

Witness Evidence in the JFK Assassination

Andrew M. Mason¹

Abstract: *Courts and other fact-finding bodies often face the task of examining eyewitness accounts to resolve factual issues. It is not unusual to find significant differences between witness recollections. The JFK assassination record contains a large number of detailed witness accounts of the events seen and heard at the scene of this horrific crime. This body of evidence illustrates how apparently divergent recollections of an event may, nevertheless, converge on particular details and provide a very reliable basis for determining key facts. Where witness recollections are independent, an individual assessment of the reliability of these witnesses is unnecessary.*

The Zapruder film captures the visual image of the assassination of President Kennedy but not the sounds of the shots fired at the President's car. Two major government reviews and hundreds of independent researchers have exhaustively studied the film in an effort to ascertain the number and timing of the shots, which is considered key to whether more than one assassin was involved. Enormous effort has been spent analyzing all the physical evidence that might establish exactly when the bullets were fired. In the clamour for scientific proof, there has been very little attention paid to witness accounts of the timing and relative spacing of the shots. These witnesses recalled a shot sequence that fits with the evidence as a whole but which does not fit the widely accepted 'second shot' single bullet theory. Moreover, this evidence shows that the single bullet theory is not needed to maintain the Warren Commission's conclusion that Oswald acted alone.

Introduction

There are well-developed principles and procedures for fact-finding in both science and law. In the world of science, fact-finding is usually based on reproducible observation and physical data. In law, fact-finding is a matter of reconstructing non-reproducible past events using physical evidence and human memories of those events.

There is a natural tendency for triers of fact to prefer physical evidence over witness recollections, citing the objectivity of real evidence and fallibility of human powers of observation and recall. However, faith in physical evidence can be misplaced. Physical evidence is very often equivocal and is subject to human interpretation. This can make it difficult to distinguish between truth and opinion.

Psychologists have studied witness perception, memory and recall under a variety of conditions. While these studies confirm that individual witnesses are fallible, they show that honest witness recollection is, more often than not, accurate - with the greatest accuracy on the most salient details.² But this is not really important. One need not start with the belief that witnesses are reliable at all. Provided there are several independent

¹ **Andrew M. Mason**, B.A., LL.B. of the Saskatchewan Bar practices law in Saskatoon, Saskatchewan.

² Loftus, Eliz. F., **Eyewitness Testimony**, (Cambridge, MA: 1979), Harvard University Press at p. 25 ff.

witnesses, determining a witness' reliability is simply a matter of seeing how their recollections fit with the rest of the evidence.

Subjective techniques for assessing witness accuracy and trustworthiness are fraught with uncertainty³. It is very important to distinguish between the fallibility of a single witness and that of a group of witnesses who independently report observing the same fact. If the witnesses are independent, they will either independently agree on a fact because they observed it or they will be independently mistaken. Where there is more than one way to be mistaken, independent errors will be distributed over the range of all incorrect possibilities.

Dishonesty is an inherently random factor unless there is collusion between witnesses. The testimony of the independently mistaken or dishonest witnesses will necessarily fail to converge on a common explanation. Conversely, the convergence of consistent witness evidence on a particular detail can have only one of two rational explanations: either they all shared a common observation *or* they are not independent.

This use of corroboration as a technique for assessing reliability does not require subjective assessment of the witness' demeanour or appearance of trustworthiness. It is not the witness recollection *per se* that is important. It is the fact that the same witness recollection is produced by **multiple independent** sources that is key.

Juries intuitively understand this and, generally, do not need to have the probabilities quantified. They apply common sense to conclude how unlikely it is that multiple witnesses will independently have with the same recollection of something that they did not actually observe. The mathematics of probability supports our common sense. For example, the chance of two witnesses independently agreeing on a particular observation for which there are 10 possible answers (the colour of the perpetrator's coat, for example) and both being wrong is less than 3 percent, even if we assume that they are poor observers.⁴ As the number of witnesses who independently agree increases, the possibility that they are all wrong becomes infinitesimally small.⁵

³ For a good illustration of the problem of using witness demeanour to assess credibility, see: **Apouviapseakoda v. Gonzales**, 475 F.3d. 881 (7th Cir. 2007). The task of the court is to look at not only the demeanour of the witness but how the evidence of that witness fits with the rest of the case: **Hvalfangerselskapet Polaris A/S v. Unilever Ltd. (1933)**, 46 Ll L Rep 29 (H.L.); **Yuill v. Yuill**, [1945] P. 15, 114 LJP 1(H.L.),

⁴ Assume the witness has only a 50% chance of being right. (In real life, witnesses are unlikely to be as poor as this - Loftus, *ibid.* 2.) There are 9 different ways to be wrong and only one correct choice. The chance that both witnesses are independently both wrong the same way is $.5 \times .5 \times 1/9 = .027$. For three witnesses, the probability is: $.5 \times .5 \times 1/9 \times .5 \times 1/9 = .0015$ (ie. it will likely occur only 15 times in 10,000 independent trials).

⁵ For n witnesses, the probability is $.5^n \times 1/9^{(n-1)}$. The likelihood that they are not independent becomes much greater than the chance that they will be independently wrong. (We are assuming that there is no source of common error: eg. that the lighting does not induce a common error in assessing colour). A simple parlour trick can be used to demonstrate this. Have a member of a group of people select a card from a deck of 52 cards and flash the card briefly to the other members of the group. Ask each person to select heads or tails and then flip a coin. If it is heads, those who chose heads must tell the truth and the rest may lie. The group is then asked to write on slip of paper the card they observed. Many of the answers will agree on the correct card. The others will be distributed over a wide range of deliberately wrong answers or guesses.

As a result, the analysis of the reliability of highly corroborated witness evidence reduces to a determination of whether the witnesses are *independent*. If they are, the convergence upon a single recollection is highly significant, bearing only one reasonable explanation: the event that they recall actually occurred.

The JFK Assassination Case

The evidence relating to the assassination of President John F. Kennedy, which occurred on November 22, 1963 in Dallas, Texas, presents an opportunity to test this approach to fact-finding.

The JFK assassination record is perhaps the largest and most complete public account of any criminal investigation in human history. The record consists of 26 volumes of evidence (approximately 25,000 pages) and a 1000 page report of the Warren Commission, the complete congressional record of the HSCA and the vast collection of original documents and records in the John F. Kennedy Assassination Records Collection at the U.S. National Archives and Records Administration (NARA).

Abraham Zapruder's 8 mm. movie camera has been described as the only unimpeachable witness to the assassination of President Kennedy.⁶ The authenticity of the Zapruder film has been verified in meticulous detail.⁷ Nevertheless, the film has been the source and subject of more controversy and disagreement than any other single piece of evidence relating to the assassination.

The timing of the shots has been the subject of intense study by assassination researchers. The goal of this research has been to establish the times of the first and second of the three shots that were fired at the President's motorcade in Dallas on November 22, 1963. (The third shot is seen in frame 313 of the Zapruder film as the President's head ruptures from the final bullet). It is generally acknowledged that if the time between any two of the shots was much less than 2.3 seconds the shots could not have been fired by a lone gunman using Oswald's bolt-action Mannlicher-Carcano rifle.⁸

The Warren Commission⁹ and, later, the House Select Committee on Assassinations (HSCA)¹⁰ relied on expert interpretations of the Zapruder film and of other physical evidence to establish the timing of the shots. The HSCA commissioned a major acoustical study of two-way radio transmissions that were recorded by the Dallas police on a mechanical 'dictabelt' system. Tape recordings of what were thought to have been live commercial radio broadcasts were analysed by engineers and scientists to determine

⁶ "A Matter of Reasonable Doubt", Life Magazine, Vol 61, No. 22, November 25, 1966, p. 41.

⁷ Roland J. Zavada, "Analysis of Selected Motion Picture Photographic Evidence" (Zavada Report), 1998 Assassination Records Review Board, (Ref. 318420P).

