evidence that the heads on the three photographs are not identical. For one, positive and negative high-contrast film images were sandwiched together and contact printed onto paper. When the positive and negative images are from the same original photograph (CE-133B) a fine-line effect is produced as shown in figure RIT 21-2. When the positive image from CE-133B is combined with the negative image from CE-133A, the areas of disparity are represented either as broader black areas or as broken lines. This print is shown in figure RIT 21-3. Similar comparisons of CE-133A and CE-133C, and of CE-133B and CE-133C are shown in figure RIT 21-4 A and B.

(504) It should be mentioned here that the head sizes were not identical on the original prints from the Archives. An adjustment was made when the copy negatives were enlarged to make the 8×10 inch diapositives. The widths of the images were matched at the temples and cheekbones, but the vertical-horizontal proportions are noticeably different. We attribute this change in the shape of Oswald's head to the downward tilt of the camera for photograph CE-133A, that placed the head farther off the lens axis. This effect is explained in greater detail below.



FIGURE RIT 21-2.—Print made from superimposed high-contrast positive and negative film images of view CE-133B to demonstrate that a fine-line effect is produced when the high-contrast images are made from the same original.



FIGURE RIT 21-3.—Comparison of CE-133A and CE-133B. The areas of disparity are represented either as broader black areas or as broken lines.



FIGURE RIT 21-4A.—Comparison of CE-133A and CE-133C.


FIGURE RIT 21-4B.-Comparison of CE-133B and CE-133C.

(505) In addition to the change in the outline shape of the head, the disparity between the images in the area of the nose, mouth, and shadow under the mouth is quite obvious. We attribute these differences to a slight change in expression around the mouth and a slightly different angle of the head with respect to the Sun and the camera. The chin shadow appears in the shape of an inverted "U" in CE-133B and an upright "U" in CE-133A.

(506) For the third and final procedure demonstrating that the heads on the three photographs are not identical, green and magenta transparencies were made from the positive and negative high-contrast film images. When the green image from CE-133B is properly registered (i.e., superimposed) on the magenta image from CE-133A and the two are opposite in negative-positive polarity (i.e., one is a negative image and the other is a positive image), the areas of disparity become evident as clear areas and as areas of a darker color produced by the overlap of green and magenta. We believe the differences are dramatic and clearly indicate that the two heads did not come from a single original photograph. This pair of images is shown in figure RIT 21-5. Similar results were obtained when high-contrast color images from view CE-133C were superimposed on those from views CE-133A and CE-133B (fig. RIT 21-6). An additional pair of green and magenta transparencies, both made from view CE-133B, is included to show the appearance of identical images in figure RIT 21-7.

[These overlaying transparencies can only be analyzed by studying them in a viewer. For this reason, they have been retained in committee files.]

Figure RIT 21-5.—When a green negative high-contrast image from CE-133B is superimposed on a magenta positive high-contrast image from CE-133A, the areas of disparity become evident as clear areas and as areas of a darker color produced by the overlap of green and magenta. (The original color transparencies should be viewed by transmitted light.)

Figure RIT 21-6A.—Superimposed high-contrast color images from CE-133B and CE-133C.

Figure RIT 21-6B.—Superimposed high-contrast color images from CE-133A and CE-133C.

Figure RIT 21-7.--Superimposed high-contrast color images, both from CE-133B, to illustrate the effect obtained with identical original images.

(507)Additionally, photographs were made of a manikin head with an Imperial Deluxe Reflex duo lens camera similar to the Oswald camera, placing the image of the head in various positions from the center of the negative to the edges. The purpose of this was to illustrate the effect such variations in placement have on the shape of the image of the head in order to explain the differences in head shapes in photographs CE-133A, CE-133B, and CE-133C, observed when the high-contrast color transparencies were superimposed. A black-andwhite contact print of three negatives (fig. RIT 21-8) shows the manikin head in the center of the photograph, near the top (tilting the camera down), and near the top left corner (tilting the camera down and aiming it to the right). Placing the image of the head off the lens axis causes it to be elongated in a direction radiating away from the center of the photograph. Thus, the head at the top of the photograph is stretched vertically and the head in the corner is stretched diagonally. This change in shape can be seen on the contact print, but the heads were also enlarged on high-contrast film and contact color transparencies were made so that direct comparisons could be made by superimposing green and magenta pairs of the three images (fig. RIT 21–9).

