

FINDINGS AND CONCLUSIONS OF THE FIREARMS PANEL. CONCERNING THE
KENNEDY ASSASSINATION

(96) The findings and conclusions were prepared by staff of the House Select Committee on Assassinations based on material submitted by the panel members. The panel has read and accepts those findings and conclusions.

KENNEDY SHOOTING

Evidence examined

(97) The following evidence was examined in connection with the shooting of President Kennedy.

(98) CE 139(71)—One 6.5-millimeter caliber, bolt-action repeating rifle, Mannlicher-Carcano Model 1938, serial number C2766. Attached was an Ordnance Optics, Inc. 4X telescopic sight and an adjustable black leather strap.* (See figs. 3A and 3B.)

(100) A visual examination of the rifle revealed pitting, rust and copper oxidation to test-firing, which the panel believed should be removed prior to test-firing. Accordingly, a dry cloth patch was pushed through the bore.

(101) The telescopic sight was attached to a mount, which itself was attached to the left side of the rifle. Mounting facilities were not provided at the time of manufacture. Also attached to the rifle were standard iron sights, placed on the rifle at the time of manufacture.

(102) The rifle was test-fired by all panel members, using 6.5-millimeter caliber ammunition of Western Cartridge Co. manufacture. Two bullets were test-fired into a horizontal water recovery tank. Further tests were conducted by loading four cartridges into the CE 375 cartridge clip and inserting it into the magazine of the rifle. The cartridges were worked through the rifle's mechanism and ejected without being fired. When the last cartridge was chambered, the cartridge clip remained in the magazine instead of falling out as it is designed to do.

(103) CE 141.—One 6.5-millimeter caliber cartridge of Western Cartridge Co. manufacture, found in the CE 139 rifle. (See fig. 4.)

(104) CE 351.—One damaged automobile windshield removed from the Presidential limousine. (See fig. 5.)

(105) CE 399.—One fired 6.5-millimeter caliber full metal-jacketed bullet, found on a stretcher in the emergency area of Parkland Hospital. The bullet weight was found to be 157.7 grains.(72) In the same box as the bullet was a tiny fragment, which was too small to weigh or otherwise examine. (See figs. 6A and 6B.)

*The CE 139 rifle was physically examined and found to be operable. It had not been properly cleaned, maintained or lubricated. The rifling of the barrel was four lands and four grooves, right twist. The magazine was a non-detachable box, clip-fed type, with a 6-cartridge capacity. The trigger pull was determined by the panel to be approximately 3 pounds.

(106) *CE 542*.—One 6.5-millimeter caliber, bolt-action repeating rifle, Mannlicher-Carcano model 1938, serial No. UC5209. Attached was 4 × Ordnance Optics, Inc., telescopic sight and an adjustable black leather strap. The strap is consistent in length, design, and construction with the strap on the CE 139 rifle. The rifle was purchased by the FBI in order to compare the method of mounting the telescopic sight. (See fig. 7.)

(107) *CE 543*.—One expended caliber 6.5-millimeter cartridge case of Western Cartridge Co. manufacture, recovered from the sixth floor of the Texas School Book Depository. (See figs. 8A and 8B.)

(108) *CE 544*.—One expended 6.5-millimeter caliber cartridge case of Western Cartridge Co. manufacture, recovered from the sixth floor of the Texas School Book Depository. (See fig. 9.)

(109) *CE 545*.—One expended 6.5-millimeter caliber cartridge case of Western Cartridge Co. manufacture, recovered from the sixth floor of the Texas School Book Depository. (See fig. 10.)

(110) *CE 557*.—Two expended 6.5-millimeter caliber cartridge cases of Western Cartridge Co. manufacture, test-fired by the FBI laboratory in the CE 139 rifle for purposes of comparison with CE 543, CE 544, and CE 545. (See Warren Commission hearings, vol. 17, p. 249.)

(111) *CE 567*.—The nose portion of a 6.5-millimeter caliber metal-jacketed bullet found on the right side of the front seat of the Presidential limousine. (See fig. 11.)

(112) *CE 569*.—The base portion of a metal-jacketed bullet found on the floor beside the right side of the front seat of the Presidential limousine. (See fig. 12.)

(113) *CE 572*.—Two fired 6.5-millimeter caliber full metal-jacketed bullets, test-fired by the FBI from the CE 139 rifle and designated as K1A and K1B*. (See fig. 13.)

(114) *CE 573*.—One 6.5 millimeter caliber metal-jacketed bullet recovered from the residence of General Walker in April 1963 after an attempted assault. (See fig. 14.)

(115) *CE 575*.—One brass cartridge clip with a six-cartridge capacity, stamped "SMI 952," removed from the CE 139 rifle. (See fig. 15.)

(117) *CE 840*.—Two lead-like fragments** recovered from the rug underneath or in the area which was underneath the left jump seat of the Presidential limousine. (73) The panel found that each fragment weighed 0.5 grain. Because of their minute size, no further examinations were conducted on this exhibit. (See fig. 16.)

(118) *CE 841*.—One round metal box containing lead residue recovered by the FBI from the inside surface of the windshield of the Presidential limousine. Because of the small size of the sample, further examinations were not conducted. (See hearings before the Warren Commission, vol. 17, p. 840.)

*The two test-fired bullets were used as standards for comparison with the class characteristics on CE 399, found on a stretcher at Parkland; with those on CE 567, the bullet nose portion found in the limousine; and with CE 569, the bullet base portion found in the limousine.

**The FBI originally recovered three particles. In 1970, an independent researcher brought to the attention of the National Archives that one of the three fragments was missing. The Archives has been unable to locate it.

(119) *CE 842*.—Four lead-like fragments. The smallest was identified as having come from Governor Connally's arm. The panel found that the largest fragment weighed 0.3 grain. The other fragments were too small to weigh. Because of the small size of the fragments, no further examinations were conducted on this exhibit. (See fig. 17).

(121) *CE 843*.—Three lead-like fragments removed from President Kennedy's brain during the autopsy. The largest weighs 0.6 grain; their combined weight is 0.7 grain. Because of the small size of the fragments, no examinations were conducted on this exhibit. (See fig. 18.)

