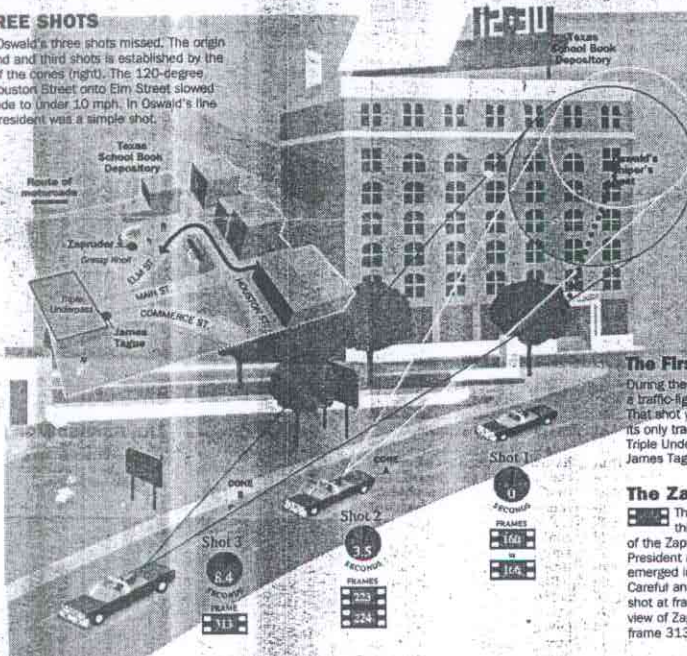


# THE THIRD BULLET

## THE THREE SHOTS

The first of Oswald's three shots missed. The origin of the second and third shots is established by the projection of the cones (right). The 120-degree turn from Houston Street onto Elm Street slowed the motorcade to under 10 mph. In Oswald's line of fire the President was a simple shot.



## The "Cones"

Using computer enhancements of the Zapruder film, Failure Analysis Associates calculated the trajectories of the two bullets that struck their targets. They fixed the position of the limousine and the postures of Kennedy and Connally at the precise moments of impact. Working backward and allowing for a margin of error, a computer then calculated a line through the entry and exit wounds. The trajectory could then be played into a "cone." Cone A shows the origin of the second shot, and Cone B of the third shot.

## The First Shot

During the first shot (dotted line) there were oak trees and a traffic-light support post between Oswald and Elm Street. That shot was almost certainly deflected by a branch, and its only trace was a nick made on a concrete curb near the Triple Underpass. A chip of concrete from that shot cut James Tague on the cheek.

## The Zapruder frames

The moments of impact of Oswald's second and third shots can be established by analyzing frames of the Zapruder film. The second shot (Cone A) hit both the President and Governor Connally just as their limousine emerged into Zapruder's view from behind a freeway sign. Careful analysis points to the impact of Oswald's second shot at frames 223-224. The third shot (Cone B), in full view of Zapruder, hit Kennedy in the back of his head at frame 313.

Lee Harvey Oswald killed JFK on Nov. 22, 1963. He fired three shots. The third bullet killed the President. Case closed. In the following excerpt of Gerald Posner's new book, "Case Closed: Lee Harvey Oswald and the Assassination of JFK," the author debunks conspiracy theories.

**C**ONSPIRACY BUFFS have yearned for 30 years for a witness able to supply conclusive evidence about what happened in Dealey Plaza. We now have that witness, thanks to technological advances.

Computer enhancements of the famous home movies of JFK's motorcade by Abraham Zapruder, as well as scale recreations using computer animation, have settled key issues with a precision unattainable by the Warren Commission in 1964 or the House Select Committee on Assassinations in 1978. They establish:

■ That Lee Harvey Oswald had ample time to fire three shots.

■ That one of the shots — dubbed "the magic bullet" by skeptics — did indeed pass through both John Kennedy and Gov. John Connally.

■ That no second gunman, on the grassy knoll or anywhere else, fired any shots into Kennedy or Connally.