⁸ See infra, fn. 91-94. This rifle was found on the sixth floor of the Texas School Book Depository (Warren Commission Exhibit CE139, often referred to by its serial number, C2766).

⁹ Report of The President's Commission on the Assassination of President John F. Kennedy, U.S. Gov. Printing Office, 1964, (Warren Report) hereinafter cited as WR.

¹⁰ Final Report of the Select Committee on Assassinations, U.S. House of Representatives, 95th Congress, 2nd Session, Report no. 95-1828, (U.S. Gov. Printing Office, 1979).

if shot sounds could be heard. A Nobel physicist analysed patterns of camera jiggle to determine when Abraham Zapruder's body responded to the sound of the shots¹¹. Medical experts opined on the cause of each gesture and grimace of President Kennedy and Governor Connally seen in the Zapruder film. In the relentless drive to bring expert opinion to bear on the evidence, the confident recollections of the many witnesses to the assassination were ignored.

It is apparent that members of the Warren Commission realized that the body of witness evidence relating to the pattern of shots had some significance, since this evidence was mentioned in their report.¹² This witness evidence was completely ignored by the HSCA. The HSCA reached a conclusion that there were four audible shots, three of which were made from the sixth floor window of the Texas School Book Depository and one of which came from the 'grassy knoll' and missed the motorcade. This conclusion was based on scientific analysis alone and was at odds with the witness accounts.

The HSCA did not appear to be concerned that its conclusion lacked other evidentiary support and conflicted with the vast majority of witnesses who recalled exactly three shots. A few years later, the National Academy of Sciences completely discredited the acoustical work and identified several problems with the methods used and some of the assumptions made.¹³ The National Academy concluded:

- (a) The acoustic analyses do not demonstrate that there was a grassy knoll shot and in particular there is no acoustic basis for the claim of a 95% probability of such a shot.
- (b) The acoustic impulses attributed to gunshots were recorded about one minute after the President had been shot and the motorcade had been instructed to go to the hospital.

It is not clear why the Warren Commission and the HSCA paid such little attention to the witness evidence. It is possible that they failed to realize that the ability of witnesses to count shots and recognize a sound pattern would be of assistance in establishing the shot pattern. Or they may simply have mistakenly believed that witnesses are not reliable. As noted above, it is the consistency of distinct and independent sources of evidence, however potentially weak each individual piece might be, which provides the ultimate assurance of reliability. Although juries understand this, the HSCA, apparently, did not.

The number of shots

At 12:34 pm on November 22, 1963, the first report that three shots had been fired at the President's motorcade was dispatched to the world's news outlets via United Press International telexes:

¹¹ Alvarez, Luis W., "A Physicist Examines the Kennedy Assassination Film", American Journal of Physics, Vol. 44, No. 9, Sept. 1976

¹² WR 105.

¹³ National Academy of Sciences (NAS) Report of the Committee on Ballistic Acoustics (1982, National Academies Press) available at <http://www.jfk-online.com/nas00.html>

"DALLAS NOV. 22 (UPI) -- THREE SHOTS WERE FIRED AT PRESIDENT KENNEDY'S MOTORCADE TODAY IN DOWNTOWN DALLAS. JT1234PCS"¹⁴

UPI reporter Merriman Smith delivered this shocking message seconds after the 12:30 pm shooting using a radio-telephone in the first press car in the motorcade, six cars behind the President's limousine. The world had the news less than four minutes later.¹⁵

Other journalists riding in the motorcade in a press bus and several press cars soon filed their own stories stating that three shots had been fired. Photographer Robert Jackson riding in an open press car in the motorcade approaching the Texas School Book Depository on Houston Street at the time of the shots recalled hearing three loud reports.¹⁶ Jackson looked up and saw the rifle in the sixth floor window directly ahead. Dallas Morning News reporter Mary Woodward reported hearing three shots as she stood in front of the Texas School Book Depository and she described in meticulous detail what the President and First Lady were doing immediately before the first shot.¹⁷

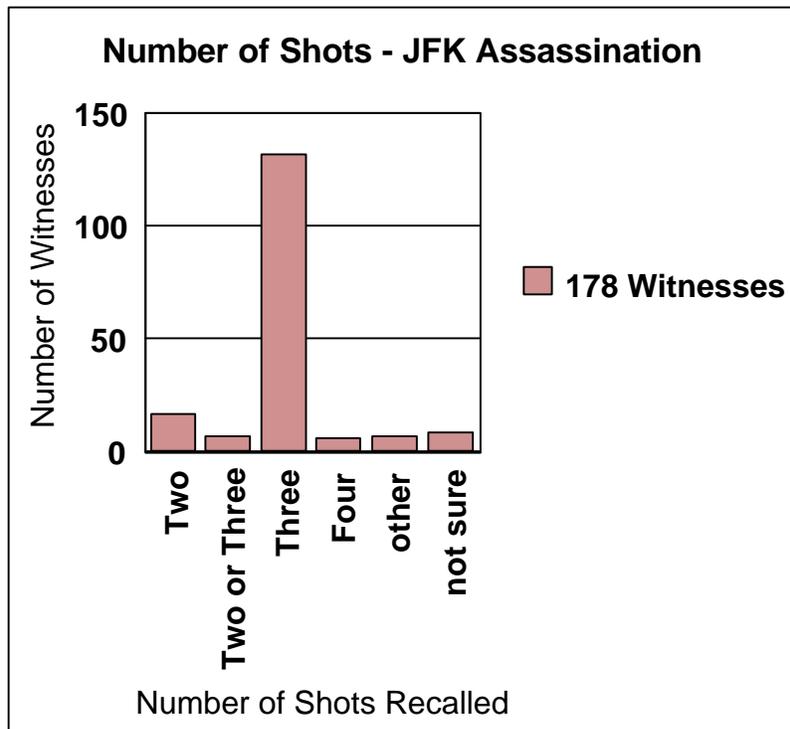


Figure 1. A chart showing the distribution of witness recollections of the number of shots

¹⁴ United Press International wire report, issued November 22, 1963, 12:34 pm CST. An original teletype copy of this is in the Sixth Floor Museum, Dallas, Texas.

¹⁵ Merriman Smith, "Eyewitness--The death of President Kennedy", UPI story, Nov. 23, 1963. See also: *Pictures of the Pain: Photography and the Assassination of President Kennedy*, Richard B. Trask, (Danvers, Mass.: Yeoman Press, 1994), page 392.

¹⁶ See *infra*, fn. 24 and 76.

¹⁷ "Witness from the News Describes Assassination", Mary E. Woodward, Dallas Morning News, November 23, 1963

Of 178 witnesses whose evidence relating to the number of shots was compiled by the HSCA: 17 recalled hearing two; 7 said they heard two or three shots; 132 reported hearing exactly three shots; 6 people said they heard four shots; and 9 said they were not sure how many shots they heard. A further 7 bystanders reported hearing 1, 5, 6, or 8 shots.¹⁸

This distribution of witness recollections is highly significant and fits only one possible scenario: that there were exactly three distinct audible shot sounds.

This is further evident when one examines the explanations of those who thought there were more than three shots. Few of those who thought they heard other than three shots were sure about it. Bystander Robert Edwards gave this puzzling testimony:

Mr. BELIN. How many shots did you hear, if you remember?

Mr. EDWARDS. Well, I heard one more than than was fired, I believe.

Mr. BELIN. You mean you said on the affidavit you heard four shots?

