

473

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notes
see 8 tab - 7*

APPENDIX A
**THE BALLISTICS
OF ASSASSINATION**

INTRODUCTION

One man, acting alone, killed the President. That was the Warren Commission's conclusion in 1964. Ever since, the technical plausibility of such marksmanship has been under attack. Did Oswald have the skill? Enough time? Could one bullet have so extensively wounded both Kennedy and Connally?

Today, the ballistics can be subjected to advances in computer analysis. By tracking the trajectories of the shots in reverse from the wounds, the source of the shots can be determined with precision. The following graphics are based on forensic evidence analyzed by these new techniques, using timing from the frames of the

now-famous 8mm film of the assassination taken by Abraham Zapruder. The crucial seconds in Dealey Plaza are reconstructed, step by step. Then Oswald's escape from the Texas School Book Depository is plotted from eyewitness accounts.

**This is the
single bullet
that wounded
both JFK
and Connally**



ACTUAL
SIZE



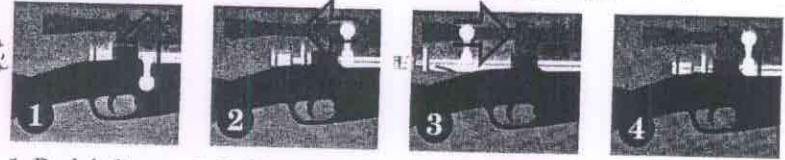
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MARKSMANSHIP

Did Oswald have time to fire three shots? Enhancements of the Zapruder film lead to the answer. His first shot missed. He had at least ~~5 seconds to reload~~, aim, and fire the second shot, which hit both Kennedy and Connally. He then had another ~~5 seconds~~—ample time—for the third shot, which killed the President.

Bolt Action *by anyone? When it doesn't work?*
 The bolt ~~action~~ can easily be executed in a fraction of a second.