The first issue is timing. In 1964, the FBI's test firing of Oswald's Mannlicher-Carcano rifle determined that a minimum of 2.25 to 2.3 seconds was necessary between shots to operate the bolt and ream. Since the first bullet was already in the rifle's chamber and ready to fire, that meant Oswald had to operate the bolt action twice. According to the commission, the fastest he could have fired all three shots was 4.5 seconds. The select committee, in its 1977 reconstruction tests, reduced the time necessary for three effective shots to 3.3 seconds.

The movie made by Zapruder serves as a time clock for the assassination. By figuring when the first and last



shots took place, it is possible to know how much total time the shooter had. The third shot is the easiest to pinpoint. On the Zapruder film, the President is hit in the head at frame 313. The witnesses were almost unanimous that the head shot was the final one.

Determining the time of the first shot — the start of the assassination clock — is harder. The commission was unsure when it was fired, or if it even hit Kennedy or Connally. Yet, because the commission thought the first shot would be the most accurate, it favored the theory that it was the first bullet that struck Kennedy in the base of the neck.

The critics have consistently interpreted the commission's work to give Oswald as little time as possible to fire all three shots. In most conspiracy books, the commission's position is presented as though the first shot came between frames 210 and 225 (while the President's car is obscured on the film by a highway sign). Under this scenario, the second shot missed and the third was the fatal head wound at frame 313, giving Oswald little time

Continued on NEXT PAGE



FROM PRECEDING PAGE

to fire all three shots, a minimum of 4.8 seconds and a maximum of 5.6 seconds. The commission concluded it was "possible" for Oswald to have done it.

But the assumption that the first shot struck the President is wrong. Earwines' testimony, in combination with the film, indicates that the first shot actually missed — and was fired earlier than frame 166. At least seven witnesses pinpointed it as coming just after the President's car turned from Houston onto Elm.

The commission did not rely on these witnesses in resolving the issue of whether the first shot missed. But new Zapruder enhancements confirm that an early shot missed the President and the governor. At frame 160, a young girl in a red skirt and white top, who was running along the left side of the President's car down Elm Street, began turning to her right. Not 1.5 seconds later, she had stopped and was staring back at the School Book Depository. The girl, 10-year-old Rosemary Willis, asked why she stopped, said "I stopped when I heard the shot... I think I probably turned to look toward the noise."

At the same time that Willis started turning, the enhanced film shows that Kennedy suddenly stopped waving. He looked to the right toward the crowd, and then back to Jacqueline, as if to be reassured that everything was all right.

As the President began waving again, Mrs. Kennedy's head abruptly twisted from left to the general direction of the book depository. Connally's recollections and actions confirm the shot. "We had just made the turn, well, when I heard what I thought was a shot," he told the commission. "I instinctively turned to my right because the sound appeared to come from over my right shoulder."

PROOF IN 'JIGGLE ANALYSIS'

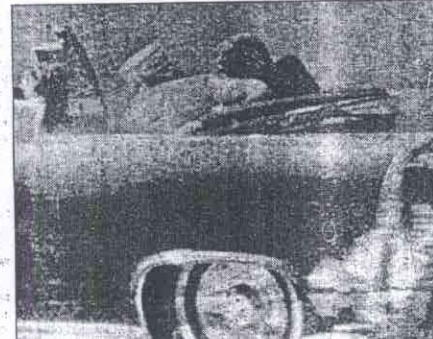
The film reveals that the governor's head turned in less than half a second, beginning at frame 162, when Willis started turning around and the President stopped waving.

"Jiggle analysis" provides additional evidence. Tests have shown that gunshots produce detectable motion on film made with a hand-held camera. The presence of a jiggle could be caused by other factors. While sudden movement of Zapruder's camera may not prove a shot was fired, its absence is good evidence there was no shot.

The House select committee determined that there were four noticeable movements, any of which could be evidence of a shot. The first blur was at frames 158-160, just as Oswald would have had to fire to avoid losing his



TEXAS GOV. John Connally (r.) rides with President John Kennedy and his wife, Jacqueline, during motorcade from airport on Nov. 22, 1963.



