Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1999-073-027J)

1999 Dodge Dakota

Indiana

April/1999

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16. Abstract

This remote investigation focused on the redesigned air bag system deployment of a 1999 Dodge Dakota compact pickup truck. This serious injury crash occurred in April, 1999 in the early morning. The weather was clear and the bituminous roadway was dry. The crash occurred on a two-way, divided, interstate highway. The roadway is comprised of seven travel lanes; three eastbound lanes, one eastbound deceleration lane, and three westbound lanes. Eastbound traffic is separated from westbound traffic by a raised concrete “jersey” barrier. The speed limit for this road is 89 kmph (55 mph). There are no traffic controls at the area of impact. The road is level at this location. Vehicle 1, a 1999 Dodge Dakota compact pickup truck (case vehicle) driven by an unrestrained 20 year old male (175 cm/69 in, 79 kg/175 lbs), was traveling east in the right eastbound lane (next to the deceleration lane) at a police estimated speed of 161 kmph (100 mph) approaching the exit ramp. The front right seat was occupied by an unrestrained 18 year old male (185 cm/73 in, 79 kg/175 lbs). The back left seat was occupied by an unrestrained 17 year old male (185 cm/73 in, 91 kg/200 lbs). The back right seat was occupied by an unrestrained 17 year old female (160 cm/63 in, 54 kg/120 lbs). Vehicle 1 was in the process of being pursued by a police cruiser with emergency lights and sirens activated. It is believed that the driver was attempting to enter the exit ramp at the time of the crash. As the driver attempted to exit the highway at a very high rate of speed, he lost control of the vehicle. Vehicle 1 departed the right roadside. Vehicle 1 continued eastbound down the grassy roadside and struck a large steel light support pole with the front plane (12FREE8). Vehicle 1 rotated clockwise after impact and came to final rest to the east of the pole facing southwest. No Delta V was calculated for this crash. As a result of this frontal impact, the supplemental restraint system (driver’s and passenger’s frontal redesigned air bags) of the case vehicle deployed. The driver was reportedly uninjured in the crash and was not transported from the scene for medical attention. All three passengers sustained varying degrees of injuries and were transported from the scene to a trauma center for medical treatment. The front right occupant was hospitalized, while the back seat occupants were treated and released. Vehicle 1 was disabled in the crash and was towed from the scene with heavy damage.

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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1999 Dodge Dakota compact pickup truck. This serious injury crash occurred in April, 1999 in the early morning. The weather was clear and the bituminous roadway was dry. The crash occurred on a two-way, divided, interstate highway. The roadway is comprised of seven travel lanes; three eastbound lanes, one eastbound deceleration lane, and three westbound lanes. Eastbound traffic is separated from westbound traffic by a raised concrete "jersey" barrier. The speed limit for this road is 89 kmph (55 mph). There are no traffic controls at the area of impact. The road is level at this location.

Figure 1. Exterior, Vehicle 1 (1999 Dodge Dakota)

Vehicle 1, a 1999 Dodge Dakota compact pickup truck (case vehicle) driven by an unrestrained 20 year old male (175 cm/69 in, 79 kg/175 lbs), was traveling east in the right eastbound lane (next to the deceleration lane) at a police estimated speed of 161 kmph (100 mph) approaching the exit ramp. The front right seat was occupied by an unrestrained 18 year old male (185 cm/73 in, 79 kg/175 lbs). The back left seat was occupied by an unrestrained 17 year old male (185 cm/73 in, 91 kg/200 lbs). The back right seat was occupied by an unrestrained 17 year old female (160 cm/63 in, 54 kg/120 lbs).

Figure 2. Crash scene. Vehicle 1 approach path.

Vehicle 1 was in the process of being pursued by a police cruiser with emergency lights and sirens activated. It is believed that the driver was attempting to enter the exit ramp at the time of the crash.

Crash Events

As the driver attempted to exit the highway at a very high rate of speed, he lost control of the vehicle. Vehicle 1 departed the right roadside. Vehicle 1 continued eastbound down the grassy roadside and struck a large steel light support pole with the front plane (12FREE8). Vehicle 1 rotated clockwise after impact and came to final rest to the east of the pole facing southwest.

No Delta V was calculated for this crash. As a result of this frontal impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed.

Figure 3. Crash scene. Vehicle 1 point of impact.

The driver was reportedly uninjured in the crash and was not transported from the scene for medical attention. All three passengers sustained varying degrees of injuries and were transported from the scene to a trauma center for medical treatment. The front right occupant was hospitalized, while the back seat occupants were treated and released.

Vehicle 1 was disabled in the crash and was towed from the scene with heavy damage.

Table 1. Delta V

	Case Vehicle	
	km/h	mph
Total	Unknown	Unknown
Longitudinal	Unknown	Unknown
Lateral	Unknown	Unknown

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1999 Dodge Dakota
VIN	1B7GL22X1XS
CDC	12FREE8

Figure 4. Exterior, Vehicle 1 (1999 Dodge Dakota pickup)

Figure 5. Exterior, Vehicle 1 (1999 Dodge Dakota pickup)

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	131	0	0	8	16	23	65
	51.6	0	0	3.1	6.3	9.1	25.6

Interior of Case Vehicle

The interior of the Dodge Dakota sustained substantial damage from intrusion and occupant contact. There was major intrusion to the front right side of the vehicle's interior. The intruded values are reported in Table 4. Occupant contact evidence was present to the sunvisor, glove compartment door, seat back, both air bags, and the passenger's air bag cover flap.

