INTRODUCTION*

(1) From the outset, the Kennedy assassination task force of the Select Committee on Assassinations believed that a complete scientific examination of all firearms evidence** was essential to its investigation. The committee wanted to address the many questions that had arisen over the last 15 years about the firearms and firearms identification in the cases of President Kennedy, Dallas Police Officer J. D. Tippit, and Lee Harvey Oswald. The primary concern was to conduct a thorough examination of all the evidence, though some items, such as Jack Ruby's revolver, were less relevant. The committee chose this approach in part to see if any new investigative leads would develop.

Background

(2) Within an hour after President Kennedy was shot at approximately 1:12 p.m. central standard time (CST) (*1*) on November 22, 1963, Deputy Sheriff Luke Mooney discovered three expended cartridge cases on the floor near a window at the southeast corner of the sixth floor of the Texas School Book Depository.(*2*) The cartridge cases were turned over to the FBI on November 23, 1963.(*3*)

(3) At 1:22 p.m.,(*4*) Deputy Sheriff Eugene Boone and Deputy Constable Seymour Weitzman discovered a bolt-action rifle equipped with a telescopic sight, also on the floor of the sixth floor of the book depository, but near the northwest corner.(*5*) Neither handled the rifle, but at the time Weitzman described it as a 7.65-millimeter caliber German Mauser.(*6*) (It was subsequently determined to be a 6.5-millimeter caliber Mannlicher-Carcano Italian military rifle.(*7*)) It was removed from the depository by Lieutenant Day and remained in his possession until it was released to the FBI at 11:45 p.m., November 22, 1963.(*8*)

(4) When found, the Mannlicher-Carcano contained one unfired 6.5-millimeter caliber copper-jacketed, military-type cartridge, manufactured by the Western Cartridge Co. The cartridge was removed from the rifle by Capt. J. Will Fritz where the rifle was found.(*9*)

(5) Later that day, the rifle's six-round cartridge clip was removed by Lieutenant Day in the Dallas Police Crime Laboratory.(*10*)

(6) While the officers were collecting evidence in the book depository, Officer J. D. Tippit was shot and killed in the Oak Cliff section of Dallas several miles away.(*11*) Four expended .38 special caliber cartridge cases were found at the scene of the murder.(*12*) Two of the recovered cartridge cases were manufactured by the Western Cartridge Co., the other two by Remington-Peters.(*13*) All four were delivered to the FBI laboratory on November 30, 1963.(*14*) Four .38

*Materials submitted for this report by the firearms panel were compiled by HSCA staff members Jim Conzelman and Whitney Watriss.

**A glossary of technical terms can be found at the end of this report.

special caliber bullets were later removed from Tippit's body during his autopsy. They were given to the FBI laboratory on March 16, 1964.(*15*)

(7) Lee Harvey Oswald was arrested as a suspect in the Tippit shooting shortly before 2 p.m.,(*16*) November 22. Apprehended after a scuffle in the Texas theater, he was carrying a Smith and Wesson revolver modified to fire .38 special caliber ammunition.(*17*) Four cartridges were found in the cylinder of the revolver and turned over to the FBI laboratory by the Dallas police on November 30, 1963.(*18*) Two cartridges were found to be of Western Cartridge Co. manufacture, two of Remington-Peters.(*19*) Five Western .38 special caliber cartridges were found in Oswald's trouser pocket and also were given to the FBI laboratory by the Dallas police on November 30, 1963.(*20*)

(8) At approximately 1:55 p.m.(*21*) on November 22, a virtually intact bullet was found on a stretcher in the emergency area of Parkland Memorial Hospital by Nathan Burgess Pool, an employee of Otis Elevator Co., and D. C. Tomlinson, power plant engineer of Parkland Hospital.(*22*) Tomlinson handed the bullet to a Secret Service agent standing by the door to the emergency entrance.(*23*) The bullet was delivered to the FBI laboratory in Washington, D.C., that same day.(*24*) The Warren Commission eventually designated this bullet Commission exhibit 399 (CE 399), and concluded that it had caused all of Governor Connally's wounds after passing through the President's neck.(*25*)