JFK slumps into arms of First Lady after being shot by assassin.

target under a tree that would block his view for several key seconds. The largest spastic movement by Zapruder came at frames 313-314, the moment of the head shot.

All told, there is strong evidence that Oswald fired the first shot at frame 160. Since the last shot was at frame 313, that translates to 8.0 to 8.4 seconds total shooting time. That is enough time for even a mediocre shooter to operate the bolt twice and aim for three shots.

TWO FRAGMENTS FOUND

After the assassination, two large bullet fragments were found in the front floorboard of the limousine, and a nearly intact bullet on a Parkland Hospital stretcher. No part of a third bullet was ever found. So how was it possible that Oswald, who put one bullet into Kennedy's neck, and another into his head, missed not only the occupants of the car with his first shot, but even the car itself?

The commission never studied the large oak tree that blocked the sniper's view for almost 2.5 seconds. According to firearms expert Robert Kraus, "if the bullet hit (a) branch head-on, it might have separated the bullet from the jacket" (the bullet lets Oswald fired had lead cores and copper jackets).

Virgie Rachley worked at the book depository and watched the motorcade from

its front steps. Just after the car passed, she heard the first noise: "I saw a shot or something hit the pavement... It looked just like you could see the sparks from it and I just thought it was a firecracker."

She was certain she saw it before she heard a second shot. Five hundred twenty feet from the book depository, in a straight line from the sniper's nest and the tree, James Tague had stopped his car and was standing at the southern end of the triple underpass.

After the assassination, a deputy asked him why he had blood on his face. "I remembered something had stung me during the shooting," he recalls. The two had crossed the street and on the edge of a curb found a bullet mark. A fragment had struck the curb, sending a chip of concrete into Tague's cheek.

What is likely is that after the bullet fragmented against a tree branch, the lead core continued moving in a straight line from the depository and struck the curb more than 500 feet away. The copper jacket hit the pavement, giving Rachley the impression of sparks. Neither fragment was recovered.

If the first shot was near frame 160 and the third one at 313, when was the middle shot? And was it possible for that second bullet to have caused both the President's neck wound and all the gov-

MARKSMANSHIP

Did Oswald have time to fire three shots? Enhancements of the Zapruder film lead to the answer. His first shot missed. He had at least three seconds to reload, aim, and fire the second shot, which hit both Kennedy and Connally. He then had another five seconds—ample time—for the third shot, which killed the President.

Bolt Action

The bolt action can easily be executed in a fraction of a second.



1. Push bolt up... 2. Pull back (to eject case and position next cartridge)... 3. Push forward... 4. Push down (to lock bolt).

The Gunsight

Through the 4X telescopic sight, the target filled Oswald's vision. The President appeared to be only about 25 yards away at the time of the third shot.



4 rounds in a six-bullet clip

The Ammunition

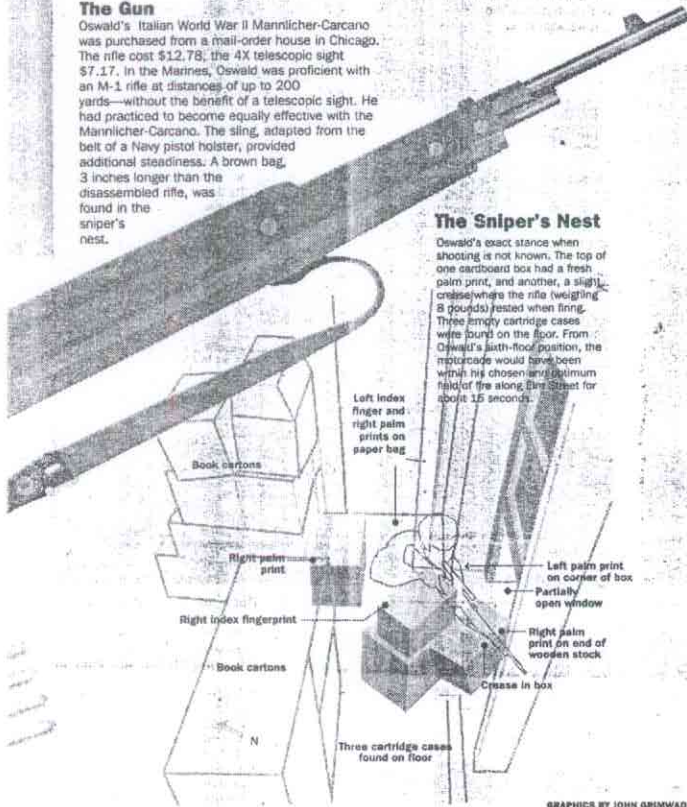
The rifle fired 6.5-mm, full-copper-jacket bullets with a muzzle velocity of more than 2,000 feet per second.



