

2537 Regent St., Apt. 202  
Berkeley, Calif. 94704  
February 25, 1969

Louis Ivon  
Office of the District Attorney  
2700 Tulane Avenue  
New Orleans, Louisiana 70119

Dear Mr. Ivon:

It has been suggested that the backwards motion of the President's head in the frames of the Zapruder film immediately following 313 was due to an acceleration of the automobile. The Warren Commission, to the best of my knowledge, never examined the Zapruder film to determine whether there was such an acceleration. My own hasty measurements, done some time ago, convince me that there was no acceleration around frame 313. (Notes and graphs enclosed.) I believe that you could show conclusively that the postulated explanation is not valid. If there will be further testimony on this matter, I would suggest that you show the enclosed material to Dr. Nichols or one of your other experts. The measurements can be easily repeated in a few minutes.

Incidentally, Shaneyfelt reportedly noted the forward motion of matter from the President's head in frame 313, and concluded that the shot had come from the rear. This is utter nonsense. It is clear that matter was driven upward as well as forward, but this certainly does not mean that Kennedy was shot from below.

Sincerely yours,

*Paul L. Hoch*  
Paul L. Hoch

NOTES ON THE ZAPRUDER FILM - DETERMINATION OF SPEED OF PRESIDENTIAL CAR

Three independent observations indicate that the President's car slowed down significantly a second or so before the fatal shot.

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Several frames from the FBI reenactment of the assassination are reproduced in Volume XVIII. The figures given for "Distance to Station C" in themselves suggest that the car slowed down, since the average speed is noticeably less for frames 255-313 than for earlier frames. (See Figure I.)

From a study of the film taken by Orville Nix, the Itek Corporation concluded that the car traveled at an average of 8.7 mph in the vicinity of the fatal shot. This is considerably less than the overall average of 11.2 mph for frames 161-313. (See Figure I.)

As suggested by Dr. Alvarez, the angular position of the car relative to various points in the background has been measured for frames 261-334. These measurements strongly suggest a decrease in velocity approximately in the middle of this interval, of roughly the same size as that indicated by the above two items. (See Table I and Figure II.)

DETAILS:

Figure I:

The FBI reenactment points are from CE 888-902, or equivalently CE 884. The dashed line is a fit through the first and last FBI points, corresponding to the average speed of 11.2 mph used by the Warren Commission (WR 49, 5H161). The solid line is an eyeballed best fit to all the FBI points except the last one. It fits these points quite well (corresponding to a speed of 12.0 mph) but is about 7 feet off when extrapolated to frame 313. This alone suggests a deceleration after frame 255.

The Itek points are from "Nix Film Analysis," a report by the Itek Corporation, Lexington, Mass. 02173, May 18, 1967, pp. 12, 45-46. Itek's values for the distance moved by the car along the centerline per 4 frames of the Nix film are plotted, normalized to the position at frame 313. Nix frame 24, which corresponds to Zapruder frame 313 (5H143), is called C3 or C4 by Itek; I have assumed the latter. I have neglected the slight difference in camera speeds. (The FBI gave 18.3 fps for Zapruder, 18.5 fps for Nix (5H160).) Using 18 fps, Itek found speeds which average 9.6 mph in frames A2-B8 (291-307) and 7.6 mph in frames B8-D (307-319) (Itek report, p. 46). Itek claims that, given the experimental errors, the deviations from the average of 8.7 mph are consistent with a "nearly uniform" speed. They are also consistent with a deceleration in the vicinity of frames 290-310, as is the data in Figure II.

Table I and Figure II:

