



## Engineering Sciences Section - 2013

### **C24 Was That Car Used as a Weapon or Not? Combining Reconstruction Skills to Answer a Critical Question**

*Michael L. Shirley, BSME, PE\*, 2290 County Rd 23, Waterloo, IN 46793-9415; and John Nixon, MBA\*, ARC, PO Box 66, Bippus, IN 46713*

After attending this presentation, attendees will gain knowledge in the mechanics of shooting incident reconstruction and vehicle incident reconstruction, and how the two disciplines complemented one another in providing a definitive answer to a key question that was critical to an investigation and the outcome of an associated civil lawsuit. It is anticipated that the presentation will be of particular interest to engineers and that it will be of benefit to both civil and criminal attorneys and their investigators.

This presentation will impact the forensic science community by discussing how incidents involving firearms and automobiles are investigated by highlighting the overlapping technologies and demonstrating how the two disciplines complement one another when the experts work as a team.

The presentation focuses on a real world practical example of a life-and-death struggle that developed from a routine traffic stop. When a law enforcement officer pulled over a lone driver following a minor traffic infraction on a suburban roadway, he did not expect a major struggle. However, after providing false identification, the suspect became aggressive and combative and the officer called for backup. The suspect was extremely strong and the two officers used Electronic Control Devices (ECDs) in a futile attempt to subdue him. The struggle lasted for several minutes and the suspect eventually managed to get behind the wheel of his manual transmission car and move off at full throttle. One of the officers was in the vicinity of the front driver's side of the vehicle and, fearing for his safety, both officers fired shots from their handguns. Bullets entered the vehicle and the suspect was fatally wounded.

Attorneys, acting on behalf of the suspect's estate, filed a lawsuit against the two officers and their employer. The plaintiff's attorney hired a shooting reconstruction expert who produced a report that indicated the police officer at the front of the car was two to four feet away from the vehicle and, consequently, was not in danger at the time the officers fired their guns and killed the suspect. The plaintiff's expert report made a number of assumptions with regard to the incident and, importantly, the lone expert had very limited technical knowledge of vehicle mechanics and dynamics.

The defense experts conducted an investigation to determine if the police officer at the front of the vehicle was in any danger at the time the officers opened fire. The investigation began by using trajectory analysis to determine the trajectory of bullets that entered the vehicle through the front windshield. Once this was ascertained, the officer was instructed to adopt his shooting stance and he was positioned so that his pistol was coincident with the trajectory line of the bullet going through the windshield. This established the position of the officer to be approximately 16" forward of the driver's side front wheel of the suspect's car.

The next step of the investigation was to determine if the officer was in any danger while standing in this position. Witness testimony stated that the suspect applied full left lock as he pulled away in his car at full throttle. The vehicle was examined and the steering geometry measured. Calculations were performed to determine the turn radius of the vehicle at full lock. Industry test data was used to calculate the acceleration of the vehicle as it sped away from a standing start. The turn radius, vehicle acceleration data, and the location of the police officer were used to perform calculations. The calculations demonstrated that it would have taken less than 0.5 seconds for the suspect's car to reach the officer. Additionally, a practical demonstration was performed with the officer and the vehicle—it demonstrated that the driver's side front wheel of the vehicle would have run over the police officer.

The combined use of measurements, calculations, and practical demonstration was sufficient to prove that the police officer was in danger at the time of the shooting, and that the shooting was justified. The combined expertise of two engineering disciplines proved invaluable in this investigation.

**Bullet Trajectory, Vehicle Engineering, Incident Reconstruction**