LIMOUSINE speeds to hospital moments after President John Kennedy was shot open-top vehicle.

### The Gun

Oswald's Italian World War II Mannlicher-Carcano was purchased from a mail-order house in Chicago. The rifle cost \$12.78; the 4X telescopic sight \$7.17. In the Marines, Oswald was proficient with an M-1 rifle at distances of up to 200 yards—without the benefit of a telescopic sight. He had practiced to become equally effective with the Mannlicher-Carcano. The sling, adapted from the belt of a Navy pistol holster, provided additional steadiness. A brown bag, 3 inches longer than the disassembled rifle, was found in the sniper's nest.



### The Sniper's Nest

Oswald's exact stance when shooting is not known. The top of one cardboard box had a fresh palm print, and another, a slight crease where the rifle (weighing 8 pounds) rested when firing. Three empty cartridge cases were found on the floor. From Oswald's sixth-floor position, the motorcade would have been within his chosen optimum field of fire along Elm Street for about 1.5 seconds.

GRAPHICS BY JOHN GRIMWADE



Secret Service agent (l.) checks on back of...

ernor's wounds, the so-called single bullet theory?

On the unenhanced version of the Zapruder film, when the presidential car emerges from behind the road sign, at frame 225, Kennedy's right arm appears to be rising in response to a bullet wound. Connally does not appear to show any reaction to his wounds until his mouth opens at frame 235. That difference of 10 frames is slightly more than half a second between the reactions of the two men. But the commission was not able to pinpoint the exact frame at which the President and the governor were hit, instead giving only a range from frames 210 to 225.

Conspiracy buffs used the earliest possible time, frame 210, and then argued that since Connally did not show a clear reaction until frame 235 (a difference of 25 frames, or 1.4 seconds), his reaction was too slow for him to have been hit by the same bullet that hit Kennedy. If Connally was hit by another bullet, it had to have been fired by a second shooter, since the Warren Commission's own reconstruction showed that Oswald could not have operated the bolt and rifled in 1.4 seconds.

Further enhancements of

the film clear up the confusion. They show that before the President disappeared behind the sign at frame 200, he was waving to the crowd with his right hand.

Even when the car and his body are obscured by the road sign, the top of his right hand can sometimes be seen waving. By frame 224, the car is back in view. In frame 225, the President is almost in full view, and his hand is lower.

### SPINAL INJURY WAS KEY

He was bringing it down from a wave. By 226, Kennedy has started raising his arm again. At 227, the President's elbow is jerked off the car. He was in full reaction to the bullet that hit him from the rear and exited his throat.

Working backward from JFK's reaction, it is possible to pinpoint the time of the second shot. The commission was not aware that the President's spine was damaged by the bullet that entered the base of his neck.

When Dr. John Latimer, a renowned New York surgeon and ballistics expert, examined the autopsy X-rays in 1972, he found trauma near the sixth cervical vertebra. Such a spinal injury can cause an instantaneous reaction called Thorburn's position. The victim's arms jerk

# OLD THEORIES UP IN SMOKE

By CORKY SIEMASZKO  
Daily News Staff Writer

**T**HE EARTH HAD barely settled on John F. Kennedy's casket when skeptics doubting that Lee Harvey Oswald was the President's lone assassin began to emerge.