(508) This change in shape is known as the wide-angle effect and it occurs with all conventional camera lenses including normal, wideangle, and telephoto, but it is most obvious with short focal length wide-angle lenses. In addition, pincushion distortion, which is evident in the curved reproduction of straight subject lines, and the altered

perspective, which is evident in the convergence of vertical subject lines when the camera is tilted, slightly affect the shape of the head. (The differences in sharpness of the images of the manikin head when placed in the center and near the edges of the photograph is further evidence of curvature of field observed in photographs made with the Oswald camera.) Thus, the difference in height to width proportions of the heads in CE-133A, CE-133B, and CE-133C can be explained in terms of these effects since the tilt of the camera changed between the photographs, thereby placing the head in different positions. Of the three effects mentioned, the wide-angle effect has the greatest influence on the shape of the head. Since the wide-angle effect applies only to three-dimensional objects, it would not alter the shape of a two-dimensional head on a photographic poster or print, the use of which has been suggested as a way of faking the photographs of Oswald. Thus, the presence of this effect in the backyard picture is another item of evidence negating the likelihood of fakery.

(509) 22. Could the negative of Oswald be a copy of a composite print rather than an original photograph?



1. Image in center with camera level. Shape of head is normal.

2. Image at top with camera tilted down. Head is elongated vertically.

3. Image in corner with camera tilted down and rotated to the right. Head is elongated diagonally, away from the center.

[These overlaying transparencies can only be analyzed studying them in a viewer. For this reason, they have been retained in committee files.]

FIGURE RIT 21-8.—A contact print of three negatives made with an Imperial Reflex duo lens camera to show the effect of variations of image placement within the picture format on the shape of a head.

FIGURE RIT 21-9.—Enlarged high-contrast positive color transparencies of the three photographs in the preceding illustration, superimposed to reveal areas of disparity. (The original transparencies should be viewed by transmitted light.)



FIGURE RIT 22-1A.—An original photographic print that was copied with the Oswald camera to determine if the reproduction (following illustration) would be acceptable as an original photograph.



FIGURE RIT 22–18.—A copy photograph made with the Oswald camera that has characteristics of an original photograph including the camera scratch pattern. The left border of the original print shows even though it was not visible in the camera viewfinder; the photograph also reveals exaggerated pincushion distortion due to use of a supplementary lens over the camera lens.

(510) The undersigned copied a photographic print with the Oswald camera, using a +4 diopter supplementary lens over the camera lens, to demonstrate that it is possible to make a copy negative that has characteristics of an original negative including edge markings, scratch patterns, variations in center to edge sharpness, pincushion distortion, and consistent grain patterns (fig. RIT 22-1 A and B). For this type of fakery to be successful, it would be necessary to use a large format camera with a good quality lens for the original photographs to avoid introducing graininess, scratches, unsharpness, or distortion at this stage. Also, any alterations would have to be made on large photographs so that retouching or discrepancies could be concealed. Furthermore, the Oswald camera would have to be available to the person making the fake photographs and it would be necessary to calculate a combination of supplementary lens focal length and original print size to obtain an in-focus image of the desired size with the fixed-focus camera.

Clues that might uncover this type of fakery would include (511)strong pincushion distortion caused by adding a supplementary lens, loss of gradation in highlight areas and loss of detail in shadow areas which typically occurs when copies are made, and possible detection of imperfect retouching or other alterations. Pincushion distortion was much more evident on the copy photograph made with the Oswald camera than on the original negative of Oswald or on other photographs made with the Oswald camera without the supplementary lens. Since there is no wide-angle effect when two-dimensional photographs are copied, to avoid detection of fakery, appropriate variations in the shape of Oswald's head would have to be incorporated in the original photographs. In summary, it is possible to make copy photographs that are acceptable as originals. Nevertheless, because such a process poses many technical problems, any one of which if not solved would lead to detection under close examination of the photographs, we do not believe such a procedure was used to produce the three backyard photographs of Oswald.