(9) Other items of evidence were later recovered. Four lead-like fragments were removed from Governor Connally's wrist (*26*) and delivered to the FBI laboratory on November 23, 1963.(*27*) During the President's autopsy at Bethesda Naval Hospital, three fragments were removed from his brain; (*28*) they were subsequently delivered to the FBI laboratory on November 23, 1963.(*29*) Four more fragments were recovered from the Presidential limousine: the nose portion of a metal-jacketed bullet, found on the right side of the front seat by the Secret Service; (*30*) the base portion of a metal-jacketed bullet, found on the floor next to the right front seat by the Secret Service; (*31*) two lead-like fragments found on the rug underneath the left jump seat by the FBI; (*32*) and lead residue taken from the inside of the windshield by the FBI.(*33*) This evidence was turned over to the FBI laboratory for analysis on November 22, 1963.(*34*)

(10) In addition to these other items, the Warren Commission obtained the bullet recovered by the Dallas police after an attempted assault on General Walker in Dallas on April 10, 1963.(*35*) It was delivered to the FBI laboratory on December 4, 1963, for analysis.(*36*) Although the Commission concluded that Oswald fired the bullet, the FBI laboratory could not conclusively identify it with the Mannlicher-Carcano rifle.

(11) An item of evidence that the Warren Commission did not consider was the .38 special caliber Colt Cobra revolver recovered from Jack Ruby at the time of his apprehension in the basement of the Dallas Police Department by Detective L. C. Graves.(*37*) The revolver had never been sent to the FBI laboratory, but had remained in the possession of Dallas District Attorney Henry Wade, pending

Jack Ruby's trial. (*38*) At the conclusion of the trial, the revolver was given to the administrator of Jack Ruby's estate, Jules Mayer, (*39*) from whom the select committee obtained it.

(12) The whereabouts of the expended cartridge case found in the Ruby revolver and the bullet removed from Lee Harvey Oswald at his autopsy are unknown. According to William Alexander, assistant district attorney for the city of Dallas, the cartridge case and bullet were presented as evidence at Jack Ruby's trial; their disposition by the court is unknown. (*40*) The committee contacted the Dallas Police Department and Jules Mayer to locate them, but to no avail.

(13) The Warren Commission relied on FBI facilities for the firearms identification. (*41*) It concluded from the FBI tests that the stretcher bullet and the larger fragments of the base and nose of the bullet found in the limousine had been fired from the Mannlicher-Carcano rifle recovered from the Texas School Book Depository. (*42*) The remaining fragments removed from the limousine, Governor Connally's arm and President Kennedy's brain were too minute for any type of microscopical examination. Spectrographic and neutron activation analysis were conducted on all fragments, allowing their elemental composition to be compared. Although they were found to be of similar metallic composition, (*43*) the FBI laboratory was unable to determine whether the nose and base fragments originated from the same or different bullets. (*44*) The firearms examination also revealed that the three expended cartridge cases found in the book depository had been fired in the Mannlicher-Carcano rifle. (*45*)

(14) Regarding the bullet fired at General Walker, the FBI was unable to identify it with the rifle found on the sixth floor of the depository due to its mutilated condition, (*46*) although it had the same physical characteristics as the bullet of the cartridge found in the chamber of the Mannlicher-Carcano rifle and other Mannlicher-Carcano ammunition. (*47*)

(15) Regarding the evidence from the Tippit shooting, the bullets removed from the officer's body could not be positively identified with Oswald's revolver. (*48*) The FBI firearm experts found that the characteristics engraved on the bullets fired by the revolver were erratic. (*49*) The FBI experts were unable to identify a correspondence among their own test-fired bullets, even though they were documented as being fired from the same revolver. (*50*) The cartridge cases found near Tippit's body were, however, identified as having been fired in Oswald's revolver. (*51*)

(16) All exhibits, with the exception of the items relating to the Oswald shooting death, were given to the National Archives, from which the select committee obtained them.