(122) *CE 853*.—One fired 6.5-millimeter caliber full metal-jacketed bullet, fired through a goat at the request of the Warren Commission to ascertain the characteristics of the bullet on penetration and its subsequent loss of velocity. The panel found that fruitful examination of this bullet was not practical. (See hearings before the Warren Commission, vol. 17, p. 819.)

(123) *CE 856*.—One fired 6.5-millimeter caliber full metal-jacketed bullet, test-fired through a cadaver's wrist at the request of the Warren Commission to ascertain the characteristics of the bullet on penetration and its loss of velocity on impact. The panel found that fruitful examination of this bullet was not practical. (See hearings before the Warren Commission, vol. 17, p. 850.)

(124) *CE 857*.—One fired 6.5-millimeter caliber full metal jacketed bullet, test-fired into a skull at the request of the Warren Commission to ascertain the characteristics of the bullet on penetration. The panel found that the jacket had been separated from the core. The panel also found that fruitful examination of the bullet was not practical. (See hearings before the Warren Commission, vol. 17, p. 851.)

(125) *Lester Bullet*.—One fired metal-jacketed soft or hollow point bullet found in 1974 by Richard Lester about 500 yards from the Texas School Book Depository and 61 paces east of the triple overpass abutment. (See fig. 19.)

Findings and Conclusions

Was the CE 141 cartridge reportedly found in the CE 139 rifle in fact loaded into that rifle?

(126) The CE 141 cartridge was compared with the panel's unfired test cartridge No. 4, which had been loaded into the rifle and removed. The panel found a correspondence between the individual identifying characteristics produced by the magazine follower and the loading ramp of the CE 139 rifle on the CE 141 cartridge case and the panel's unfired cartridge. (See fig. 20.)

(127) In the Mannlicher-Carcano rifle, the loading ramp consists of a concave ramp located at the front edge of the magazine. It permits smooth insertion of the cartridge into the chamber. When a cartridge is chambered by moving the bolt forward, the front portion of the cartridge case slides up the loading ramp as it leaves the magazine. The loading ramp is a machined-steel surface and can engrave individual microscopic identifying characteristics on the cartridge case. Similarly, the magazine follower, which raises the cartridges, also may engrave individual microscopic identifying characteristics on the last cartridge in the magazine.

From which direction was the impact which damaged the CE 351 windshield of the Presidential limousine?

(128) The CE 351 windshield, made of two layers of laminated, tinted glass, has two separate fracture areas. (See fig. 5.) In the first (I), the point of impact is located $13\frac{3}{8}$ inches down from the top edge and $22\frac{7}{8}$ inches to the right of the left edge (the measurements were made from the front side of the windshield). No fractures were noted on the inside surface of the glass. On the outside surface, some fracture lines radiated out from the point of impact. The presence of fracture lines on the outside is indicative of a foreign object striking the windshield from the inside. (74)

(129) The second area (II) is located to the left of the first. No point of impact was found.

(130) Two lines, one radiating from each area, now connect at one point. This condition occurred after the panel's examination, but before the windshield was photographed. The additional fracture lines could have been caused by jolting the windshield during its removal from its exhibit case for photographing.

Were the three expended cartridge cases (CE 543, CE 544 and CE 545) found on the sixth floor of the Texas School Book Depository fired in the CE 139 Mannlicher-Carcano rifle?

(131) The panel compared microscopically the three expended cartridge cases (CE 543, CE 544, and CE 545) with the two cartridge cases test-fired by the FBI (CE 557) and the four cartridge cases (Kennedy T-1 to T-4) test-fired by the panel in the CE 139 rifle.

(132) The panel found correspondence among the individual identifying characteristics made by the firing pin and bolt face on the cartridge cases. (See Figs. 21A, B, C, and D.)

(133) The panel found, in addition to the above impressions, three sets of striations on the head of the CE 543 cartridge case. The marks were not found on any of the other 6.5-millimeter caliber cartridge cases. The origin of the marks could not be established.

(134) The panel concluded that all three cartridge cases had been fired in the CE 139 rifle.

Was the CE 399 bullet found at Parkland Hospital fired from the CE 139 Mannlicher-Carcano rifle?

(135) The CE 399 bullet is a 6.5-millimeter caliber full metal-jacketed, lead core bullet with a weight of 157.7 grains. The class characteristics engraved on it are four lands and four grooves, right twist.

(136) The panel found the physical characteristics of CE 399 to be the same as those of the bullet portion of the CE 141 cartridge found in the Mannlicher-Carcano rifle's chamber.

(137) CE 399 was microscopically compared with the two bullet test-fired by the FBI (CE 572) in the CE 139 rifle. Based in a correspondence of individual identifying characteristics, the panel concluded that CE 399 was fired through the same firearm barrel as the FBI test-fired bullets. (See fig. 22A and 22B.)

(138) Next, the panel compared CE 399 with bullets it test-fired in the CE 139 rifle. The panel was unable to identify its test-fired bullets

with the CE 399 bullet. The panel attributed this to changes in the bore caused by repeated firings of the rifle by the FBI and the Infantry Weapons Evaluation Branch of the U.S. Army to test its accuracy,⁽⁷⁵⁾ as well as to deterioration of the surfaces because the rifle had not been properly cleaned, lubricated, and maintained. For the same reasons, the panel was unable to identify its test-fired bullets with those of the FBI. The panel's test-fired bullets also could not be identified with each other, probably as a consequence of the poor condition of the barrel.

Was the CE 567 bullet nose portion found on the right side of the front seat of the Presidential limousine fired from the CE 139 Mannlicher-Carcano rifle?

(139) CE 567 is the nose portion of a damaged 6.5-millimeter caliber full metal-jacketed, lead core bullet. The weight of the exhibit is 41.5 grains. The class characteristics on the jacket are four lands and four grooves. The panel could not determine the direction of twist.

(140) The panel found the physical characteristics of this bullet fragment to be the same as the bullet portion of the CE 141 cartridge found in the chamber of the CE 139 rifle. When it compared CE 567 with the two CE 572 bullets test-fired by the FBI in the CE 139 rifle, it noted a correspondence among the individual identifying characteristics. (See fig. 23A and 23B.)