ATTACHMENT A

GLOSSARY OF PHOTOGRAPHIC TERMS 1

Composite image.—A photograph in which two or more separate images have been combined by any camera, printing, or post-printing technique—for example, camera montage, film stripping, printing montage, and pasteup.

Contact printing.—To expose photographic paper or other sensitized material through a negative or transparency while the two are pressed together for the purpose of making a reproduction that is the same size as the original.

Contrast.—The actual (objective) or the perceived (subjective) variation between two or more parts of an object or image with respect to any of various attributes such as luminance or hue. Subjective contrast is commonly described in general or relative terms such as high contrast or lower-than-normal contrast. Normal-contrast films generally represent luminance differences in the subject with corresponding density differences in the negative whereas high-contrast films record most of the subject tones as a uniform high density and a uniform low density.

Copy negative.—A negative produced by photographing a photograph as distinct from a negative produced by photographing an original scene.

Curvature of field.—A lens defect in which the sharpest image of a subject plane assumes the shape of a curved surface rather than conforming to the flat surface of the photographic film or paper. If a lens with this defect is focused in the center of the film or paper the image will be out of focus in the corners, and if it is focused in the corners the image will be out of focus in the center.

¹The illustrations and some of the definitions are from *Dictionary of Con*temporary Photography, Leslie Stroebel & Hollis N. Todd, Dobbs Ferry, N.Y.: Morgan & Morgan, 1974, with the permission of the authors and the publisher.

Density.-A logarithmic measure of the light-absorbing characteristics of an image, filter, et cetera. (Perceptually, there is an inverse relationship between density of various areas in a photograph and perceived lightness, so that a shadow area that has high density is perceived as having low lightness.)

Depth of field.-The range of object distances within which objects are imaged with acceptable sharpness, for example, on a photographic print or transparency. Depth of field increases as the object distance, viewing distance, and f-number increase, and as the focal length decreases.

Diapositive.—(1) A transparency intended to be viewed or projected by transmitted light. (2) A positive image on a transparent or translucent support, used as an intermediate step in forming the final image. For example, a diapositive is made from an original negative to produce one or more duplicate negatives.

Dimensional stability.—The ability of film, paper, or other material to remain relatively unchanged in size when subjected to aging, processing, et cetera. Photographic papers may change dimensions by different amounts with the paper grain, and across the paper grain during processing.

Diopter.—A measure of lens power equal to the reciprocal of the focal length in meters. Plus and minus signs are used to denote positive and negative lenses, respectively. A +4 lens, for example, is a converging (positive) lens with a focal length of 1/4 meter or 250 mm. To a first approximation, the power of a lens combination is the sum of the powers of the components.

Distortion.—A lens condition that causes straight subject lines to bow inward or outward on the image (barrel distortion, pincushion distortion). This optical effect is caused by a variation of magnification across the field.



Distortion

Distortion

Edge markings.—Masking irregularities around the edge of the picture area on film exposed in a camera that correspond to irregularities in the film aperture in the camera.

Film aperture.—An opening in a plate, located close to the film plane of a camera or a projector, that delimits the area of illumination. The plate adjacent to the film aperture in a camera supports the film and prevents exposure of the film beyond the picture format.

F number.—A number, such as f/11, obtained by dividing the focal length of a lens by the effective aperture. The f-number and the shutter speed are two basic exposure controls in cameras.

Focal length.—The distance from the rear nodal point of a lens to

the sharpest image of an object located at a very great distance on the lens axis. With camera lenses of normal design, the focal length is approximately the distance from the center of the lens to the film plane when the camera is focused on infinity.

Gradation.—A change in tone, texture, et cetera, between adjacent areas of an object or the corresponding image. Gradation provides the viewer with information concerning the form or depth of the subject, e.g., the facial features of a portrait subject as revealed by the lighting. Synonym: Local contrast.