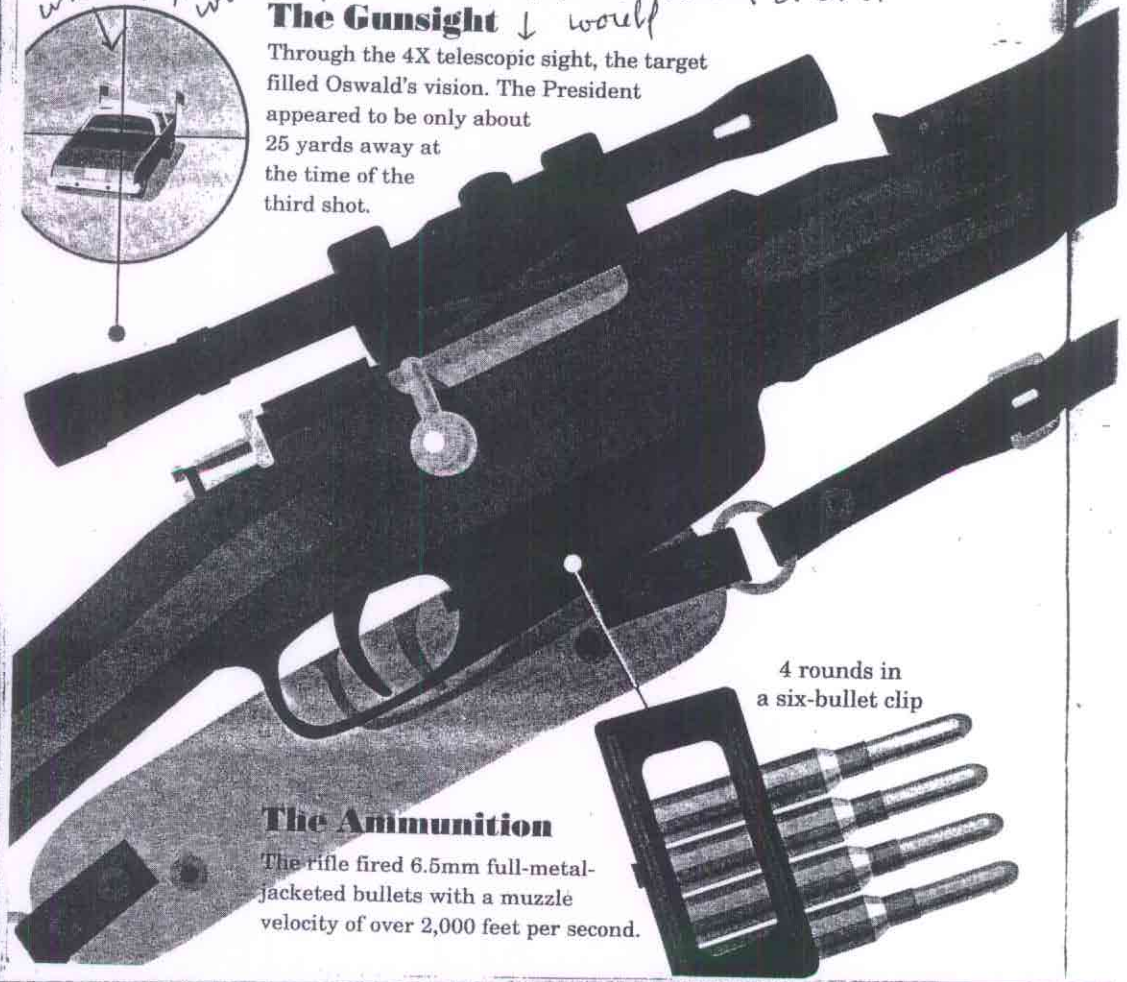


1. Push bolt up...
2. Pull back (to eject case and position next cartridge)...
3. Push forward...
4. Push down (to lock bolt).

