C18 Rural Roads, Curves, and Vehicular Loss- of-Control

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After attending this presentation, attendees will obtain an understanding of the physical evidence that accompanies an event involving vehicular loss-of-control at a curve on a rural roadway. Original data will be presented on the chronological development of roadway edge drop-offs, the likelihood that travelling onto a drop-off will lead to a loss-of-control, the unusual motions of vehicles that might lead to a loss-of-control, the tire marks that identify a loss-of-control, and the actions drivers take when attempting to navigate through a challenging roadway curve.

This presentation will impact the forensic science community by providing orginal, objective data about the frequency of loss-of-control evidence on rural roadways that is often not officially reported, but the larger-than-reported frequency of these events may provide more accurate information about how and why loss-of-control events occur.

The loss of directional control of a vehicle leads to single vehicle rollovers and impacts with trees, poles, and roadside obstacles. It is also present prior to many serious and fatal head-on collisions. It has been observed that a large number of these events occur at curves of rural, two-way, two-lane roadways. Objective data is needed to understand how and why these events occur.

This presentation will provide a review of the physical evidence of vehicle loss-of-control that existed over three years (2009 – 2012) at the site of a complex S-curve in rural southern Ontario, Canada. This S-curve is made up of one segment that contains a small horizontal radius and a second segment of a larger radius. The segment with the shorter radius also contains an undesirable vertical alignment within the horizontal curve that would appear to make travel aligned within the lane challenging.

Detailed video footage taken over six days has been examined to explore how vehicles progress through this curve. Observations of vehicles passing through the site are summarized to identify unusual motions that lead to the potential of loss-of-control. Those vehicles conducting unusual motions are documented with respect to their type/size and their speed and how they progressed through the curve in relation to a grid of markers that was set up to document their longitudinal and lateral position in their lane.

Evaluation of edge drop-offs and estimates of the number of vehicles exiting the paved road edge are provided. Historically, roadway edge drop-off has been considered a causal factor in many loss-of-control collisions, while debate has continued over what characteristics should require early repair. As municipalities, provinces, and states are pressured by budget deficits to minimize maintenance costs, the definition of what constitutes a reasonable level of public safety is shifted. New Minimum Maintenance Standards (MMS) in Ontario define that an edge drop-off of 8 centimeters (just over 3in) existing over a full distance of 20 meters (about 65ft) is the new threshold at which maintenance of the drop-off is required. This presentation will discuss data that was collected of the changes in the edge drop-off through the three-year study and will demonstrate that deep edge drop-offs over 11 centimeters (4.5in) existed at individual locations while the criterion of 8 centimeters along the total 20 meter distance was never met. Efforts to fill in the exposed edge drop-off by plowing and then shifting the gravel back toward the edge drop-off causes a shoulder surface of deep and soft gravel which is argued to be as unsafe as leaving the area untreated.

The location/type of loss-of-control evidence in 54 incidents is reviewed. A comparison is made between the location of these events and the features of the site to provide an estimate of which features are more likely to be associated with a vehicular loss-of-control. Characteristics of the loss-of-control tire marks resulting from these events are discussed so investigators can further their ability to detect and understand this evidence.

Documentation is provided from travels through the curve in an instrumented passenger car. Longitudinal and lateral accelerations are presented as well as driver actions (braking, steering) at select speeds. These data are compared to the location of the loss-of-control incidents.

Crash, Curve, Loss-of-Control

 ** Presenting Author*