Grain.—On black-and-white photographs, subject areas of uniform tone, such as blue sky, are composed of randomly distributed particles of silver. At low magnifications and large viewing distances the eye blends the small scale dark and light areas to produce a uniform tone. At high magnifications the nonuniformity can be seen as a clumping of the silver particles. The appearance of this clumping varies with a number of factors including the type of film, the exposure level, and development.

Lens axis.—A line joining the centers of curvature of spherical surfaces and perpendicular to plane surfaces. With camera lenses, the lens axis can be approximated as a straight line perpendicular to the lensboard and through the center of the front surface of the lens. Synonym: Optical axis.



Lensboard.—A panel that supports the lens on photographic optical equipment. Lensboards are detachable on most view cameras and enlargers to permit the substitution of other lenses.

Lighting.—The character or quality of the illumination as seen on a subject or in a photograph or a motion picture. Included among lighting variables are placement of the light source and the resulting placement of highlights and shadows, uniformity of lighting, lighting ratio, and shadow sharpness.

Lighting ratio.—A factor obtained by dividing the illuminance on the highlight side of an object by the illuminance on the shadow side. A lighting ratio of 3 to 1 is commonly recommended for studio portraiture, whereas the lighting ratio for an object in direct sunlight is typically 8 to 1.

Magenta.—A hue (color) obtained by mixing red light and blue light, or by removing green from white light.

Magnification.—A scale of reproduction larger than one. An 8×10^{-1} inch print made from a 4×5^{-1} inch negative without cropping would have a magnification of 2.0, obtained by dividing an image (print) dimension by the corresponding object (negative) dimension. In some contexts magnification refers to the ratio of the image size on the print to the size of the object being photographed irrespective of the image size on the negative.

Mask.—A device to protect specific areas of photosensitive materials from exposure. The mask on printing easels produces the white border on black-and-white prints and the panel around the film aperture in cameras masks the film around the picture.

Negative.—A photographic image in which the light subject tones are reproduced as dark, and dark subject tones are reproduced as light.

Negative lens.—A single-element lens that is thinner in the center than at the edges, or any lens that causes entering parallel rays of light to diverge. Negative lenses do not form real images, but they can be used in combination with positive lenses to form real images, where the combination will have a longer focal length than that of the positive lens alone.

Perspective (linear).—The representation of depth in a two-dimensional photograph by the convergence of parallel subject lines or the decrease in image size with increasing object distance. For example, train tracks converge and the distance between the two rails decreases in the photograph as the object distance increases.

Pincushion distortion.—An optical effect in which the magnification within a subject plane increases with distance from the lens axis, causing straight subject lines to be curved in the image. For example, the outside vertical edges of a building would curve away from each other at the top and bottom of the photograph. (See illustration under "Distortion.")

Positive.—A photographic image in which the tones are in approximately the same relationship as in the original, where light subject tones are reproduced as light tones and dark subject tones are reproduced as dark tones.

Positive lens.—A single-element lens that is thicker in the center than at the edges, or any lens that causes entering parallel rays of light to converge. Positive lenses can be used alone or in combination with positive or negative lenses to form real images. A combination of positive lenses will have a shorter focal length than that of any of the individual lenses.

Projection printing.—The use of an optical device containing a light source to project images of negatives or transparencies onto sensitized material for the purpose of making a print which may be larger than, smaller than, or the same size as the original. Commonly called enlarging.

Resolution target.—A design typically consisting of alternating light and dark lines that systematically vary in width, used to test the ability of one or more components of a photographic system, such as a lens, to image detail. Resolution is commonly expressed as lines per millimeter.

Retouching.—The technique of modifying a photographic image by manual methods of adding colorants, by abrading or bleaching the image, or by airbrushing. In portrait retouching of black-and-white negatives, for example, low density areas representing imperfections in the skin are darkened to match surrounding areas by adding graphite with a needle-sharp pencil.

