

used.

During the first test shooters fired three rounds, one at each of three targets. Timers measured the period between the second and third shots. Shooters repeated the test, the second time with timers measuring the period between the first and third shots. Each test was carried out three times, measured by three timers, with results averaged individually and as a group.

## RESULTS

As indicated previously, the mean cycle time for SWAT snipers was found to be 0.99 seconds. Accordingly a correction factors was developed to control for the cycle rate difference between the Manlicher-Carcano and Remington rifles;  $(2.3 - 0.99 = -1.3 \text{ sec / cycle})$ . Subjects fired with 88 percent accuracy, determined by a bullet strike within the human silhouette of the target; in most cases the bullet strikes were to the head.

SWAT snipers fired two rounds in an average of 3.43 seconds. Corrected for the Warren Commission cycle rate, the subjects fired two shots in 4.73 seconds (0.14 sec VAR). These data fall below the Warren Commission maximum of 5.6 seconds; suggesting that Lee Harvey Oswald may have been capable of firing two shots within the time frame established by the Warren Commission.

SWAT snipers fired three rounds in an average of 7.02 seconds. Corrected for the Warren Commission cycle rate, the subjects fired three shots in 9.62 seconds (0.27 sec VAR). These data exceed the Warren Commission maximum of 7.9 seconds, suggesting that Oswald was not capable of firing three shots within the time frame established by the Warren Commission.

## DISCUSSION

The data from this study suggests that Oswald was, at most, capable of firing two shots in the time allotted by the Warren Commission. The study was limited by the number of shooters ( $N = 6$ ), however each shooter completed each task three times, giving somewhat greater data. Assuming that Lee Harvey Oswald was not a more skillful shooter than school-trained SWAT officers, the data undermines the assertion by the Warren Commission that Oswald was capable of firing three rounds in the time they specified.

## References

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# FOLLOW-UP AND CONTINUATION TO FIRST SHOT/FIRST HIT CIRCA Z-190

**Douglas DeSalles, M.D.**

I applaud Barb Junkkarinen's article *First Shot/ First Hit Circa Z-190* (*Kennedy Assassination Chronicles*, Vol. 5, Issue 2, Summer, 1999). Anyone can examine her points on photo evidence, and anyone interested enough to read her article (and this one) should do just that. I would like to direct such a review. Get a good copy of the Zapruder film (and Groden's version with between-sprocket image film). Obtain full-frame Betzner and Altgens photos. Find the Willis. Bronson and Croft pictures. Gather these together to check one against another. A good Dealey Plaza schematic, such as in Trask's *Pictures of the Pain*, will help.

Your overview will quickly reveal that all witnesses north of Elm are accounted for between these photos. Check this. The tall black man with the white shirt in Croft is plain in Altgens. Betzner (waving) and early Z frames. To his right several places down was a portly man in a hard hat near the light pole. He is evident in Betzner. Willis. Altgens and the Z film. Hat-wearing Ernest Brandt.

visible in the Z film with a red headed man to his left, is plainly visible in Bronson and Willis. Blocked from Zapruder by the Stemmons sign are the Chism family, but they are evident in Bronson in front of the limo. You can use these figures to see who was where. Satisfy yourself that a yardstick of humanity exists for the Elm witnesses. We will return to this.

Hal Verb has done a fine job establishing that the first shot hit JFK. I would amplify several of his points. Testimony of Nellie Connally was specific that the men were hit separately. She said she looked back and saw the stricken President after the first shot, before shot #2 hit her husband. She is entirely credible and unlike her husband she saw JFK after shot #1. Many witnesses described JFK's wave to the crowd on his right, which was punctuated by a gunshot. Although it is not as apparent in available Z films as in the National Archive slides, Barb and I indeed verified that JFK is smiling and waving into the Z180s.

Examine Betzner's photo (Z186). It captures those very individuals to whom the President made his final gesture! They



are waving vigorously as he passed perhaps 15 feet away. He actually turns slightly rearward to his right to wave (see the Z film). Bonnie Ray Williams' observation of JFK smoothing his hair just before shot #1 is wrong (no such action is on film) but he surely mistook that last wave as seen from above as a motion to the scalp. The strongest argument against a shot before Z186 is this simple comparison of Z-film action vs. those waving witnesses of Betzner. I am aware of no spectator who reported that JFK continued waving after the first gunshot (though a minority feels that this first shot missed, no one reported the President waving after it)!