when it did not work right & the FBI could not correct it so it

The Gunsight

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



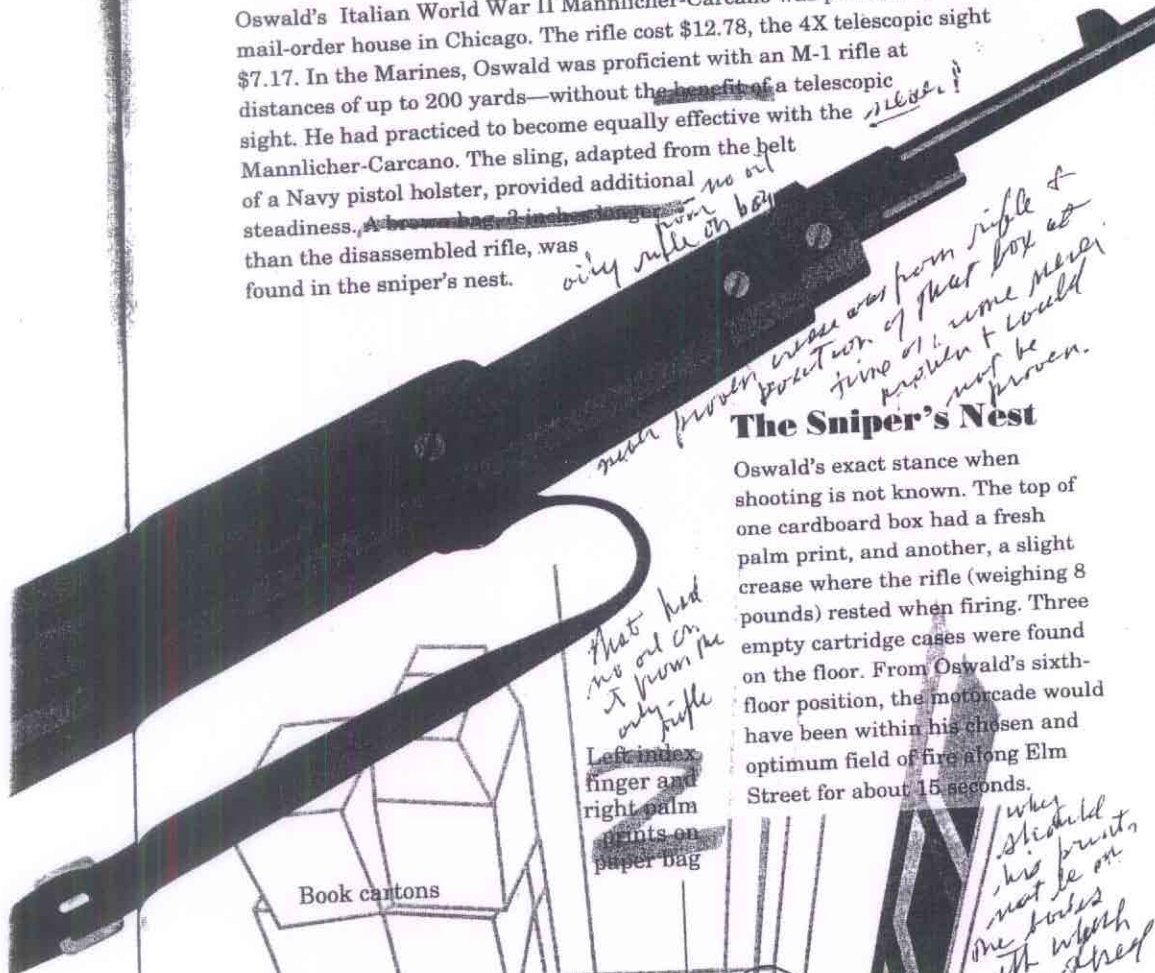
4 rounds in a six-bullet clip

The Ammunition

The rifle fired 6.5mm full-metal-jacketed bullets with a muzzle velocity of over 2,000 feet per second.

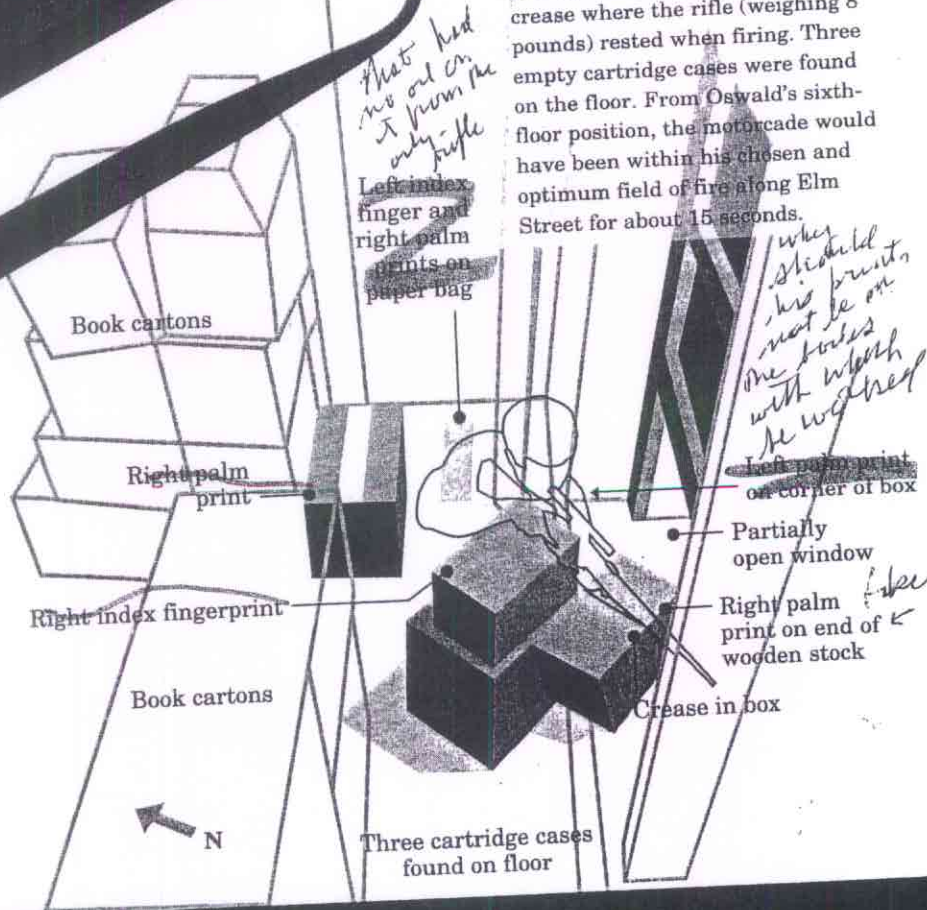
The Gun

Oswald's Italian World War II Mannlicher-Carcano was purchased from a mail-order house in Chicago. The rifle cost \$12.78, the 4X telescopic sight \$7.17. In the Marines, Oswald was proficient with an M-1 rifle at distances of up to 200 yards—without the benefit of a telescopic sight. He had practiced to become equally effective with the Mannlicher-Carcano. The sling, adapted from the belt of a Navy pistol holster, provided additional steadiness. A ~~paper bag, 2 inches longer~~ ^{no oil} than the disassembled rifle, was found in the sniper's nest.