Scratches.—Physical imperfections on a surface due to abrasion. For example, roll film can be scratched in a camera as it is advanced or rewound due to contact with irregularities in the camera film track or pressure plate, or the light trap in the film cassette.

Sharpness.—That subjective quality of an image associated with the distinctness of boundaries between adjacent objects. Acutance is the objective measure of edge quality that is related to sharpness. For example, a variation of sharpness in photographs is associated with camera focus and depth of field.

Supplementary lens.—A positive or negative lens that is added to the lens on a camera or other optical device for the purpose of changing the focal length. A positive supplementary lens decreases the focal length and a negative supplementary lens increases the focal length. Positive supplementary lenses are sometimes referred to as closeup lenses since they enable cameras to focus on shorter object distances.

Transparency.—An image (usually positive) intended to be viewed by light that passes through the image and the base by projection or on a transparency viewer, as distinct from reflection prints which are on a more or less opaque base and are viewed by reflected light.

Wide-angle effect.—A systematic change in shape of images of three-dimensional objects with angular displacement from the lens axis (that is, from the center to the edges of the film), most noticeable in photographs made with short focal length wide-angle lenses, where images of three-dimensional objects near the edges of the field of view appear to be stretched out of shape in directions radiating away from the center of the photograph. The effect is usually not apparent in photographs made with normal focal length lenses viewed at the correct distance because images near the edges are viewed at oblique angles that compress the images in proportion to the stretching that occurred when the images were formed by the camera lens. The image of a spherical object is widened about 10 percent at 25 degrees laterally off the lens axis and about 42 percent at 45 degrees off the lens axis.

ATTACHMENT B

BRITISH BROADCASTING CORP.

Lime Grove Studios, London, February 9, 1978.

Representative RICHARDSON PREYER, House of Representatives, U.S. Capitol, Washington, D.C.

DEAR CONGRESSMAN PREYER: I wanted to send this transcript along to you immediately. We initiated a detailed analysis of the Oswald holding the rifle photos by Detective Superintendent Malcolm Thompson who ran the Police Forensic Science Laboratory Identification Bureau for 25 years. He is also an ex-president of the Evidence Photographers International Council and a fellow of the Institute of Incorporated Photographers, the Royal Photographic Society and the Institute of Professional Investigators. In short, he knows what he's talking about.

As you will see, he is sure that it is a fake photo—a montage of three separate pictures. Naturally, I'll be using him in our film, but I wanted your committee to have this information directly. I'll be returning to New York on February 20, and we'll be having a prescreening in Washington sometime thereafter. We'll be in touch with your office to work out a convenient time and place for you and any committee or staff who might be interested.

My best,

DAVID OSTERLUND.

PANORAMA KENNEDY

ROLL 1A

INTERROGATOR. Mr. Thompson would these photographs be acceptable as evidence in a British court of law?

Mr. THOMPSON. No. I have examined these photographs and have established without doubt that there is retouching on them and it is a basic principle with a forensic photographer that he would never, never retouch a photograph in any form of litigation.

INTERROGATOR. What would happen in a British court of law if photographs like this were produced as evidence in a murder case?

Mr. THOMPSON. If they were produced in a murder case then the defending counsel without doubt would have an expert examine them and if retouching was found on them then they would not be included in the evidence.

INTERROGATOR. Are you saying that if photographs like this were produced in a British court of law in a case, they would be thrown out?

Mr. THOMPSON. I do. Yes. They would be thrown out.

INTERROGATOR. What leads you to feel that?

Mr. THOMPSON. Well primarily the retouching is very very obvious in certain parts of the picture but more in particular in a perpendicular pillar here which should be a straight line. When one comes to a point, the subjects chin, one finds that there is a bulge in a line. Without doubt that shows this area between the head and the pillar has been retouched and the retoucher has just not been careful enough to maintain the retouching he should which is within the pillar in what should be a shadow area. Now that is photograph B.

In photograph A we do see the pillar as a straight pillar, it is not as if the wood has a flaw at that point there. The flaw is created in photograph B due to the fact that the retouching has extended over onto the pillar.