Consider the testimony of Joe Rich driving the fourth motorcade car and Mayor and Mrs. Cabell, his passengers. They all say they were turning onto Elm as the first shot rang out. Review of between sprocket Z film images show the car entering the turn in the Z170s. How much later a shot could have rung out and found them turning still is unclear (they may not have been onto Elm until Z240) but Dave Wiegman's movie corroborates the car being in the turn immediately after shot #1 just as they say. The motorcade photographer started his black and white movie after the first shot as he leaped from his auto and catches Cabell's car (two places up) still in the turn.

A review of Croft's photo (Z161) amplifies the portrait of a hale JFK. In the Z film he salutes the crowd on his left by Z161 then cheerily turns to his right to address the people seen in Betzner. This all fits a shot after the Z180s well. It fits a shot before this not at all.

The first shot came *after* Z186 if Hugh Betzner recalled correctly that he snapped his picture before the sound of the report. Allow that Z187 is the earliest frame that jibes with his memory though the speed of sound might permit Z185-6 to be its exact timing.

Phil Willis was always clear that he *reacted* to shot #1 to snap his picture (Z202). He allowed that the shot could have come a hair later, but was *very* close if not simultaneous with *hearing* the noise and snapping the shutter. Willis needed at least a Z frame to hear the noise of the gun (he was surely 60 feet from it, and one Z frame is about 60 feet of sound travel). Adding a minimal reaction time means factoring 1/4 to 1/3 second for Willis to actually snap the shutter. Subtracting a conservative correction factor of 6-8 frames derives an estimate of Z194-196 for the actual timing of shot #1.

The two photographers provide compelling testimony for a Z187 to Z196 timing of the first shot. There is a third photographer's tale that agrees with this: that of Charles Bronson. Confirming this requires the reader should photocopy two copies of the slide from the excellent copy on page 25 in Bob Groden's *The Killing of a President*. Cut out the limo from one to overlay it on the other. The Presidential limo's velocity of 11 mph is 16 ft/sec. A limo length of 21 feet means your 7mm paper car equals about 1.3 seconds of motorcade travel or about 24 Z frames. Bronson's slide is at Z225. He told Trask that he was waiting for the car to come from behind the concrete wall obstructing his view of upper Elm. The car *had not* fully appeared when he heard a gunshot. Slide your paper car one car-length up Elm to approximate this.

The car in fact cleared the wall about Z219 to Bronson's perspective. This is around 1/4 car length = 1/3 second = 6 Z frames past it. Subtract 4 more frames to factor in sound travel (Bronson was about 70 yards from Elm) to find Z 215 as the *last possible moment* for the first shot given Bronson's recall that the car had

not yet *fully* appeared. Thus, Z215 is about *the last* moment which fits his description. What is the earliest moment?

Your model demonstrates that the front of car would have peeked around that wall 1.2 to 1.3 car lengths (= 1.6 to 1.7 seconds = 29 to 31 Z-frames) earlier. Everything Bronson recalled still applies this early: limo not yet in full view yet coming from behind the wall, and <bam>, the sound arrives. Subtract the 29 to 31 frames for the car to be just appearing around the wall. Synch that visual to a sound leaving 4 frames earlier to find yourself at Z190 to Z192, right in our hypothesized time frame! Don't believe me however - make the paper model and re-read Trask to decide if this is a stretch. Martin Shackelford thinks the Bronson slide is closer to Z230. If so add five frames to the above argument and still find good agreement with Phil Willis and Hugh Betzner.

Next take up the Z film. The HSCA and Louis Alvarez agreed that the first tracking error is in the Z190s. Zapruder heard two shots. He had only two prolonged tracking errors from being startled by what he heard or saw. One is the mortal injury. The other is the Z190s. Verify that the Z190s are a mess. In 1966, for CBS news, Alvarez subtracted a few frames from the 190s to estimate Zapruder's reaction time to arrive at a shot at Z186. For his published paper he moved the figure to Z177 with no explanation for the change. CBS bought heavily into a shot coming during a break in the oak foliage (from the 6<sup>th</sup> floor TSBD) at Z186. Alvarez was apparently rather accommodating in the frame he chose for them. Alvarez's original estimate fits his published graph better given his own estimation of 1/3 second for a tracking error to show up.

As you verify the shaky tracking from Z191 to Z205 observe Rosemary Willis. Gerald Posner, among many untruths, claims that the youngster stopped running in the Z 160s. She can be seen to in fact stop at Z195. The near synching of the little girl's halt to Zapruder's jiggle should be inspected. It is powerful evidence that they both reacted to the same thing at the same time, and that thing is most surely the first shot.

