Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1999-049-136J)

1999 Chrysler Sebring

Texas

July/1999

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16. Abstract

This remote investigation focused on the redesigned air bag system deployment of a 1999 Chrysler Sebring convertible. This major injury crash occurred in July, 1999 in the afternoon. The weather was clear and the bituminous roadways were dry. The crash occurred in a three-legged, T-shaped intersection. The northbound leg of the intersection is a one-way undivided roadway and is comprised of two northbound travel lanes, and one northbound exit ramp travel lane. The speed limit for this road is 56 kmph (35 mph). There are no traffic controls for this road at the area of impact. The road is level at this location. The eastbound leg of the intersection is a two-way undivided roadway and is comprised of two eastbound travel lanes, and two westbound travel lanes. The speed limit for this road is 56 kmph (35 mph). It is controlled by a stop sign at the area of impact. The road is level at this location. Vehicle 1, a 1999 Chrysler Sebring convertible (case vehicle) driven by a 21 year old male (188 cm/74 in, 75 kg/165 lbs), was traveling north on the one-way, single lane, highway exit ramp approaching the intersecting road at an unknown speed. The driver was preparing to merge onto the one-way, two lane, northbound access road. The driver was unrestrained. The front right seat was occupied by a 22 year old female (unknown ht/wt) who was also unrestrained. Vehicle 2, a 1998 Freightliner medium/heavy truck-tractor with no cargo trailer driven by a 35 year old male, was stopped facing east in the right eastbound travel lane of the intersecting road. The driver was waiting at the stop sign for traffic to clear and was preparing to make a right turn at the intersection. It is unknown if the driver was restrained. There were no other occupants in Vehicle 2. Vehicle 1 crossed from the single lane exit ramp over both northbound travel lanes and entered the eastbound leg of the intersection, where Vehicle 2 was stopped. The front plane of Vehicle 1(12FDEW3) impacted the left plane of Vehicle 2 (unknown CDC) in the right eastbound travel lane. A Delta V could not be calculated for this event due to Vehicle 2 being a medium/heavy truck which is beyond the scope of WinSMASH reconstruction. A barrier equivalent speed was calculated for Vehicle 1 however, utilizing WinSMASH, as 56 kmph (35 mph). As a result of this frontal impact, the supplemental restraint system (driver's and passenger's redesigned air bags) of the case vehicle deployed. Vehicle 1 came to rest in the adjacent gas station parking lot facing southeast. Vehicle 2 came to rest in the same lot facing south. Both occupants of Vehicle 1 sustained incapacitating injuries in the crash and were transported from the scene to a trauma center where they were both hospitalized. The driver of Vehicle 2 was reportedly uninjured and was not transported for medical attention. 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 Chrysler Sebring convertible. This major injury crash occurred in July, 1999 in the afternoon. The weather was clear and the bituminous roadways were dry. The crash occurred in a three-legged, T-shaped intersection. The northbound leg of the intersection is a one-way undivided roadway and is comprised of two northbound travel lanes, and one northbound exit ramp travel lane. The speed limit for this road is 56 kmph (35 mph). There are no traffic controls for this road at the area of impact. The road is level at this location. The eastbound leg of the intersection is a two-way undivided roadway and is comprised of two eastbound travel lanes, and two westbound travel lanes. The speed limit for this road is 56 kmph (35 mph). It is controlled by a stop sign at the area of impact. The road is level at this location.

Vehicle 1, a 1999 Chrysler Sebring convertible (case vehicle) driven by a 21 year old male (188 cm/74 in, 75 kg/165 lbs), was traveling north on the one-way, single lane, highway exit ramp approaching the intersecting road at an unknown speed. The driver was preparing to merge onto the one-way, two lane, northbound access road. The driver was unrestrained. The front right seat was occupied by a 22 year old female (unknown ht/wt) who was also unrestrained.

Vehicle 2, a 1998 Freightliner medium/heavy truck-tractor with no cargo trailer driven by a 35 year old male, was stopped facing east in the right eastbound travel lane of the intersecting road. The driver was waiting at the stop sign for traffic to clear and was preparing to make a right turn at the intersection. It is unknown if the driver was restrained. There were no other occupants in Vehicle 2.

Figure 1. Exterior, Vehicle1 (Chrysler Sebring)

Figure 2. Exterior, Vehicle 2 (Freightliner tractor)

Crash Events

Vehicle 1 crossed from the single lane exit ramp over both northbound travel lanes and entered the eastbound leg of the intersection, where Vehicle 2 was stopped. The front plane of Vehicle 1(12FDEW3) impacted the left plane of Vehicle 2 (unknown CDC) in the right eastbound travel lane.