INTERROGATOR. I wonder if you could go through the two photographs and list for me what you regard as the discrepancies in those photographs.

Mr. THOMPSON. The backgrounds are very very similar to the point that either the camera was on a tripod when the pictures were taken or we are speaking about a common negative having been used to produce the two backgrounds. They look disimilar, there is a horizontal shift and a vertical shift in the two pictures but that purely and simply, I think, is meant to mislead the viewer.

When one measures the pictures, photograph A is enlarged slightly greater than photograph B but even allowing for that, the shadow detail in the static areas of the picture, that is in particular on the staircase here, the shadows are so exact that there is no doubt in my mind, it is either a common negative used to produce the two prints or two successive negatives with the camera on a tripod and neither camera or tripod moved in any way between the two exposures.

There is a discrepancy up in this area here. At this point I can only assume that someone has cut out this area and changed its position slightly, it is fractional but in this picture here we see the horizontal part of the neighboring house with a highlight in this area, whereas in this picture here the horizontal part can be seen far below the section the angle caused by the upright pillar and the step. You can see a fractional difference there whereas in this picture the fractional difference does not exist.

Again with that if we take a dark triangle here between the roof of the house next door and the skyline then that d - - - angle finishes up level with the shadow of the staircase there and in the other picture the diactoral angle is below the shadow of the staircase. Similarly, the vine passing up through here is in a lower position at that point in that picture than it is in that picture.

I then come to the conclusion that part has been raised in photograph B and retouching done down here to fill up the small gap created. That is again borne out out by the fact that here in photograph A the picture finishes up dark and in photograph B at that point the picture finishes up gray.

So much for the background. If we take the body. The body shadows don't relate to the other shadows in the picture and one can only come to the conclusion that this body has been placed in the background and photographed but all the shadows here are swinging to the left whereas this shadow is slightly to the left but also behind the body is common to both pictures but when one examines the shadow content, one sees the gun at an angle to the body which does not relate to the angle in the shadow. The gun is reaching far more out to the right, more in a horizontal position here in relation to the body shadow than the gun is actually being held by the person.

INTERROGATOR. So you think that those shadows have actually been touched in.

Mr. THOMPSON. They have been touched in.

Again, there is something peculiar about this hand. The entire hand and arm is very, very unnatural. It possibly could have been stuck in afterward; but I can't relate physiologically the position of that arm to the body.

The butt of the rifle I think is the telltale in this picture here where we see very, very little of the butt actually protruding beyond the trouser line and yet down here having been painted in is a very, very large butt, I say very large in relation to the length of the shadow and we can measure the length of that shadow in relation to the height of the person and measure off the butt of the gun as against the shadow of the butt and that is to me unnatural.

The head itself, I have seen photographs of Oswald and his chin is not square. He has a rounded chin. Having said that, the subject in this picture has a square chin but again it doesn't take any stretch of the imagination to appreciate that from the upper lip to the top of the head is Oswald and one can only conclude that Oswald's head has been stuck on to a chin, not being Oswald's chin.

Then to cover up the montage, retouching has been done both to the right, that is Oswald's right and Oswald's left and when we consider this area of retouching here—compare it with what we see in photograph A we have a shadow cast by this wooden pillar. I have measured those and even allowing for the difference and degree of enlargement between photograph A and photograph B the area we see in shadow here is far in excess of what it should be and of course that is the area to which I referred earlier on where the pillar coming down does not continue in a straight line but has this bulge in it.

INTERROGATOR. Are there other things about the face itself which would make you suspicious?

Mr. THOMPSON. Yes, again we have a shadow underneath the nose. In photographs A and B you see Oswald's face in a different posture and yet the shadow under the nose hasn't moved or if it has moved it is only fractional compared with the actual movement we see in the face and one comes to the conclusion that it is the same picture used for both faces, possibly in this face here he has got a scowl on his face and there has been retouching done in the chin area which is what would expect if my conclusion is correct, that this face has been added on to the chin.

He has a very, very thick lower lip here which is not consistent with Oswald's lip and again the shadow underneath the lip is a horizontal shadow, that is consistent in both, even allowing for the fact that we have a slight tilt in the head of photograph B as against that in photograph A.

