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REMOTE REDESIGNED AIR BAG REPORT

CASE NUMBER - IN97-054
LOCATION - MISSOURI
VEHICLE - 1998 JEEP WRANGLER SPORT
CRASH DATE - November, 1997

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

Technical Report Documentation Page

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15. <i>Supplementary Notes</i> Remote redesigned air bag deployment investigation involving a 1998 Jeep Wrangler Sport, 4x4, two-door, sport utility vehicle, with manual belts and dual front air bags, and a 1995 Cadillac DeVille, four-door sedan					
16. <i>Abstract</i> This report covers a remote investigation of an air bag deployment crash that involved a 1998 Jeep Wrangler Sport (case vehicle) and a 1995 Cadillac DeVille (other vehicle). This crash is of special interest because the case vehicle was equipped with redesigned air bags and the case vehicle's driver (22-year-old female) sustained only minor injuries in a crash in which her air bags deployed. The case vehicle was traveling south in the southbound lane of a two-lane, undivided, county roadway and was approaching a four-leg intersection. The Cadillac had been stopped heading east on the west leg of the intersection in the eastbound lane of a two-lane, undivided, county roadway and accelerated forward into the intersection. The crash occurred in the four-leg intersection of the two roadways. The front right of the case vehicle impacted the left front of the Cadillac, causing the case vehicle's driver and front right supplemental restraints (air bags) to deploy. Both vehicles were redirected toward the southeast and side slapped with the case vehicle's right side impacting the Cadillac's left side. The case vehicle continued moving in a southeasterly direction and departed the east side of the roadway, subsequently knocking down a ONE-WAY sign prior to coming to rest heading southeastward. The case vehicle's driver was seated, leaning to the right with her right arm on the center arm rest and her seat track located in its rearmost position, and the tilt steering wheel was located in its upmost position. She was restrained by her available, active, three-point, lap-and-shoulder, safety belt system and sustained, according to her interview, minor (i.e., police reported "B") injuries which included: a traumatic brain injury and an abrasion and contusion over her left shin. The driver also complained of having muscle spasms to the right side of her body, a swollen right thumb, and headaches for several days following the crash.					
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No photographs are available

This remote report was brought to NHTSA's attention on December 15, 1997 by GES sampling activities. This crash involved a 1998 Jeep Wrangler (case vehicle) and a 1995 Cadillac DeVille (other vehicle). The crash occurred in November, 1997, at 8:55 a.m., in Missouri and was investigated by the applicable county sheriff. This crash is of special interest because the case vehicle was equipped with redesigned air bags and the case vehicle's driver [22-year-old, White (non-Hispanic) female] sustained only minor injuries in a crash in which her air bags deployed. This contractor interviewed the driver for the case vehicle on January 14, 1998. This report is based on the Police Crash Report, an interview with the case vehicle's driver, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling south in the southbound¹ lane of a two-lane, undivided, county roadway and was approaching a four-leg intersection intending to continue traveling southward (this four-leg intersection was composed of a "Tee" intersection with the fourth leg being a driveway access). The Cadillac had been stopped heading east at the "Tee" (i.e., west leg of) intersection in the eastbound lane of a two-lane, undivided, county roadway and accelerated forward attempting to cross over the south and northbound travel lanes to enter a driveway to a parking lot on the east side. According to the case vehicle's driver, she braked and steered to the left, attempting to avoid the crash. The crash occurred in the four-leg intersection of the two roadways.

According to the Police Crash Report, the county roadway was straight and level at the area of impact. The pavement was bituminous, and the width of the travel lanes for both vehicles is unknown. It is unknown if there were any shoulders and/or curbs in the area. Pavement markings consisted of a double solid yellow centerline for both north and southbound traffic. It is unknown if there were any edge lines present. A regulatory **STOP** sign was located on the west leg of the intersection for traffic heading eastward, and a regulatory ONE-WAY sign was located on the east roadside of the north/south roadway, but the direction this sign was facing or the traffic it was controlling is unknown. The posted legal limit on the north/south roadway is 56 km.p.h. (35 m.p.h.). At the time of the crash the light condition was daylight, the atmospheric condition was cloudy, and the road pavement was dry. Traffic density, according to the case vehicle's driver, was light, and the site of the crash was rural, but the character of the area is unknown. (i.e., residential, commercial, industrial, agricultural, undeveloped, etc.). As previously mentioned, there was a driveway on the east side of the intersection, comprising the fourth leg.

The front right of the case vehicle impacted the left front of the Cadillac, causing the case vehicle's driver and front right supplemental restraints (air bags) to deploy. Both vehicles were redirected toward the southeast and side slapped with the case vehicle's right side impacting the Cadillac's left side. The case vehicle continued moving in a southeasterly direction and departed the east side of the roadway, subsequently knocking down a ONE-WAY sign prior to coming to

¹ The Police Crash Report indicated that the case vehicle was traveling westward; however, available maps of the crash location indicate that the case vehicle was traveling southward.

rest heading southeastward. The case vehicle's driver estimated her travel speed prior to her evasive maneuvers as 56- 61 km.p.h. (35-38 m.p.h.).

CASE VEHICLE

The 1998 Jeep Wrangler was a four wheel drive, four-passenger, two-door, soft top, sport utility vehicle (VIN: 1J4FY19S1WP-----) equipped with a 4.0L, I-6 engine and either the standard five-speed manual or an optional three-speed automatic transmission. Four wheel anti-lock brakes are an option for this model, but it is unknown if the case vehicle was so equipped. The case vehicle's wheelbase was 237 centimeters (93.4 inches), and the odometer reading is unknown because the case vehicle was not inspected.