(17) Two additional items, unavailable to the Warren Commission, were considered by the committee as possibly relevant to its inquiry. The first was a bullet fragment found in 1974 near the triple overpass in Dealey Plaza by Richard Lester. (*52*) Lester turned it over to the FBI on December 1, 1976, requesting that an analysis be conducted to determine if it might be connected with the assassination. (*53*) The FBI laboratory obtained from the National Archives the bullets test-fired in the Mannlicher-Carcano rifle in 1963, and on July 28, 1977,

examined the bullet fragment and compared it to the Mannlicher-Carcano test-fired bullets.(*54*) The laboratory determined that both the Lester bullet and the test-fired bullets were 6.5 millimeter caliber, but the Lester bullet was found to be a jacketed, softpoint or jacketed, hollow-point sporting bullet, whereas the Mannlicher-Carcano bullet was to be a full metal-jacketed, military-type. Although the rifling impressions were similar, four lands and grooves, right twist, the widths of the land and groove impressions were found to vary by about 0.01 inch. The individual identifying characteristics were found to be different. Thus, the laboratory concluded that there was no indication the Lester bullet had been fired from the Mannlicher-Carcano rifle.(*55*) The laboratory returned the test-fired bullets to the Archives(*56*) and the fragment to Lester at the completion of its examination.(*57*) The select committee obtained the bullet from Lester on November 10, 1977.(*58*)

(18) The second item of evidence was a bullet fragment found in 1967 by Rich Haythorne, who was working as a roofer on top of the Massey Roofing Co. building in the 1200 block of Elm Street, about eight blocks from the Texas School Book Depository(*59*) (the building is no longer there). It had remained in the possession of Haythorne's attorney, Bill Mason, until he sent it to the committee on April 20, 1977.(*60*)

(19) Critics of the Warren Commission have used the firearms evidence to cast doubt on its conclusions. Illustrative of the issues that have been raised are the following:

(20) Edward J. Epstein, in "Inquest", contends that more bullet fragments were found in Governor Connally's body than could have been left by the CE–399 bullet that the Commission concluded caused all his wounds.(*61*)

(21) Mark Lane, in "Rush to Judgment," and others claim that the CE–399 bullet could not have remained virtually intact after causing the Governor's many severe wounds.(*62*)

(22) In "They've Killed the President," Robert Sam Anson contends that the telescopic sight on the Mannlicher-Carcano rifle was mounted for a left-handed person.(*63*) Since Oswald is right-handed, it is doubtful that he could have fired the shots in the requisite amount of time. (*64*)

(23) Sylvia Meagher, in "Accessories After the Fact," questioned Oswald's ability to fire the Mannlicher-Carcano accurately because of the rifle's "hair trigger."(*65*) She cited the testimony before the Warren Commission of Ronald Simmons of the Ballistics Research Laboratory, Department of the Army, that it was difficult for experts when test-firing the rifle to become accustomed to the drag in the trigger.(*66*)

(24) Josiah Thompson, in "Six Seconds in Dallas," questioned whether the cartridge cases recovered on the sixth floor of the depository were in fact fired in the Mannlicher-Carcano.(*67*) He alleged that two of the cartridge cases had markings indicating that they had been loaded into a weapon at least twice—and not necessarily into the Mannlicher-Carcano. He further claimed that the third cartridge case was dented such that it could never have been fired in any rifle.(*68*)

(25) Finally, some critics, including Mark Lane, were suspicious because of Weitzman's initial misidentification of the Mannlicher-Carcano rifle as a 7.65-millimeter caliber German Mauser.(*69*)

(26) In light of the criticisms of the Warren Commission's treatment of the firearms evidence, such as those mentioned above, and as part of its obligation to investigate fully the events surrounding President Kennedy's assassination, the select committee decided to convene a panel of experts to reexamine the firearms evidence.

Selection of the Panel

(27) In April 1977, the select committee sought recommendations for membership for the panel from the Association of Firearm and Tool Mark Examiners, the Forensic Science Foundation and the American Academy of Forensic Sciences. Candidates were to be leading firearms experts who had had no prior affiliation with either the King or the Kennedy assassination cases.*

(29) A list of 27 experts was proposed. Five were eliminated initially: three were current or past employees of the FBI; one had authored material on the firearms evidence; and one was unable to undertake the project.