INTERROGATOR. Is it easy to make a photo montage like this?

Mr. THOMPSON. Yes; it is very, very common in the advertising world, professional photography, advertising photographers do montages all the time because it is the easiest way of obtaining the effect they want as against trying to set up that effect, it might be an impossible effect to set up, they have got to resort to a photo montage to do it.

801 Take 1

INTERROGATOR. What about the arm?

Mr. THOMPSON. The arm in photograph B just doesn't look natural, in fact it looks as if it has been stuck on the body.

INTERROGATOR. How easy is it to make a photo montage like this, how would people go about it?

Mr. THOMPSON. It's not difficult. If one has a background scene, the subject photographed against a white background making it simpler to cut out the subject from the back.

INTERROGATOR. How do you think this photo montage was achieved?

Mr. THOMPSON. The montage could be achieved by a photograph of the background and a photograph of a body against a white background and having been cut away from that white background and then multed as we see it here and then being in possession of a photograph of Oswald's head, merely mounting that on to the top of the body, stuck down and touched in such a way that your lines are not going to be too cut and dried between the body and the background and then rephotographed on to a negative and then from that negative of course producing as many prints as you like and possibly rephotographing the print from the negative in order to soften down the background and that would develop each time the photograph was copied. INTERROGATOR. Is that very easy to do?

Mr. THOMPSON. It is not difficult at all, don't ask me to do it. I am a forensic photographer. The last thing I would do is to retouch or indulge in any form of montage. My duty would be to present to the court what I know about the case and illustrate what I know about it in straightforward photography but there are retouchers in many facets of professional photography, they do resort to photo montages, in particular the advertising profession.

INTERROGATOR. Would the investigator agencies in America like the FBI and the CIA have that sort of professional expertise themselves?

Mr. THOMPSON. I would hope they don't have it because it is not part of their duties as forensic photographers to produce anything in court which has been retouched.

INTERROGATOR. Yes; but regardless of your hopes, I am asking whether you believe that the professional agencies in America have that sort of photographic expertise?

Mr. THOMPSON. I wouldn't think they have it but most certainly it wouldn't be difficult to get access to it. Every moderate studio in America has its retoucher in the same way as the biggest studios in Britain have their retoucher but in America you do have photographic artists, a profession all to itself, and they are spread all throughout the United States, access to one of those persons, its mostly ladies who do it and do an extremely good job in producing from a black and white picture, anything from anything as far as an oil painting from photographs.

INTERROGATOR. How quickly could you make a photographic montage like that?

Mr. THOMPSON. I would guess and say that you need at least 4 hours to produce it and that is working hard and possibly a team working at it, not just one man but I have no personal experience of how long it takes.

INTERROGATOR. Would you be prepared to produce yourself those photographs as evidence in court?

Mr. THOMPSON. After having examined them definitely not. I couldn't resort to producing anything in court which was other than just the original print from the original negative, even to the point if there was a flaw in the negative I'd be prepared to leave that in the final enlargement for the court purposes. If I was asked during the trial or the hearing then I could explain away quite simply as it being a flaw in the negative and possibly have the negative there as evidence. There is no need to retouch anything in a forensic photograph and certainly in Britain forensic photographers would just not retouch anything.

INTERROGATOR. Do you believe that those photographs are a fake?

Mr. THOMPSON. I think they are a fake and possibly the shadow detail and its relation to the static scene and the body are the giveaway, plus the fact there is retouching in sufficient salient places to make one appreciate that something peculiar has gone in relation to the head and the body and the areas surrounding it.

INTERROGATOR. Can you describe what your method was in order to try and determine that it was a fake?

Mr. THOMPSON. One measures the pictures first to ascertain the degree of enlargement, there is no use comparing distances on a picture unless you are certain that the two pictures you are comparing are of the same degree of enlargement. In this case they weren't of the same degree of enlargement and that created slight difficulty in relating one subject to another.

After having done that a very close examination of the fine detail present in the pictures brought me to my conclusion.

