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PRESIDENT KENNEDY?
FURTHER BALLISTIC STUDIES

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Reprinted from

BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE

Second Series, vol. 48, no. 3, pp. 513-524, April 1972

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CRITICS of the Warren Commission report on the assassination of President John F. Kennedy in Dallas, Texas, in 1963 have claimed that the Italian military Carcano rifle, caliber 6.5 mm. model 91-38, used by Lee Harvey Oswald (sometimes referred to as a carbine because of its short barrel length of 20.5 inches) could not have been fired as rapidly and accurately as was proposed by the Warren Commission investigators.¹

It appeared to us that this matter was susceptible to additional experimentation and that perhaps Oswald had enjoyed a longer period of

*Presented at a meeting of the Section on Historical Medicine of the New York Academy of Medicine, November 12, 1969.

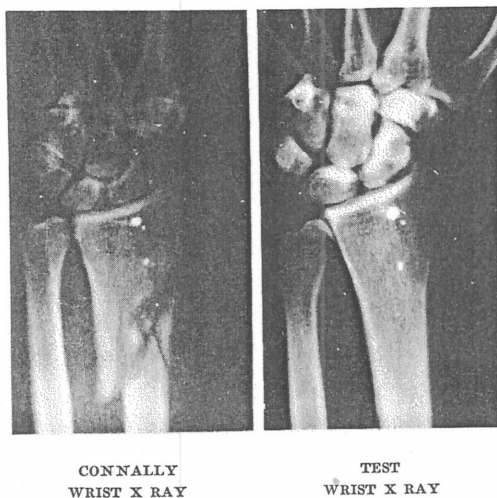


Fig. 1. Bullet fragments (three white dots over wrist, as in Governor Connally's x rays, could easily be reproduced from the two grains of lead extruded from an experimental bullet (see Figure 4). Reproduced by permission from: Lattimer, J. K. and Lattimer, J.: The Kennedy-Connally single bullet theory. *Int. Surg.* 50:524-32, 1968.

familiarization with the rifle than had been afforded those who later tested his rifle briefly. Government experts dared to fire only a limited number of shots for fear of damaging the rifle.²

During our earlier investigations into the feasibility of whether a single bullet could have wounded both President Kennedy and Governor John B. Connally, Jr.³ (Figure 1), as alleged by the Warren Commission report, we were finally able to accumulate several hundred rounds of the exact type of ammunition used by Oswald; it represented three of the four lots (6001, 6002, and 6003) manufactured by the Western Cartridge Company at the time his ammunition was made. The Federal Bureau of Investigation (FBI) had previously tested more than 100 cartridges from lot 6000, and Robert Frazier, fire-arms expert, like us, had encountered no failures to fire.⁴ This answered one statement of critics who had claimed that Oswald's ammunition was undependable.⁵ We therefore decided to expand our tests, out of curiosity, to see for ourselves whether it was at all possible for ordinary civilians, after lengthy "dry-firing" practice (like Oswald's), to reproduce Oswald's marksmanship by firing three shots in rapid succession at shifting targets, at ranges up to 263 feet, using equipment and positioning as similar as we could arrange, to those used by Oswald.

Since it was not practical for us to fire shots from the sixth floor of the Texas Book Depository Building, as Oswald appears to have done, we arranged boxes of the same type and dimensions as used by Oswald (some on which to sit and some on which to rest his hand) on the roof of a building which would permit a reasonable (although of course not exact) simulation of Oswald's firing position. One of us (JKL) had had an opportunity to sit on the boxes in the actual window used by Oswald in Dallas, and so was familiar with the general configuration and characteristics of his well-arranged firing position, with its low window sill. Photographs from the Warren Commission report, taken immediately after the shooting, made it possible for us to duplicate most of the conditions.⁵

The advantageous nature of the arrangements made by Oswald were not fully appreciated by us until we sat on the box in the actual window he used.