The supposition that Zapruder's jiggle and Rosemary Willis's halt are due to shot #1 is strongly supported on the Z film by SSA Hickey's actions and those of Jackie Kennedy.

Hickey testified that he turned to look at JFK after he heard a shot. Comparing Betzner vs. Willis shows you that Hickey's turn to his right took place between Z186 and Z202. Review of between-sprocket z film images shows he reacted after Z195. Factoring in 1/4 to 1/3 sec. for reaction time on the head swivel to peg shot #1 to Z188 to Z190.

Jackie fixed on her husband before Z200. Her head is right of center and remains there for many seconds afterward. As late as Z187 she was looking slightly right of forward (at Zapruder) having made a slow turn to the right from Z161 when she looks directly at Croft. She said she looked at her husband after the first shot. Ray Marcus's monograph on the Z film concludes that by Z198 Jackie was looking at JFK and I agree. In the Z187 to Z198 interval one cannot doubt that turn to her right; but check it anyway.

The presumably injured JFK has his arm go stiff in the Z190s. He no longer waves as in the sequence from about Z155 to circa Z192 (his last wave to the crowd at his right starts about Z172). Another abnormal motion, an abrupt head jerk to the left, is clear between Z200 and 204. Is it any wonder that by mid-1964 the Secret Service examination of the Z film, FBI report on the assassination and two Warren Commission reviews of the Z film con-



cluded that the first shot hit JFK before the second shot hit JBC. JFK does not *just* appear to have been hit before emerging from the sign at Z225—he reacts earlier on film as the HSCA. Ray Marcus, Robert Groden and so many others have noted since. If the Stemmons sign had not blocked Zapruder's view of JFK from Z207 to Z225, then Arlen Specter could never have invented the single bullet theory out of necessity. The sign adds enough ambiguity to permit such a notion with a straight face, but prior to Arlen nobody saw the film and took issue with Connally's conviction that he was hit *after* the President.

No review of the Z film is complete without examining the Governor's actions. Barb and I puzzle over the ennui of researchers regarding the flipping lapel of frame Z224. Todd Vaughan, Failure Analysis and Gerald Posner seem to regard this motion as proof of a bullet hit and thus proof of the SBT. Their opponents seem to do likewise and thus *reject* it by the unsound reasoning that the SBT is wrong therefore a lapel flip *consistent with* it must be invalid. Given a convergence of data on shot #1 hitting JFK at Z190 this is very odd.

Everyone agrees that JBC is showing a hit by Z236, but how much time has elapsed since that slug? Review of Z226 to Z230 will show a bizarre jerk of JBC's right hand that looks non-voluntary and reflexive. His Stetson pops to chin level! Those who suggest that JBC's grip on his Stetson in Z230-232 proves that his wrist was still uninjured could not possibly be more wrong. Would not an "injury to the radial nerve" preclude this? No! JBC suffered injury to a superficial (skin) branch of that nerve. Severing motor (muscle) branches of that nerve would eventually cause a loss of extension ability at the wrist, but it would not affect hand grip. That involves two entirely different nerves to fingers and thumb. Also, JBC still grips the hat on film seconds after his chest was obviously punctured, and to account for this, advocates of the "radial nerve" theory are forced to claim that another bullet must have separately struck his wrist. Occam's razor says that the easiest explanation for the continuity in JBC's reaction of lapel flip, hand jerk, then chest drop with cheeks puffed represents a chain of *physiologic reactions* to being hit.

I shot thirty melons with a Mannlicher-Carcano and generally saw no significant motion of the target. I must, therefore, reject two six-foot Irishmen being knocked about on film by the physics of bullet impacts to their torso as some think they see. By actual experiment, free-to-move melons in duct tape or plaster wrap scarcely budged. This is contrary to Hollywood, but consistent with the reality I have recorded on video. A ballistics consultant of mine told me that shotgunning of a dummy free to roll produces less than an inch of motion. With all due respect to Tink Thompson, whose work I much admire, the steepening of JBC's shoulder in Z238 is *not* the near instantaneous effect of a bullet strike. It is physiology, not the physics of impact (with the possible exception of the lapel flap, an object of such tiny mass can easily be envisioned as undergoing very rapid motion).