(30) The remaining 22 prospects were asked to submit resumes, with information on past affiliations with the case and opinions about the assassination or the firearms evidence. Eighteen responded, 10 of whom did not want to be considered or did not meet the committee's criteria.

(31) The following five experts were chosen to serve on the panel:

(32) *John S. Bates, Jr.*—Senior firearms examiner in the New York State Police Laboratory at Albany. He has been a lecturer at the New York State Police Academy, New York State Municipal Police Training Council, and various community colleges.

(33) Bates is a member of the Association of Firearm and Tool Mark Examiners, serving as secretary since 1973. In that year, he received the association's Distinguished Member Award. He has written numerous professional articles.

(34) *Donald E. Champagne.*—Firearm and tool mark examiner with the Florida Department of Criminal Law Enforcement in Tallahassee for the past 10 years. He served in the crime detection laboratory of the Royal Canadian Mounted Police in Ottawa, Ontario, for 15 years, and he has lectured extensively at the Canadian Police College and other law enforcement agencies.

(35) Champagne is president and a distinguished member of the Association of Firearm and Tool Mark Examiners. He is a member of the Southern Association of Forensic Scientists and the Canadian Society of Forensic Science.

(36) *Monty C. Lutz.*—Firearm and tool mark analyst with the Wisconsin Regional Crime Laboratory in New Berlin. He has been the chief firearm and tool mark examiner for the U.S. Army.

(37) Lutz is a past president of the Association of Firearm and Tool Mark Examiners. He has been named a distinguished member of the

*The same panel members were also to examine the firearms evidence in the King assassination case.

association. He has lectured at colleges and law enforcement schools across the country and is the author of numerous professional publications. He received a B.S. in criminal justice from the University of Nebraska.

(38) *Andrew M. Newquist.*—Special agent and firearm, tool mark and latent fingerprint examiner for the Iowa Bureau of Criminal Investigation.

(39) Newquist is a distinguished member and past president of the Association of Firearm and Tool Mark Examiners and currently serves on its executive committee. He is a member of the International Association for Identification and a lecturer at the Iowa Department of Public Safety.

(40) The panel conducted its examination at the facilities of the Metropolitan Police Department firearm identification section, Washington, D.C. Assigned as liaison to the panel and working closely with it as technical assistant was George R. Wilson, senior firearms examiner, Metropolitan Police Department, Washington, D.C., a position he has held for 9 years. The laboratory, which he established, was the first in the department's history.

(41) Wilson is second vice president of the Association of Firearm and Tool Mark Examiners. In 1974, he received the association's Distinguished Member Award. During his 25-year tenure with the Metropolitan Police Department, he has been awarded over 30 commendations for outstanding and meritorious performance of duty.

(42) Photographic services were provided by police photographer Gary R. Phillips of the Metropoltian Police Department's photographic services section.

The issues addressed

(43) The panel was asked to address a number of issues concerning three categories of firearms evidence:

(44) —That relating to the shooting of President Kennedy and Governor Connally, which includes the Walker bullet and the bullet found in 1974 by Richard Lester;

(45) —That relating to the shooting of Tippit; and

(46) —The Ruby revolver (the bullet that killed Oswald and the expended cartridge case were not located).

The issues were as follows: In the Kennedy case:

(47) —Was the cartridge reportedly found in the Mannlicher-Carcano rifle in fact loaded into that rifle?

(48) —From which direction was the impact which damaged the windshield of the Presidential limousine?

(49) —Were the three expended cartridge cases found on the sixth floor of the Texas School Book Depository fired in the Mannlicher Carcano rifle?

(50) —Was the bullet found at Parkland Hospital fired from the Mannlicher-Carcano rifle?

(51) —Was the bullet nose portion found on the right side of the front seat of the Presidential limousine fired from the Mannlicher Carcano rifle?

(52) —Was the bullet base portion found on the floor beside the right front seat of the Presidential limousine fired from the Mannlicher-Carcano rifle?