Four rifles of exactly the same type as that used by Oswald were procured, and four 4-power telescopes made by the Ordnance Optical Company, of the exact type used by Oswald, were obtained (with some difficulty). A sling was made of materials similar to those used by him, in exactly the same configuration and dimensions as his. The telescope mount was assembled with the same number of screws (two) placed in the same positions as those used in Oswald's rifle.

Oswald's rifle was examined at the National Archives in Washington, D.C., and our rifle, telescope, and assembly, which most closely resembled his in both condition and ease of operation, was selected from our four carefully chosen sample rifles for use in our firing tests. Several clips (cartridge holders) exactly like the type used by Oswald (labeled SMI), were obtained for our experiments, after much searching.

The telescopic sight was first aligned by looking through the barrel at the target and then adjusting the telescope to point at the bull's-eye (a technique known as "bore-sighting"). To align the sight perfectly, it was necessary to place thin metal wafers (shims) under the front ring of the mount of the telescope, just as had been found necessary with Oswald's rifle, in order to correct the faulty alignment of his telescope.^{6,7} Test firings from a fixed (bench) rest were then done for the final adjustments of the telescope.

Various types of targets were positioned at distances at which Oswald's shots might have been fired.⁸

One hundred and eleven rounds of this fairly-high-velocity military ammunition (2,200 feet per second) were fired before it was necessary to retighten the screws holding the telescope mount, even though the depth of the threaded holes was rather shallow. We watched this carefully, in view of the reported loosening of the screws of Oswald's telescope mount, either in the search for fingerprints or during the firing tests by the government authorities. We were thus able to verify the fact that after a large number of rounds (111) had been fired these screws did indeed tend to loosen, but that they did *not* loosen with the firing of only three or four shots, or even 50 or 60 shots.

A long period of "dry-firing" was undertaken, running "dummy" cartridges (from our previous experiments on the feasibility of the Kennedy-Connally single bullet theory)⁸ through the magazine and through the action, in order to become dexterous at the procedure of pulling back the bolt, pushing it forward quickly, aiming, pulling the trigger, and then repeating the performance as rapidly as possible, so that three "simulated" shots were dry-fired, as Oswald seems to have done. It was found that with the sling binding the rifle tightly to the experimenter's arm, and by resting both forearms flat against the legs, above the knees (as was possible from Oswald's high perch), three cartridges could be worked through the action in six or seven seconds, still allowing a short period for aiming, before each simulated shot. If the interval between each shot was increased to five seconds (10 seconds total) aiming became quite easy. It was found necessary not only to push the bolt vigorously forward but to pull it vigorously back, each time, with more force than is usually required with bolt-action rifles. Facility with these motions was acquired only after many, many workings of the action over a period of two weeks of both simulated and actual firing. It became obvious to us that the ability to fire this rifle rapidly and dexterously required a prolonged period of practice.

We found that the clip was "ejected" from the magazine of two of our four Carcano rifles, but not from all of them. Two rifles would retain the clip in a half-ejected position, thus accounting for the report which had puzzled us,⁹ that the (empty) clip was found "in" Oswald's rifle, even though the last cartridge had been pushed into the rifle's chamber, leaving the clip empty. (We had expected that all Carcano rifles would eject the clip when it was empty, after testing our first rifle.) It was only after trying all four that we found that the clip *could*

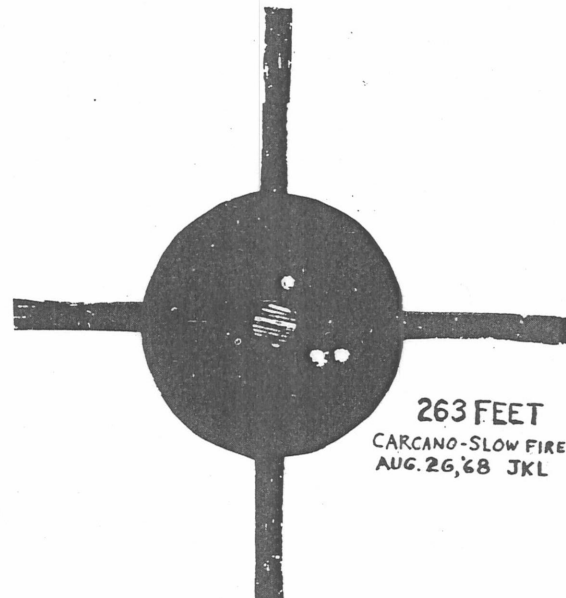


Fig. 2. Slow-fire target showing the accuracy of the rifle at 263 feet, using sling, rest, and telescope, as Oswald did.

be retained by some (as with Oswald's rifle, which we verified by trial of his actual rifle).