The Sniper's Nest

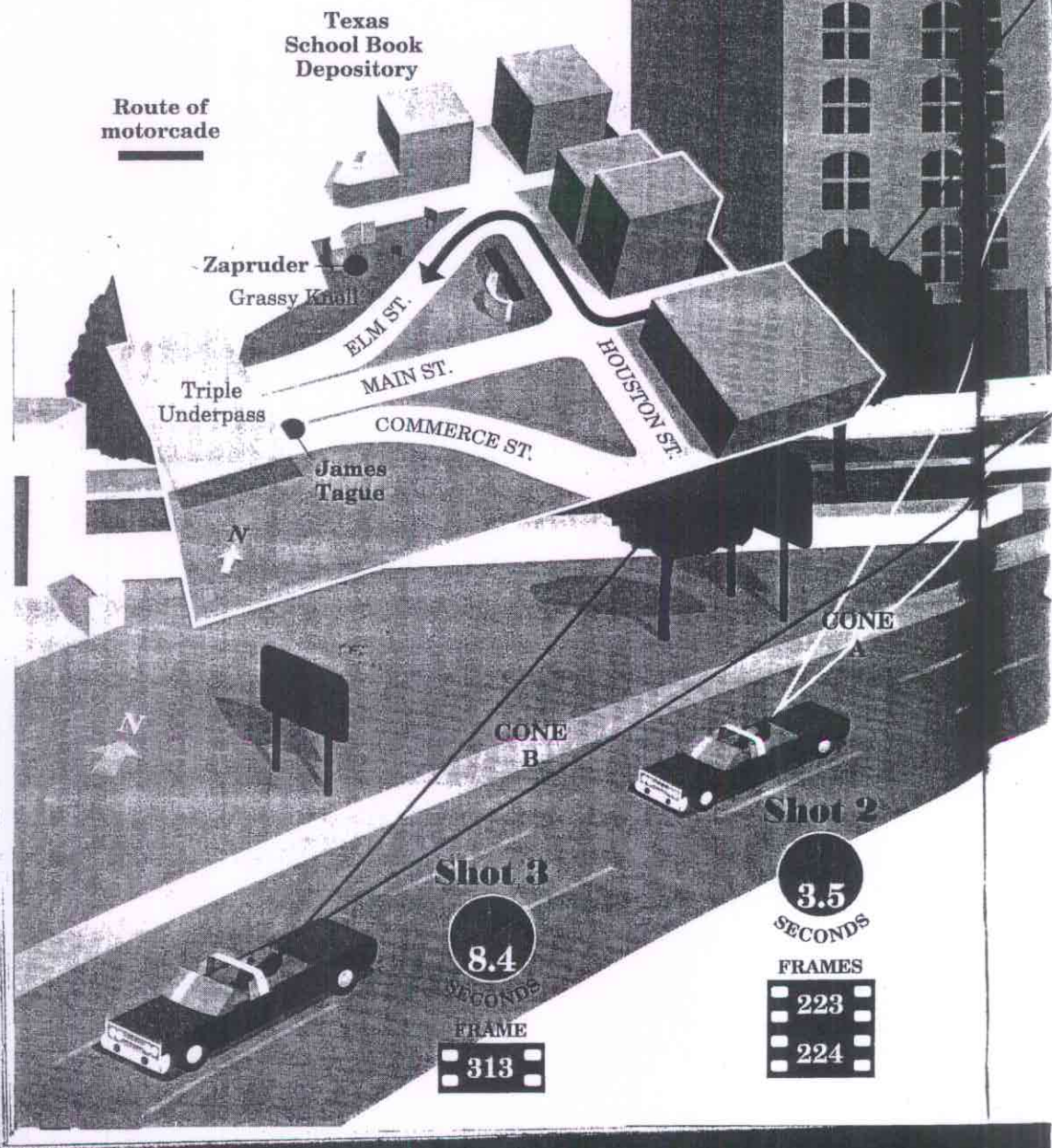
Oswald's exact stance when shooting is not known. The top of one cardboard box had a fresh palm print, and another, a slight crease where the rifle (weighing 8 pounds) rested when firing. Three empty cartridge cases were found on the floor. From Oswald's sixth-floor position, the motorcade would have been within his chosen and optimum field of fire along Elm Street for about 15 seconds.