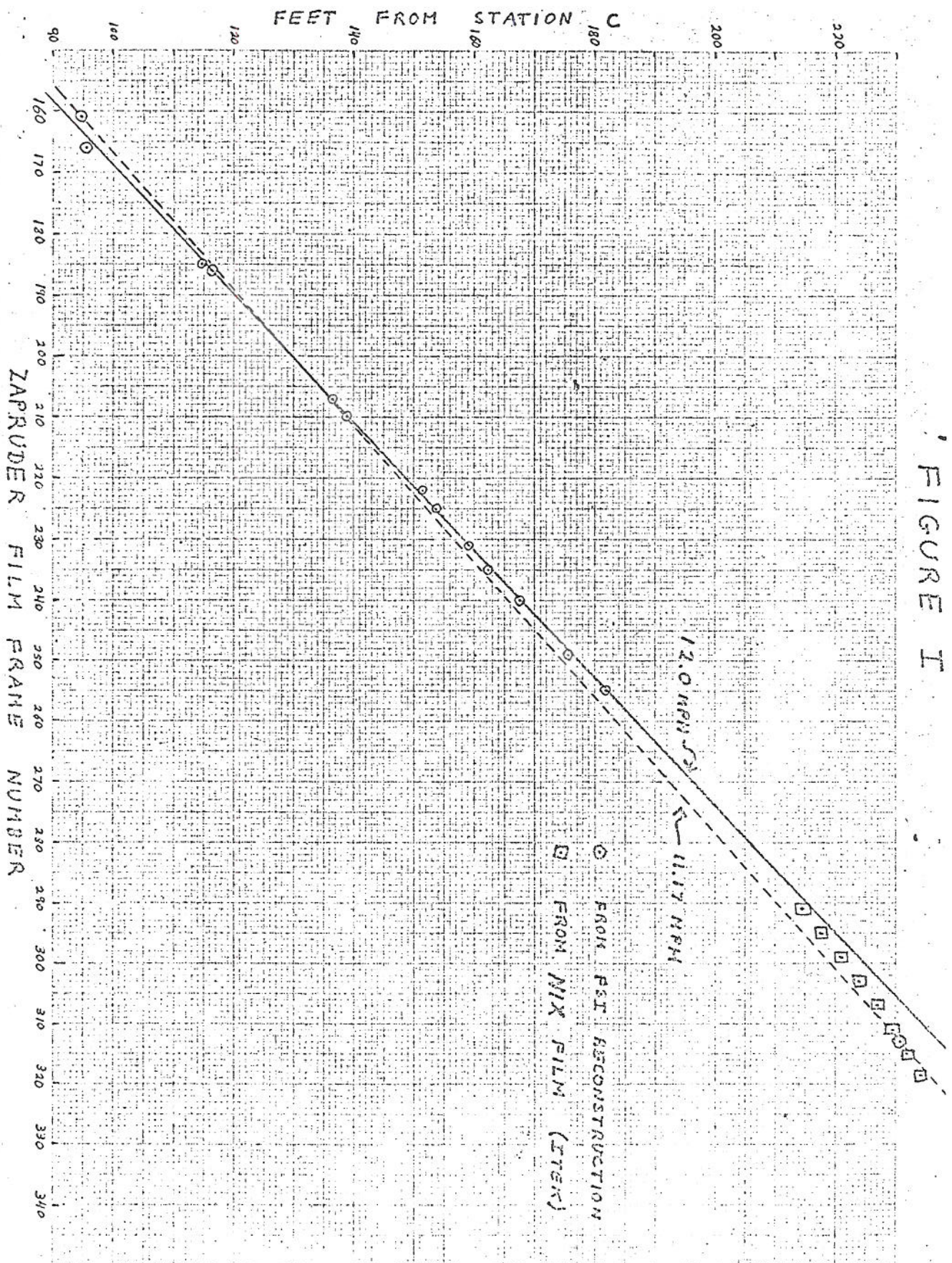
"XY" means the horizontal distance from X to Y, on the prints in CE 885. The first column is the frame number; the second is the distance in mm; the third gives the normalized distance (in units of 0.1 mm), as plotted in Figure II. (The 7 overlapping sets of data are normalized at the 6 indicated frames.)

No attempt has been made to correct for the camera optics, or for the fact that the car's motion is only nearly perpendicular to the line of sight. Although the individual measurements are quite crude ( $\pm 0.5$  mm), Figure II does seem to confirm the deceleration indicated in Figure I.

From Table I, the (angular) velocity of the car in frames 291-334 is about 82% of that in frames 261-291. From Figure I, the speed in frames 291-319 is about 75% of that in frames 161-255. I feel that these numbers are quite consistent.

Paul L. Hoch  
October 29, 1967

FIGURE I



10-2-40 SEE PAGE 10 FOR  
 MORE INFORMATION ON THIS SYSTEM  
 MODEL OF 10-2-40

FIGURE II