It was also found that single rounds could not be inserted into our rifle by hand without a clip unless the bolt was dismounted and the single cartridge base inserted under the ejector. This made us think the ejector was faulty, but we soon found that all Carcano rifles of this type act this way, and that they will still accept cartridges normally if a clip is used. Thus our first impression that the ejector was defective mirrored similar hasty opinions that Oswald's rifle's firing mechanism was in some way defective. This proved to be due to our initial lack of familiarity with this foreign rifle.

The rifle was then tested for accuracy by firing groups of three shots at a bull's-eye mounted 263 feet from the muzzle of the rifle, using a rest for the front hand, as on the front box used by Oswald; the sitting position and the sling were similar to those used by him. Since none of us had fired this rifle before, we approached it with caution, but found that it had relatively little recoil, especially considering the weight and fairly high velocity of the military-type bullet. The sound of each shot

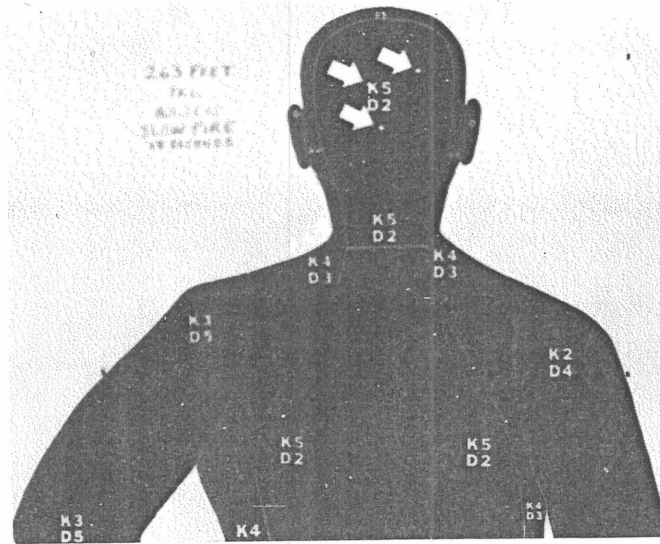


Fig. 3. Three shots fired at five-second intervals could easily and consistently be placed in the central area of a silhouette target of the head at 263 feet, whether it was one target, as here, or whether three targets were placed at the different distances and locations at which Oswald appears to have fired as the presidential car moved downhill and away from the shooter.

was very loud, and for firing a large number of rounds it was found more comfortable to cover the ears with ear protectors similar to earmuffs. The intensity of the recoil and the noise of the shot were approximately similar to those of the popular 30-30 cartridge used extensively by American riflemen. If one stood even a little in front of the rifle muzzle, without ear coverings, however, the reports were so loud as to be nearly intolerable. We were impressed by the fact that if such a rifle had been discharged a few feet to the right rear of photographer Abraham Zapruder (as from the "grassy knoll," as alleged by some), Mr. Zapruder would have been acutely aware of a deafening explosion with each shot.

When slow, deliberate aiming was used three shots could repeatedly be clustered (Figure 2) in an area one to two inches in diameter, just to the right of the bull's-eye, at 263 feet.