(141) The panel concluded that all were fired through the same barrel.

(142) The panel also compared CE 567 with bullets it test-fired in the CE 139 rifle. The panel was unable to identify its tests with CE 567. The panel attributed this to changes in the bore caused by repeated firing of the rifle by the FBI and the Infantry Weapons Evaluation Branch of the U.S. Army to test its accuracy, ⁽⁷⁶⁾ as well as deterioration of the surfaces because the rifle had not been properly cleaned, lubricated, and maintained. For the same reasons, the panel was unable to identify its test-fired bullets with those of the FBI. The panel's test-fired bullets also could not be identified with each other, probably as a consequence of the poor condition of the barrel.

Was the CE 569 bullet-base portion found on the floor beside the right front seat of the Presidential limousine fired from the CE 139 rifle?

(143) CE 569 is a base portion of a damaged 6.5-millimeter caliber full metal-jacketed, lead core bullet. The weight of 20.6 grains. The rifling impressions on the jacket are four lands and four grooves, right twist. The physical characteristics of this bullet are the same as the bullet portion of the CE 141 cartridge found in the chamber of the CE 139 rifle.

(144) The panel microscopically compared this bullet jacket with the two bullets (CE 572) test fired by the FBI from the CE 139 rifle. Correspondence of individual identifying characteristics was found on CE 569 and the FBI test-fired bullets. (See figs. 24A and 24B.)

(145) The panel concluded that the CE 569 was fired through the same barrel as the FBI test-fired bullets.

(146) Next, the panel compared CE 569 with bullets it test fired in the CE 139 rifle. The panel was unable to identify its tests with the

CE 569. The panel attributed this to changes in the bore caused by repeated firings of the rifle by the FBI and the Infantry Weapons Evaluation Branch of the U.S. Army to test its accuracy,(77) as well as to deterioration of the surfaces because the rifle had not been properly cleaned, lubricated, and maintained. For the same reasons, the panel was unable to identify its test-fired bullets with those of the FBI. The panel's test-fired bullets also could not be identified with each other, probably as a consequence of the poor condition of the barrel.

Were the CE 567 bullet nose portion and the CE 569 bullet base portion found in the Presidential limousine components of the same bullet?

(147) The panel was unable to determine whether CE 567 and CE 569 were components of the same bullet. The panel weighed and measured the fragments and found their combined weight and length did not exceed that of a single-fired projectile. Nevertheless, the panel could not match the two fragments physically because a considerable portion of the bullet jacket was absent.

(148) Both bullet fragments were examined for cannelures. The panel found only one cannelure present; it was on the base portion of the CE 569 bullet.

Was the CE 573 bullet recovered from the residence of General Walker fired from the CE 139 rifle?

(149) CE 573 consists of a damaged 6.5-millimeter caliber full metal-jacketed, lead core bullet. The weight of this exhibit is 147.1 grains. The class characteristics are four lands and four grooves, right twist. (See fig. 14.)

(150) The panel compared this bullet microscopically with the FBI's and its own test-fired bullets. Correspondence among the class characteristics was found on all bullets. No significant correspondence was, however, found among the individual identifying characteristics. Conversely, gross differences were not found.

(151) The panel concluded that because of the damage to CE 573 caused by impact and penetration, it could not be identified or eliminated as having been fired from the CE 139 rifle.

What are the nature and characteristics of the 6.5-millimeter caliber Mannlicher-Carcano rifle and ammunition with respect to power and impact?

(152) The 6.5-millimeter caliber Mannlicher-Carcano rifle is a bolt-action military rifle used as the standard service rifle by the Italian military from 1891 to 1945. It was chambered for a 6.5-millimeter caliber Mannlicher-Carcano cartridge. It was comparable to the service rifles of other nations at that time. These rifles include the U.S. model 1903 Springfield and 1917 Enfield, chambered for the .30-06 Springfield caliber cartridge; the British .303 Enfield, chambered for the .303 British caliber cartridge; the German 8-millimeter Mauser, chambered for the 8-millimeter Mauser caliber cartridge; and the Japanese Arisaka, chambered for both the 7.7-millimeter Arisaka caliber cartridge and 6.5-millimeter caliber Japanese Arisaka cartridge. The standard military factory statistics for these cartridges are:(78)

Cartridge	Bullet weight (grains)	Muzzle velocity (feet per second)	Muzzle energy (foot per pound)
.30-06 Springfield.....	150	2, 990	2, 980
.303 British.....	174	2, 440	2, 310
8-millimeter Mauser.....	154	2, 880	2, 835
7.7-millimeter Japanese Arisaka.....	175	2, 400	2, 237
6.5-millimeter Mannlicher-Carcano.....	162	2, 296	1, 902
6.5-millimeter Japanese Arisaka.....	156	2, 060	1, 460

Could the CE 139 rifle have been fired with a high degree of accuracy even though it has been described as having a "hair trigger"?

(153) The trigger pull of CE 139 is approximately 3 pounds, not considered average for most military rifles. At the same time, it cannot be called "a hair trigger." Technically, a hair trigger requires an extremely light pull, normally measured at 16 ounces or less. Furthermore, the panel's examination of CE 139 disclosed that, as in most military weapons, it has a two-stage trigger that requires some movement of the trigger before the sear mechanism is engaged, allowing the weapon to fire.

(154) It is the opinion of the panel that the CE 139 does not have a hair trigger that would affect accurate aiming and firing.

Would the dent on the mouth of CE 543, one of the three expended cartridge cases found on the sixth floor of the Texas School Book Depository, prevent the bullet from being fired in the CE 139 Mannlicher-Carcano rifle, or any other rifle? Can it be determined whether these cartridge cases had been chambered on more than one occasion?

(155) Figure 8B shows a dent on the mouth of the CE 543 cartridge case which Josiah Johnson, a critic of the Warren Commission, said would prevent CE 543 from being fired in any rifle. (79)

(156) It is the opinion of the panel that the dent on the mouth of the CE 543 cartridge case was produced when the cartridge case was ejected from the rifle. This condition was duplicated during test-firing of the CE 139 rifle by the panel. (See fig. 2.) The dent had nothing to do with loading the bullet during the manufacturing process, nor is it the type of deformation expected if the case were stepped on.