They and their theories have mushroomed in number since that fateful Nov. 22, 1963, day in Dallas.

The theories range from the zany (Kennedy's body was stolen and altered to disguise wounds from a second gunman) to the almost plausible (various witnesses placing Oswald away from the scene of the shooting). Those hinting at KGB, Cuban or Mafia involvement have shown themselves to be remarkably durable.

In his book "Case Closed: Lee Harvey Oswald and the Assassination of JFK," author Gerald Posner revisited the testimony of witnesses, used photographic enhancements and other scientific techniques to debunk some of the theories. He places the blame squarely on a smirking loner whose misspelled diary entries more than hint at his derangement.

Here then are some of the myths Posner dispels:

### OSWALD AND THE KGB

This is a favorite of conspiracy buffs who point out that Oswald moved to the Soviet Union and therefore had to have gotten involved with the shadowy organization. Yet the Soviet Foreign Ministry denied Oswald's request for citizenship in 1959. A failed suicide attempt in a Moscow hotel room followed the rejection, according to records Posner uncovered. Frightened by the prospect of having a dead American tourist on their hands, the Soviets granted Oswald asylum and shipped him off to Minsk. But, as former KGB officer Yuri Nosenko told Posner: "The KGB did not want Oswald from Day 1."

### THE LUNCHROOM DEBATE

Some conspiracy buffs believe Oswald could not have shot Kennedy from the Texas School Book Depository because a secretary there

told author Anthony Summers in 1978 that he was in the lunchroom at the time of the shooting. Carolyn Arnold said the FBI misquoted her when she said — shortly after the shooting — that she "could not be sure" if Oswald had been in the lunchroom. Oswald himself told authorities that he had been with co-worker Junior Jarman in the lunchroom when Kennedy was shot. But Posner found testimony from other workers who say Oswald was not in the lunchroom. And Jarman denied seeing Oswald during the lunch break.

### CORSICAN CONNECTION

This theory holds that Kennedy was shot from a grassy knoll on the parade route by a band of mercenaries from the island of Corsica, who managed to obtain bogus CIA identification. The story that fueled this scenario came from an ex-soldier named Gordon Arnold. He said he was home on leave when he ran into the gang on the grassy knoll. He claims he hit the ground when a bullet whizzed by his ear, and he started taking photographs. He said a man in a police uniform confiscated the film. Arnold fled to Alaska afterward and kept mum about what supposedly happened for almost 15 years until he became the centerpiece of a documentary about the alleged Corsican role. But Arnold may not have been on the grassy knoll. He is nowhere to be found on enhancements of photographs taken at the time of the shooting.

### THE PUFF OF SMOKE

Conspiracy theorists also cite the testimony of witnesses who claim to have seen a "puff of smoke" coming from the grassy knoll as proof of a second gunman. But, as Posner points out, Kennedy was killed on a windy day. Besides, modern ammunition is smokeless.

up into a fixed position, almost parallel with the chin, with the hands gathered near the neck and the elbows pushed out to the sides.

That is exactly the position the President started assuming at frames 226-227.

Most observers of the Zapruder film, as well as eyewitnesses that day, incorrectly thought the President was grabbing at his throat. The enhanced film shows that the President's hands never touch his throat. Kennedy's Thorburn response at frames 226-227 would have come between one and two tenths of a second after the bullet hit, which translates into 1.8 to 3.66 Zapruder frames. That means he was wounded at frames 223-224, or just before he was visible from behind the road sign. That is 3.5 seconds after Oswald had fired his first shot, near frame 180, more than enough time for

him to cock the bolt, reaim and fire again.

The focus now moves to Connally. When does he show evidence of being shot? Is there enough of a delay to raise the possibility that a separate bullet, from a second gunman, struck him?

