C37 The Forensic Analysis of an Airbag Deployment Causing Injury in a Non-Collision Event

Kurt D. Weiss, MS, Automotive Safety Research, 5350 Hollister Avenue, Ste D, Santa Barbara, CA 93111-2326*

The goal of this presentation is to outline the steps used to analyze and evaluate the cause of an unintended airbag deployment that resulted in an injury to the vehicle operator.

This presentation will impact the forensic science community by providing background and illustrating the analytical techniques used to find the cause of an injurious airbag deployment.

The driver and sole occupant of a small, domestic Sports Utility Vehicle (SUV) suffered cartilage and ligament damage to the left wrist, with complications, when the driver-side frontal airbag deployed in a non-collision event. An investigation was undertaken to determine the cause of the unintended airbag deployment that included the review of vehicle maintenance and repair records, inspection of the roadway, inspection of the incident vehicle, and removal of the airbag system components.

The vehicle had been parked parallel to a curb. After entering the vehicle and starting the engine without incident, the driver-side airbag unexpectedly deployed just as the slow moving vehicle was maneuvered a short distance into the roadway. While the vehicle was also equipped with a passenger-side frontal airbag, only the driver-side device activated.

A document review showed the SUV, purchased as a new vehicle, was routinely serviced by two authorized dealers under a factory-specified maintenance schedule. The service records reveal the SUV was involved in two minor traffic collisions. One collision occurred at an odometer reading of approximately 9,000 miles that resulted in minor property damage to the rear quarter panel. A second collision, categorized as a right side T-bone impact, was noted to have occurred at approximately 27,000 miles. Both collisions were not likely to have affected the function of the frontal airbag system; however, the records also show that at about 15,000 miles, the steering wheel was removed and the cruise control switch assembly was replaced under warranty. This switch assembly was damaged by the owner's pet, who regularly occupied the vehicle's interior.

The roadway was inspected where the incident had occurred. No physical evidence related to a curb strike of sufficient magnitude that could be associated with airbag deployment was noted.

The incident vehicle was inspected and thoroughly examined for physical evidence indicative of a frontal impact. None of the wheel rims showed evidence of a curb strike. There was no evidence of ground contact to the undercarriage and suspension components. Furthermore, no evidence to the reinforcement beam related to a frontal impact of significant magnitude was observed during the tear-down of the front bumper assembly.

The vehicle was scanned for diagnostic trouble codes prior to the removal of the steering wheel and driver-side airbag module, clock-spring, and, Engine Control Unit (ECU). Two fault codes were identified. The first code was related to a low-voltage condition of the battery that had subsequently drained during vehicle storage. A second code identified a system condition related to the deployment of the driver airbag.

A close-up examination of the vehicle components that were removed from the incident vehicle revealed abrasions to the wire's insulation and connector of the clock spring. It was proposed that these abrasions were caused by a misalignment of the steering wheel during the replacement of the cruise control assembly switch. When these two components were realigned, an interaction between the wire insulation and a pin on the back of the steering wheel was observed. Therefore, it was concluded that the reinstallation and misalignment of the steering wheel caused the insulation abrasion that resulted in grounding the wire core to the steering wheel's metal frame.

Frontal Airbag, Clock-Spring, Fault Codes

 ** Presenting Author*