

Remote, Redesigned Air Bag Special Study  
Dynamic Science, Inc., Case Number ( 1998-075-802C)  
1998 Honda CR-V  
Colorado  
August/1998

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16. Abstract <p>This remote investigation was focused on the redesigned air bag system deployment of a 1998 Honda CR-V Sport Utility Vehicle. This two-vehicle head-on crash occurred during the afternoon hours of a summer weekend day in August, 1998. The crash took place on a rural two-lane, undivided roadway and the bituminous roadway surface was dry. The westbound travel lane is curved to the right with a positive 5% grade while the eastbound travel lane is curved to the left with a negative 5% grade. There were no adverse weather conditions or traffic controls and the posted speed limit is 56 km/h (35 mph). A paved shoulder borders the north side of the roadway while a paved shoulder borders the south side of the roadway with an adjacent w-beam guardrail. Vehicle 2, a 1998 Honda CR-V Sport Utility Vehicle, was driven by a 25 year-old-female (165 cm/ 65 in., 61 kg/ 134 lbs.) who was fully restrained by the available three-point manual lap and shoulder belt. She was traveling eastbound and was negotiating the left curve in the mountainous roadway. She was traveling at an estimated speed of 48-56 km/h (30-35 mph). Vehicle 1, a 1995 Jeep Cherokee 4-Door Sport Utility Vehicle was being driven by a 20 year-old-male who reportedly was wearing the available three-point manual lap and shoulder belt. Driver 1 was traveling westbound and was negotiating the right curve in the roadway at an undetermined rate of speed. Driver 1 allowed his vehicle to drift to the left, traversing the double solid (no passing) center lines and entering the eastbound travel lane. The front, left bumper corner region of Vehicle 1 (12FYEW4) impacted the front, left region of Vehicle 2 (12FYEW4) in an offset head-on impact configuration. Upon the significant frontal impact, the air bags in both of the involved vehicles deployed. The calculated Delta V for Vehicle 2 (Honda CR-V) was 46.8 km/h (29.0 mph) with a longitudinal Delta V of -46.8 km/h (29.0 mph) which was of sufficient force to deploy both the frontal air bags. The delta V for Vehicle 1 was calculated at 45 km/h (28 mph) with a longitudinal delta V of -45 km/h (-28 mph). Vehicle 1 (Jeep) rotated counterclockwise approximately 228 degrees before coming to rest perpendicular in the westbound travel lane. Vehicle 2 (1998 Honda CR-V) also rotated counterclockwise coming to rest perpendicular in the eastbound travel lane and facing north at final rest. The driver of Vehicle 2 sustained a left knee and lower leg abrasion (AIS-1) due to impacting the knee bolster. She also sustained a left shoulder abrasion and contusion from the shoulder belt webbing. Driver 2 sustained abrasions (AIS-1) to the left side of her face and neck from the deploying air bag. The 25 year-old-female driver also sustained a cervical neck strain due to her involvement with the driver's air bag. She reported that her whole abdominal region was contused (AIS-1) due to loading the lap belt webbing. Driver 2 was transported to a local hospital where she was treated and released. It is unknown if the driver of Vehicle 1 was injured. Both vehicles were subsequently removed from the crash location by two separate towing agencies.</p>					
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**Summary**

This remote investigation was focused on the redesigned air bag system deployment of a 1998 Honda CR-V Sport Utility Vehicle. This two-vehicle head-on crash occurred during the afternoon hours of a summer weekend day in August, 1998. The crash took place on a rural two-lane, undivided roadway and the bituminous roadway surface was dry. The westbound travel lane is curved to the right with a positive 5% grade while the eastbound travel lane is curved to the left with a negative 5% grade. There were no adverse weather conditions or traffic controls and the posted speed limit is 56 km/h (35 mph). A paved shoulder borders the north side of the roadway while a paved shoulder borders the south side of the roadway with an adjacent w-beam guardrail.



**Figure 1.** Pre-impact trajectory of Vehicle 1 (1995 Jeep Cherokee)



**Figure 2.** Close up view showing point of impact



**Figure 3.** Pre-impact trajectory of Vehicle 2 (1998 Honda CR-V)

**Crash Events**

Vehicle 2, a 1998 Honda CR-V Sport Utility Vehicle, was driven by a 25 year-old-female (165 cm/ 65 in., 61 kg/ 134 lbs.) who was fully restrained by the available three-point manual lap and shoulder belt. She was traveling eastbound and was negotiating the left curve in the mountainous roadway. She was traveling at an estimated speed of 48-56 km/h (30-35 mph).

Vehicle 1, a 1995 Jeep Cherokee 4-Door Sport Utility Vehicle was being driven by a 20 year-old-male who reportedly was wearing the available three-point manual lap and shoulder belt. Driver 1 was traveling westbound and was negotiating the right curve in the roadway at an undetermined rate of speed. Driver 1 allowed his vehicle to drift to the left, traversing the double solid (no passing) center lines and entering the eastbound travel lane.