A Delta V could not be calculated for this event due to Vehicle 2 being a medium/heavy truck which is beyond the scope of WinSMASH reconstruction. A barrier equivalent speed was calculated for Vehicle 1 however, utilizing WinSMASH, as 56 kmph (35 mph).

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

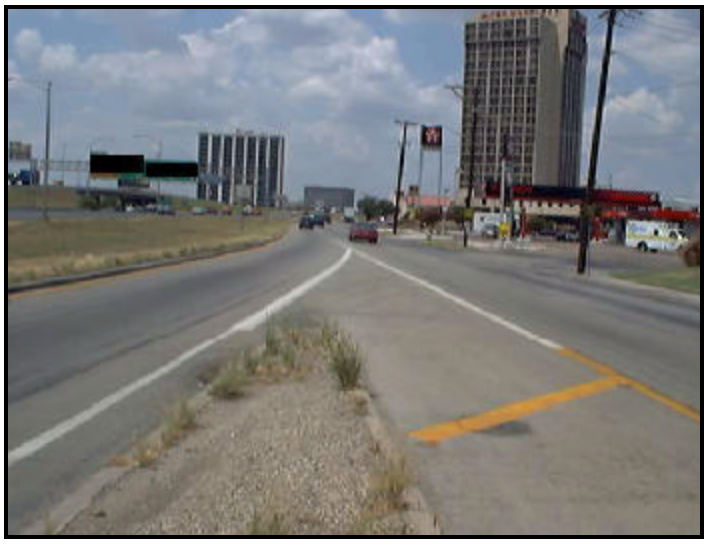

Figure 3. Crash scene, Vehicle 1 approach path.

Vehicle 1 came to rest in the adjacent gas station parking lot facing southeast. Vehicle 2 came to rest in the same lot facing south.

Both occupants of Vehicle 1 sustained incapacitating injuries in the crash and were transported from the scene to a trauma center where they were both hospitalized. The driver of Vehicle 2 was reportedly uninjured and was not transported for medical attention.

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	Unknown	Unknown	Unknown	Unknown
Longitudinal	Unknown	Unknown	Unknown	Unknown
Lateral	Unknown	Unknown	Unknown	Unknown
Barrier speed	56	34.8	Unknown	Unknown

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1999 Chrysler Sebring
VIN	3C3EL55H5XT
CDC	12FDEW3

Figure 4. Exterior, Vehicle 1 (1999 Chrysler Sebring)

Figure 5. Exterior, Vehicle 1 (1999 Chrysler Sebring)

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	104	75	52	50	62	51	51
	40.9	29.5	20.5	19.7	24.4	20.1	20.1

Interior of Case Vehicle

The interior of the Chrysler Sebring sustained moderate damage from occupant contact. There were several areas of intrusion into the passenger compartment (see Table 4). Occupant contact evidence was found on the steering wheel, instrument panel, knee bolster, seat backs, glove compartment door, and both frontal air bags.

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 forward most and middle track positions. Both front seats were equipped with adjustable head restraints which were not damaged in the crash. The rear of the vehicle was equipped with bench seats with no head restraints in the back left and back right seating positions. There is no back center seat in this vehicle.

Table 4. Intrusions

Intruded Component	Location of Intrusion	Intruded Value cm/in.		Dominant Crush Direction
Toe pan	Front right	41	16.1	Longitudinal
Front seat back	Back left	32	12.6	Longitudinal
Toe pan	Front left	28	11	Longitudinal
Left instrument panel	Front left	22	8.7	Longitudinal
A-pillar	Front left	20	7.9	Longitudinal
Center instrument panel	Front right	16	6.3	Longitudinal
Floor pan	Front left	14	5.5	Vertical
Right instrument panel	Front right	12	4.7	Longitudinal
Floor pan	Front right	8	3.1	Vertical
Side panel	Back left	3	1.2	Lateral
B-pillar	Front right	3	1.2	Longitudinal

Case Vehicle Occupant Protection Systems

The Chrysler Sebring convertible 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.

The front left air bag was housed in the steering wheel hub and was concealed by asymmetrical H-configuration cover flaps which were not damaged in the crash. The circular air bag was equipped with two tether straps and one vent port. Contact evidence consisting of blood was found primarily on the lower half of the front of the bag. The air bag was not damaged.

The front right air bag was housed in the top-instrument panel position and was concealed by a single inverted D-shaped cover flap which was not damaged in the crash. The rectangular air bag was not equipped with tether straps

or vent ports. Contact evidence consisting of scuffs, blood, and a makeup transfer was found on the lower half of the front of the bag. The air bag was not damaged.