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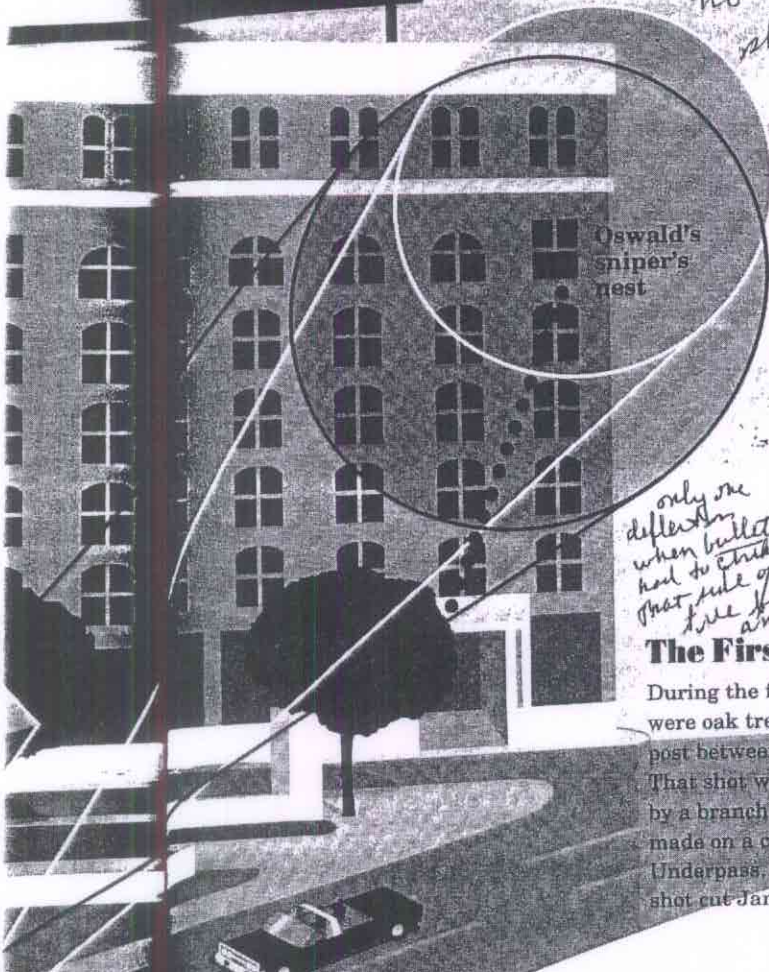
THE THREE SHOTS

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



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no "cone" for "missile" shot in this theory



Oswald's sniper's nest

only one deflection when bullet had to strike that side of tree before it hit

The First Shot

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

there a abrupt change in direction that meant it had to go through that tree?

Shot 1

0 SECONDS

FRAMES

160

to

166

which way?

The Zapruder frames

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

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THE SINGLE BULLET

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

BULLET SPEED
1,700-1,800 feet per second

FRAMES
223
224

? where

Entry wound
in the back
6.5 mm in diameter

Exit wound
in throat

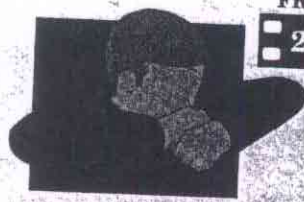
where?

Bullet grazed on
a vertebra in the neck
slightly splintered the bone

Caused momentary
paralysis of the
paralysis

bullet tumbling

By frame 226 the President began to show a neurological reflex—known as the Thorburn position—to spinal injury. His arms jerked up to a fixed position, hands nearly at his chin, elbows pushed out.



