Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1999-074-802E)

1999 Chevrolet Cavalier

Nebraska

May/1999

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16. Abstract

This remote investigation focused on the redesigned air bag system deployment of a 1999 Chevrolet Cavalier 2-door coupe. This moderate injury crash occurred in May, 1999 in the afternoon. The weather was clear and the concrete roadways were dry. The crash occurred in a four-legged intersection. The southbound leg of the intersection is a two-way undivided roadway and is comprised of five travel lanes; one southbound right-turn lane, one southbound thru lane, one southbound left-turn lane, and two northbound lanes. The speed limit for this road is not known. It is controlled by overhead traffic signals. The road is level at this location. The northbound leg of the intersection is a two-way undivided roadway and is comprised of four travel lanes; one northbound left-turn lane, two northbound thru lanes, and one southbound lane. The speed limit for this road is 56 kmph (35 mph). It is controlled by overhead traffic signals. The road is level at this location. Vehicle 1, a 1999 Chevrolet Cavalier 2-door coupe (case vehicle) driven by a 20 year old female (160 cm/63 in, 64 kg/142 lbs), was traveling south in the center southbound lane approaching the intersection at a driver estimated speed of 56-64 kmph (35-40 mph). The driver was preparing to travel straight through the intersection. The overhead traffic signal was in the green phase at this time. The front right seat was occupied by a 20 year old female (160 cm/63 in, 53 kg/116 lbs). Neither occupant of Vehicle 1 was restrained. Vehicle 2, a 1999 Chevrolet Monte Carlo 2-door coupe driven by a 48 year old male, was traveling north in the northbound left-turn lane approaching the intersection at an unknown speed. The driver was preparing to make a left turn at the intersection. The overhead traffic signal was in the green phase at this time. It is unknown if the driver was restrained. There were no other occupants in Vehicle 2. The driver of Vehicle 2 initiated the left turn in the path of Vehicle 1 and was struck. The front plane of Vehicle 1 (12FDEW2) struck the front plane of Vehicle 2 (01FZEW1) in the intersection. A Delta V was calculated for Vehicle 1, utilizing the Damage Only Algorithm of WinSMASH, as 22 kmph (14 mph). As a result of the frontal impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed. Vehicle 1 came to rest in the center of the intersection facing southwest. Vehicle 2 came to rest next to Vehicle 1 facing west. Both occupants of the case vehicle sustained non-incapacitating injuries and were transported by land to a local hospital where they were both treated and released. The medical disposition of the driver of Vehicle 2 is not known. Both vehicles were disabled due to damage sustained in the crash and were towed from the scene.

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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1999 Chevrolet Cavalier 2-door coupe. This moderate injury crash occurred in May, 1999 in the afternoon. The weather was clear and the concrete roadways were dry. The crash occurred in a four-legged intersection. The southbound leg of the intersection is a two-way undivided roadway and is comprised of five travel lanes; one southbound right-turn lane, one southbound thru lane, one southbound left-turn lane, and two northbound lanes. The speed limit for this road is not known. It is controlled by overhead traffic signals. The road is level at this location. The northbound leg of the intersection is a two-way undivided roadway and is comprised of four travel lanes; one northbound left-turn lane, two northbound thru lanes, and one southbound lane. The speed limit for this road is 56 km/h (35 mph). It is controlled by overhead traffic signals. The road is level at this location.

Figure 1. Exterior, Vehicle 1 (Chevrolet Cavalier)

Vehicle 1, a 1999 Chevrolet Cavalier 2-door coupe (case vehicle) driven by a 20 year old female (160 cm/63 in, 64 kg/142 lbs), was traveling south in the center southbound lane approaching the intersection at a driver estimated speed of 56-64 km/h (35-40 mph). The driver was preparing to travel straight through the intersection. The overhead traffic signal was in the green phase at this time. The front right seat was occupied by a 20 year old female (160 cm/63 in, 53 kg/116 lbs). Neither occupant of Vehicle 1 was restrained.

Figure 2. Exterior, Vehicle 2 (Chevrolet Monte Carlo)

Vehicle 2, a 1999 Chevrolet Monte Carlo 2-door coupe driven by a 48 year old male, was traveling north in the northbound left-turn lane approaching the intersection at an unknown speed. The driver was preparing to make a left turn at the intersection. The overhead traffic signal was in the green phase at this time. It is unknown if the driver was restrained. There were no other occupants in Vehicle 2.