When three shots were fired at five second intervals, it was repeatedly possible to place them in a group measuring $2\frac{3}{4}$ inches in diameter, at 263 feet. When the rate of fire was increased so that the three shots were fired within 6.5 seconds, the spread of the bullets was greater, so that all

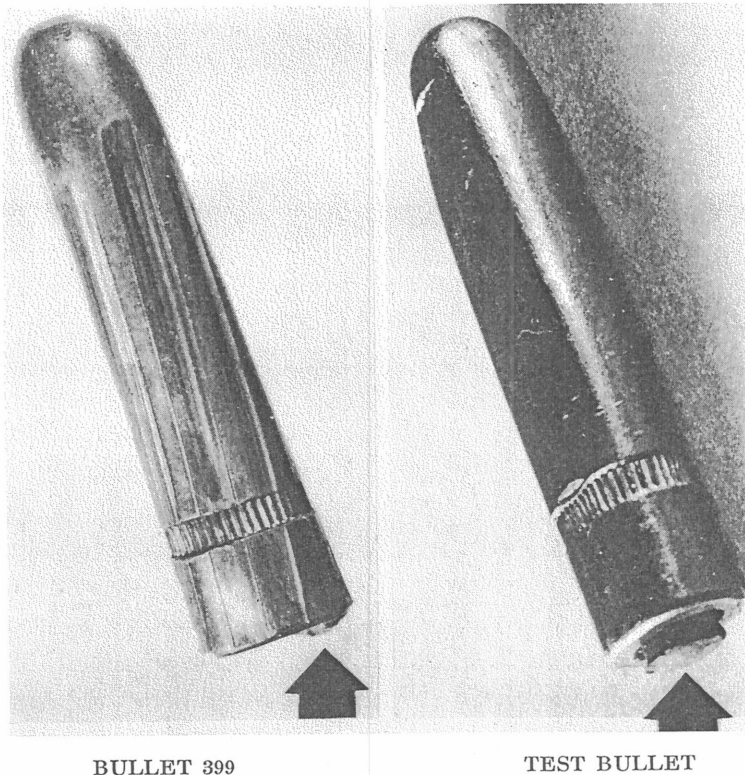


Fig. 4. On the left is the actual bullet believed to have gone through President Kennedy and through the chest and wrist of Governor Connally, lodging in his leg. On the right is a test bullet flattened to exactly the same degree, and showing the resultant extrusion of its soft metal core in the amount of exactly two grains (see Figure 1). Reproduced by permission from: Lattimer, J. K. and Lattimer, J.: The Kennedy-Connally single bullet theory. *Int. Surg.* 50:524-32, 1968.

three shots landed within a circle six inches in diameter, again at 263 feet, which was the longer range of the two shots which hit President Kennedy.

After two weeks of practice, it was found relatively easy to place three bullets in the central area of the head (or the torso) of a military-type silhouette target, if five seconds were used between shots (Figure 3). As the speed of shooting was increased, the spread of the bullets was greater, but all three bullets almost always landed within the head or neck area until the telescope-mounting screws loosened, after 111 rounds had been fired.

Oswald's Marine Corps rifle scorebook (which we own) showed him

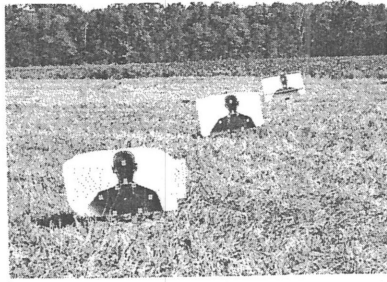


Fig. 5. Targets were placed at each of the distances and locations at which Oswald fired his shots, so that the rifle had to be shifted the same distance that Oswald's was, and re-aimed before each shot.

to be capable of placing almost every bullet in such a silhouette target, even at 600 feet, at "rapid fire," without using a telescope.¹⁰ Our greatest difficulty with this Carcano rifle was in learning to pull the bolt back with unusual vigor. If this was not done briskly, time would be wasted with a second pull.

The elongated, 160-grain, fully-jacketed, ball-type military bullets, of high cross-sectional density (Figure 4), proved very stable, and the holes in our targets never showed signs of the bullets turning sideways ("yawing" or "tumbling") before hitting the target.