The case vehicle was equipped with split bench seats with folding backs with no head restraints in the front left, front center, and front right seating positions. All front seats were adjusted to the middle track position. The front left and front right seats were equipped with integral head restraints. The rear of the vehicle was equipped with bench seats with no head restraints in all three seating positions. The back seats were not adjustable.

Table 4. Intrusions

Intruded Component	Location of Intrusion	Intruded Value cm/in.		Dominant Crush Direction
Side panel	Front right	54	21.3	Longitudinal
Seat cushion	Front right	54	21.3	Longitudinal
Toe pan	Front right	52	20.5	Longitudinal
Right instrument panel	Front right	37	14.6	Longitudinal
Toe pan	Front center	36	14.2	Longitudinal
A-pillar	Front right	25	9.8	Longitudinal
Center instrument panel	Front center	22	8.7	Longitudinal
Windshield header	Front right	5	2	Longitudinal
Windshield	Front right	5	2	Longitudinal
Windshield header	Front center	3	1.2	Longitudinal

Case Vehicle Occupant Protection Systems

The Dodge Dakota compact 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.

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 no vent ports. Contact evidence consisting of "orange faint stains" was found primarily on the top half of the front of the bag. The air bag was not damaged.

The front right air bag was housed in the mid-instrument panel position and was housed 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 blood was found on the top half of the front and back of the bag. Blood was also bound on the cover flap. The air bag was not damaged.

Figure 6. Driver's frontal air bag.

Case Vehicle Occupant Demographics

Table 5. Case Vehicle Occupant(s) Demographics

	Occupant 1	Occupant 2	Occupant 3	Occupant 4
Age/Sex:	20/Male	18/Male	17/Male	17/Female
Seated Position:	Front left	Front right	Back left	Back right
Seat Type:	Bench with folding back - cloth covered	Bench with folding back - cloth covered	Bench - cloth covered	Bench - cloth covered
Height (cm/in:):	175 69	185 73	185 73	160 63
Weight (kg/lbs).:	79 175	79 175	97 200	54 120
Pre-existing Medical Condition:	None noted	None noted	None noted	None noted
Body Posture:	Unknown	Unknown	Unknown	Unknown
Hand Position:	Unknown	Unknown	Unknown	Unknown
Foot Position:	Unknown	Unknown	Unknown	Unknown
Restraint Usage:	None used	None used	None used	None used
Air bag:	Deployed redesigned air bag system	Deployed redesigned air bag system	None available	None available

Occupant Injuries

Table 6. Case Vehicle Occupant(s) Injuries

Occupant #	Injury	Injury Severity (AIS)	Injury Mechanism
1	Not injured		
2	Abdomen skin contusion	1	Passenger's frontal air bag
2	Lower left extremity skin contusion	1	Glove compartment door
2	Lower right extremity skin contusion	1	Toe pan
2	Upper right extremity skin abrasion	1	Passenger's frontal air bag
2	Minor facial skin laceration	1	Passenger's frontal air bag
2	Facial skin abrasion	1	Passenger's frontal air bag
2	Nose fracture	2	Passenger's frontal air bag
2	Left humerus fracture	3	Passenger's frontal air bag
2	Left shoulder dislocation	2	Passenger's frontal air bag
2	Right tibia fracture	2	Toe pan
2	Left femur shaft fracture	3	Glove compartment door
2	Lumbar spine compression fracture	2	Passenger's frontal air bag
3	Multiple skin contusions (unknown locations)	1	Unknown source
4	Injured, details unknown		

Occupant Kinematics

The driver of the Dodge Dakota was seated in an unknown posture in the front left position of the vehicle. The other three passengers were also seated in unknown postures in the front right, back left, and back right positions of the vehicle. None of the occupants in Vehicle 1 were restrained. 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 presence of heavy frontal contact evidence in the vehicle. Prior to impact, the driver applied the brakes (with lock-up) in an attempt to avoid the crash so the occupants may have been out of position.

At impact, the occupants reacted to the 0 degree principle direction of force by moving forward. The driver appears to have contacted the deploying driver's frontal air bag but was not injured in the crash. The front right passenger impacted the deploying passenger's frontal air bag with substantial force-resulting in the lumbar spine fracture, left shoulder dislocation, left humerus fracture, nose fracture, abdominal contusion, right extremity abrasion, facial abrasion, and facial laceration. The passenger's lower extremities contacted the intruding instrument panel and toe pan-causing the right tibia fracture, left femur fracture, and lower extremity contusions. The back left occupant sustained multiple unknown skin contusions from an unknown source. The back right occupant's injuries are not known. The driver was immediately taken into custody by police and was not transported to a hospital from the scene. All three other occupants were transported from the scene to a trauma center for medical attention. The front right passenger was hospitalized for 22 days. The back left and back right passengers were treated and released.

Figure 7. Passenger's air bag contact evidence.

Scene Diagram