Mr. EDWARDS. I still right now don't know how many was fired. If I said four, then I thought I heard four.¹⁹

Jean Hill, who was standing on the south side of Elm Street near the President's limousine when the fatal bullet struck, said she thought she heard four to six shots. All one can conclude from such a statement is that she was not sure how many shots she heard, but that she had an impression there were more than three and fewer than seven.²⁰ One witness thought he heard eight shots, five of which were heard several minutes after the motorcade had departed Dealey Plaza.²¹

Echo or Reverberation

Some researchers have suggested that more shots were fired and that ear-witnesses to the assassination were fooled by echoes.²²

Although many witnesses, if not most, were confused as to the direction of the sound source, there are no indications that witnesses had difficulty in hearing the distinct shot sounds. James Tague, who was standing at the far west side of Dealey Plaza in the median between Main and Commerce streets a few feet from a railroad overpass and about 200 feet from the scene of the assassination, said he heard three distinct shots and

¹⁸ D. M. Green, "Analysis of Earwitness Reports Relating to the Assassination of President John F. Kennedy", Report No. 4034, House Select Committee on Assassinations Hearings, Vol. 8, p. 128 (abbreviated: 8 HSCA 128) at page 142.

¹⁹ Edwards: WC 6 H 205. In his affidavit sworn Nov. 22, 1963, WC 24 H 207, Mr. Edwards said he thought there were four shots. In his a December 2, 1963 interview with the FBI he is reported to have said he heard three or four shots. He was standing with his friend Robert Fischer who heard only three shots.

²⁰ FBI Report (Jean Hill), March 13, 1964, WC 25 H 854.

²¹ A. C. Millican, undated Statement, Decker Exhibit 5823, WC 19 H 486.

²² See for example, D. M. Green, *ibid*, at p. 136-7. Despite acknowledging an Army simulation in which 20-30 witnesses showed no confusion about the number of shots, Green suggests that reflections from buildings may have caused witnesses to inflate the number of shots.

some reverberation but no separate echoes. He was standing directly in line with the President's limousine and the sixth floor window of the Texas School Book Depository.²³

Any reflection of sound off the various surfaces in Dealey Plaza would have created additional sounds arriving at the observers' ears within fractions of a second after the sound of the original muzzle blast. At 68°F, the temperature that day in Dallas, sound travels at 1127 feet per second. For people located within 55 feet of a reflective surface, which would include most of the people lining the streets as the motorcade passed, the first of the reflected sound waves would have reached their ears less than one-tenth of a second after the sound of the muzzle blast. The reflected sound waves would not have been as loud as the sound arriving directly from the rifle.²⁴

Echo or reverberation may well have affected witness perception of the direction of the shots. But if echoes confused people about the *number* of shots, this would only have caused witnesses to perceive *more* shots than were actually fired. As most witnesses heard exactly three shots and since there is other evidence that at least three shots were fired, it appears that there was little confusion about the number of shots due to echoes.²⁵

2. The relative timing of the shots.

The 1.....2....3 pattern

There is a significant body of evidence regarding the relative spacing of the shots. The Warren Commission, in stating its conclusion that there were three shots, observed that most witnesses recalled that the second and third shots were closer together than the first and second.²⁶ The Commission made little use of this evidence in reaching its conclusions, however.

There were at least 47 witnesses who recalled this pattern.

Photographer Robert H. Jackson, who was one of four people who actually saw the sniper's rifle in the sixth-floor window of the School Book Depository building, testified:

Then we realized or we thought that it was gunfire, and then we could not at that point see the President's car. We were still moving slowly, and after the third shot the second two shots seemed much closer together than the first shot, than they were to the first shot.

...

²³ James Tague, testimony: WC 7 H 557. Tague was also struck by a bullet fragment that ricocheted off the curb near where he was standing.

²⁴ The intensity of a sound wave varies inversely as the square of the distance the sound has traveled from the source. For example, to Listener A, a sound is 4 times as loud as that heard by Listener B situated twice the distance from the source as A. See D. M. Green, *ibid*, at p. 133.

²⁵ Examples of other evidence of at least three shots: Governor Connally felt a bullet strike his back seconds after he heard the first shot. He also heard and felt the effect of the third bullet that struck the President's head (WC 4 H 129) seconds later. Amos Euins (Affidavit November 22, 1963, WC 24 H 207) standing across from the Texas School Book Depository said that he looked up to the sixth floor window after he heard the first shot and saw two shots being fired from the sniper's rifle. There were three empty shells found on the floor inside the sixth floor window.

²⁶ WR 115. See also Warren Commission member Allan Dulles' comment at WC 5 H 174

I would say to me it seemed like 3 or 4 seconds between the first and the second, and between the second and third, well, I guess 2 seconds, they were very close together. It could have been more time between the first and second. I really can't be sure.²⁷

Linda Willis, a fourteen year old girl watching the motorcade with her father, recalled:

Yes, I heard one. Then there was a little bit of time, and then there were two real fast bullets together. When the first one hit, well, the President turned from waving to the people, and he grabbed his throat, and he kind of slumped forward, and then I couldn't tell where the second shot went.²⁸

Dallas Mayor Earle Cabell, who was riding in the motorcade two cars behind Vice-President Johnson's car, recalled a longer pause between the first and second shots:

I heard the shot. Mrs. Cabell said, "Oh a gun" or "a shot", and I was about to deny and say "Oh it must have been a firecracker" when the second and the third shots rang out. There was a longer pause between the first and second shots than there was between the second and third shots. They were in rather rapid succession. There was no mistaking in my mind after that, that they were shots from a high-powered rifle.²⁹

Texas patrolman Hurchel Jacks, driver of the Vice-President's car, said that the pause between the first two shots was long enough for a Secret Service agent to shield the Vice-President with his body:

I heard a shot ring out which appeared to come from the right rear of the Vice President's car. Mr. Rufus Youngblood, the Secret Service Agent riding in my car asked me what that was and at the same time he advised the Vice President and Mrs. Johnson to get down. He climbed to the rear of the seat with the Vice President and appeared to be shielding the Vice President with his own body. At that time I heard two more shots ring out.³⁰

Lady Bird Johnson recalled:

We were rounding a curve, going down a hill, and suddenly there was a sharp loud report--a shot. It seemed to me to come from the right, above my shoulder, from a building. Then a moment and then two more shots in rapid succession.³¹

Luke Mooney, of the Dallas County Sheriff's office, testified:

The second and third shot was pretty close together, but there was a short lapse there between the first and second shot.³²

Secret Service Special Agent (SA) Paul Landis, standing on the right rear running board of the President's follow-up car, recalled only two shots. He said that the interval between the first and second shots was enough for him to quickly look at the President, scan the depository building and the crowd and look at a tire of the President's limousine. He concluded:

²⁷ Jackson: WC 2 H 159

²⁸ L. Willis: WC 7 H 498

²⁹ Cabell: WC 7 H 478

³⁰ Jacks: CE 1024, WC 18 H 801. Statement signed Nov. 28, 1963

³¹ Johnson: WC 5 H 564. Statement dictated in early Dec. 1963 and signed July 16, 1964.

³² Mooney: WC 3 H 282.

The time lapse between the first and second report must have been about four or five seconds.³³

Bonnie Ray Williams, one of three men watching the motorcade from the fifth floor of the Texas School Book Depository just below the window where the rifle was seen, recalled:

The first shot--there was two shots rather close together. The second and the third shot was closer together than the first shot and the second shot, as I remember.³⁴

Deputy Sheriff Roger Craig standing on Main Street watching the motorcade testified:

Mr. BELIN. About how far were these noises apart?

Mr. CRAIG. The first one was—uh—about three seconds—2 or 3 seconds.

Mr. BELIN. Two or 3 seconds between the first and the second?

Mr. CRAIG. Well, it was quite a pause between there. It could have been a little longer.

Mr. BELIN. And what about between the second and third?

Mr. CRAIG. Not more than 2 seconds. It was—they were real rapid.³⁵

Senator Ralph Yarborough, riding with the Vice-President, provided an affidavit stating:

After what I took to be about three seconds, another shot boomed out, and after what I took to be one-half the time between the first and second shots (calculated now, this would have put the third shot about one and one-half seconds after the second shot--by my estimate--to me there seemed to be a long time between the first and second shots, a much shorter time between the second and third shots--these were my impressions that day), a third shot was fired. After the third shot was fired, but only after the third shot was fired, the cavalcade speeded up, gained speed rapidly, and roared away to the Parkland Hospital.