Three silhouette targets were next arranged at three different points and distances, to simulate the slight lateral and upward shift of President Kennedy's car within Oswald's field of vision, so as to simulate the three points at which Oswald might have fired at President Kennedy (Figure 5). These were at 150, 190, and 263 feet from Oswald's perch. The torso was tilted, as was President Kennedy's, for the final target (hit) at 263 feet.^{3, 8} This arrangement required the shooter to change his point of aim between successive shots, and made it possible to study how much of a shift was required for Oswald again to "zero in" on the slowly moving car at the new range. It was found that this shift, while real, was small and did not prove to be any great problem, since the automobile was going downhill and away from Oswald's high perch, thus shifting relatively little in his field of vision.

When three shots were fired within 6.5 seconds at these silhouette targets it was still found possible to hit all three targets in the head or neck area with consistency, although the spread of the bullet holes increased as rapid fire was used, some of the bullets sometimes landing

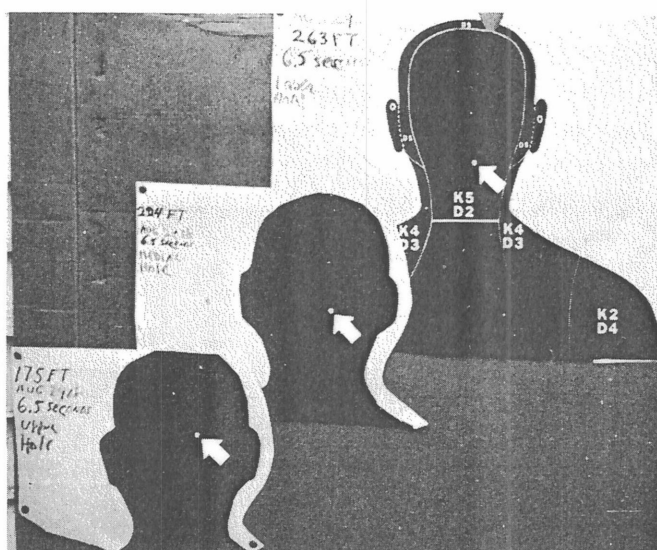


Fig. 6. If three shots were fired very rapidly at the shifting targets (all within the 6.5 seconds) the spread of the bullets was greater, but not excessively so.

in the neck area and others in the margins or occasionally just outside the head area (Figure 6). The bullets were generally clustered within an area six inches in diameter.

In order to determine whether an even less-experienced civilian marksman could attain this same degree of accuracy with the same conditions, another of us, who was at that time a 14-year-old high school student (G.L.), was able to duplicate the same degree of accuracy, although his rate of fire was slower. His 17-year-old brother (J.L.), a more experienced marksman, was easily able to do as well. There was no doubt, however, that the strength of forearm of an adult was an advantage in operating the bolt of this military-type firearm at the brisk rate required for rapid fire.

DISCUSSION

It should be emphasized again that a leisurely period of repeated manipulation and dry-firing (as practiced by Oswald, according to his wife's testimony¹¹) was essential to acquiring the proficiency. It was immediately apparent to all three of us that restriction in practice with Oswald's rifle, for fear of damaging it, would have interfered signifi-

cantly with the familiarization and vigorous manipulation needed to achieve optimum proficiency in operating this unfamiliar foreign military weapon.

In view of the delay and additional hard work involved in firing three quick shots at his victim (thus imperiling his chances of escape) we were puzzled as to why Oswald was not content to fire just one careful shot and then flee. We speculated, however, that his failure to hit General Edwin Walker with a single-shot attempt seven months earlier,¹² plus his experience of escaping undetected on that occasion, might have persuaded him to sharpen his skill at rapid fire (as he did all too well) by further practice, before November 22nd, and to accept the risk caused by the delay in firing the three shots instead of just one.

It should also be noted that the actual interval between the two documented "hits" on President Kennedy was about five seconds, as seen in the Zapruder movie. We found *no* difficulty in hitting the shifting head targets twice in *five* seconds. The third shot fired by Oswald may well have gone either before or after the two that hit President Kennedy. Thus the interval of five seconds between shots seemed entirely reasonable, and much easier to achieve than if three shots were required within the shorter interval of 6.5 seconds, even though this could be done.

