Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1998-048-803G)

1998 Chevrolet 1500 pickup truck

Alabama

October/1998

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16. Abstract

This remote investigation focused on the redesigned air bag system deployment of a 1998 Chevrolet 1500 pickup truck. This crash occurred in October, 1998 in the morning. The weather was clear and the bituminous roadway was dry. The crash occurred in a four legged intersection. The eastbound leg of the intersection is a two-way divided roadway and is comprised of seven travel lanes; three eastbound lanes, one eastbound left-turn lane, and three westbound lanes. The eastbound lanes are separated from the westbound lanes by a raised concrete median strip. The speed limit for this road is 72 kmph (45 mph). It is controlled by overhead traffic signals. The road is level at the area of impact. The northbound leg of the intersection is a two-way undivided roadway and is comprised of two travel lanes; one northbound and one southbound lane. The road is controlled by overhead traffic signals. Vehicle 1, a 1994 Toyota Camry 4-door sedan driven by a 15 year old female, was traveling west in the westbound left-turn lane approaching the intersection at a police estimated speed of 8 kmph (5 mph), preparing to make a left turn at the intersection. The driver reported that she had a left-turn arrow at the time but witnesses dispute this. It is unknown if the driver was restrained. There were no other occupants in Vehicle 1. Vehicle 2, a 1998 Chevrolet 1500 pickup truck (case vehicle) driven by a 20 year old male (185 cm/73 in, 75 kg/165 lbs), was traveling east in the right eastbound lane approaching the intersection at a driver estimated speed of 40-48 kmph (25-30 mph), intending to travel straight through the intersection on a solid green traffic signal. The driver was restrained by the available manual lap/shoulder restraint. There were no other occupants in Vehicle 2. The driver of Vehicle 1 initiated the left turn and failed to yield the right-of-way to Vehicle 2. Vehicle 1 crossed the path of Vehicle 2 and was struck in the intersection. The front plane of Vehicle 2 (11FDEW1) struck the right plane of Vehicle 1 (02RDAW3). A Delta V was calculated for this impact, utilizing WinSMASH, to be 33 kmph (21 mph) for Vehicle 1 and 21 kmph (13 mph) for Vehicle 2 (case vehicle). As a result of the frontal impact, the supplemental restraint system (driver and passenger side redesigned air bags) of the case vehicle deployed. The center instrument panel mounted air bag shut off switch was turned to the “on” position at the time of the crash. Vehicle 1 came to rest with it’s left wheels against the east curb of the intersecting road facing south. Vehicle 2 came to rest in the middle of the intersecting road facing southeast. Neither driver of Vehicles 1 and 2 were reported as injured or transported for medical attention.

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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Chevrolet 1500 pickup truck. This crash occurred in October, 1998 in the morning. The weather was clear and the bituminous roadway was dry. The crash occurred in a four legged intersection. The eastbound leg of the intersection is a two-way divided roadway and is comprised of seven travel lanes; three eastbound lanes, one eastbound left-turn lane, and three westbound lanes. The eastbound lanes are separated from the westbound lanes by a raised concrete median strip. The speed limit for this road is 72 kmph (45 mph). It is controlled by overhead traffic signals. The road is level at the area of impact. The northbound leg of the intersection is a two-way undivided roadway and is comprised of two travel lanes; one northbound and one southbound lane. The road is controlled by overhead traffic signals.

Vehicle 1, a 1994 Toyota Camry 4-door sedan driven by a 15 year old female, was traveling west in the westbound left-turn lane approaching the intersection at a police estimated speed of 8 kmph (5 mph), preparing to make a left turn at the intersection. The driver reported that she had a left-turn arrow at the time but witnesses dispute this. It is unknown if the driver was restrained. There were no other occupants in Vehicle 1.

Vehicle 2, a 1998 Chevrolet 1500 pickup truck (case vehicle) driven by a 20 year old male (185 cm/73 in, 75 kg/165 lbs), was traveling east in the right eastbound lane approaching the intersection at a driver estimated speed of 40-48 kmph (25-30 mph), intending to travel straight through the intersection on a solid green traffic signal. The driver was restrained by the available manual lap/shoulder restraint. There were no other occupants in Vehicle 2.

Figure 1. Exterior, Vehicle 2 (Chevrolet 1500 case vehicle)

Figure 2. Exterior, Vehicle 1 (Toyota Camry)

Crash Events

The driver of Vehicle 1 initiated the left turn and failed to yield the right-of-way to Vehicle 2. Vehicle 1 crossed the path of Vehicle 2 and was struck in the intersection. The front plane of Vehicle 2 (11FDEW1) struck the right plane of Vehicle 1 (02RDAW3).

A Delta V was calculated for this impact, utilizing WinSMASH, to be 33 kmph (21 mph) for Vehicle 1 and 21 kmph (13 mph) for Vehicle 2 (case vehicle).