I heard three shots and no more.³⁶

SA Winston Lawson, traveling in the lead car ahead of the President, testified:

... It came from behind me. Then I heard two more sharp reports, the second two were closer together than the first. There was one report, and a pause, then two more reports closer together, two and three were closer together than one and two.³⁷

SA Rufus Youngblood, riding with the Vice-President, recalled:

There seemed to be a longer span of time between the first and the second shot than there was between the second and third shot.³⁸

³³ Landis: CE 1024, WC 18 H 755

³⁴ Williams: WC 3 H 175

³⁵ Craig: WC 6 H 263

³⁶ Yarborough: WC 7 H 439. The affidavit was sworn July 10, 1964

³⁷ Lawson: WC 4 H 353

³⁸ Youngblood: WC 2 H 150

SA George Hickey, riding in the rear of the President's follow-up car, provided this account:

After a very short distance I heard a loud report which sounded like a firecracker. It appeared to come from the right and rear and seemed to me to be at ground level. I stood up and looked to my right and rear in an attempt to identify it. Nothing caught my attention except people shouting and cheering. A disturbance in 679x [*the car he was in*] caused me to look forward toward the President's car. Perhaps 2 or 3 seconds elapsed from the time I looked to the rear and then looked at the President. He was slumped forward and to his left, and was straightening up to an almost erect sitting position as I turned and looked. At the moment he was almost sitting erect I heard two reports which I thought were shots and that appeared to me completely different in sound than the first report and were in such rapid succession that there seemed to be practically no time element between them. It looked to me as if the President was struck in the right upper rear of his head.

The first shot of the second two seemed as if it missed because the hair on the right side of his head flew forward and there didn't seem to be any impact against his head. The last shot seemed to hit his head and cause a noise at the point of impact which made him fall forward and to his left again.³⁹

Many others recalled that the second and third shots were closer together than the first and second, including Special Agents Forrest Sorrels⁴⁰, William McIntyre⁴¹, William Greer (driver of the President's limousine)⁴² and Samuel Kinney (driver of the Secret Service follow-up car)⁴³, Sheriff's Deputies C.M. Jones⁴⁴, Allan Sweatt⁴⁵, John Wiseman⁴⁶, Harold Elkins⁴⁷, Dallas Police Chief Jesse Curry⁴⁸, Dallas police officer

³⁹ Hickey: CE 1024, WC 18 H 762

⁴⁰ Sorrels: WC 21 H 548 and WC 7 H 345. "There was to me about twice as much time between the first and second shots as there was between the second and third shots."

⁴¹ McIntyre: WC 18 H 747. "The Presidential vehicle was approximately 200 feet from the underpass when the first shot was fired, followed in quick succession by two more."

⁴² Greer: WC 2 H 118. Greer stated that the second followed the first by three or four seconds and "The last two seemed to be just simultaneously, one behind the other, but I don't recollect just how much, how many seconds were between the two. I couldn't really say."

⁴³ Kinney: CE 1024, WC 18 H 731. "There was a second of pause and then two more shots were heard." SA Kinney, like SA Hickey, saw JFK's hair fly up on the second shot.

⁴⁴ Jones: WC 19 H 512 (Decker exhibit, 5323). "I heard an explosion followed in about 3 to 5 seconds later two more explosions."

⁴⁵ Sweatt: WC 19 H 531 (Decker exhibit). "I heard a shot and about 7 seconds later another shot and approximately 2 or 3 seconds later a third shot".

⁴⁶ Wiseman: WC 19 H 535 (Decker exhibit). Wiseman was standing in front of the Sheriff's office, which is on Main Street, half a building from the corner of Main and Houston, when he heard the first shot. "I ran at once to the corner of Houston and Main Street and out into the street when the second and third shots rang out".

⁴⁷ Elkins: WC 19 H 540 (Decker exhibit). Elkins said a "couple of seconds elapsed" after the first and "then two more shots ring out"

⁴⁸ Curry: WC 4 H 172. Chief Curry was not asked directly about the shot pattern. He was asked about the positions of the President's car on Elm Street when he heard the shots. He said that he heard the first shot when the President's car was mid-way between Houston Street and the overpass; that at the second shot the car was about 25-30 feet further along; and the third occurred after it had moved another 15-20 feet. In making this distinction of the distances traveled between the shots, he described

Clyde Haygood⁴⁹, and bystanders Victoria Adams⁵⁰, Eugene Boone⁵¹, Lee Bowers⁵², Rose Clark⁵³, James Crawford⁵⁴, Wesley Frazier⁵⁵, James Jarman Jr.⁵⁶, Emmett Hudson⁵⁷, Billy Lovelady⁵⁸, John Martin Jr.⁵⁹, Mary Ann Mitchell⁶⁰, Joe Molina⁶¹, Lillian Mooneyham⁶², Samuel Paternostro⁶³, Arnold Rowland⁶⁴, Edward Shields⁶⁵, William

the last two shots as being closer together as measured by the distance the President's car traveled between shots.

⁴⁹ Haygood: WC 6 H 298. "The last two were closer than the first. In other words, it was the first, and then a pause, and then the other two were real close."

⁵⁰ Adams: WC 6 H 388. "And we heard a shot, and it was a pause, and then a second shot, and then a third shot."

⁵¹ Boone: WC 3 H 292. "there seemed to be a pause between the first shot and the second shot and third shots-a little longer pause.

⁵² Bowers: WC 6 H 287. "I heard three shots. One, then a slight pause, then two very close together".

⁵³ Clark: CE 2100, WC 24 H 533 (FBI report). "She noted that the second and third shots seemed closer together than the first and second shots".

⁵⁴ Crawford: WC 6 H 172. "The second shot followed some seconds, a little time elapsed after the first one, and followed very quickly by the third one". He also confirms that the VP security car had completed the turn when the first shot was heard.

⁵⁵ Buell Wesley Frazier testified before the Warren Commission but was not specifically asked about the shot pattern. However, he did mention that he heard a noise and then a few seconds later heard two more but did not elaborate: WC 2 H 234. In his 1969 testimony at the Clay Shaw trial he said this (Transcript, State of Louisiana v. Clay L. Shaw Trial, Feb 13, 1969, afternoon, page 27-28, part of the HSCA JFK Collection, Ex. RG 233):

A Shortly after there were two more in rapid succession.

...

Q Did you recognize any of the noises as rifle shots?

A Well, the two that come in fast succession by that time, like I said, people were hollering, and then I recognized them, they were rifle shots.

Q Approximately how much time lapsed from the first noise you heard until you heard the second noise?

A It was just a few seconds.

Q How much time elapsed from the time you heard the second noise until your heard the third noise?

A When I heard the second noise, the third was followed nearly just right back to back. It was fired in rapid succession.

⁵⁶ Jarman: WC 3 H 204. "and then the third shot was fired right behind the second one."

⁵⁷ Hudson, FBI report, November 26, 1963 CD5 (unpublished Warren Commission document): "He said he then heard two more loud reports which sounded like shots, such reports coming in rapid succession after the first shot." His much later testimony was quite different, however: see, infra, fn. 78.

⁵⁸ Lovelady: CE 2003 (affidavit) WC 24 H 214. "there was a slight pause after the first shot and then the next two was right close together".

⁵⁹ Martin: FBI Interview, March 31, 1964. CD 897 "he heard a loud report and first thought that it was a firecracker and a few seconds later heard two more reports".

⁶⁰ Mitchell: FBI Interview, January 18, 1964. CD 329 "heard a loud report or explosion and then after a short pause of four or five seconds, there were two more rapid explosions".

