



Engineering Sciences Section - 2015

D31 Certainties and Uncertainties in Accident Reconstruction — How Correcting the Other Side’s Misstatements Affects Jury Verdicts

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After attending this presentation, attendees will understand uncertainties in accident reconstruction.

This presentation will impact the forensic science community by improving attendees’ understanding of accident reconstruction.

Accident reconstruction involves the examination of the data from an accident (usually a multi-vehicle collision) to determine what happened. Since the state or local police usually provide reconstruction services for the prosecution in criminal cases, the independent accident reconstructionist is often engaged to support the defense. The goals are to provide the defense with an objective understanding of what actually happened and to assess whether the prosecution’s charges are supported by the evidence. The reconstruction addresses such issues as the speed and headings of the vehicles, an analysis of where each vehicle was located both before and after the impact, visibility issues, perception/reaction times, and analysis of any violations of the relevant driving statutes.

Although accident reconstruction can produce surprisingly accurate results, unless the limitations of the analytical methodology used are clearly understood, there can be significant potential errors associated with all the techniques employed. It is prudent to understand these uncertainties to ensure that the other side is not relying on a faulty premise when they claim that the accused was traveling at 100mph just before the collision. This presentation will discuss not only the uncertainties inherent in the physical procedures used to reconstruct accidents but also misinterpretations of the accident parameters to support charges which cannot be sustained.

Uncertainties relating to methods for determining a vehicle’s speed during an accident are described in the table below. Some of these uncertainties can lead to very large errors in the reconstructed speed value.

| VEHICLE SPEED DERIVATION METHOD | SOURCE OF UNCERTAINTY |
|--|--|
| Speed loss from length of skid marks x drag factor | Vehicle travel before braking marks appear Uncertainties in the coefficient of friction value |
| Black box data | Crash event may not trigger recording Data record may be corrupted Sometimes provides wrong results |
| Vehicle damage Comparison to staged crash tests Using Numerical Models (CRASH III) | A crash test at the speed needed is not always available Need to convert Vehicle-To-Barrier results to Vehicle-To-Vehicle speeds Models contain many simplifying assumptions and are very inaccurate at onset of crush Stiffness values are highly variable |
| Momentum conservation calculation | Need accurate approach and departure angles, post-impact travel distances |
| ANCILLARY INFORMATION | |
| Distances from police scene survey | Police laser-scene surveys found to have significant errors |
| Roadway friction | Friction values from drag sled and accelerometer measurements are not precise Coefficient of restitution can vary widely |
| Coefficient of restitution | |

The above discussion involved errors inherent in the physical procedures used to reconstruct accident speeds. A similar discussion could be held regarding vehicle headings and other factors relating to the reconstruction. Sometimes individuals are prosecuted or even convicted based on erroneous interpretations of the accident data.



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A number of vehicular homicide criminal case studies will be presented in which the accident data did not support the charges levied by the prosecution. This resulted in a substantial reduction in the charges that were sustained by the jury. Often the accident analysis presented by the prosecution found a speed for the defendant's vehicle which was far above the speed that was reconstructed by the defense. In some cases, the laws of physics were violated in the prosecution's analysis in order to arrive at the claimed vehicle speed. These questionable forensic analysis practices have a pernicious effect on a broad spectrum of the legal system since a civil action frequently follows the criminal prosecution. In that event, the questionable results of the prosecution's reconstruction often find their way into the civil litigation.

Reconstruction, Uncertainties, Verdicts