

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number ( 1998-48-093C)

1998 Jeep Grand Cherokee

Alabama

October 1998

**Technical Report Documentation Page**

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<p>16. Abstract</p> <p>This remote investigation focused on the redesigned air bag system deployment in a 1998 Jeep Grand Cherokee. This single vehicle crash took place in October 1998 at 0852 hours. The weather was clear and the bituminous roadway surface was dry. The was a downhill grade at this location. This crash is located on curved, two lane roadway. The speed limit is 40 km/h (25 mph) for westbound traffic.</p> <p>Vehicle 1, a 1998 Jeep Grand Cherokee driven by a properly restrained 50-year-old female (168 cm/60 in., 61 kg/134 lbs), was traveling westbound at a police reported speed of 40 km/h (25 mph). The driver of this vehicle reached over to her right to get her purse. Vehicle 1 drifted to the right, departed the roadway, and struck a wooden retaining wall (CDC = 12FREE3). Vehicle 1 sustained a longitudinal delta v of -12 km/h (-7.5 mph). The driver and passenger side front air bags deployed at this point. Vehicle 1 rotated 90E and flipped onto its left side (00LDAO2) and came to rest on the roadway.</p> <p>The driver of Vehicle 1 sustained a laceration to the lateral aspect of the left elbow (AIS-1) due to contact with the disintegrating left side window and a contusion to the left upper arm from contact with the air bag. She also sustained lumbar strain (AIS-1) which was attributed to the seat back support. She was transported to a local hospital complaining of a headache. She was treated for her minor injuries and released. She lost one day of work.</p>			
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**Summary**

This remote investigation focused on the redesigned air bag system deployment in a 1998 Jeep Grand Cherokee. This single vehicle crash took place in October 1998 at 0852 hours. The weather was clear and the bituminous roadway surface was dry. There was a downhill grade at this location. This crash is located on curved, two lane roadway. The speed limit is 40 km/h (25 mph) for westbound traffic.

Vehicle 1, a 1998 Jeep Grand Cherokee driven by a properly restrained 50-year-old female (168 cm/60 in., 61 kg/134 lbs), was traveling westbound at a police reported speed of 40 km/h (25 mph). The driver of this vehicle reached over to her right to get her purse. Vehicle 1 drifted to the right, departed the roadway, and struck a wooden retaining wall (CDC = 12FREE3). The driver attempted to avoid the collision by steering to the left. Vehicle 1 sustained a longitudinal delta v of -12 km/h (-7.5 mph). The driver and passenger side front air bags deployed at this point. Vehicle 1 rotated 90E and flipped onto its left side (00LDAO2) and came to rest on the roadway.

The driver of Vehicle 1 sustained a laceration to the lateral aspect of the left elbow (AIS-1) due to contact with the disintegrating left side window and a contusion to the upper left arm from contact with the deploying air bag. She also sustained lumbar strain (AIS-1) which was attributed to the seat back support. She was transported to a local hospital complaining of a headache. She was treated for her minor injuries and released. She lost one day of work.



**Figure 1.** Path to object struck



**Figure 2.** Wooden retaining wall (closeup)

**Table 1. Delta V**

	Case Vehicle	
	km/h	mph
Total	12	7.5
Longitudinal	-12	-7.5
Lateral	0	0



**Figure 3.** Exterior, oblique view, 1998 Jeep Cherokee

**Exterior of Case Vehicle**

**Table 2. Vehicle Information**

Model year, make and model	1998 Jeep Grand Cherokee
VIN	1J4FX48X3WC
CDC	Impact #1: 12FREE3 Impact #2: 00LDAO2



**Figure 4.** Exterior, 1998 Jeep Grand Cherokee

**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	156	2	0	0	0	0	3
	61.4	0.8	0	0	0	0	1.2

### ***Interior of Case Vehicle***

This vehicle sustained integrity loss through the left front side glass. The glass was disintegrated due to both the rollover and the interaction of the driver's left side. There were no intruding components. There were occupant contacts noted to the left interior side surface and to the center mirror.

The vehicle is equipped with leather covered, front bucket seats with adjustable head restraints—which were not damaged. The left front seat was adjusted to the middle track position. The seat was slightly reclined.



**Figure 5.** Interior

### ***Case Vehicle Occupant Protection Systems***

The Jeep Cherokee was equipped with standard equipment “Next Generation” driver and front-passenger air bags.

The front left air bag was housed in the steering wheel hub and was concealed by double horizontal H-configuration module cover flaps. The circular air bag was tethered by two straps and did not have any vent ports. The lower instrument panel is shrouded with a rigid plastic knee bolster. The tilt steering wheel was adjusted to the full up position at the time of the vehicle inspection.



**Figure 6.** Driver and front-passenger air bags

The front right air bag was located in the face of the instrument panel. There are horizontal module cover flaps. The untethered, unvented air bag was undamaged. There was no occupant in this seat position.

## *Case Vehicle Occupant Demographics*

	Occupant 1
Age/Sex:	50/Female
Seated Position:	Left front
Seat Type:	Bucket
Height (cm/in.):	168          66.1
Weight (kg/lbs.):	61            134
Pre-existing Medical Condition:	Cerebral palsy with some left sided weakness. Some atrophy noted in left forearm and left lower leg.
	Wearing contact lenses.
Body Posture:	Leaning to right to retrieve purse from passenger seat.
Hand Position:	Left on wheel, right near purse. Both hands may have returned to the steering wheel in the attempt to steer left.
Foot Position:	Right foot on accelerator, left presumed to be on floorboard.
Restraint Usage:	Lap and shoulder belt used properly. Equipped with adjustable anchorage—adjusted to full down position.
Air bag:	Equipped with “Next Generation” redesigned air bags. Deployed.