⁶¹ Molina: WC 6 H 371. "Of course, the first shot was fired then there was an interval between the first and second longer than the second and third."

⁶² Mooneyham: CE 2098, WC 24 H 531. "Following the first shot, there was a slight pause and then the second and third shots sounding closer together"

Shelley⁶⁶, Ruth Smith⁶⁷, John Solon⁶⁸, Pearl Springer⁶⁹, Ruth Thornton⁷⁰, and reporter Mary Woodward.⁷¹

There were many others who reported hearing a shot and then two more shots, without describing the relative times between shots.⁷²

The witnesses who recalled equally spaced shots

There were ten witnesses who thought that the shots were about equally spaced. This evidence is important because it provides an indication of just how close the last two shots could have been. It would be less likely that the last two shots were extremely close together if several people thought they were about equally spaced.

Four witnesses, Clifton Carter, Delores Kounas, James Romack and Jack Watson, gave unqualified views that the spacing was "even" or "equal".

Carter stated in an affidavit dated May 20, 1964:

"I distinctly remember three shots. There was an interval of approximately 5 to 6 seconds from the first to the last shot, and the three shots were evenly spaced."⁷³

An FBI report on Delores Kounas states:

⁶³ Paternostro: CE 2105, WC 24 H 536. "He said he estimated several seconds, possibly four or five or more, elapsed between the first report and the second and third reports"... "then when the other reports followed in quick succession"

⁶⁴ A. Rowland: WC 19 H 494 (Decker exhibit). "and then in about 8 seconds I heard another report and in about 3 seconds a third report"

⁶⁵ Shields: WC 7 H 394. "I heard one shot and then a pause and then this repetition-two shots right behind the other".

⁶⁶ Shelley: WC 6 H 329. "Well, I heard something sounded like it was a firecracker and a slight pause and then two more a little bit closer together.

⁶⁷ Smith: CD 206. "...she heard what she felt was a shot. She stated there was a pause then two more shots fairly close together."

⁶⁸ Solon: CE 2105, WC 24 H 535. "First shot, pause, two shots, then echoes of the shots. Mr. Solon advised he would judge that approximately five and one-half seconds was taken for all three shots."

⁶⁹ Springer: CE 2087, WC 24 H 523. "She recalled that after the first shot there was a pause, then two more shots were fired close together."

⁷⁰ Thornton: CE 2107, WC 24 H 537. "Then she said two more reports followed in quick succession"

⁷¹ Woodward: FBI report, CE2084, WC, 24 H 520. "There seemed to be a pause of a few seconds and then there were two more loud noises...". In her Dallas Morning News report, published November 23, 1963, she stated: "Then after a moment's pause I heard another shot and I saw the President start slumping in the car. This was followed rapidly by another shot". In a 1988 interview by Nigel Turner for the film "The Men Who Killed Kennedy", Mary Woodward stated: "The second two shots were immediate --- it was almost as if one were an echo of the other -- they came so quickly. The sound of one did not cease until the second shot." ... "and then the third shot came very, very quickly, on top of the second one"

⁷² See, for example, Jane Berry, FBI Interview, Nov. 22/63, WCD 5, "Just as the car was passing by her, she heard a rifle shot. A few seconds later she heard a second and third shot." See also: T.E. Moore, WC 24 H 534; Patricia Anne Lawrence, WC 22 H 660; James Underwood, WC 6 H 169.

⁷³ Affidavit of Vice-presidential aide Clifton Carter dated May 20, 1964. WC 7 H 475. No earlier statement was provided by Mr. Carter.

"She stated there were three of these noises which she now knows were shots equally spaced by a few seconds."⁷⁴

In his first two statements in March 1964 James Romack did not comment on the spacing. This comment was made in response to a somewhat leading question at his deposition on April 8, 1964:

"Mr. ROMACK. Oh, they happened pretty fast. I would say maybe 3 or 4 seconds apart.

Mr. BELIN. Were they equally spaced, or did one sound like it was closer than another one in time?

Mr. ROMACK. It sounded like to me that they were evenly spaced. They rang out pretty fast.

Mr. BELIN. Have you ever operated a bolt action rifle?

Mr. ROMACK. Yes, sir.

Mr. BELIN. Do you own one?

Mr. ROMACK. Yes, sir.

Mr. BELIN. Did it sound like the shots were faster than it could be operated with a bolt action rifle?

Mr. ROMACK. No, sir."⁷⁵

Jack Watson was operating radio communications in the Sheriff's office in the Courts building which looks out onto Main Street, a short block from the Texas School Book Depository. He said:

"and about that time I heard three loud reports evenly spaced which I presumed to be rifle or shotgun blasts."⁷⁶

Another four witnesses: API photographer James Altgens⁷⁷, motorcycle patrolman Marrion Baker⁷⁸, Dallas news photographer Thomas Dillard⁷⁹ and bystander Ronald Fischer⁸⁰ gave qualified opinions, using words like "almost regular", "approximately", "pretty well even". Fischer said "As far as I can remember, the shots were evenly spaced." but he also thought he had had heard four shots. Altgens could not specifically recall how many shots there were but he did say that there was only one shot before he took his photograph which corresponds to frame 255 of the Zapruder film - which is about 3.2 seconds before the final shot.

Emmett Hudson, testified in July 1964 that the shots were equally spaced. However, the FBI report about Hudson made a few days after the assassination stated:

⁷⁴ FBI report dated November 24, 1963, WC 22 H 846.

⁷⁵ Romack, April 8, 1964, WC 6 H 280

⁷⁶ Statement of Jack Watson, November 22, 1963, WC 22 H 522

⁷⁷ Altgens: WC 7 H 520. "They seemed to be at almost regular intervals and they were quick."

⁷⁸ Baker: WC 3 H 247. "It seemed to me like they just went bang, bang, bang; they were pretty well even to me."

⁷⁹ Dillard: WC 6 H 164. "I heard three-the three approximately equally spaced."

⁸⁰ Fischer: WC 6 H 195.

"He said he was looking directly at President Kennedy and saw his head slump to one side simultaneously with the loud report made by the first shot fired by the assassin. He said he then heard two more loud reports which sounded like shots, such reports coming in rapid succession after the first shot. He volunteered the shots were fired 'just about as fast as you could expect a man to operate a bolt action rifle' or words that effect."⁸¹

In his deposition on July 24, 1964 Hudson gave a confused story that was very different from his earlier statement. At this time he thought the shots took place over two minutes and "seemed pretty well evenly spaced". The inconsistency between this testimony and his much earlier statement was not addressed.

Two witnesses, Lawrence O'Brien and Phillip Willis, thought the shots were equally spaced but they appear to have been occupied with other tasks at the time of the shots. O'Brien was in one of the open press cars in the motorcade. He provided his 'impression' of the shot spacing, in response to a rather leading question:

"Mr. ADAMS. Is it your recollection that these sounds were evenly spaced?

Mr. O'BRIEN. That is my impression. As I say, I apparently immediately engaged the driver in conversation after the first shot which forces me to conclude that there had to be a time between the first and second and third shots- because I simply-describing the exchange of my question and his answer, and his answer, I must say, probably was completed after the third shot. But he had started his answer to the question at about or just before the third shot."⁸²

Willis, thought the shots were fired approximately two seconds apart but he said his immediate attention was on his daughters:

"I proceeded down the street and didn't take any other pictures instantly, because the three shots were fired approximately about 2 seconds apart, and I knew my little daughters were running along beside the Presidential car, and I was immediately concerned about them, and I was screaming for them to come back, and they didn't hear me. But I was concerned about them immediately, because I knew something tragic had happened, and the shots didn't ring out long like a rifle shot that is fired into midair in a distance."⁸³

Witnesses who recalled the reverse pattern

Six witnesses apparently recalled the reverse pattern of shots with the first two sounding closer together than the second and third.