INTERROGATOR. Was your method to look for discrepancies?

Mr. THOMPSON. Exactly, that has been my life's work looking for the unusual and comparing one thing with another to see similarities or dissimilarities and what in general has been your conclusion in looking at those two photographs.

In general I have come to the conclusion that we have a montage of three pictures to make one end product as we see it here today.

INTERROGATOR. Does it strike you as strange that the police did not find those photographs, despite an intensive search on the day of the assassination and only found them the next day.

Well searches of premises are always difficult things, to carry out one has got to be systematic, there is only one way to carry out a proper search of a scene of crime or any other premises which might be of interest to the police and that is there are two officers doing it and one officer systematically follows round doubling what the other officer has done and in that way then two pairs of eyes should be better than one pair and nothing of importance should be missed.

So does it strike you as strange that in their search, after all connected with the assassination of a president that they should find such damning evidence the next day?

Mr. THOMPSON. It does, it does seem unusual. One would think that the officers involved would be highly experienced officers, would know and have been trained to carry out the search of premises.

INTERROGATOR. Is there any possibility in your mind that those two photographs are genuine?

Mr. THOMPSON. I don't think there is any possibility, having examined them for a considerable time it is my considered opinion that they are not genuine.

INTERROGATOR. Thank you very much.

ROLL 2A

802 Take 1

INTERROGATOR. After examining these photographs what is your professional opinion on them?

MAN. My opinion is those photographs are faked.

INTERROGATOR. What makes you think that?

MAN. The amount of retouching that is done and possibly more in particular the relationship between the shadows of the background and the shadows in the front of the body in the picture.

INTERROGATOR. Would you ever be prepared to produce those photographs in a British court of law.

MAN. No. I certainly would never contemplate using pictures which had been retouched or spotted in any way in a court of law. My task would be purely and simply to illustrate the evidence I was giving by straightforward photography. Any blemishes in my pictures then most certainly I would leave them in there and finish the enlargements and be able to explain to the court what exactly had happened, have the negative in my pocket as a protection if necessary. There is no need to spot pictures and forensic photographers in this country will just not resort to any form of retouching of any picture.

INTERROGATOR. Is there any possibility in your view that those photographs are genuine?

MAN. There is no possibility in my view that they are genuine, they have been retouched and I consider the picture to be the result of a montage.

INTERROGATOR. Thank you.

2. AUTHENTICATION OF THE KENNEDY AUTOPSY PHOTOGRAPHS AND X-RAYS

(a) Introduction

(512) Authentication of the autopsy photographs allegedly taken of President Kennedy was considered essential because of the discrepant descriptions that have been given of the wounds incurred by the President. The description of the size and location of the President's head wounds, for example, by eyewitnesses at Parkland Hospital differed dramatically from the testimony of the autopsy doctors and the account set forth in the Warren Report. (195) More recently, the panel of medical experts convened by then-Acting Attorney General Ramsey Clark described Kennedy's head entrance wound as approximately 10 centimeters higher than the location reported by the Warren Commission. (196) As a result of these discrepancies, it was essential to verify that the autopsy photographs and X-rays did, in fact, depict Kennedy, and that these materials had not been altered in any way.

(b) Issues

(513) 1. Do the postmortem photographs and X-rays in the custody of the National Archives purporting to depict President Kennedy, in fact, depict him?

(514) 2. Is there any evidence that either President Kennedy's autopsy photographs or X-rays have been altered?

(c) Materials examined

(515) Twenty-seven original color transparencies and the twentyfive original black and white negatives were examined. These depicted the subject's head and upper torso from various positions.* In addition, $8'' \ge 10''$ color and black and white photographic prints generated from these transparencies were evaluated.

(516) The X-ray materials consisted of the following items: (517) 1. An attempted anteroposterior projection of a skull identified as:

21296 (numbers upside down). U.S. Naval Hospital. NNMC Bethesda, Md. November 22, 1963.

^{*}A more detailed description of these photographs is provided in pars. 570–571, 583–595 infra.