FRAME
230

When t
ha

tentious.

could

no

Failure

FRAMES

223
224

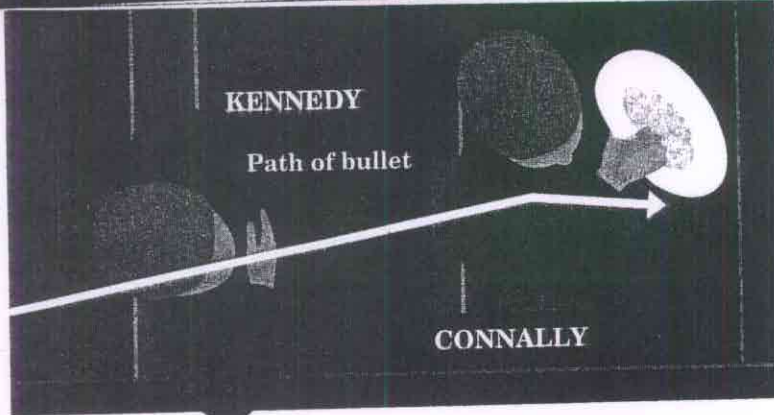
KENNEDY

where?

knifing

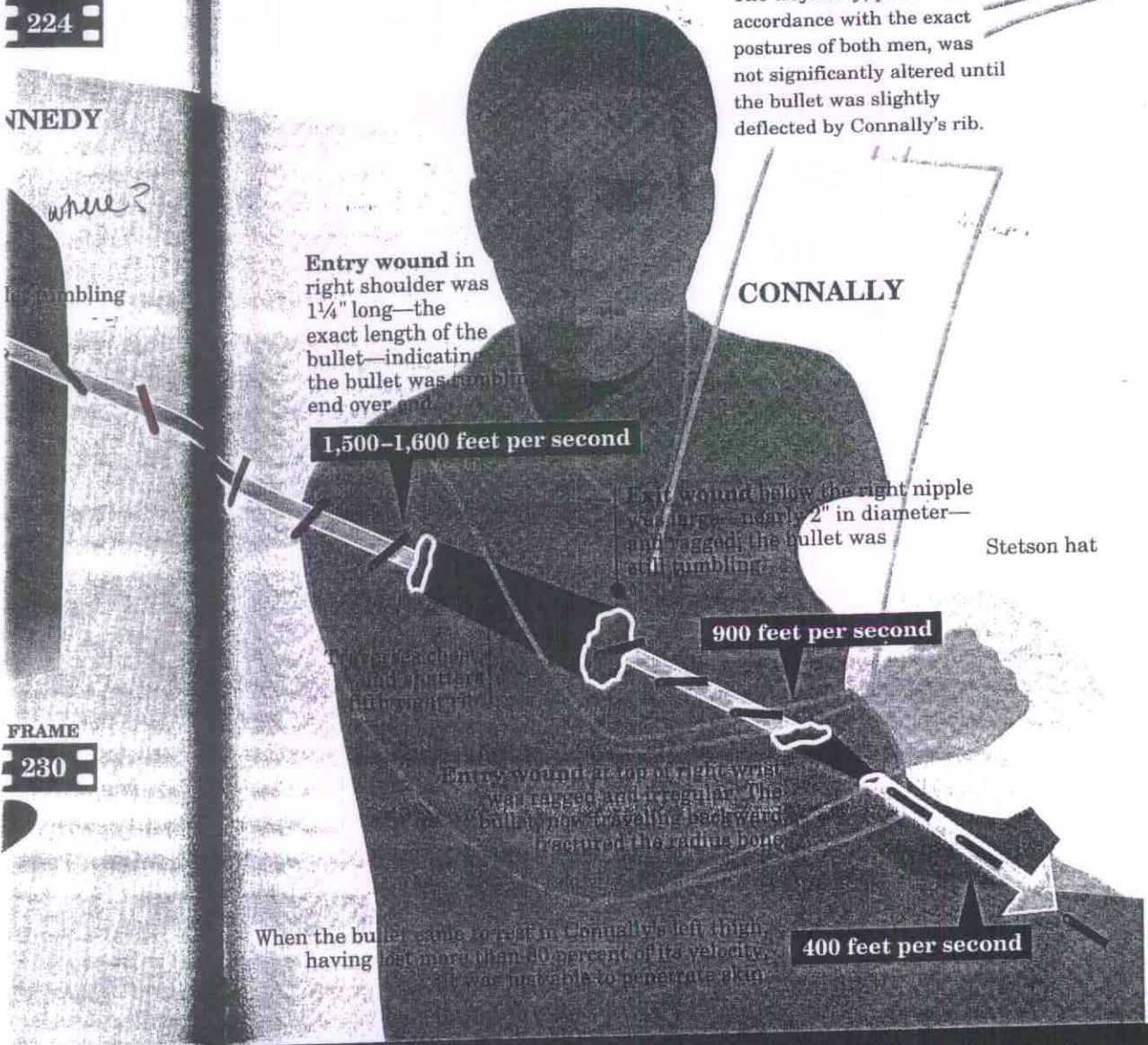
FRAME

230



View from above

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



Entry wound in right shoulder was 1 1/4" long—the exact length of the bullet—indicating the bullet was tumbling end over end.