(157) There was no evidence in the form of multiple extractor or ejector marks on the cartridge case to indicate that it was chambered in the rifle more than once. This also applies to cartridge cases CE 544 and CE 545.

Does the method of mounting a scope on a rifle affect, or have any influence on whether the rifle can be fired by a left-handed individual?

(158) There is no such thing as a left- or right-handed telescopic sight. The location of a telescopic sight on a rifle is determined not by whether it is to be shot left-handed or right-handed, but rather by such factors as receiver design, cartridge case ejection direction and bolt handle travel pattern. On CE 139, the telescopic sight is mounted on the left side of the receiver because of the vertical bolt handle travel pattern and the split receiver (see fig. 1). Because this rifle has a right-

handed action, a telescopic sight cannot be mounted on the right side of the receiver.

(159) The position of the bolt in a bolt-action rifle, that is, right- or left-handed action, is the factor that influences ease of operation, rather than the placement of the telescopic sight. A left-handed action would be difficult for a right-handed individual to operate, and conversely, a right-handed action would be difficult for a left-handed individual to operate.

The Warren Commission found that the CE 399 stretcher bullet weighed 158.6 grains (80) when recovered and assumed its original weight before firing to have been 160–161 grains. Is it possible that the CE 399 bullet sustained a weight loss of only 1.4 to 2.4 grains during the wounding of President Kennedy and Governor Connally?

(160) Because of manufacturing variations, all bullet weights are approximate, and it is not possible to determine the exact weight loss of a fired bullet without knowing its exact weight prior to firing. Nevertheless, it is possible that the weight loss from friction, pressure and intense heat during the firing process, and the weight loss caused by impact and penetration, would not have exceeded the range of 1.4 to 2.4 grains. The panel was, however, unable to render a definite opinion.

Could a 6.5-millimeter caliber Mannlicher-Carcano rifle be easily mistaken for a 7.65-millimeter caliber German Mauser rifle? What are the obvious differing characteristics, if any?

(161) In the opinion of the panel, a Mannlicher-Carcano rifle could very easily be mistaken for other military rifles of its general type, including the 7.65-millimeter caliber German and other model Mausers.

(162) At one time, bolt-action rifles like the German Mauser, the Argentine Mauser (which is made in Germany) and the Mannlicher-Carcanos were the standard military weapons of most countries. Although manufactured in many different calibers and models, all have the same general characteristics—right-hand action (bolt mechanisms), a full-length wooden stock covering most of the barrel, a sling attachment, bayonet mounting lugs and a generally rough and dull appearance. In the absence of a complete examination, almost any such bolt-action military rifle could be confused with a Mannlicher-Carcano rifle. (See figs. 1, 2, and 25.)

(163) Further, the caliber of a rifle cannot be determined merely by looking at it. For example, the bore of the 7.65-millimeter caliber German Mauser, or other 7.65-millimeter caliber rifles, is only 0.05 inches larger than the 6.5-millimeter caliber Mannlicher-Carcano. Even if a knowledgeable individual identified a particular rifle after a cursory examination, it is unlikely that the caliber could be readily established without further examination.

Was the bullet found in 1974 by Richard Lester near the Texas School Book Depository fired from the CE 139 Mannlicher-Carcano rifle?

(164) The panel found the Lester bullet to be the base portion of a metal-jacketed, softpoint or hollowpoint bullet. It weighs 52.7 grains and is consistent in diameter with 6.5-millimeter caliber bullets. The rifling impressions are four lands and four grooves, right twist.

(165) The panel found that the physical characteristics of this bullet were different from the CE 399 bullet recovered at Parkland Hospital and the CE 567 and CE 569 bullet fragments recovered from the Presidential limousine. When the panel compared the bullet microscopically with the CE 572 FBI test-fired bullets, it noted gross differences among class characteristics. As a result, the panel concluded that this bullet was not fired through the same firearm barrel as the FBI test-fired bullets.

Could the iron sights found on the CE 139 Mannlicher-Carcano rifle be used with a high degree of accuracy and operability, as compared with the telescopic sight?

(166) The iron sights found on CE 139 are the standard, fixed sights placed on the firearm at the time of manufacture at the military arsenal. On CE 139, a block of metal is attached to the area immediately in front of the chamber area. A V-shaped notch in this piece of metal acts as the rear sighting alignment device. The sighting is made by lining up the front sight in the notch of the rear sight. A fixed sight cannot be adjusted for windage or elevation.

(167) The 4X scope mounted on this particular weapon is designed so that the cross hairs move from the center position when adjusting for windage or elevation. Hence the shooter is not always looking dead center through the scope.

(168) It is the opinion of this panel that an individual could attain better accuracy using the iron sights than the scope under the circumstances involved in Dealey Plaza.

Do rifles using smokeless powder emit smoke discernible to the eye when fired?

(169) When a cartridge is fired, the propellant is not completely consumed or burned. Due to this, residue and smoke are emitted. During the test firing of CE 139 by the members of the panel, in October, some smoke was observed coming from the muzzle of the weapon.

TIPPIT MURDER

Evidence examined

(170) CE 143—One .38 special caliber Smith and Wesson revolver, Victory model, serial No. V510210, seized from Oswald when he was apprehended in the Texas theater. (See figs. 26A and 26B.)* The barrel is rifled with five lands and five grooves, right twist. The cylinder has a six-cartridge capacity.

(172) The CE 143 revolver had been altered to accept .38 special caliber ammunition and presumably to allow easier concealment, as follows:

1. The barrel had been shortened from the muzzle end to its present length of $2\frac{1}{4}$ inches.
2. The muzzle end had been recrowned.
3. The cylinder had been rechambered from .38 S. & W. caliber to accommodate .38 special caliber cartridges.
4. The front sight had been reset.

*The panel found the revolver to be in good operating condition. It can be fired single action or double action. The trigger pull was measured at about $3\frac{1}{2}$ pounds single action and $10\frac{1}{4}$ pounds double action.