As a result of the frontal impact, the supplemental restraint system (driver and passenger side redesigned air bags) of the case vehicle deployed. The center instrument panel mounted air bag shut off switch was turned to the "on" position at the time of the crash.

Figure 3. Crash scene, area of impact

Vehicle 1 came to rest with it's left wheels against the east curb of the intersecting road facing south. Vehicle 2 came to rest in the middle of the intersecting road facing southeast.

Neither driver of Vehicles 1 and 2 were reported as injured or transported for medical attention.

Both Vehicles became disabled due to damage sustained in the crash and were towed from the scene.

Table 1. Delta V

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	21	13	33	20.5
Longitudinal	-20	-12.4	-11	-6.8
Lateral	7	4.3	-31	-19.3

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Chevrolet 1500 pickup truck
VIN	1GCEK19R9WE
CDC	11FDEW1

Figure 4. Exterior, Vehicle 2 (1998 Chevrolet 1500)

Figure 5. Exterior, Vehicle 2 (1998 Chevrolet 1500)

Table 3. Crush Measurements

Plane of Impact	Field L cm/in.	C1 cm/in.	C2 cm/in.	C3 cm/in.	C4 cm/in.	C5 cm/in.	C6 cm/in.
Bumper	174	25	18	17	16	15	22
	68.5	9.8	7.1	6.7	6.3	5.9	8.7

Interior of Case Vehicle

The interior of the Chevrolet 1500 sustained minor damage from occupant contact. There were no areas of intrusion into the passenger compartment. There was occupant contact evidence to windshield, sunvisors, and center armrest.

The case vehicle was equipped with bucket seats with folding backs in the front left and front right seating positions. Both front seats were adjusted between the middle and rear most track positions and both were equipped with adjustable head restraints which were not damaged in the crash. The rear of the vehicle was equipped with bench seats with folding backs in all three seating positions. The outboard seats were equipped with adjustable head restraints which were not damaged. The center rear seat was not equipped with a head restraint system.

Case Vehicle Occupant Protection Systems

The Chevrolet 1500 pickup truck was equipped with a redesigned air bag system which consisted of front left and front right air bag modules which housed air bags and depowered inflator units, and a front right air bag shut off switch.

Figure 6. Driver's side air bag, case vehicle

The front left air bag was housed in the steering wheel hub and was concealed by symmetrical I-configuration cover flaps. The circular air bag was equipped with two tethers and two vent ports. No contact evidence was found on the bag and the bag and cover flaps were not damaged.

The front right air bag was housed in the mid-instrument panel position. The rectangular air bag was concealed by asymmetrical H-configuration cover flaps. The bag was equipped with two vent ports and no tethers. No contact evidence was found on the bag and the bag and cover flaps were not damaged.

The front right air bag shut off switch was located on the center-instrument panel area. The switch is key activated and was turned to the right "on" position at the time of the crash. There was no evidence of any failures related to the air bag switch and the front right air bag deployed upon impact.

Figure 7. Interior, case vehicle. Box indicates location of air bag shut off switch.

Figure 8. Passenger air bag shut off switch.

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant Demographics

	Occupant 1	
Age/Sex:	20/Male	
Seated Position:	Front left	
Seat Type:	Bucket with folding back, cloth covered	
Height (cm/in:):	185	73
Weight (kg/lbs).:	75	165
Pre-existing Medical Condition:	None noted	
Body Posture:	Normal, upright facing forward	
Hand Position:	On steering wheel at 10 & 2 o'clock positions	
Foot Position:	On floor or foot controls	
Restraint Usage:	Manual lap & shoulder restraint	
Air bag:	Deployed redesigned air bag system	

Occupant Injuries

Table 5. Injuries

Injury	Injury Severity (AIS)	Injury Mechanism
Not injured		

Occupant Kinematics

The driver (case occupant) of the Chevrolet 1500 was seated in a normal upright posture in the front left position of the vehicle. He was wearing the manual lap/shoulder restraint. Seat belt usage was determined by visual inspection by the researcher, the lack of prominent frontal contact evidence, and observations of the investigating police officer at the scene of the crash. Due to pre-impact braking (with lockup), the driver moved forward and loaded the lap/shoulder restraint.

At impact, the driver reacted to the 340 degree principle direction of force by moving forward and slightly left. The locked lap/shoulder restraints prevented further significant forward movement by the occupant. As the driver's side air bag deployed, it appears that the case occupant's hands may have rebounded off of the deploying bag into the sunvisors and windshield. Both visors were knocked out of place and a scratch was found on the windshield. The center armrest of the front left seat also was moved out of place possibly as a result of contact with the driver's right arm. No evidence of occupant contact was found on the air bag but it is presumed that he contacted the bag somewhat with his chest in this moderate frontal collision. The case occupant was not injured but complained of "soreness" to the center of his back and back of his neck. He was not treated for these symptoms.

Figure 9. Interior, case vehicle. Possible contact points.

Figure 10. Interior, case vehicle. Possible contact point.

Scene Diagram