1,500-1,600 feet per second

Entry wound below the right nipple was large—nearly 2" in diameter—and ragged; the bullet was still tumbling.

Stetson hat

900 feet per second

Entry wound in left arm was irregular and ragged. The bullet was traveling backward through the arm.

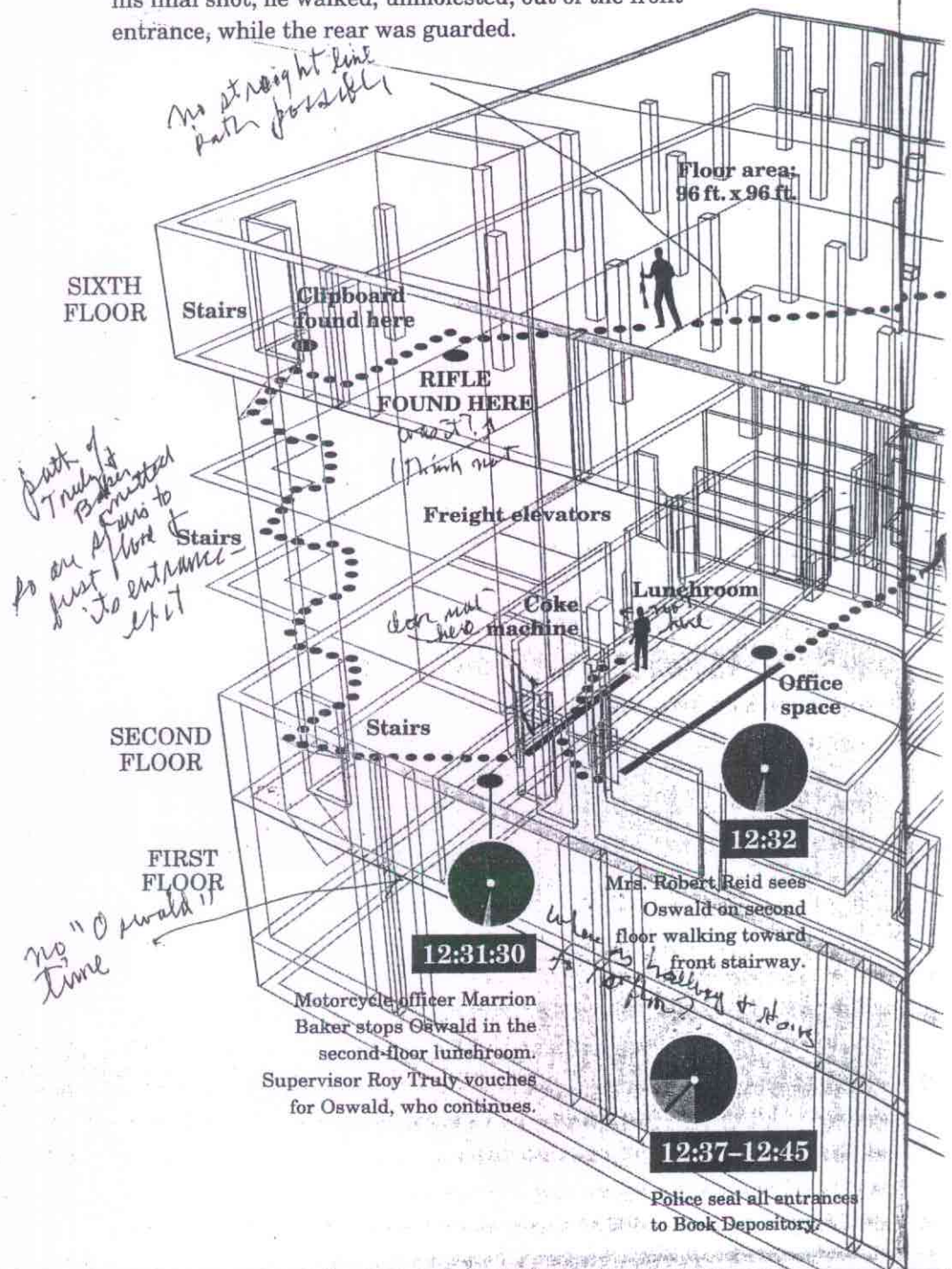
When the bullet came to rest in Connally's left hand, having lost more than 80 percent of its velocity, it was unable to penetrate skin.