The President's secretary, Kenneth O'Donnell, riding on the left side of the middle seat of the President's follow-up car, described the shots this way:

Mr. SPECTER. And was there any distinguishable tempo to the shots?

Mr. O'DONNELL. Yes; the first two came almost simultaneously, came one right after the other, there was a slight hesitation, then the third one.⁸⁴

⁸¹ Hudson: FBI report November 26, 1963 (part of the HSCA JFK Collection: Ex. RG 233, and Warren Commission Document CD5). WC testimony: (WC 7 H 565).

⁸² O'Brien: WC 7 H 162

⁸³ Willis: WC 7 H 495.

⁸⁴ O'Donnell: WC 7 H 448 (testimony given May 18, 1964).

It may be noted this statement was made six months after the assassination and Mr. O'Donnell had not provided any statements or notes close to the time of the assassination.

Nellie Connally, who was sitting beside her husband in the President's limousine, thought the first two shots 'seemed' closer together than the second and third:

Mr. SPECTER. What is your best estimate on the time that passed from the first to the last shot?

Mrs. CONNALLY. Very short. It seemed to me that there was less time between the first and the second than between the second and the third.⁸⁵

Her recollection of this was provided on April 21, 1964. There is no earlier statement or note in which the shot spacing was mentioned.

Cecil Ault was inside a courtroom in the Court House on Houston Street looking through a closed window. He did not testify and gave only a verbal statement to an FBI agent that is contained in an FBI report.⁸⁶ According to the report, Mr. Ault "noted that the first and second shots sounded to him to be close together and the third shot was spaced more after the second shot, first two shots sounding close enough to be automatic rifle". The report also states: "Following the first shot Mr. Ault noted that President Kennedy appeared to raise up in his seat in the Presidential automobile and after the second shot the President slumped into his seat". (It may be noted that the President actually fell over in his seat immediately after the third shot, which struck his head).

William and Gayle Newman were standing with their two children on the sidewalk 15 feet from the motorcade's path at the time of the shots. The FBI report on Gayle Newman dated November 24, 1963 states: "She believed there were first two shots in succession, a pause, and then another shot was fired which struck the President".⁸⁷ In a separate FBI report of the same date regarding William Newman this statement is found: "It was his belief that two shots were fired in rapid succession"... and "about that time another shot was fired which he estimated was about 10 seconds after the first shot was fired".⁸⁸

Texas School Book Depository employee, Steven Wilson, was sitting in his office three floors directly below the sixth floor window sniper's nest. He gave a statement in December 1963 in which he did not mention the spacing of the shots. In a statement dated March 25, 1964 he said he was positive that he heard three shots and gave his 'opinion' of the spacing:

In a matter of ten seconds or less after car and occupants were obscured from my view by the trees, I heard three shots. I am positive there were three shots, no more and no less. It is my opinion there was a greater space of time between the second and third shots than between the first and second. The three shots were fired within a matter of less than five seconds.⁸⁹

⁸⁵ Nellie Connally: WC 4 H 149

⁸⁶ Ault: FBI report dated January 10, 1964, CE2103, WC 24 H 534.

⁸⁷ Gayle Newman: WC 22 H 842.

⁸⁸ William Newman: WC 22 H 842.

⁸⁹ Wilson: statement, March 25, 1964, WC 22 H 685

Conclusions about the shot pattern

As seen from the above review of the evidence, there are at least 47 witnesses who recalled a shorter separation between the last two shots. Only 6 thought the pattern was the reverse. Another 9 (not counting Emmett Hudson) may have thought the shots were about equally spaced.

The distribution of witnesses shows the high significance of the witness recollection that the last two shots were closer. If the shot pattern was really the opposite, one would have to explain how it could be possible that only 6 out of 62 witnesses perceived the pattern correctly. One would also have to explain why 47 of them randomly made the *same* mistake.

One can only conclude from this evidence that there were three unevenly spaced shots, the second shot being closer in time to the third than the first. Since the difference in spacing of the shots was obvious to so many witnesses, one can conclude that the second shot occurred several frames after the midpoint between the first and third shots. From the witness evidence as a whole, it appears that the last two shots were separated by a perceptible pause.

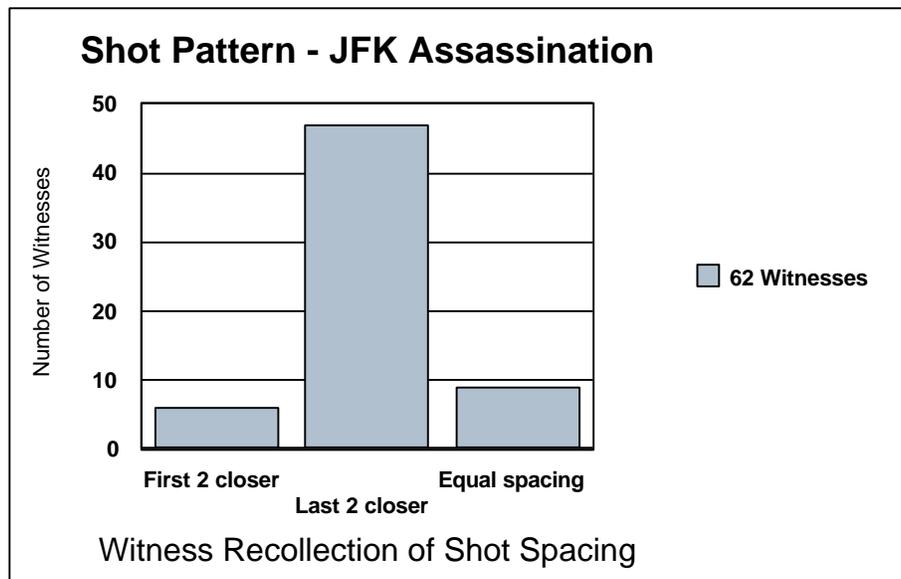


Figure 2. Chart of the distribution of witness recollections of the shot spacing

The time of the first shot

There is some controversy as to the time of the first shot. The proponents of the Single Bullet Theory maintain that the first shot occurred about frame 160 of the Zapruder film and missed the limousine entirely.⁹⁰ The second shot, they say, occurred at frame z223 of the Zapruder film, over three seconds later. The third shot occurred a further five

⁹⁰ for example see: Vincent Bugliosi, *Reclaiming History: The Assassination of President John F. Kennedy* (WW. Norton, 2007), and Gerald Posner, *Case Closed* (Random House, 1993);

seconds later at frame 313. One of many problems with this theory is that it conflicts with the recollections of the witnesses.

At least 16 witnesses recalled that the President reacted to the first shot by leaning left and bringing his hands to his neck ⁹¹. From frame 167 to frame 198 of the Zapruder film

⁹¹ The witnesses who observed JFK react this way to the first shot are:

- T.E. Moore (24 H 534, "President KENNEDY had reached the Thornton Freeway sign, a shot was fired and Mr. MOORE observed the President slumping forward in the Presidential car.")
- Nellie Connally (4 H 147. "I turned over my right shoulder and looked back, and saw the President as he had both hands at his neck.")
- David Powers (7 H 473: "I noticed then that the President moved quite far to his left after the shot from the extreme right hand side where he had been sitting. There was a second shot and Governor Connally disappeared from sight and then there was a third shot which took off the top of the President's head")
- Gayle Newman (19 H 488: "President Kennedy kind of jumped like he was startled and covered his head with his hands and then raised up. After I heard the first shot, another shot sounded and Governor grabbed his chest and lay back on the seat of the car")
- William Newman (19 H 490 "The President jumped up in his seat, and it looked like what I thought was a firecracker had went off and I thought he had realized it.")
- John Chism (19 H 472 "When I saw the motorcade round the corner, the President was standing and waving to the crowd. And just as he got just about in front of me, he turned and waved at the crowd on this side of the street, the right side; at this point I heard what sounded like one shot, and I saw him, "The President," sit back in his seat and lean his head to his left side.")
- Faye Chism (19 H 471 "As the President was coming through, I heard this first shot, and the President fell to his left.")
- James Altgens (7 H 520. He said his z255 shot was after first shot and before any other. It shows JFK reacting.)
- Abraham Zapruder (TV interview at 2:00 pm Nov. 22/63: <http://www.jfk.org/Research/Zapruder/Transcript.htm> - " I heard a shot, and he slumped to the side, like this. Then I heard another shot or two, I couldn't say it was one or two)
- Clint Hill (2 H 138, Recalled only two shots. After the first: "I saw President Kennedy grab at himself and lurch forward and to the left". CE1024, 18 H 742: "I saw the President hunch forward and then slump to his left.")
- Linda Willis (7 H 498. " Yes; I heard one. Then there was a little bit of time, and then there were two real fast bullets together. When the first one hit, well, the President turned from waving to the people, and he grabbed his throat, and he kind of slumped forward, and then I couldn't tell where the second shot went.)
- George Hickey (CE1024, 18 H 761. Perhaps 2 or 3 seconds elapsed from the time I looked to the rear and then looked at the President. He was slumped forward and to his left, and was straightening up to an almost erect sitting position as I turned and looked. At the moment he was almost sitting erect I heard two reports which I thought were shots and that appeared to me completely different in sound than the first report and were in such rapid succession that there seemed to be practically no time element between them.")
- Sam Kinney (CE1024, 18 H 731. "As we completed the left turn and on a short distance, there was a shot. At this time I glanced from the taillights of the President's car that I use for gauging distances for driving. I saw the President lean toward the left and appeared to have grabbed his chest with right hand. There was a second of pause and then two more shots were heard").
- Paul Landis (CE1024, 18 H 754. "At this moment I heard what sounded like the report of a high-powered rifle from behind me, over my right shoulder. When I heard the sound there was no question in my mind what it was. My first glance was at the President, as I was practically looking in

the President and First Lady turned to their right to smile and wave at the crowd. No one said that the smiling and waving occurred after the first shot. On the contrary, many witnesses recalled that this occurred just before the first shot⁹².

The witnesses in the motorcade recalled that the first five cars had turned the corner at Houston Street and Elm Street when the first shot was heard.⁹³ The Zapruder film shows

his direction anyway. I saw him moving in a manner which I thought was to look in the direction of the sound.".)

- Cecil Ault (24 H 534. Viewing from court house on Houston. Reported to have seen JFK rise up in his seat after first shot.)
- Harold Norman (3 H 191. "but I know I heard a shot, and then after I heard the shot, well, it seems as though the President, you know, slumped or something,")
- Malcolm Summers (Affidavit, 19 H 500 "The President's car had just come up in front of me when I heard a shot and saw the President slump down in the car and heard Mrs. Kennedy say, "Oh, no", then a second shot and then I hit the ground as I realized these were shots.")
- Mary Moorman (Affidavit, 19 H 487, "As I snapped the picture of President Kennedy, I heard a shot ring out. President Kennedy kind of slumped over.")
- Jean Newman (Affidavit, 19 H 489, "The motorcade had just passed me when I heard that I thought was a firecracker at first, and the President had just passed me, because after he had just passed, there was a loud report, it just scared me, and I noticed that the President jumped, he sort of ducked his head down and I thought at the time that it probably scared him, too, just like it did me, because he flinched, like he jumped. I saw him put his elbows like this, with his hands on his chest.")
- Charles Brehm (Dallas Times Herald statement, Nov. 22, 1963 "The witness Brehm was shaking uncontrollably as he further described the shooting. 'The first shot must not have been too solid, because he just slumped'.")
- Pierce Allman, (WFAA Dallas radio interview November 22, 1963, in which he states that he thought "the President was ducking from the first shot")

⁹² Mary Woodward a reporter for the Dallas Morning News wrote a story within hours after the events in Dealey Plaza that was published the next morning (Dallas Morning News, Nov. 23, 1963, page 2). Woodward said that she and her friends shouted as the President approached to get their attention. She said that both he and Jackie turned to them and smiled and waved. Then, as the President turned forward she heard the "horrible ear-shattering noise" of the first shot.

⁹³ These witnesses are:

In the VP car (4th in motorcade):

Hurchel Jacks (driver), WC 18 H 801, said "My car had just straightened up from making the left hand turn" when the first shot rang out.

SA Rufus Youngblood, WC 18 H 767, said that the VP car had turned the corner and he observed grassy area to his right before first shot was heard.

Vice-President Lyndon Johnson WC 5 H 562: said he heard the first shot "after we had proceeded a short way down Elm Street"

Lady Bird Johnson, WC 5 H 565: said "we were rounding a curve and going down a hill" when the first shot was heard.

Senator Ralph Yarborough WC 7 H 440: "as the motorcade went down the slope of Elm Street a rifle shot was heard by me".

Occupants of the VP follow-up car (5th in motorcade) described the moment of the first shot:

Joe Rich. (driver), WC 18 H 800: "I was staying right on his bumper" (of the VP car). "we turned off Houston Street onto Elm Street"

the fifth car (the Vice-President's security car) still turning the corner at frame 191. Hugh Betzner took a photograph of the back of the President corresponding to frame 186 of the Zapruder film. He said that he was winding his camera to take another when the first shot sounded.⁹⁴ It is also consistent with the recollection of Phillip Willis who said that his photograph of the President, exposed at frame 202, was taken at the very instant the first shot was heard. His daughter, Linda, said that the first shot occurred when the President's limousine was in line with her and the Stemmons sign, which occurs between frames 195 and 207.⁹⁵

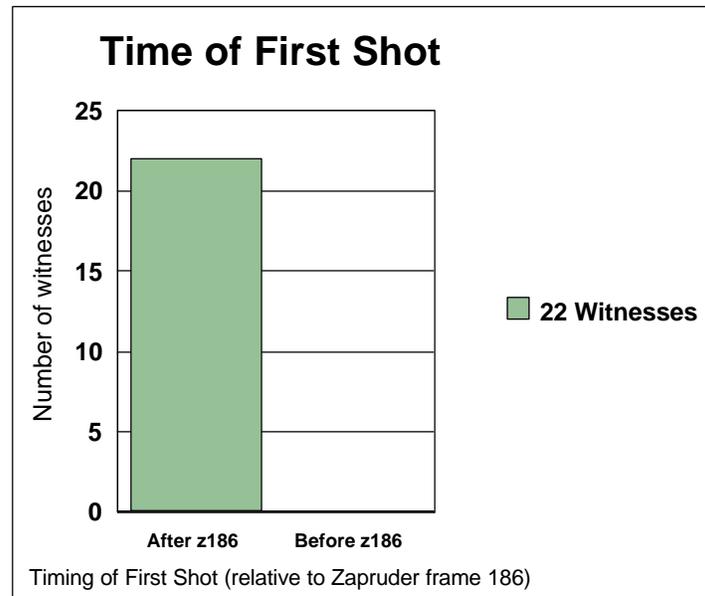


Figure 3. Chart of the distribution of witness recollections of the time of the first shot.

Clifton Carter, WC 7 H 474: "our car had just made the lefthand turn off Houston onto Elm Street and was right along side of the Texas School Book Depository Building"

SA Kivett, WC 8 H 778: "The motorcade was heading slightly downhill toward an underpass. As the motorcade was approximately 1/3 of the way to the underpass.."

SA Johns, WC 18 H 764: "at this time were were on a slight downhill curve to the right"

SA Taylor, (18 H 782): "our automobile had just turned a corner"

Occupants of Mayor Cabell's car (6th in motorcade) recalled hearing the first shot as follows:

Milton Wright (driver), WC18 H 802: "had just turned onto Elm Street and approximately 30 feet from the intersection" [note: the turn onto Elm begins before the streets intersect due to the greater than 90 degree angle turn at Elm].