Barb Junkkarinen notes that JBC's oft-quoted turn to his right to see JFK after he heard shot #1 is not so evident on the Z film. True enough. It is easy to imagine that JBC was addressing those

people waving in Betzner, hard to imagine this motion over several seconds represents his post-shot reaction. It is not abrupt. Could he have jerked quickly to his right while behind the Stemmons sign? We can never know. Connally clearly moves leftward after Z222 on the other hand and he always noted turning leftward to straight-ahead when he felt the blow. He looks straight-on by Z228. Dramatic reactions soon follow. It took him a finite interval to feel the blow. Despite the research community's disputation of a "delayed reaction" in Connally—because it is so heavily relied upon by Warren apologists—a second interval between a bullet at Z224 and the perception of same is more than plausible—especially compared to the idiotic companion idea that JFK reacted instantly at Z225 to produce change on film in 1/18 second (less than an eye blink)!

Let me again stress that those video 30 impacts of Carcano rounds on melons I recorded show rare motion of the melon target.

One should not accept that bullet impacts on the trunk of either victim could be appreciable on film until someone can show on tape a bullet moving 50 pounds of flesh around. If JFK was hit at Z189 and JBC at Z224 then about a 2/3 second (12 Z frames) interval can be measured off to both Kennedy's

abrupt head jerk and Connally's cheek puff/shoulder drop. Comparably timed reactions are not expected necessarily, but two similarly injured men reacting in similar time frames makes more sense than one reacting twelve times faster than the other, does it not?

As regarding the quoting of Elm Street witnesses in relation to the limo, we researchers have a problem. Thompson's 1966 diagram is as valuable as the rest of his work, but his witness placement is not precise. John Chism can be placed with exactness but that is all. As far as I am aware, astonishingly, no one has yet compiled a diagram of witnesses based upon actual spectator positions on the photos. To this day we cannot locate who is where, when they say they saw such-and such. Use of photo placement, followed by asking identified witnesses whether the limo was up the street, right in front or down the street from their position could have established the timing of shot #1 in 1964. The imprecision of a given witness would have been overcome by the aggregate data. The closest witnesses to the car when the first shot rang out could be relied upon to recall whether the car was up the street, adjacent, or beyond. This basic piece of research could still be done. Your review of Croft, Altgens and Betzner will show you 12 blacks grouped just east of the light pole. I think most, if not all of them, have never been identified. We must find these people. Many of them look youthful in 1963 and are likely still around.

Known witnesses like Mary Woodward are likely to identify themselves for the record and state whether they think the limo was east, west or in front at the first shot. Gloria Calverly and Karen Hicks both noted that the car was directly in front of them at the first shot. Excellent! Except that, as far as I know, no one has ever identified either in photos. Their placement has been a guess based on their descriptions. Guessing should never have been necessary. In 1998 a new, firsthand report from eyewitness June Dishong surfaced. It was written to herself diary style. Dishong described the limo's position vs. the first shot but she did so ambiguously. She

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wrote: "He drops his arm as they go by—possibly 20 feet. Suddenly - a sound. Gunshots? Hard to tell above the clamor of the crowd. The President bent forward into his wife's lap as his arms slipped off the side of the car." Dishong is the 4<sup>th</sup> woman left of the Stemmons sign in the Z film. She is visible in Betzner and Bronson where she looks a yard ahead of JFK. Her note does not say whether she meant "as they passed 20 feet away" or "as they passed us by 20 feet." Per Bronson, factoring in sound travel (the limo's 16 fps divided by 18.6 frames per second is about a foot a frame), shows that Dishong's position a yard in front of JFK eliminates the limo passing her by 20 ft as a possibility, but it does not establish whether she meant 20 ft perpendicular to her position or 20 ft. up the street. Use your paper model to verify that one limo length of 20+ feet would put the car behind the concrete wall as described by Bronson. This is good for our thesis except that the limo was in the middle of the street, and even at its closest pass JFK was surely still 15 ft. from spectators. A check of Z189 on a diagram verifies that JFK was closely in front of her, but he was probably more like 35 feet away. Her description of arm drop is also hard to pin down. By Z224 his hand is near horizontal, but JFK is not seen on the Z film between Z207 and Z224. His arm drop has commenced pre-sign. After Z224 his arms do not drop. He stopped waving in the Z190s. What was Dishong describing? As she is deceased we cannot ask the dear lady follow-up questions, and no officials ever contacted her at all. Living witnesses may yet be found and queried specifically, however. No one proposes shot #1 before Z153. Its last possible moment is Z224. The whole 71 frame difference is but three lengths of the limousine, but what a critical difference that makes.