5. The "U.S. Property" markings located on the left side of the top strap had been partially obliterated.
 6. The lanyard swivel and ring had been removed and the hole filled with metal.
- (173) CE 143 was test-fired four times by the panel into a horizontal water recovery tank, using two Western Cartridge Co. .38 special caliber cartridges with 158-grain, copper-coated (Lubaloy), lead, round-nose bullets, and two Remington-Peters .38 special caliber cartridges with 158-grain, plain lead, round-nose bullets.
- (174) CE 518—Four cartridges found in the CE 143 revolver. Two cartridges, designated Q78 and Q79 by the FBI, are Western Cartridge Co. .38 special caliber cartridges with copper-coated (Lubaloy), lead, round-nose bullets. The other two, designated Q80 and Q81 by the FBI, are Remington-Peters .38 special caliber cartridges with plain lead, round-nose bullets.* (See fig. 27.)
- (175) CE 587—One Western Cartridge Co. .38 S. & W. caliber cartridge with a copper-coated (Lubaloy), lead, roundnose bullet, acquired by the FBI and used as a standard. (See hearings before the Warren Commission, vol. 17, p. 264.)
- (176) CE 588—One Western Cartridge Co. unfired .38 S. & W. caliber cartridge case and one unfired .38 caliber copper-coated (Lubaloy), lead, round-nose bullet, weighing 145.1 grains and measuring 0.635 inch long, acquired by the FBI. Both were used as standards. (See hearings before the Warren Commission, vol. 17, p. 264.)
- (178) CE 589—Assembled and disassembled cartridges—one Remington-Peters .38 S. & W. caliber cartridge with a plain lead, round-nose bullet measuring 1.20 inches long overall; one Remington-Peters unfired .38 S. & W. caliber cartridge case measuring 0.763 inch long and one unfired .38 S. & W. caliber plain lead, round-nose bullet measuring 0.661 inch long. The FBI used these as standards. (See hearings before the Warren Commission, vol. 17, p. 264.)
- (179) CE 590—Assembled and disassembled cartridges—one Western Cartridge Co. .38 special caliber cartridge with a copper-coated (Lubaloy), lead, round-nose bullet measuring 1.530 inches long; one unfired Western Cartridge Co. .38 special caliber cartridge case measuring 1.150 inches long; and one .38 special caliber copper-coated (Lubaloy), lead, round-nose bullet measuring 0.730 inch long. The cartridges and components in this exhibit were used by the FBI as standards. (See hearings before the Warren Commission, vol. 17, p. 264.)
- (180) CE 591—Assembled and disassembled cartridges—one Remington-Peters .38 special caliber cartridge with a plain lead, round-nose bullet measuring 1.550 inches long overall; one unfired Remington-Peters .38 special caliber cartridge case measuring 1.150 inches long; and one .38 caliber plain lead, round-nose bullet measuring 0.730 inch long. The FBI used these as standards. (See hearings before the Warren Commission, vol. 17, p. 264.)
- (181) CE 592—Five Western Cartridge Co. .38 special caliber cartridges with copper-coated (Lubaloy), lead, round-nose bullets, found

*The panel's visual and microscopic examinations revealed no markings that could be attributed to any attempt to discharge them in a firearm.

in Oswald's trouser pocket, designated Q82 through Q86 by the FBI.* (See fig. 28.)

(183) *CE 594*.—Four expended cartridge cases retrieved from the scene of the Tippit murder, designated Q74 through Q77 by the FBI. Q75 and Q76 are .38 special caliber of Western Cartridge Co. manufacture; Q74 and Q77 are .38 special caliber of Remington-Peters manufacture. (See fig. 29.)

(184) *CE 595*.—Two cartridge cases test-fired by the FBI in the CE 143 revolver—one Winchester Repeating Arms .38 special caliber designated K3 by the FBI** and one Western Cartridge Co. .38 special caliber, designated K3 by the FBI. (See fig. 30.)

(185) *CE 602*.—One .38 special caliber copper-coated (Lubaloy), lead, round-nose bullet, and one damaged, brass-colored button with the lettering "city of Dallas." The bullet and button were removed from the body of Officer Tippit. The bullet is consistent with Western Cartridge Co. manufacture. The class characteristics are five lands and five grooves, right twist. The weight is 155.4 grains. (See fig. 31.)

(186) *CE 603*.—One .38 special caliber copper-coated (Lubaloy), lead, round-nose bullet removed from the body of Officer Tippit. The bullet is consistent with Western Cartridge Co. manufacture. The class characteristics are five lands and five grooves, right twist. The weight is 155.1 grains. (See fig. 32.)

(187) *CE 604*.—One .38 special caliber lead, round-nose bullet removed from the body of Officer Tippit. The bullet is consistent with Remington-Peters manufacture. The class characteristics are five lands and five grooves, right twist. The weight is 154.7 grains. (See fig. 33.)

(188) *CE 605*.—One .38 special caliber copper-coated (Lubaloy), lead, round-nose bullet removed from the body of Officer Tippit. The bullet is consistent with Western Cartridge Co. manufacture. The class characteristics are five lands and five grooves, right twist. The weight is 152.8 grains. (See fig. 34.)

(189) *CE 606*.—Two bullets test-fired by the FBI in the CE 143 revolver, as follows: One .38 special caliber lead, round-nose bullet consistent with Winchester Repeating Arms manufacture; and one .38 special caliber copper-coated (Lubaloy), lead, round-nose bullet consistent with Western Cartridge Co. manufacture. (See hearings before the Warren Commission, vol. 17, p. 271.)

(191) *Panel Tippit T-1—T-4*.—T-1 and T-2: .38 special caliber cartridges of Remington Cartridge Co. manufacture, with lead bullets (see figs. 35A, 35B, and 35E); T-3 and T-4: .38 special caliber cartridges of Western Cartridge Co. manufacture with copper-coated (Lubaloy), lead, round-nose bullets (see figs. 35C, 35D, and 35E).

(192) All cartridges were test fired by the panel into a horizontal water-recovery tank.

Findings and Conclusions

What are the dimensional differences of a .38 S. & W. caliber cartridge and a .38 special caliber cartridge? Can a .38 special caliber

*The panel's visual and microscopic examination revealed no markings which could be attributed to any attempt to discharge them in a firearm.