Crash Events

The driver of Vehicle 2 initiated the left turn in the path of Vehicle 1 and was struck. The front plane of Vehicle 1 (12FDEW2) struck the front plane of Vehicle 2 (01FZEW1) in the intersection.

A Delta V was calculated for Vehicle 1, utilizing the Damage Only Algorithm of WinSMASH, as 22 km/h (14 mph).

As a result of the frontal impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed.

Vehicle 1 came to rest in the center of the intersection facing southwest. Vehicle 2 came to rest next to Vehicle 1 facing west.

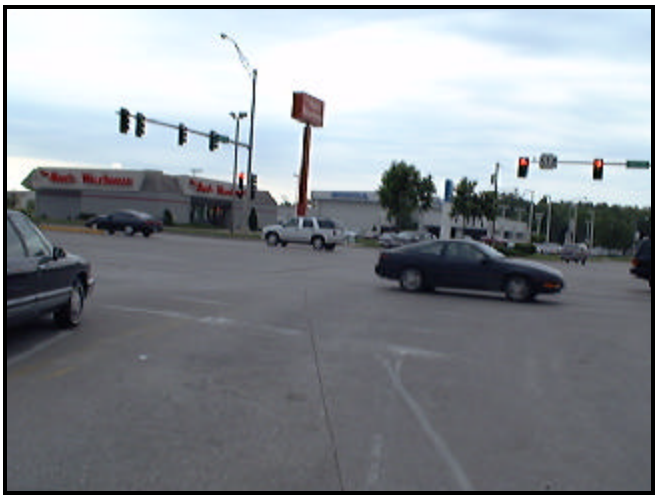

Figure 3. Crash scene. Vehicle 1 approach path.

Both occupants of the case vehicle sustained non-incapacitating injuries and were transported by land to a local hospital where they were both treated and released. The medical disposition of the driver of Vehicle 2 is not known.

Both vehicles were 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	22	13.7	18	11.2
Longitudinal	-22	-13.7	-16	-9.9
Lateral	4	2.5	-9	-5.6
Barrier speed	25	15.5	16	9.9

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1999 Chevrolet Cavalier
VIN	1G1JC124XX7
CDC	12FDEW2

Figure 4. Exterior, Vehicle 1 (1999 Chevrolet Cavalier)

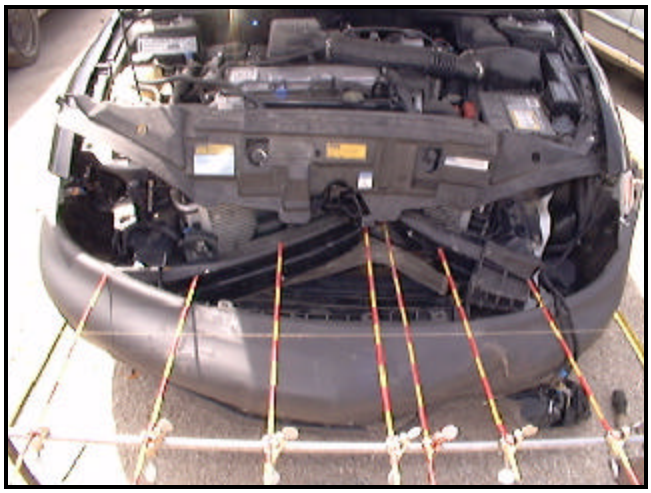

Figure 5. Exterior, Vehicle 1 (1999 Chevrolet Cavalier)

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	97	3	18	28	17	7	0
	38.2	1.2	7.1	11	6.7	2.8	0

Interior of Case Vehicle

The interior of the Chevrolet Cavalier sustained minor damage from occupant contact. There were no areas of intrusion into the passenger compartment. There was occupant contact evidence present to the left instrument panel, mirror, driver's air bag, and front windshield header.

The case vehicle was equipped with bucket seats with folding backs in the front left and front right seating positions. The front left seat was adjusted to the middle track position. The front right seat was adjusted between the middle and forward most track positions. Both front seats were equipped with adjustable head restraints which were not damaged. The rear of the vehicle was equipped with non-adjustable bench seats in all three seating positions.