A third point from Hal Verb's paper was that some of the best witnesses said that the first shot hit JFK. Woodward is an exception to this. Nevertheless combat vets Phil Willis and Charles Brehm saw it that way, and so did Jackie Kennedy and Nellie Connally. Linda Willis. Malcom Summers, Gayle Newman, Ernie Brandt, Jean Newman, Harold Norman, Abraham Zapruder, Marilyn Sitzman, Sam Holland and SSA Clint Hill also said that JFK was wounded by the first shot. Hill began his run to the limo in response to this perception. We may add June Dishong to this list as her words clearly describe a hit with shot #1. To review: a shot about Z190 represents convergence of data from:

1. Betzner's statements and his photo
2. Willis' statements and his photo
3. Bronson's statements and his photo
4. "Jiggle" analysis of both Louis Alvarez and the HSCA
5. Rosemary Willis' on-film action
6. SSA Hickey's on-film actions laid against his testimony
7. Jackie's on-film action laid against her testimony
8. Joe Rich and Mayor and Mrs. Cabell's statements, which are film corroborated
9. JBC's statements, which can be partly film corroborated
10. Nellie Connally statements
11. Numerous eyewitnesses, who described JFK's wave (the Z180s) preceding shot #1
12. Specific statements from many Elm St witnesses who stood near the car
13. JFK's on-film action

Any scenario of shot #1 outside of Z187-196 pulls away from this cluster of data.

The conspiracy advocating reader should accept that JBC was likely hit at Z224. This is not a notion favoring the nutter camp! A

shot at Z190 and a second shot before Z232 is death to the SBT. The balky bolt of the Carcano needed 2.3 seconds or 42 Z frames to operate. Favoring a Z224 hit are:

1. the lapel flip, which to my eye is not film artifact
2. the explosive jerk upwards of JBC's known-to-be-struck wrist from Z226 to Z230
3. the fact that JBC is turning leftward and is straight ahead by Z228
4. the necessity of a small time interval to see a reaction in JBC given no known evidence that a bullet from a Carcano can move a human torso
5. the fact that after Z 225 the wrist is even or above the door of the limo, no longer near the chest exit site under the right nipple requiring yet another bullet to hit his wrist.

The second shot hitting JBC is what Connally always said happened, is what Nellie saw, and what eyewitness Gayle Newman testified. It is deadly to the SBT. Note: a separate strike to JBC at Z236 does not eliminate it as a possibility once conceding the hit to JFK at around Z190. The even better evidence for a Z224 strike, however (something accepted as gospel by apologists now) does not let them off the hook, but instead kills the SBT.

A word of caution for those of you who have thought the SBT was killed 25 years ago. It wasn't. At least not by the spurious argument that no bullet in history could have done what CE399 did, and come out looking good. Twice I arranged for a 6.5mm Carcano round to be shot through a roast, a layer of spare ribs (breaking bone each time), a layer of casting plaster, several feet of high density foam and a newspaper bullet trap. On both occasions the round was dug out of the bullet trap looking pristine - better than CE399. Omission of the roast conversely produced a bent, broken bullet by virtue of the sudden deceleration upon hitting rib. The allegation that staged slowing of the bullet would preserve its appearance is not a load of corn, and I refuse to debate this with anyone who has not tried the experiment.

Let us identify some witnesses on film. There are several clumps on Elm. Identifying them would help immensely. Three groups come to mind whose identification would suddenly establish better positions for 13 people.

1. "Between the light poles" were five from the Allyn-Bacon Publishing Co in the TSBD: Mrs Peggy Joyce Hawkins, Mrs Billie P. Clay, Miss Georgia Ruth Hendrix, Mary Williams and Mary Dickerson.
2. "Near the Stemmons Freeway sign" was a Dallas Morning News group: Ann Donaldson, Mary Woodward, Maggie Brown and Miss Aurelia Alonzo.
3. "Half way to the overpass" were employees of the South-Western Publishing Co (TSBD: Mrs. Gloria Calverly, Miss Karen Westbrook, Carol Reed and Mrs. Karen Hicks.

I believe that the second group is closest to the light pole near the hard hat man and Woodward is the blonde in the dark outfit, but I have never see this established. Were it possible to say which of these groups were which, then witness identification would be advanced greatly, especially since Alonzo in group 2 said the car had just passed her at shot #1. Both Westbrook and Calverly from group 3 say the limo was right in front of them. Jean Newman put the motorcade as "just past" her.

In conclusion, if we could say who they were in the photos, these descriptions would be much more valuable. It is my hope that this can be accomplished by someone in the research community.