Case Vehicle Occupant Demographics

Table 5. Case Vehicle Occupant(s) Demographics

	Occupant 1	Occupant 2
Age/Sex:	21/Male	22/Female
Seated Position:	Front left	Front right
Seat Type:	Bucket with folding back - leather covered	Bucket with folding back - leather covered
Height (cm/in:):	188 74	Unknown
Weight (kg/lbs).:	75 165	Unknown
Pre-existing Medical Condition:	None noted	None noted
Body Posture:	Unknown	Unknown
Hand Position:	Unknown	Unknown
Foot Position:	Unknown	Unknown
Restraint Usage:	None used	None used
Air bag:	Deployed redesigned air bag system	Deployed redesigned air bag system

Occupant Injuries

Table 6. Case Vehicle Occupant(s) Injuries

Occupant #	*Injury*	*Injury Severity (AIS)*	*Injury Mechanism*
1	Right femur fracture	3	Knee bolster
1	> 3 rib fractures - left side	3	Air bag compartment cover flaps
1	Right fibula head fracture	2	Knee bolster
1	Right open tibia shaft fracture	3	Knee bolster
1	Right knee major artery laceration	3	Knee bolster
1	Left hand multiple tendon lacerations	1	Left instrument panel
1	Bilateral upper extremity lacerations	1	Left instrument panel
1	Right upper extremity abrasions	1	Left instrument panel
1	Chest skin laceration	1	Air bag compartment cover flaps
1	Right knee abrasions	1	Knee bolster
1	Right knee contusion	1	Knee bolster
1	Left knee avulsion	1	Knee bolster
2	Right femur shaft fracture	3	Glove compartment door
2	Right fibula fracture	2	Toe pan
2	Right knee laceration into joint	2	Glove compartment door
2	Left foot toe dislocations	1	Toe pan
2	Left foot contusion	1	Toe pan
2	Chest skin abrasion	1	Passenger's frontal air bag
2	Dislocated right ankle	2	Toe pan

Occupant Kinematics

The driver (case occupant 01) of the 1999 Chrysler Sebring was seated in an unknown posture in the front left position of the vehicle. He was unrestrained. The front right passenger (case occupant 02) was also seated in an unknown posture and was unrestrained. The lack of seat belt usage was determined through visual inspection by the researcher, observations by the investigating police officer at the scene of the crash, and the appearance of heavy frontal contact evidence in the vehicle. It is not known whether the driver performed any pre-impact avoidance maneuvers.

At impact, the occupants reacted to the 0 degree principle direction of force by moving sharply forward. The driver's lower extremities severely loaded the knee bolster-causing the right femur, fibula, and tibia fractures, as well as the knee laceration, abrasion, contusion, and avulsion. The driver also impacted the left instrument panel-causing the upper extremity abrasions and lacerations. As the driver's frontal air bag deployed, the occupant's upper torso was

struck by the opening air bag cover flaps-causing the rib fractures and chest laceration. The front right passenger was moving forward as the right toe pan was intruding rearward. Impact with the intruding toe pan caused the right fibula fracture and right ankle dislocation. The passenger's left foot contusion and toe dislocation was also caused by impact with the toe pan. Case occupant 02 also came into contact with the glove compartment door-causing the right femur fracture and knee laceration. The passenger's upper torso also came into contact with the deploying passenger's frontal air bag-causing the chest abrasion. Both occupants of the case vehicle were transported from the scene to a trauma center with incapacitating injuries. The driver was hospitalized for 10 days and the passenger was hospitalized for six days.

Figure 7. Case occupant 01 seating position.

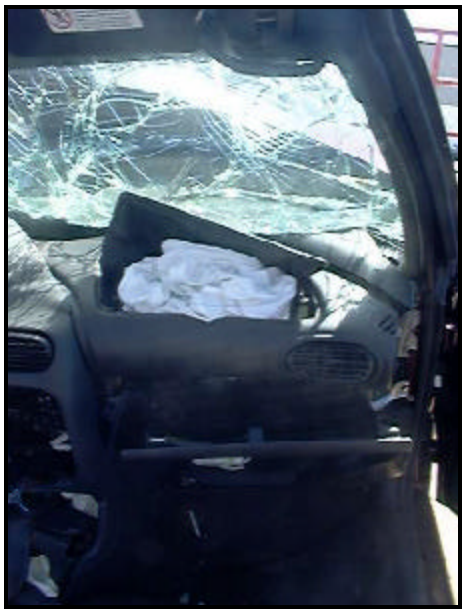

Figure 8. Case occupant 02 seating position.

Scene Diagram