The Zapruder film at its normal speed provides a misleading impression. The enhanced film shows several reactions that reveal exactly when the governor was hit. At 224, the right leg of the governor's suit flies away from his chest. The jacket movement was discovered in a 1992 computer enhancement by Failure Analysis Associates, which specializes in computerized reconstructions.

It may be one of the most important timing confirmations in the case, as it establishes the moment the bullet

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FROM PRECEDING PAGE

hit him. This is the exact area where the governor's suit and shirt have a bullet hole, as the missile passed through his right shoulder blade and out under his right nipple.

Connally's reaction, while slower than Kennedy's, was still very fast. He showed signs of physical stress (the Stetson hat in his right hand flipped up) within one-tenth of a second, and he reacted visibly to pain (his mouth opening and cheeks expanding) only two-thirds of a second after he was hit.

Although convinced he was struck by the second bullet, Connally thought the President was hit by the first shot. This was because of his wife, Nellie, who was beside him in the car. She told the commission that when she heard the first shot, "I turned over my right shoulder and looked back and saw the President as he had both hands at his neck... Then very soon there was a second shot which hit John."

TESTIMONY OVERLOOKED

In her testimony, there is a key sentence that the commission and subsequent researchers have overlooked. Mrs. Connally said, "As the first shot was hit, and I turned to look at the same time, I recall John saying, 'Oh, no, no, no.' Then there was a second shot and it hit John."

However, she could not have heard her husband say "Oh, no, no, no" at the first shot. He was clear in his testimony: "Immediately, when I was hit, I said, 'My God, they are going to kill us all.' Nellie pulled me into her lap, she could tell I was still breathing and moving, and she said 'Don't worry. Be quiet. You are going to be all right.'"

When Mrs. Connally turned to look at the President, she did indeed see his hands up near his neck, but it was in reaction to the bullet that struck him at frame 224, the same bullet that forced her husband into her arms a second later. The conclusive evidence is again found in the Zapruder film. The enhancement shows Mrs. Connally, despite her recollection of turning to her right after the first shot, actually turning at 227-228, a split second after the second shot.

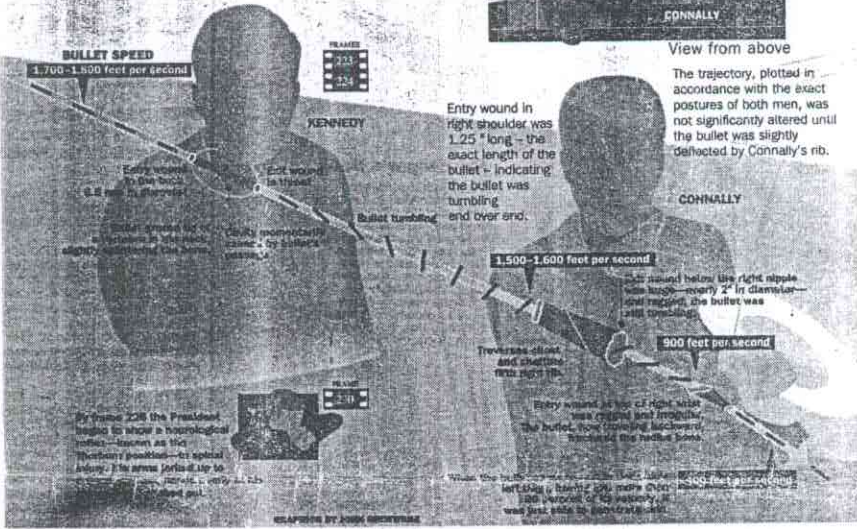
Was it possible for one bullet to have inflicted the neck wound on Kennedy and all the wounds on Connally? To find out, Failure Analysis Associates used a technique called reverse projection to answer two questions.

