C8 Visibility Reconstruction of Nighttime Collisions: Correcting for Investigator Bias

James B. Hyzer, PhD, Hyzer Research, 1 Parker Place, Suite 330, Janesville, WI 53545-4077*

The goal of this presentation is to provide the attendee with insight into how visibility-distance data obtained from nighttime site observations and/or a reenactment of the collision should be interpreted when used to model or predict what the driver involved in the subject collision should reasonably be expected to have perceived.

This presentation will impact the forensic community and/or humanity by providing a better understanding of investigator bias associated with visibility reenactments and the scientific basis by which to account and correct for such bias.

The objective of this paper is to describe, validate, and expand upon a published methodology[1] for reconstructing the visibility aspects of nighttime collisions between a vehicle and a roadway hazard such as a pedestrian, object, or obstruction, appearing ahead under headlamp illumination. The outcome will be to provide the attendee with insight into how visibility-distance data obtained from nighttime site observations and/or a reenactment of the collision should be interpreted when used to model or predict what the driver involved in the subject collision should reasonably be expected to have perceived.

The goal of a forensic visibility reconstruction is typically to determine a statistically valid distance by which reasonably alert drivers should have perceived and responded to visual signals that preceded a nighttime collision. If a nighttime reenactment is performed, then clearly, the investigator who is reenacting the event, even under substantially similar conditions, has many visual and other advantages over the driver who was involved in the actual event being reenacted. Among them, the investigator has the advantage of knowing, *a priori,* what to look for, where to look, and, not having the burden of also driving the vehicle, has plenty of time to search for and detect the exemplar pedestrian or hazard. Consequently, the visibility distance an investigator determines by reenactment will be significantly biased toward being greater than what should be expected of most alert drivers under the dynamic conditions of the real-world encounter and collision to which he was subjected. Therefore, to be reliable it is necessary to correct the investigator's experimentally derived visibility distances to reflect what a statistical sample of typical drivers should be expected to visually experience.

A methodology for interpreting reenactment and post-collision observational data will be described along with the science and statistics upon which it is based. Limitations and typical applications will be discussed. In shortcut form, and with simplifying assumptions that must be understood, after reenactment visibility distance observations are made the method basically involves the following steps: First, the observed visibility distance of the reenactment is multiplied by two thirds (2/3) to approximate the distance that would be expected of the average driver in a structured test. Second, that mean distance is multiplied by one half (1/2) to account for driver expectancy. Third, the standard deviation about the mean is determined by multiplying that distance by one third (1/3). And lastly, the mean distance may be further reduced to account for the age of the driver and other typical attenuating factors by an amount that will be described.

It is important to recognize that this shortcut method is an approximation and is based on many assumptions that must be taken into account. One assumption is that the brightness of a headlamp-illuminated object in the roadway is inversely proportional to the distance between the vehicle headlamps and the object. In many typical low-beam nighttime driving situations this is not the case and the statistical visibility distance calculations must be determined instead as a function of object luminance and/or contrast. The details and consequences of this and other assumptions will be discussed.

The impact of this presentation will be to provide a better understanding of investigator bias associated with visibility reenactments and the scientific basis by which to account and correct for such bias.

Reference:

1 Forensic Aspects of Driver Perception and Response, Second Edition, Paul L. Olson and Eugene Farber, Lawyers & Judges Publishing Company, Inc., 2003, pages 153-154 & 295 (describes "shortcut" methodology attributed to Hyzer, W.G. and Hyzer, J.B.).

Visibility, Nighttime Visibility, Accident Reconstruction

 ** Presenting Author*