**The panel found a split in the side of the Winchester Repeating Arms cartridge case. (See fig. 30.)

cartridge be inserted in a weapon chambered for a .38 S. & W. caliber cartridge? Would this cause the side of the cartridge case to split, as happened with the CE 595 cartridge case test fired by the FBI in Oswald's revolver?

(193) A .38 S. & W. caliber cartridge and the .38 special caliber cartridge differ in the diameter of the neck, head and rim, and in length. The standard dimensions are: (81)

[In inches]

	.38 S & W	Average	.38 special	Average
Diameter neck.....	0. 375-0. 386	0. 380	0. 372-0. 378	0. 375
Diameter head.....	. 379-. 386	. 381	. 372-. 379	. 376
Diameter rim.....	. 424-. 441	. 433	. 424-. 444	. 434
Length.....	. 725-. 794	. 760	1. 120-1. 168	1. 144

(194) The .38 S&W caliber cartridge is approximately 0.005 inch larger in neck and head diameters, 0.001 inch smaller in rim diameter, and 0.384 inch shorter in case length. (82)

(195) Overall length of the .38 S&W caliber cartridge is approximately 1.20 inches. Overall length of the .38 special caliber cartridge is approximately 1.55 inches. (83)

(196) A revolver designed and manufactured to accept a .38 S&W caliber cartridge cannot fire a .38 special caliber cartridge without modification. One common method of modification is rechambering the cylinder.

(197) The panel noted that one of the FBI test-fired cartridge cases was split on the side. The panel attributed this split to one or more of the following factors: (1) The oversized chamber on the CE 143 revolver; (2) a weak cartridge case sidewall; or (3) excessive chamber pressures. During the panel's test firing of the CE 143 revolver, one test cartridge case split in a similar manner, which it attributed to the same possible causes.

Were the four cartridge cases (CE 594) recovered from the scene of the Tippit murder fired in the CE 143 revolver recovered from Oswald when apprehended?

(198) The panel microscopically compared the four CE 594 cartridge cases with the two CE 606 cartridge cases test-fired by the FBI and the four cartridge cases test fired by the panel in the CE 143 revolver. The panel found correspondence among the individual identifying characteristics produced by the firing pin and breech face. The panel concluded the four CE 494 cartridge cases were fired in the CE 143 revolver. (See figs. 36 A, B, C, and D and 36E.)

Were the four bullets recovered from officer Tippit's body (CE 602 through CE 605) fired from the CE 143 revolver recovered from Oswald when apprehended?

(199) The panel conducted microscopical examinations and comparisons of the four bullets recovered from Tippit's body (CE 602 through CE 605), the two bullets test fired by the FBI (CE 606), and the four

bullets (Tippit T-1 through T-4) test fired by the panel in the CE 143 revolver.

(200) The panel found correspondence among the class characteristics on all the fired bullets. Nevertheless, no significant correspondence was found among the individual identifying characteristics of CE 602 through CE 605 and the test-fired bullets. Conversely, no gross differences were found. The finding was inconclusive because of the extensive damage to the bullets recovered from Tippit's body. The panel attributed this to the effects of impact, penetration and wiping. Portions of the bearing surfaces of the CE 602 through CE 605 bullets also showed indications of gas erosion, which is caused by the hot gases produced by the burning of the propellant powder. The panel attributed this to the firing of either undersized bullets through the CE 143 barrel or the barrel of the revolver having become oversized due to wear and deterioration.

(201) The panel's two test-fired lead bullets could be identified with each other, as could its two test-fired copper-coated (Lubaloy) lead bullets. The lead and the copper-coated bullets could not, however, be identified with one another. The panel attributed these differences to variations in the composition of bullet surface materials.

(202) Due to the inconsistent markings on the recovered bullets and on all the test-fired bullets, the panel concluded that the CE 602 through CE 605 bullets could not be conclusively identified or eliminated as having been fired from the CE 143 revolver. (See figs. 31, 32, 33, 34, 35A, 35B, 35C, and 35D.)

Of the four expended cartridge cases found at the scene of the Tippit murder, two were of Western Cartridge Co. manufacture, two of Remington-Peters. The autopsy of Tippit, however, revealed three bullets of Western Cartridge Co. manufacture and one of Remington-Peters. Can the panel formulate an opinion about this discrepancy? Is it possible to determine which bullet came from each particular cartridge case?

(203) The two expended .38 special caliber cartridge cases (CE 574—Q75 and Q76) of Western Cartridge Co. manufacture and three of the recovered .38 special caliber copper-coated (Lubaloy) lead bullets (CE 602, CE 603, and CE 605) are components of Western Cartridge Co. ammunition. The two expended Remington-Peters cartridge cases (CE 594—Q74 and Q77) and the recovered .38 special caliber lead bullet (CE 604) are components of Remington-Peters Co. ammunition.

(204) The panel concluded that they were all components of factory-loaded ammunition. Visual and microscopical examination of the recovered cartridge cases revealed no evidence of reloading. It is logically assumed that cases and bullets of the same manufacture could have originated from the recovered cartridge cases and bullets, but the panel can render no opinion beyond this. There is no known scientific procedure that can conclusively relate a fired bullet to an expended cartridge case.

(205) The panel offers two possible explanations for the discrepancy :

1. One Western cartridge case was not recovered or is missing, and one Remington-Peters lead bullet missed Officer Tippit and also was not recovered.
2. One Western cartridge case was not recovered or is missing, and one fired Remington-Peters cartridge case was in the revolver prior to the Tippit shooting.

(206) Inasmuch as the panel's examinations were related to physical evidence only, a hypothesis to account for the discrepancy regarding the recovered cartridge cases and bullets is speculation. (See figs. 24, 31, 32, 33, and 34.)

OSWALD MURDER

Evidence examined

(207) *Jack Ruby Revolver.*—A .38 special caliber Colt Cobra revolver, serial No. 2744-LW, recovered from Jack Ruby at the time of his arrest in the Dallas Police Department basement on November 24, 1963. (See figs. 37A and 37B.)*

(209) *Panel Ruby T-1 through T-6:*

—*Ruby T-1 and T-2*—Two .38 special caliber cartridges of Remington-Peters manufacture, with 158-grain, plain lead, round-nose bullets, test-fired in the Ruby revolver into a horizontal water recovery tank. (See fig. 38A.)