ONE BULLET, MANY WOUNDS

The first was whether one bullet could cause all the

THE SINGLE BULLET

Oswald's second shot, the first to strike, is the most contentious. It is variously called the "magic" or "pristine" bullet by conspiracy theorists, who contend that no single bullet could have so seriously wounded both men. The bullet needed no magic and was not pristine. Its trajectory, based on the Failure Analysis computations and the Zapruder film, is reconstructed here.



The trajectory, plotted in accordance with the exact postures of both men, was not significantly altered until the bullet was slightly deflected by Connally's rib.

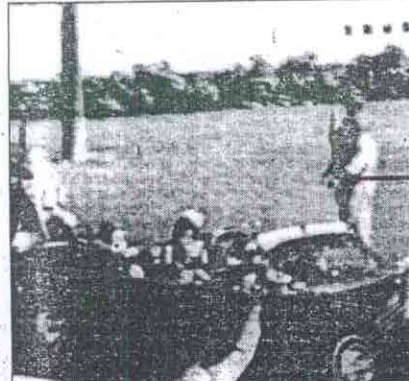
JFK MOVES EXPLAINED

AT THE MOMENT Kennedy was struck in the head by a bullet from the rear, he can be seen on the Zapruder film jerking violently backward. Conspiracy buffs see this as vivid confirmation that the bullet came from the front — and was fired by a second gunman positioned on the grassy knoll. In fact, medical experts say it proves nothing of the kind.

The backward movement is the result of two factors. First, when the bullet destroyed the President's cortex, it caused a neuromuscular spasm that sent a massive discharge of neurologic impulses from the injured brain shooting down the spine to every muscle in Kennedy's body.

"The body then stiffens, with the strongest muscles predominating," says Dr. John Lattimer, a New York surgeon with long expertise in the case. The muscles contract, lurching the body upward and to the rear. Kennedy's back brace likely accentuated the movement, preventing the President from falling forward.

At the same instant, the bullet exploded out of the right side of his head. Dr. Luis Alvarez, a Nobel prize-winning physicist, focused on that to discover the second factor that drove the President's head back with such force. Dubbed the "jet effect," Alvarez established it



KENNEDY'S backward movement after bullet hit him has been explained, scientifically, by leading ballistics experts.

both through physical experiments that re-created the head shot and through extensive laboratory calculation.

He found that when the brain and blood tissue exploded out of JFK's head, it came forward more momentum than was brought in by the bullet. That caused the head to thrust backward — in an opposite

direction — as a rocket does when its jet fuel is ejected.

Dr. Lattimer did 12 experiments confirming Alvarez's work. In each instance, the jet effect, on a mockup of a human head struck from the rear by a 6.5-mm. bullet, caused the specimen to lurch back toward the shooter.

— Gerald Posner

floor of the Texas School Book Depository.

The final issue on the single bullet is whether the bullet found on the stretcher at Parkland Hospital within 90 minutes of the assassination, could have inflicted the wounds to both men and remained only partially deformed. Designated the "magic bullet" by buffs, it is described as "pristine" in conspiracy books. In fact, it is somewhat flattened.

Dr. Martin Fackler, president of the International Wound Ballistics Association, finds the condition of the bullet "entirely consistent" with a bullet that inflicted the seven wounds on two men.

Finally, there is the question of the flakes of metal recovered from Connally's wrist and thigh. Did these come from the bullet found on Connally's stretcher?

OSWALD ONLY KILLER

Bullet fragments from Kennedy's brain matched three fragments found on the floorboard of the limousine, meaning they were all part of the third shot fired — and the stretcher bullet proved to be indistinguishable from the fragments recovered from the governor's wrist.

For those seeking the truth, the facts about the assassination are incontrovertible. They can be tested. Chasing shadows will never substitute for real history. Oswald was the only assassin at Dealey Plaza on Nov. 22, 1963. To say otherwise, in light of the overwhelming evidence, is to absolve the man with blood on his hands, and mock the President he killed.

"Case Closed: Lee Harvey Oswald and the Assassination of JFK." Copyright © 1993 by Gerald L. Posner. To be published Sept. 1 by Random House.