(53) —Were the bullet nose portion and the bullet base portion found in the Presidential limousine components of the same bullet?
(54) —Was the bullet recovered from the residence of General Walker fired from the Mannlicher-Carcano rifle?
(55) —What are the nature and characteristics of the 6.5 millimeter caliber Mannlicher-Carcano rifle and ammunition with respect to power and impact?
(56) —Could the Mannlicher-Carcano rifle have been fired with a high degree of accuracy even though it has been described as having a "hair trigger"?
(57) —Would the dent on the mouth of 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 Mannlicher-Carcano rifle, or any other rifle? Can it be determined whether these cartridge cases had been chambered on more than one occasion?
(58) —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?
(59) —The Warren Commisison found that the stretcher bullet weighed 158.6 grains when recovered and assumed its original weight before firing to have been 160–161 grains. Is it possible that the bullet sustained a weight loss of only 1.4 to 2.4 grains during the wounding of President Kennedy and Governor Connally?
(60) —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?
(61) —Was the bullet found in 1974 by Richard Lester near the Texas School Book Depository fired from the Mannlicher-Carcano rifle?
(62) —Could the iron sights found on the Mannlicher-Carcano rifle be used with a high degree of accuracy and operability, as compared with the telescopic sight?
(63) —Do rifles using smokeless powder emit smoke discernible to the eye when fired?
(64) The issues the committee asked the panel to address in the Tippitt shooting were as follows:
(65) —What are the dimensional differences between a .38 S. & W. caliber cartridge and a .38 special caliber cartridge? Can a .38 special caliber 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 one of the cartridge cases test-fired by the FBI in Oswald's revolver?
(66) —Were the four cartridge cases recovered from the scene of the Tippit murder fired in the revolver recovered from Oswald when apprehended?
(67) —Were the four bullets recovered from Officer Tippit's body fired from the revolver recovered from Oswald when apprehended?
(68) —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 dis

crepancy? Is it possible to determine which bullet came from each particular cartridge case?

(69) The issues the committee asked the panel to address in the Oswald shooting were as follows:

(70) —Are there any characteristics which are easily identifiable of Jack Ruby's revolver? Does it have a "hair trigger"?

(71) —What can the panel determine from an examination of the Ruby evidence?

(72) During the course of its investigation but after the panel had completed its work in Washington, D.C., the committee obtained a bullet which had been found in 1967, by Rich Haythorne on top of the Massey Roofing Co. building in Dallas. The committee asked George R. Wilson, the panel's technical assistant who was with the police department in Washington, D.C., to determine if the Haythorne bullet had been fired from the Mannlicher-Carcano rifle.

(73) Wilson described the bullet as jacketed, soft-point and .30 caliber; its class characteristics were six lands and six grooves, right twist. The bullet weighed 149.3 grains. It was consistent with Remington-Peters ammunition.

(74) Wilson concluded that the physical characteristics of the bullet were different from those of Mannlicher-Carcano ammunition, as well as from the rifling characteristics of the Mannlicher-Carcano rifle. Therefore, the bullet definitely was not Mannlicher-Carcano ammunition and was not fired from the Mannlicher-Carcano rifle.

Procedures and equipment

(75) The panel conducted its examination at the firearm identification section of the Washington, D.C. Metropolitan Police Department. These facilities were conveniently located to the National Archives and the select committee's offices, and they were made available by Police Chief Maurice J. Cullinane and firearms section supervisor George R. Wilson.

(76) The firearms panel met on November 12, 1977, at the National Archives to conduct a cursory examination of the evidence stored there. On January 30, 1968, the panel and its technical assistant met with representatives of the select committee at the Washington, D.C., Metropolitan Police Department firearm identification section. The following procedures were adopted at that time:

(77) —The panel members would jointly conduct visual and microscopical examinations of the evidence in the possession of the select committee and the National Archives. Each examiner would submit an independent worksheet to the select committee on each item of evidence examined.