SUMMARY

A rifle, telescope, and sling, identical to the types used by Oswald, were assembled from several such units, selecting the ones most like those used by him both as to condition and function, after carefully examining, measuring, and manipulating his rifle at the National Archives in Washington.

The telescope was aligned by "bore-sighting," and "shims" (thin wedges of metal) were found to be necessary under the front mounting ring, just as with Oswald's rifle. Only two screws were used to fix our telescope mount to the receiver of the rifle, just as on Oswald's gun, even though there were additional holes available in the telescope mount for still more screws in both instances.

Measurement of the number of shots required to cause loosening of the distal screw of the telescope assembly was made, and found to be 111 rounds in our case.

The accuracy of our Carcano rifle, when fired from exactly the type

of "rest" and with the same type of "sling" used by Oswald, was found to be excellent. The four-power telescope, just like Oswald's, was most helpful. After a two-week period of familiarization with "dry" and actual firing, it was found possible to cluster three bullets consistently in an area $2\frac{3}{4}$ inches in diameter at 263 feet when they were fired at five-second intervals, which was the time between Oswald's two documented "hits" on President Kennedy. Two additional male civilians aged 14 and 17 years, also unfamiliar with this rifle, were also able to achieve similar consistent accuracy after two weeks of dry-firing, actual firing, and familiarization, but their rates of fire had to be slower.

When the rate of fire was speeded up to three shots in 6.5 seconds at the shifting target, the size of the "group" of bullets then spread out to an area six inches (or less) in diameter. It was still possible to group all three shots in a life-size silhouette target of the head and neck, however. The prolonged period of practice and familiarization was found to be essential for the achievement of any kind of accuracy during rapid firing of this rifle. In general, we were surprised and interested to observe how effectively proficiency with this rifle could be acquired, if plenty of time was allowed. We could then appreciate why this calibre rifle has become a favorite among European riflemen.

In the process of these and other tests about 600 rounds of the same four lots of "Western" ammunition used by Oswald were fired, with no "failures-to-fire." The ammunition, made by the Western Cartridge Company, a Division of the Winchester Company, was found to be highly reliable, even though it was more than 20 years old at the time of our experiments. These bullets had been shown by Dr. John Marshall Nichols of the Department of Pathology, University of Kansas Medical School, in March 1968, to have the capability of penetrating 47 inches of solid pine wood without deforming.¹⁸ The American ammunition, of the type used by Oswald, is not to be confused with some foreign ammunition which is less dependable.

While we remain open-minded as to the general picture of what happened during the Kennedy assassination and await with interest the eventual release of the x rays and the withheld autopsy data concerning President Kennedy, we have at least satisfied ourselves as to the feasibility of certain ballistic details about Oswald's rifle and ammunition.

Our tests have left us with no reason to doubt that the type of rifle used by Oswald was accurate enough, dependable enough, and adaptable

enough to be fired accurately three times in either ten or 6.5 seconds, at a slowly-moving target the size of President Kennedy's head, even by ordinary marksmen who had been given sufficient opportunity to practice, as contended by the Warren Commission.

Our previous forensic and ballistic experiments³ had satisfied us that the four fragments of metal seen in Governor Connally's x rays were by no means too many to have been accounted for by the 2 grains of weight missing from the bullet which the Warren Commission suggests went through both President Kennedy and Governor Connally (Figures 1 and 4). In fact our test bullets also extruded 2 grains of metal, from which we were easily able to slice even more fragments similar to those found in Governor Connally. The ammunition was found to be highly reliable despite its age.

We were thus able to satisfy ourselves that the contentions of the Warren Commission were certainly possible, at least in regard to these particular points of issue with which our experiments dealt.

In short, it proved to be entirely feasible for Oswald to have shot President Kennedy twice in a few seconds, using the rifle and ammunition attributed to him, as claimed by the Warren Commission.

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