## *Occupant Injuries*

**Table 4. Injuries**

Injury	Injury Severity (AIS)	Injury Mechanism
Left upper arm contusion	1	Driver air bag
Left elbow laceration	1	Side glass
Lumbar strain	1	Seat back

## *Occupant Kinematics*

The 50-year-old female driver of the Jeep Cherokee was properly restrained and situated in the front left seat position. She was leaning to the right attempting to get her purse. Upon realizing that an impact was imminent, she likely returned to an upright position to begin to steer to the left. The driver responded to the 000 degree impact force by moving forward. The driver likely engaged with deploying air bag to some degree with her left upper arm—there was a related occupant contact mark on the right side of the air bag. As the Jeep began a sharp clockwise rotation around the struck object, the driver responded by moving to the left into the driver’s side door and possibly the side glass. As the Jeep turned over onto its left side, the driver would have landed heavily on her left side—engaging both the door and the side glass. The side glass disintegrated in response to both the impact and the occupant contact. The driver sustained an elbow laceration which likely occurred due to contact with the glass. She also sustained a lumbar strain that the investigator attributed to the seat back—though this was more likely related to the torquing forces as the vehicle rotated and turned over. The driver’s lower body would have remained belted but her upper torso would have been more able to move freely.



**Figure 7.** Possible door contact.

Scene Diagram

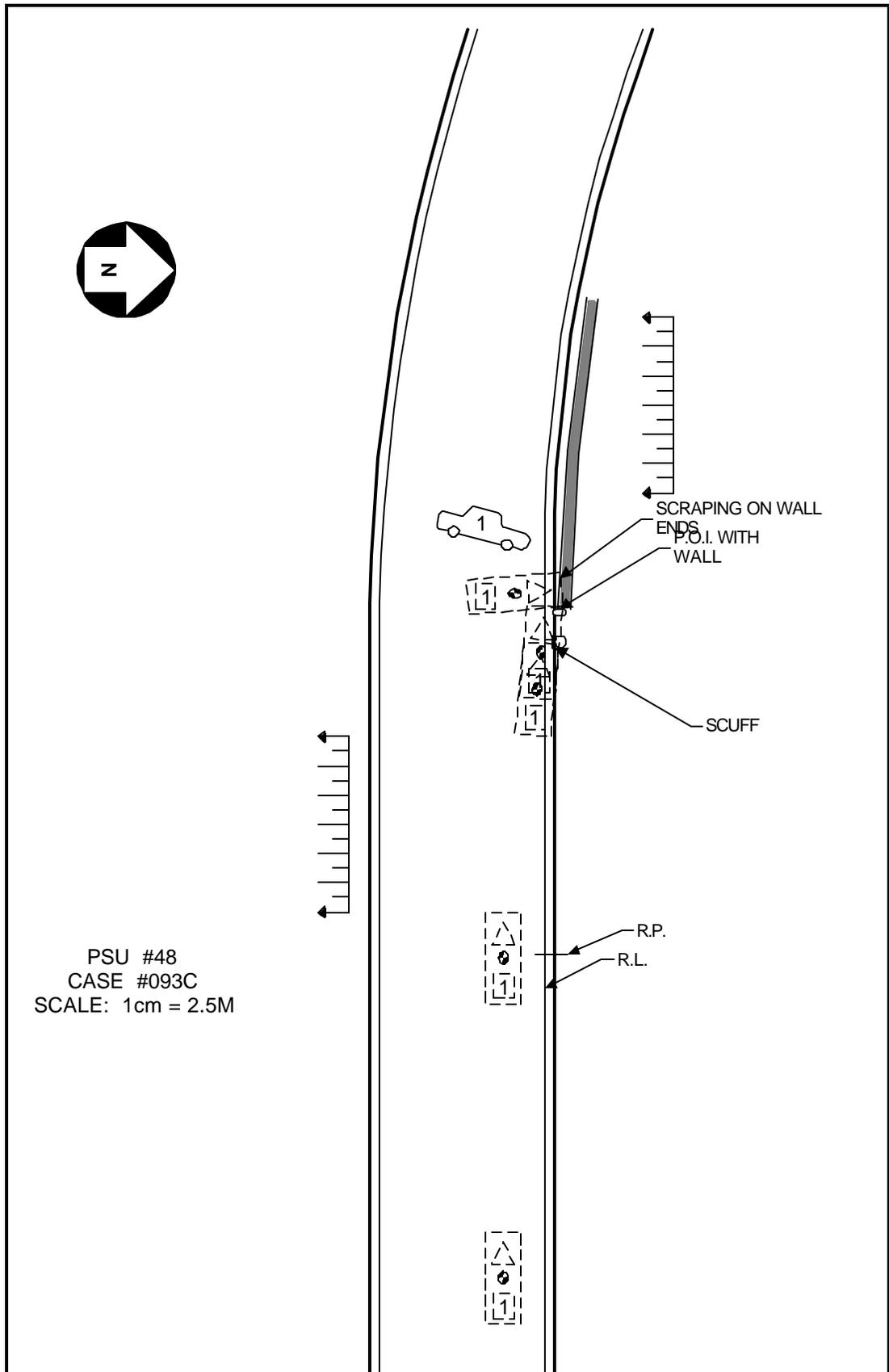


Figure 8. Scene Diagram