Case Vehicle Occupant Protection Systems

The Chevrolet Cavalier 2-door coupe 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.

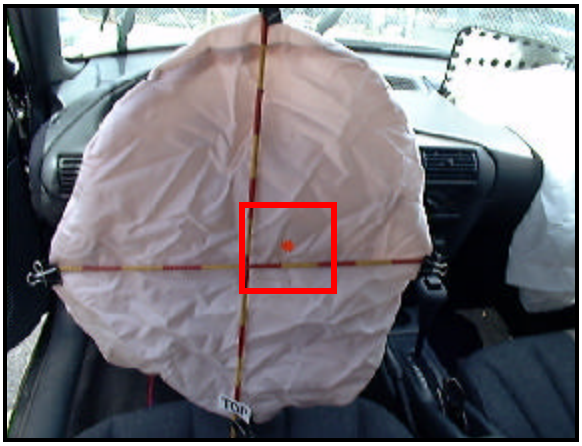

Figure 6. Driver's frontal air bag. Box indicates location of transfer.

The front left air bag was housed in the steering wheel hub and was concealed by symmetrical I-configuration cover flaps which were not damaged in the crash. The circular air bag was equipped with two vent ports and no tether straps. Contact evidence consisting of a "yellowish transfer" was found near the center of the front of the bag. The air bag was not damaged.

The front right air bag was housed in the top-panel position and was concealed by a single rectangular shaped cover flap which was not damaged in the crash. The rectangular air bag was not equipped with vent ports or tether straps. No contact evidence was found on the bag and the air bag was not damaged.

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant(s) Demographics

	Occupant 1	Occupant 2
Age/Sex:	20/Female	20/Female
Seated Position:	Front left	Front right
Seat Type:	Bucket with folding back - cloth covered	Bucket with folding back - cloth covered
Height (cm/in:):	160 63	160 63
Weight (kg/lbs).:	64 142	53 116
Pre-existing Medical Condition:	None noted	None noted
Body Posture:	Normal - upright in seat facing forward	Normal - upright in seat facing forward
Hand Position:	Both on steering wheel rim	Unknown
Foot Position:	On floor or foot controls	On floor
Restraint Usage:	None used	None used
Air bag:	Deployed redesigned air bag system	Deployed redesigned air bag system

Occupant Injuries

Table 5. Case Vehicle Occupant(s) Injuries

Occupant #	Injury	Injury Severity (AIS)	Injury Mechanism
1	Bilateral forearm abrasions	1	Driver's frontal air bag
1	Bilateral wrist abrasions	1	Driver's frontal air bag
1	Bilateral knee contusions	1	Knee bolster
1	Cervical spine strain	1	Impact forces
2	Scalp contusion	1	Front header
2	Bilateral knee contusions	1	Right instrument panel
2	Right knee abrasion	1	Right instrument panel
2	Unconsciousness at scene	2	Front header
2	Cervical spine strain	1	Impact forces

Occupant Kinematics

The driver (case occupant 01) of the Chevrolet Cavalier was seated in a normal upright posture in the front left position of the vehicle. The passenger (case occupant 02) was also seated in a normal upright posture in the front right position of the vehicle. Neither occupant was restrained. The lack of seat belt usage was determined through visual inspection by the researcher and statements made by the driver to that effect during the interview. The driver reported that she attempted to avoid the collision by braking (without lock-up) so the case occupants may have been out of position prior to impact.

Figure 7. Interior, case vehicle. Knee bolster contact.

At impact, the occupants reacted to the 350 degree principle direction of force by moving forward and slightly left. The driver engaged the deploying driver's frontal air bag-causing the bilateral forearm and wrist abrasions. The driver's knees came into contact with the knee bolster-causing the bilateral knee contusions. A large scuff was found on the knee bolster (see Figure 7). The front right passenger moved sharply forward and impacted the front windshield header-causing the loss of consciousness and scalp contusion. The passenger's knees came into contact with the right instrument panel-causing the bilateral knee contusions and right knee abrasion. Both occupants sustained cervical strains most likely caused by impact forces rather than contact with any component of the vehicle's interior. Both occupants were transported from the scene to a local hospital where they were both treated and released.

Scene Diagram