Earle Cabell, WC 7 H 479, said that he was turned around talking to Rep. Roberts and Mrs. Cabell with the TSBD situated to his back.

Mrs. Cabell, WC 7 H 486, "we were making the turn" ... "I was directly facing [the TSBD]"

[Rep. Ray Roberts did not provide any statement.]

⁹⁴ Betzner, WC 24 H 200: "I took another picture as the President's car was going down the hill on Elm Street. I started to wind my film again and I heard a loud noise."

⁹⁵ Phillip Willis: WC 7 H 493; Linda Willis: WC 7 H 498.

How the witness evidence affects the analysis of the assassination

The current view of the proponents of the Single Bullet Theory is that the shots were fired at frames 160, 223 and 313 of the Zapruder film. This would mean that the second shot occurred almost five full seconds before the fatal shot, making the time between the first and second noticeably *shorter* than the interval between the second and third. This view appears to be based almost entirely on detailed examination and analysis of the Zapruder film.

The shot pattern witness evidence establishes that there was only one shot prior to the mid-point between the first and last shots. This ‘second bullet SBT’ hypothesis cannot be reconciled with the shot pattern evidence. If the SBT is correct, it must have occurred on the first shot⁹⁶.

Since the third shot struck the President in the head between frames 312 and 313, if the first shot occurred very close to frame 200, the mid-point of the shooting was at frame 256. The second shot must have been fired a perceptible amount of time after this mid-point to account for the number of people who observed the unequal spacing. A second shot at frame 275 would make the time difference between the first and second shots twice as long as the interval between the last two, which is what many witnesses recalled.

The Warren Commission found that a minimum of about 2.3 seconds was required to fire, reload aim and fire again using Oswald’s rifle.⁹⁷ This appears to be based on the FBI re-enactment using that rifle. FBI ballistics expert Robert Frazier, who actually fired 3 shots in 4.6 seconds, said “4.6 seconds is firing this weapon as fast as the bolt can be operated, I think”.⁹⁸ The FBI’s Ronald Simmons noted that one marksman fired three shots in 4.6 seconds using the telescopic sight and three shots in 4.45 seconds using the iron sights.⁹⁹ There was no time placed on the middle shots so we cannot determine the smallest interval between shots. None of the FBI marksmen had practised with the Mannlicher-Carcano rifle. Simmons admitted that with practice the shooter would likely

⁹⁶ As previously noted, practically all of the witnesses who commented on the President’s reaction to the first shot said that he immediately move to the left and brought his hands to his neck. Only one witness, SA Glen Bennett riding in the follow-up car behind the President, reported seeing him being hit by the second shot (Nov. 22, 1963 statement WC 18 H 760) although his original handwritten notes (CE 2112, WC 24 H 542) suggest it was the first shot:

“At this point I heard a noise that immediately reminded me of a firecracker. I immediately, upon hearing the supposed firecracker, looked at the Boss’s car. At this exact time I saw a shot that hit the Boss about 4 inches down from the right shoulder; a second shoot (sic) followed immediately and hit the right rear high of the boss’s head.”

SA Hickey, who was seated beside Bennett, specifically noted that the President was not hit by the second shot and that it appeared to pass to the right of his head as his hair flew up at the moment the second shot was heard. See fn. 36. The only other point in the car struck by a bullet was Governor Connally.

⁹⁷ WR 97.

⁹⁸ Frazier: WC 3 H 407

⁹⁹ Simmons: WC 3 H 446

be able to operate the bolt smoothly without moving the rifle from its target.¹⁰⁰ There was evidence that Oswald practised using the bolt action.¹⁰¹

The witness evidence establishes that if Governor Connally was hit by the second bullet - as he and his wife always maintained - it must have struck him around frame 270 or later. Since Zapruder's film ran at an average speed of 18.3 frames per second, if Connally was hit any later than about frame 276 there would have been less than 2 seconds between shots and, therefore, more than one person was shooting.

A shot around frame 270 would fit the shot pattern and would be consistent with the Warren Commission's 'lone assassin' conclusion. So, if the Warren Commission reached the correct conclusion and Connally was right about being hit by the second shot, there should be evidence of a shot striking him in the back at around frame 270.

Such a shot sequence would come as no surprise to the late Governor John Connally and the late Nellie Connally. They had always maintained that the Single Bullet Theory was wrong but were satisfied that Oswald did the shooting. They just could not explain the timing of the shots.

Once the time of the second shot is determined from the shot pattern evidence (in the range of frame 270-275), one can find abundant confirmatory evidence for a shot there:

1. a slight but very apparent forward movement of Governor Connally is seen between frames 272-279, consistent with the impact that the Governor described¹⁰² and the "recoil" that Nellie Connally observed¹⁰³.
2. limousine driver, S.A. William Greer, turned his head to the rear from frame 277 to 280. Mr. Greer said he turned around immediately upon hearing the second shot and saw Governor Connally falling back¹⁰⁴.
3. the hair on President Kennedy's right side flies up and forward and then falls back down from frames 273 to 276. This is consistent with what S.A. Hickey¹⁰⁵ and S.A. Kinney¹⁰⁶ observed at the instant of the second shot. No one else's hair moves at this time. This hair movement does not occur anywhere else in the Zapruder film.
4. the left sun visor over above the windshield appears to move up slightly between frames 271 and 272. This is consistent with it being struck by a bullet fragment from the second shot. Damage occurred to the windshield during the shooting and James Tague standing well ahead of the limousine felt a

¹⁰⁰ WC 3 H 449

¹⁰¹ Testimony of Marina Oswald: WC 1 H 53 and 65

¹⁰² Testimony of Gov. John B. Connally, WC 4 H 133 and 144

¹⁰³ Testimony of Nellie Connally, WC 4 H 147.

¹⁰⁴ Testimony of S.A. William Greer, WC 2 H 118.

¹⁰⁵ Testimony of S.A. George Hickey: *ibid*, footnote 38. Testimony is also quoted on page 10 of this paper. "The first shot of the second two seemed as if it missed because the hair on the right side of his head flew forward and there didn't seem to be any impact against his head. "

¹⁰⁶ Testimony of S.A. Kinney: CE 1024, WC 18 H 732: S.A. Kinney observed: "At this time the second shot was fired and I observed hair flying from the right side of his head."

fragment strike him on the cheek on what he recalled was the second shot¹⁰⁷. If this is correct, a fragment must have exited the car, passing over the windshield at the time of the second shot.

5. the appearance of Governor Connally's wrist changes between frames 271 and 272. This is consistent with the movement of either his wrist or his clothing. The right shirt cuff appears to catch significantly more sunlight in frame 272 than in 271, a time interval of about 55 milliseconds.

Such a shot at frame 271 is consistent with Oswald firing all three shots and all three shots striking within the President's car¹⁰⁸.

Epilogue

There has not been a satisfactory resolution to the timing of the shots in the JFK assassination. The Single Bullet Theory did not receive unanimous endorsement of all members of the Warren Commission and has been mired in controversy since 1964. The different theories, particularly that of the current "second shot SBT" do not explain the evidence. Indeed, they all contemplate that a substantial amount of reliable witness evidence, including the evidence of Governor and Mrs. Connally, is wrong.

To solve this "mystery", one must take into account the fact that there is remarkable consistency in the recollections of witnesses on important details. When this witness evidence is dusted off and re-examined, it provides a new perspective on the sequence of events during those tragic and awful few seconds in Dallas 45 years ago.

¹⁰⁷ Testimony of James Tague, WC 7 H 555.

¹⁰⁸ The time between the second and third shot (frames 271 to 313 – 42 frames) is 2.29 seconds, very close to the minimum which the FBI said was needed to fire, reload, aim and fire again. Not surprisingly, given the abundant and cogent evidence establishing the guilt of Lee Harvey Oswald. Ibid, Fn. 97-99,