According to the manufacturer, the interior was equipped with adjustable front bucket seats with folding backs; a non-adjustable back bench seat; and continuous loop, three-point, lap-and-shoulder, safety belt systems at the front and back outboard positions. The front seat belt systems were not equipped with manually operated height adjusters for the "D"-rings. The vehicle was equipped with knee bolsters for both the driver and front right passenger. Automatic restraint was provided by a Supplemental Restraint System (SRS) that consisted of a redesigned frontal air bag for the driver and front right passenger seating positions. Both frontal air bags deployed as a result of the case vehicle's frontal impact with the Cadillac.

With no available vehicle photographs, the CDCs for the case vehicle are not estimable. Based on the available information, the crash severity to the case vehicle was estimated as moderate [24-40 km.p.h. (15 to 25 m.p.h.)]. The case vehicle was towed due to damage.

The case vehicle's redesigned driver air bag was located in the steering wheel hub. Because this case is a remote investigation, the existence, number, and size of tethers or vent ports could not be assessed nor could the shape or size of the driver's air bag be described. The investigating police officer made no mention of any evidence of contact or damage to the air bag's fabric.

The instrument panel location of the front right passenger redesigned air bag is unknown. Because this case is a remote investigation, the existence, number, and size of tethers or vent ports could not be assessed nor could the shape or size of the front right passenger's air bag be described. The investigating police officer made no mention of any evidence of contact or damage to the air bag's fabric.

CASE VEHICLE OCCUPANT

Immediately prior to the crash the case vehicle's driver [22-year-old, White (non-Hispanic) female; 180 centimeters and 61 kilograms (71 inches, 135 pounds)] was seated leaning to the right with her right arm on the center arm rest, her back against the upright seat back, her left foot on the floor, her right foot on the brake, and her left hand on the steering wheel. Her seat track was located in its rearmost position, and the tilt steering wheel was adjusted in its upmost position.

Both the Police Crash Report and the interview with the case vehicle's driver indicated that she was restrained by her available, active, three-point, lap-and-shoulder, safety belt system.

The case vehicle's driver braked and steered to the left, attempting to avoid the crash. As a result of these attempted avoidance maneuvers and the use of her available safety belts, she most likely moved slightly forward just prior to impact. The case vehicle's primary impact with the Cadillac enabled the case vehicle's driver to continue forward and to her right toward the Direction of Principal Force as the case vehicle decelerated. The Direction of Principal Force was most likely somewhere in the 10 to 50 degree range, based on the crash configuration and known post-crash trajectories. The driver's seat belt locking mechanism was most likely engaged, restricting the driver's forward movement into the excursion of the deploying, driver's air bag. As the case vehicle was redirected to its left, the driver was most likely beginning to rebound from her interaction with the deployed air bag and the loading placed on her safety belt system when the two vehicles side slapped. As a result of the side slap, the driver moved toward her right while most likely still engaging her air bag and safety belts. The driver rebounded back to the left off the center arm rest and her safety belt as the two vehicle's separated. As the case vehicle moved in its southeasterly travel path prior to departing the roadway, the driver most likely rebounded backwards toward her seat back. The vehicle's own deceleration forces now caused the driver to move slightly forward as the vehicle struck the sign post. At final rest, the driver was still seated and restrained by her safety belts.

DRIVER INJURIES

The driver was not transported by ambulance to the hospital. She sustained minor (i.e., police reported "C") injuries and declined medical transport from the scene, indicating that she would go to her private physician later in the day. According to her interview, the injuries sustained by the case vehicle's driver included: a traumatic brain injury and an abrasion and contusion over her left shin. The driver also complained of having muscle spasms to the right side of her body, a swollen right thumb, and headaches for several days following the crash. The driver initially indicated that she would sign a medical release but did not return the release form.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Traumatic brain injury ² with headaches	115099.7 unknown	Unknown mechanism	Unknown	Interviewee (same person)
2	Abrasion left shin, location not specified	890202.1 minor	Knee bolster, driver's	Probable	Interviewee (same person)
3	Contusion left shin, location not specified	890402.1 minor	Knee bolster, driver's	Probable	Interviewee (same person)

² The case vehicle's driver alleged that she had sustained a cerebral concussion.

The 1995 Cadillac DeVille was a front wheel drive, six-passenger, four-door sedan (VIN: 1G6KD52B6SU-----) equipped with a 4.9L, V-8 engine and a four-speed automatic transmission. Four wheel anti-lock brakes and traction control are standard for this model. The Cadillac was equipped with driver and front right passenger air bags. According to the Police Crash Report, both of these air bags deployed as a result of this crash. The Cadillac's wheelbase was 289 centimeters (113.8 inches), and the odometer reading is unknown because the Cadillac was not inspected. With no available vehicle photographs, the CDCs for the Cadillac are not estimable. The Cadillac was towed due to damage.

The Cadillac's driver air bag was located in the steering wheel hub. Because this case is a remote investigation, the existence, number, and size of tethers or vent ports could not be assessed nor could the shape or size of the driver's air bag be described. The investigating police officer made no mention of any evidence of contact or damage to the air bag's fabric.

The instrument panel location of the front right passenger's air bag is unknown. Because this case is a remote investigation, the existence, number, and size of tethers or vent ports could not be assessed nor could the shape or size of the front right passenger's air bag be described. The investigating police officer made no mention of any evidence of contact or damage to the air bag's fabric.

The restraint use for the Cadillac's driver (79-year-old male; of unknown race and/or ethnic origin) is unknown, and he sustained police-report "A" (incapacitating-evident) injuries and was transported via ambulance to a medical facility. The Cadillac's front right passenger (75-year-old female; of unknown race and/or ethnic origin) sustained a police-reported "C" (possible) injuries and was also transported via ambulance to a medical facility. According to the Police Crash Report, the front right passenger was restrained by her available, active, three-point, lap-and-shoulder, safety belt system.