

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, D.C. 20594

November 28, 2017

Video Study

NTSB Case Number:
HWY17SH008

A. ACCIDENT

Location: Lewiston, Maine
Date: November 3, 2016
Time: 7:10 AM
Vehicle: Ford F-150

B. AUTHOR

Dan T. Horak
NTSB

C. ACCIDENT SUMMARY

While crossing the roadway within a cross walk a 13-year-old pedestrian was struck by a Ford pickup truck. As a result of the crash, the pedestrian was fatally injured.

D. DETAILS OF INVESTIGATION

The main goal of this investigation was estimating the speed of the vehicle during the 1.9 seconds before it struck the pedestrian. During this time, the vehicle was visible in a video recorded by a security camera. A secondary goal was estimating the speed of the pedestrian crossing the road.

Vehicle Speed

The video had resolution of 1280x720 and frame rate of 30 fps. Vehicle speed was estimated based on the times when it was at reference locations that were visible both in the video and in Google Earth. Vehicle location was defined as the location of its front left corner along the road. The time at a location was set to the time when a video frame was acquired.

Figure 1 shows an aerial view of the accident site. Red line DEF is the assumed trajectory of the left side of the vehicle as it was moving from location D to location F. The vehicle hit the pedestrian less than 10 feet past location F. The security camera was located at point C. The lines from C to points D, E and F are the lines of sight from the camera to the reference points at road locations that were used for speed estimation.

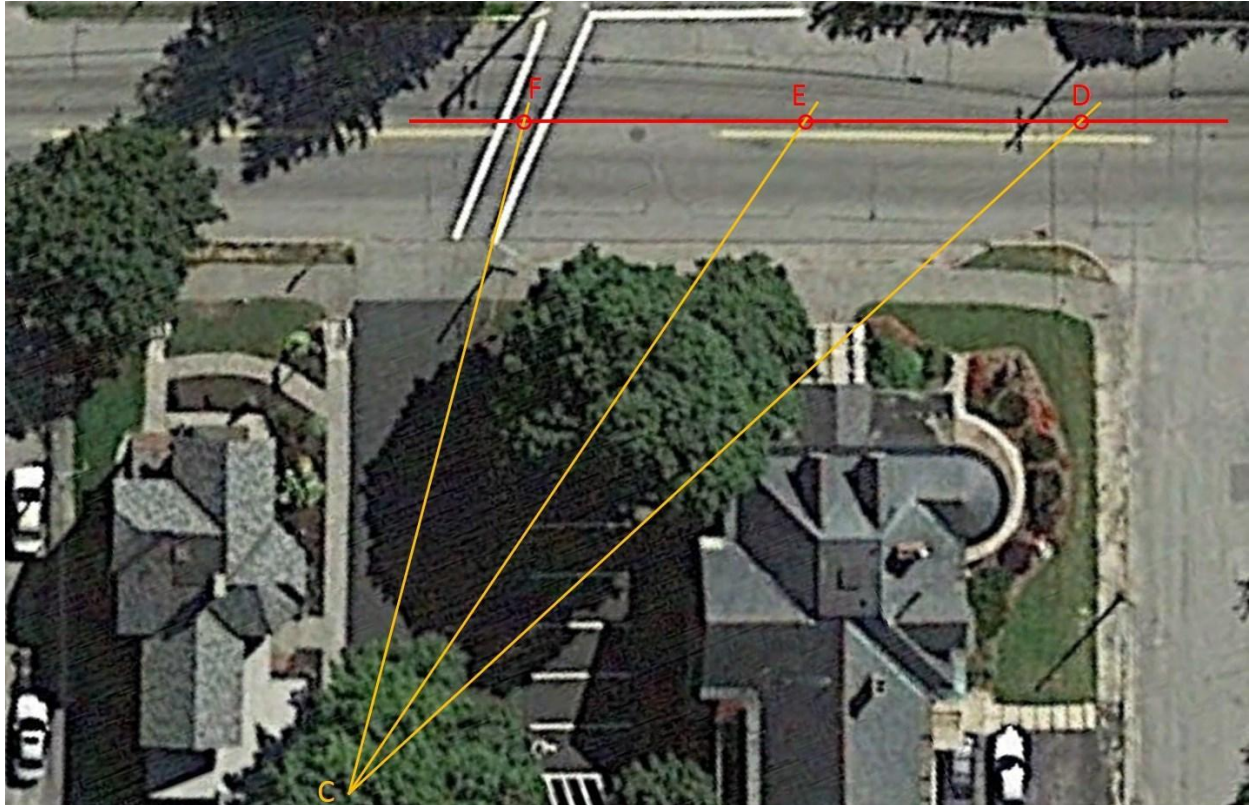


Figure 1. Aerial View of the Accident Location with Marked Reference Points

It was possible to correlate road locations D, E and F, seen in Figure 1, with locations seen in the video. The locations seen in the video are illustrated below using a vehicle that passed the accident location before the accident vehicle and was not related to the accident. This was done to avoid showing video frames that show the pedestrian.

Figure 2 shows the vehicle that was not related to the accident at location D, when its left front corner emerged from behind the corner of a house. Figure 3 shows it at location E, when its front left corner in the video was behind a tree. Figure 4 shows it at location F, when its front left corner was along a line of sight passing through a pole.

The number of video frames it took the accident vehicle to reach location E after it was at location D was 29. The number of video frames it took the accident vehicle to reach location F after it was at location E was 28. Since the video frame rate was 30 frames per second, 29 and 28 video frames correspond to $29/30=0.97$ seconds and $28/30=0.93$ seconds, respectively. The road distances from point D to point E is 49 feet. The road distances from point E to point F is also 49 feet.



Figure 2. Frame from the Video Showing a Vehicle when it Was at Location D (the shown vehicle was not involved in the accident)



Figure 3. Frame from the Video Showing a Vehicle when it Was at Location E (the shown vehicle was not involved in the accident)



Figure 4. Frame from the Video Showing a Vehicle when it Was at Location F (the shown vehicle was not involved in the accident)

The average speed between road location D and road location F can be estimated using the DF distance of $2 \times 49 = 98$ feet and $29 + 28 = 57$ video frames. The estimated speed is $98 / (57 / 30) = 51.6$ ft/s or 35.2 mph. Considering timing and distance errors involved in the estimation, the speed can be specified as 35 ± 2 mph.

Two observations can be made based on the video. The accident vehicle was moving at a speed similar to speeds of other vehicles that passed that location before the accident. Their speeds ranged from 34 mph to 42 mph.

The accident vehicle was moving at an approximately constant speed, passing the two 49-foot-long segments in approximately equal number of video frames, 29 and 28. The small decrease of number of frames from 29 to 28 should not be interpreted as acceleration. This difference is within the location estimation uncertainty range.

Pedestrian Speed

The pedestrian walked the approximately 20 feet to the center of the street in approximately 5 seconds and stopped. The walking speed was $20 / 5 = 4$ ft/s or 2.7 mph, corresponding to normal walking speed. At that time the pedestrian was past the lane of traffic approaching from the pedestrian's left. Then the accident vehicle approached from the pedestrian's right and the pedestrian started running across its lane when the vehicle was approximately 40 feet away. The pedestrian was hit by the accident vehicle before reaching the sidewalk that was about 20 feet away.

E. CONCLUSIONS

Video recorded by a security camera was used for estimating the speed of a vehicle involved in an accident. The estimated speed was 35 ± 2 mph. It was also estimated that the pedestrian walked to the center of the street at the speed of 2.7 mph before pausing there.