(78) —The panel would jointly determine the operability of the Mannlicher-Carcano rifle, the Oswald revolver and the Ruby revolver. Each firearm would be test fired to obtain bullets and cartridge cases for comparison purposes.

(79) —A joint firearms panel report would be submitted to the select committee at the completion of all examinations.

(80) The panel was to conduct visual and microscopical examinations, as necessary, on each item of evidence. A summary of general principles follows.

(81) A cartridge, or round of ammunition, consists of a cartridge case, primer, powder and bullet. The primer contains a detonable mixture and fits into the base of the cartridge case, which contains powder. The bullet, constructed of lead or a lead core encased in a stronger metal jacket, fits into the mouth of the cartridge case. A bullet is fired by placing the cartridge in the chamber of a firearm. The cartridge base rests against a solid support, called a breech or bolt face. When the trigger is pulled, the firing pin strikes the primer, igniting the detonable mixture, which in turn ignites the powder in the cartridge case. The combustion propels the bullet through the barrel.

(82) The bore (inside of the barrel) of modern firearms is "rifled" with spiral grooves in it to give bullets fired through it a spinning motion for flight stability. The raised portions between the grooves are called lands. The number, width and direction of twist of the lands and grooves are called the class characteristics of a barrel.

(83) In addition to the class characteristics, the components of every firearm, such as the barrel, firing pin and breech face, bear distinctive microscopic characteristics. While the class characteristics are common to all firearms of a given model and manufacture, an individual firearm's microscopic characteristics differ from all other firearms, regardless of model or manufacture. These distinctive markings, usually referred to as individual identifying characteristics, are produced initially by the manufacturing tools, which change microscopically during operation and vary from one firearm to another. Further individual identifying characteristics are produced as the firearm is used, during its disuse, and as a consequence of maintenance or the lack of it.

(84) When a firearm is discharged, the individual identifying characteristics of its barrel, as well as its class characteristics, are engraved on the bearing surface of the bullet. The individual identifying characteristics of the firing pin and breech or bolt face are impressed on the base or primer of the cartridge case at the time of firing. Using a comparison microscope, an expert can compare the markings with those produced on a similar cartridge test-fired in the same firearm. If the patterns of the microscopic markings are sufficiently similar, it can be concluded that both cartridge cases were fired in the same firearm. Microscopical examination of other firearm components and the markings they produce may also demonstrate such things as whether a cartridge was ever loaded into a particular firearm or was loaded into a firearm more than once. It is also possible, through comparative microscopical examinations, to determine whether two bullets were fired from the same firearm.

(85) In its examinations, the panel used the following equipment:

(86) —Two American Optical forensic comparison microscopes, model K1453, serial Nos. 328 and 277, with fluorescent and incandescent lighting, fiber optics, photographic unit and 10X eyepieces and objectives. One had a combined magnification of 12X, 20X, and 40X, the other 20X, 40X, and 80X.

(87) —American optical low power binocular microscope with a zoom lens of 0.7 to 3 power and 10X eyepiece.

(88) —Mico model 5100 balance with a 1,000-grain capacity.

(89) —Sloccomb "Speedmike" direct readout micrometer.

(90) —Brown and Sharpe stage micrometer for air gap measuring.

(91) —Horizontal water recovery tank.
(92) —Horizontal cotton waste recovery box.
(93) —6.5-millimeter caliber Mannlicher-Carcano cartridges with full metal-jacketed bullets of Western Cartridge Co. manufacture. These were test fired by the panel in CE 139 and designated panel Kennedy T–1—T–4. (See Figs. 1 and 2.)

(94) Additional 6.5-millimeter caliber Mannlicher-Carcano cartridges were used, unfired, for loading and unloading in the rifle to obtain class and individual identifying characteristics produced in that process.

(95) Strict security measures were observed throughout the examinations. Public access to the firearms evidence at the National Archives was denied during this time.(*70*) A member of the Archives staff accompanied the evidence while it was examined at the Archives or removed and examined at the laboratory. The panel's materials—photographs, photomicrographs, test-fired bullets and cartridge cases—were secured in a safe in the firearm identification section at the District of Columbia Metropolitan Police Department.