—*Ruby T-3 and T-4*—Two .38 special caliber cartridges of Western Cartridge Co. manufacture, with 158-grain, copper-coated (Lubaloy), lead, round-nose bullets, test-fired in the Ruby revolver into a horizontal water recovery tank. (See fig. 38B.)

—*Ruby T-5 and T-6*—Two .38 special caliber cartridges of Remington Arms Co. manufacture, with 130-grain, full metal-jacketed, round-nose bullets, test-fired in the Ruby revolver into a horizontal water recovery tank. (See fig. 38C.)

Findings and conclusions

Are there any characteristics which are easily identifiable on Jack Ruby's revolver? Does it have a "hair trigger"?

(210) There was nothing out of the ordinary about Jack Ruby's revolver except that it had a hammer shroud, which is an attachment that covers most of the hammer of a weapon. The purpose of a shroud is to prevent the hammer from snagging on clothing. It was impossible to determine if the shroud was installed at the factory.

(211) The trigger pull was found to be slightly above the maximum weight specified by the factory; the revolver, therefore, cannot be said to have a "hair trigger."

What can the panel determine from an examination of the Ruby evidence?

(212) The panel members conducted a microscopical examination and comparison of the cartridge case and bullet components of two of its test-fired cartridges (Panel Ruby T-5 and T-6). Based on the correspondence among the individual identifying characteristics produced by the breech face and firing pin, the panel concluded that the cartridge cases could be identified with each other. Regarding the bullet components, they could also be identified with each other, based on the correspondence of individual identifying characteristics.

*The panel physically examined the revolver and found it to be in good operating condition. It can be fired single action or double action. The trigger pull was measured at approximately 5 pounds single action and 10½ pounds double action, slightly above the maximum weight specified by the factory. The barrel is rifled with six lands and six grooves, left twist. The cylinder has a six-cartridge capacity.

(213) Photomicrograph and microscopical comparisons of the panel's test-fired cartridge cases and bullets with those connected with Oswald's murder were not conducted. As noted earlier, the bullets that killed Oswald and the expended cartridge case recovered from the Ruby revolver were not located by the committee. This evidence was presented at Jack Ruby's trial, but its ultimate disposition was unknown. The panel recommended that an appropriate examination be conducted on this evidence if and when it is located.

SUMMARY AND CONCLUSIONS

(214) The CE 139 Mannlicher-Carcano military rifle was found by the panel to be operable. It was in generally poor condition because of a lack of proper cleaning, maintenance or lubrication. Although the trigger pull was found to be light, the panel concluded it was not a "hair trigger." The mounting of the telescopic sight on the left side of the rifle was done as a matter of necessity because the bolt action is on the right side.

(215) As to the misidentification of the rifle as a German Mauser, many bolt-action military rifles are so similar in profile that misidentification may occur.

(216) After examining the CE 141 cartridge found in the chamber of the CE 139 rifle, the panel concluded that it had in fact been worked through the action of that rifle from the magazine.

(217) The three expended cartridge cases found on the sixth floor of the depository building were compared microscopically by the panel with the FBI test-fired cartridge cases and those test-fired by the panel in the CE 139 rifle. Based on a correspondence of individual identifying characteristics produced by the firing pin and bolt face, the panel concluded that all three were fired in the CE 139 rifle.

(218) In the opinion of the panel, the dent on the mouth of the CE 543 case (one of three found on the sixth floor) was made by the CE 139 rifle during ejection. The panel duplicated the dent when it test-fired the rifle.

(219) The panel found no evidence of multiple extractor or ejector marks on the cartridge cases which would indicate that they had been chambered on more than one occasion.

(220) The panel compared microscopically the CE 399 stretcher bullet with the two bullets test-fired by the FBI (CE 572) in the CE 139 rifle. Based on a correspondence of individual identifying characteristics, the panel concluded that CE 399 was fired from the same barrel as the FBI test-fired bullets.

(221) The panel then compared microscopically the bullets it test-fired in the CE 139 rifle with the FBI test-fired bullets and with the CE 399 stretcher bullet. The panel was unable to identify its test-fired bullets with those of the FBI or with the CE 399 bullet, nor could the panel's test-fired bullets be identified with each other. The panel attributed the results to one or more of the following factors:

1. Repeated test-firing of the CE 139 rifle, which had caused extensive changes in the rifling characteristics within the barrel, or
2. Deterioration of rifling surfaces within the barrel of the CE 139 rifle over an extended period of time because of a lack of proper cleaning, maintenance, and protective lubrication.

(222) The panel compared the CE 567 bullet fragment (nose portion) and the CE 569 bullet fragment (base portion), both found in the limousine, with the two FBI test-fired bullets (CE 572). Based on a correspondence of their individual identifying characteristics, the panel concluded that CE 567, CE 569, and the two FBI test-fired bullets were all fired through the same barrel. Again, the panel was unable to identify these bullets and fragments with its own test-fired bullets. The panel was unable to determine if CE 567 and CE 569 originated from the same bullet.

(223) The CE 573 Walker bullet was compared microscopically with the FBI test-fired bullets. A correspondence of class characteristics was found, but a correspondence of individual identifying characteristics was not found. Conversely, no gross differences were noted. The panel concluded that the Walker bullet was too damaged to allow conclusive identification of the bullet with a particular firearm.

(224) Because of their minute size, microscopic examinations were not performed on the following: CE 840—lead-like fragments found in the limousine; CE 841—lead residue removed from the limousine's windshield; CE 842—four lead-like fragments removed from Governor Connally's wrist; and CE 843—three lead-like fragments removed from President Kennedy's brain during his autopsy at Bethesda Naval Hospital.

(225) The panel concluded from its examination of the bullet fragment found near the depository building by Richard Lester in 1974 that it was not fired through the same barrel as the FBI test-fired bullets and that its physical characteristics were different from the CE 399 stretcher bullet and the CE 567 and CE 569 bullet fragments found in the Presidential limousine.

(226) The panel found the CE 143 Oswald revolver to be in good operating condition. The trigger pull was not considered exceptionally light and could not be considered a "hair trigger." The revolver had been altered; changes included the shortening of the barrel and the modification of the chamber to accommodate .38 special caliber cartridges.