400 feet per second

400

THE ESCAPE

Oswald came very close to being captured as he fled from the Book Depository. But within 3 minutes after his final shot, he walked, unmolested, out of the front entrance, while the rear was guarded.



Floor area: 96 ft. x 96 ft.

SIXTH FLOOR

No straight line path possible

Clipboard found here

RIFLE FOUND HERE

Just of Truly & Baker's view to just floor to its entrance at it

Freight elevators

Coke machine

Lunchroom

Office space

SECOND FLOOR

FIRST FLOOR

12:31:30

12:32

No "Oswald" time

Motorcycle officer Marrion Baker stops Oswald in the second-floor lunchroom. Supervisor Roy Truly vouches for Oswald, who continues.

Mrs. Robert Reid sees Oswald on second floor walking toward front stairway.

12:37-12:45

Police seal all entrances to Book Depository.

— Witnessed route
- - - - - Assumed route

Floor area:
16 ft. x 96 ft.

SNIPER'S
NEST

Room
at

Office
space

Stairs

Main
entrance

ELM STREET



12:30

Oswald shoots JFK.



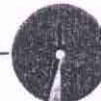
12:36

Sergeant D.V. Harkness, relying on eyewitnesses, cites Book Depository as possible sniper's nest.



12:45

Police radio a description of suspect based on the account of witness Howard Brennan.



12:33

Oswald leaves via Elm Street front entrance, meets Robert MacNeil (of NBC), directs him to a phone.

12:32

Walt Reid sees Oswald on second floor walking toward front stairway.

12:37-12:45

Police seal all entrances to Book Depository.

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THE SINGLE BULLET TESTED



C.E. 399 8/23/78



*Not original - alt used for gunn. N/A
Feet not studied. El. Sem. H. at 1100
visib. of removal of sample
by FBI*

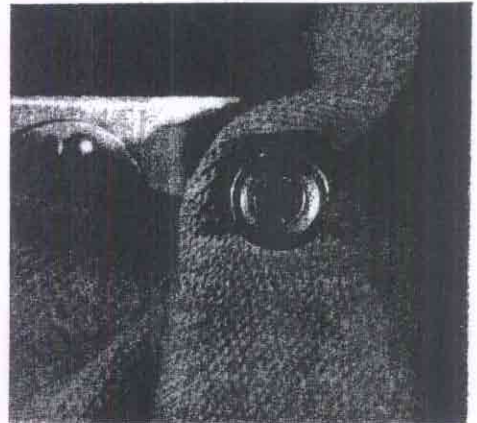
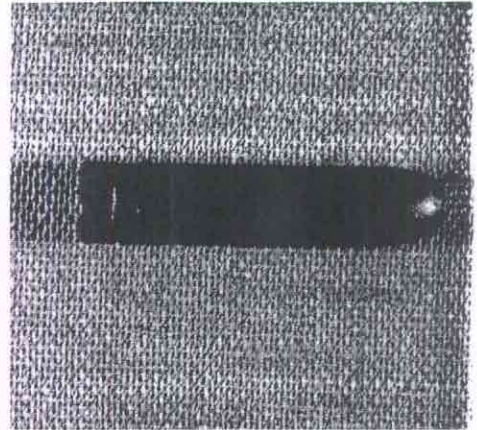


8/23/78

DATE

C.E. 399

E



Left: A side and rear view of Warren Commission Exhibit 399, the single bullet that wounded President Kennedy through his neck as well as inflicting all of Governor Connally's injuries.

Right: The bullet (also shown in side and rear views) from a 1992 reconstruction done by Failure Analysis Associates. In that test, the bullet's charge was reduced so it would strike a cadaver's wrist at 1100 feet per second, approximating the speed of CE 399 when it struck Governor Connally's wrist. Emerging in even better condition than 399, it provided the final physical evidence necessary to prove the single-bullet theory.

(National Archives and Failure Analysis Associates)

The base of the F.A.A. test bullet shows no sign of impact on wrist