



Pathology & Biology Section – 2008

G94 Reconstruction of a Fatal Dragster Crash

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After attending this presentation, attendees will understand the basic principles in crash reconstruction, vehicle crash dynamics, measures of impact severity, occupant kinematics, seatbelt overloading, and biomechanics of injury in the context of a unique type of motor vehicle collision.

This presentation will impact the forensic science community by presenting concepts in crash reconstruction vehicle crashworthiness, occupant protection and human tolerance to impact by an in-depth analysis of an uncommon type of high-severity collision, this presentation will be of interest to all motor vehicle collision investigators.

This presentation examines a number of different concepts in crash reconstruction, vehicle crashworthiness, occupant protection and human tolerance to impact through the in-depth analysis of an uncommon type of high-severity collision. This illustrative case will be of interest to anyone investigating motor vehicle collisions and consequent injury patterns.

A 17-year-old female driver lost control of her rail-type dragster at the finish line during a routine performance run. The vehicle struck a rigid left concrete barrier running parallel to the track. The driver's seatbelt failed during the crash, and she was ejected and fatally injured. The cause of the seatbelt failure and its role in the death of the young woman were major considerations during the in-depth investigation of the crash.

The light stiff dragster rail was propelled by a jet engine mounted behind the seat and was traveling at a speed of 305 mph when it suddenly veered to the left at the finish line. The driver shut off the jet engine just past the finish line, and the vehicle began to decelerate rapidly due to large aerodynamic forces that also put the vehicle into a hard counterclockwise rotation. The "jet car" was traveling at approximately 280 mph and slipping sideways when it struck the barrier with its front end just 80 yards past the finish line. At impact, the approach angle of the vehicle's center of mass was 9.3 degrees to the barrier as indicated by a single tire mark. The component of the vehicle's velocity directed perpendicular to the barrier was 45 mph. Impact speed is often a poor measure of crash severity, and the velocity change (ΔV) and time duration (Δt) of the impact must be considered. The ΔV in this case would be similar in magnitude to the component of the impact velocity that was directed perpendicular to the barrier. A ΔV of 45 mph is indicative of a severe crash. By comparison, full-frontal passenger vehicle crash tests into fixed rigid barriers are conducted at test speeds of 30 mph by regulatory agencies in North America. While the ΔV sustained by the dragster was very high and well beyond the compliance limits of passenger vehicles, there are additional considerations when evaluating impact severity. Due to the low mass and very stiff construction of the vehicle it sustained minor front-end crush. As a result of the short ride-down distance, the Δt would be much less than a similar severity crash by a passenger vehicle. Consequently, the resulting decelerations sustained by the dragster were very large, and the impact extremely severe.

The occupant compartment remained intact, but the driver's five-point restraint harness failed during the crash. The left lap belt, right lap belt latch plate and central crotch strap separated due to occupant loading. The failure of the left lap belt occurred at the adjuster mechanism and appeared similar to the restraint failure observed after Dale Earnhardt's fatal NASCAR crash. The dragster driver was ejected and slipped out of her helmet, which remained tethered to the vehicle. Both driver and vehicle traveled approximately 275 yards from the point of impact before coming to rest near the barrier. The driver sustained severe injuries to the head, neck, torso and abdomen. Some of the injuries that contributed to her death resulted from excessive lap belt loading.

This case is an example of high severity crash occurring in a unique vehicle. The severity of the collision is due not only to the high ΔV of the crash but also its short time duration. Irrespective of the restraint system integrity, a fatal outcome was predictable.

Dragster, Crash, Reconstruction