(227) The panel compared microscopically the four expended cartridge cases found at the scene of the Tippit murder (CE 594) with the cartridge cases test-fired by the FBI and by the panel in the CE 143 revolver. Based on the correspondence of individual identifying characteristics produced by the breech face and firing pin, the panel concluded that all four cartridge cases were fired in the CE 143 revolver. The panel also examined the five cartridges found in Oswald's pocket after his arrests (CE 592). No marks were found that could be attributed to an attempt to discharge them in a firearm.

(228) The panel noted that one of the FBI test-fired cartridge cases was split on the side. The panel attributed this split to either an oversized chamber, a weak cartridge case sidewall, excessive chamber pressure, or some combination of these factors. One of the panel's test-fired cartridge cases split in a similar manner during the test-firing of the CE 143 revolver.

(229) The panel examined the four bullets removed from the body of Officer Tippit during his autopsy. All four had sustained considerable damage from impact, penetration, and wiping. CE 604 was found

to be consistent with Remington-Peters manufacture, while CE 602, 603, and 605 were found to be consistent with Western Cartridge Co. manufacture. A correspondence was found among the number of lands and grooves and direction of twist of all four bullets, but no significant correspondence among individual identifying characteristics was found when the Tippit bullets were compared with bullets test-fired by the FBI or the panel in the CE 143 revolver. Consequently, the panel was unable to conclude that the Tippit bullets were fired from the CE 143 revolver. Conversely, the panel was unable to eliminate the bullets as having been fired from the CE 143 revolver.

(230) The Tippit bullets, the FBI, and the panel test-fired bullets all showed variations in their individual identifying characteristics, which commonly result from firing under-sized bullets in a barrel or the firing of normal-sized bullets in a firearm that has become oversized due to wear and deterioration.

(231) The panel took note of a discrepancy between the brand of the bullets removed from Tippit's body and the brand of the cartridge cases found at the Tippit murder scene. Three of the recovered bullets were of Western Cartridge Co. manufacture, the fourth of Remington-Peters manufacture. Of the four recovered cartridge cases, however, two were of Western Cartridge Co. manufacture and two were of Remington-Peters manufacture. The panel gave two possible explanations. First, one Western cartridge case was not recovered and one Remington-Peters bullet missed Officer Tippit and also was not recovered. Second, one Western cartridge case was not recovered, and one Remington-Peters cartridge case was in the revolver prior to the Tippit shooting. The panel noted that its function was to examine the physical evidence as presented by the select committee. Hypotheses about the discrepancies in the physical evidence were beyond its scope of responsibility.

(232) The Jack Ruby revolver, which was seized from him at the time of his apprehension in the basement of the Dallas Police Department, was examined by the panel and found to be in good operating condition. The trigger pull was measured and found to be in the normal range; the revolver did not have a "hair trigger."

(233) The barrel of the Ruby revolver is rifled with six lands and six grooves, left twist. The only thing out of the ordinary is that the revolver has a hammer shroud, which protects against snagging on clothing. There was no way to determine if the shroud was put on the revolver at the factory.

(234) The panel could not conduct a microscopical examination of the fatal bullet or the cartridge case from which it originated because the evidence has not been located. The panel suggested that such an examination be conducted when and if the evidence is found.

Recommendations of the firearms panel

(235) The panel found that the firearms evidence had not been maintained in proper condition. It strongly recommended that the firearms evidence—cartridges, cartridge cases, bullets and fragments—be permanently sealed. More specifically:

1. All foreign material should be removed from the exhibit with a mild solution of saline or hemozol.

2. After cleaning, they should be handled with cotton gloves to prevent oxidation from body fluids.
 3. They should then be sealed in airtight plastic containers.
- (236) With respect to the rifle and revolver, the panel recommended that:
1. The foam rubber packing material in their storage cases should be removed and replaced with nonmoisture absorbing partitions.
 2. The storage cases should have small ventilation holes drilled in them to prevent condensation.
 3. The rifle and revolver should be cleaned and lightly oiled or protected with a silicone compound. All future handling should be done with clean cotton gloves.
- (237) The cleaning and sealing of the evidence could appropriately be done by the firearms panel.

ILLUSTRATIONS

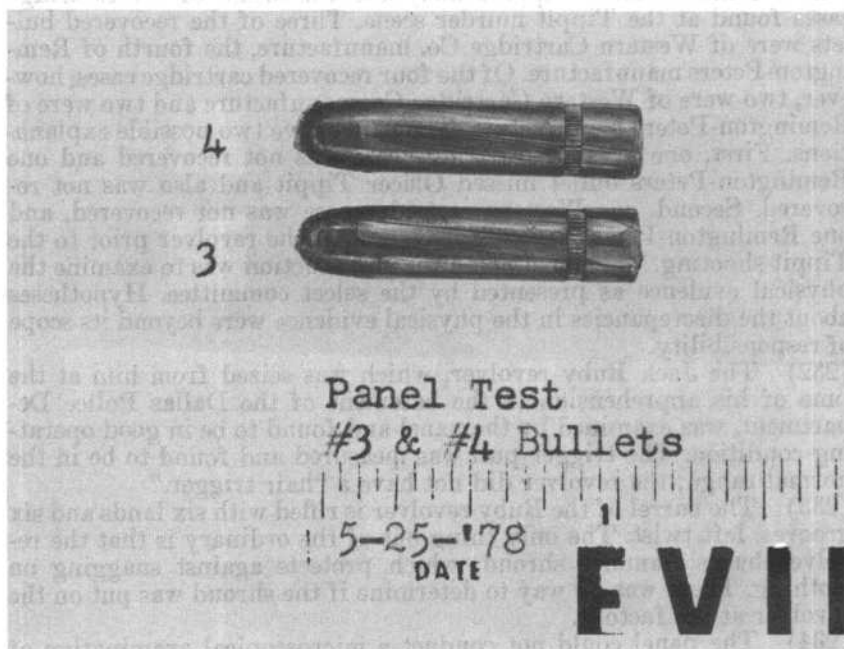


FIGURE 1.—Panel test-fired bullets from the CE 139 rifle.