**Figure 4.** Exterior, Vehicle 1 (Jeep)



**Figure 5.** Exterior, Vehicle 2 (Honda)

The front, left bumper corner region of Vehicle 1 (12FYEW4) impacted the front, left region of Vehicle 2 (12FYEW4) in an offset head-on impact configuration. Upon the significant frontal impact, the air bags in both of the involved vehicles deployed. The calculated Delta V for Vehicle 2 (Honda CR-V) was 46.8 km/h (29.0 mph) with a longitudinal Delta V of -46.8 km/h (29.0 mph)<sup>1</sup> which was of sufficient force to deploy both the frontal air bags. The delta V for Vehicle 1 was calculated at 45 km/h (28 mph) with a longitudinal delta V of -45 km/h (-28 mph)<sup>2</sup>.



**Figure 6.** Three quarter frontal view of Vehicle 2

Vehicle 1 (Jeep) rotated counterclockwise approximately 228 degrees before coming to rest perpendicular in the westbound travel lane. Vehicle 2 (1998 Honda CR-V) also rotated counterclockwise coming to rest perpendicular in the eastbound travel lane and facing north at final rest.

The driver of Vehicle 2 sustained a left knee and lower leg abrasion (AIS-1) due to impacting the knee bolster. She also sustained a left shoulder abrasion and contusion from the shoulder belt webbing. Driver 2 sustained abrasions (AIS-1) to the left side of her face and neck from the deploying air bag. The 25 year-old-female driver also sustained a cervical neck strain due to her involvement with the driver's air bag. She reported that her whole abdominal region was contused (AIS-1) due to loading the lap belt webbing. Driver 2 was transported to a local hospital where she was treated and released. It is unknown if the driver of Vehicle 1 was injured. Both vehicles were subsequently removed from the crash location by two separate towing agencies.

**Table 1. Delta V**

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	46.8	29.1	45.0	28
Longitudinal	-46.8	-29.1	-45.0	-28
Lateral	0.0	0	0.0	0

<sup>1</sup>SCI adjusted delta v

<sup>2</sup> Calculated utilizing the Damage Only Routine of the WinSmash 1.2.1 program



**Figure 7.** Exterior, Vehicle 2

***Exterior of Case Vehicle***

**Table 2. Vehicle Information**

Model year, make and model	1998 Honda CR-V
VIN	JHLRD174XWC
CDC	12FYEW4

**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.
Front Bumper	153	46	48	38	23	17	10
	60.2	18.1	18.9	15	9.1	6.7	3.9

### *Interior of Case Vehicle*

The interior of the 1998 Honda CR-V sustained moderate damage from intrusion and occupant contacts. All of the intruding components were isolated to the front, left seated position (driver's side). The intruded values are reported in Table 4. The laminated windshield glazing was damaged from the impact forces and the extrication process. The left front side window glazing disintegrated due to induced damage to the left door panel. There was reported occupant contact damage to the steering wheel rim in the form of scuff marks. The knee bolster was dented due to knee loading.

**Table 4. Intrusions**

<b>Intruded Component</b>	<b>Location of Intrusion</b>	<b>Intruded Value cm/in.</b>		<b>Dominant Crush Direction</b>
Instrument panel	Front, left	15	5.9	Longitudinal
Toe pan	Front, left	14	5.5	Longitudinal
Steering Assembly	Front, left	14	5.5	Longitudinal
A-pillar	Front, left	8	3.1	Longitudinal
Sill	Front, left	7	2.8	Lateral

This vehicle was equipped with front bucket seats and adjustable head restraints. The front, left seat track was adjusted between the forward most and middle tracking position. The front, right seat was adjusted between the middle and rear most tracking position. The second row was equipped with a split bench seat with a folding back. There were adjustable head restraints at the outboard positions.

## Case Vehicle Occupant Protection Systems

The 1998 Honda CR-V Sport Utility Vehicle was equipped with redesigned air bag systems. This system consists of a SRS unit (diagnostic module) which is located centrally in the center console, forward of the transmission selector lever. The SRS unit houses the safing sensor and the impact sensor.<sup>3</sup> The SRS ready lamp indicator is located in the lower left instrument cluster, adjacent to the speedometer.

The driver's air bag is housed in the steering wheel hub and encases the nylon air bag unit. The double, horizontal module cover flaps are asymmetric in design and opened at their designated tear points. The circular air bag is 62 cm (24.4 in.) in diameter and is equipped with two tether straps and two exhaust vent port holes. The vent ports are located at the 11 and 1 o'clock positions. The rigid plastic knee bolster was dented due to driver knee loading.

The front, right passenger air bag is located on the instrument panel (top mounted). The module deployment door is rectangular in shape and is equipped with double horizontal cover flaps that are symmetrical in design (23 cm wide x 4.7 cm in height). The non-tethered air bag deployed and was undamaged. The passenger air bag is equipped with two vent port holes which are at the 10 and 2 o'clock positions respectively.



**Figure 8.** Deployed driver's air bag



**Figure 9.** Deployed passenger air bag (upper half)



**Figure 10.** Deployed passenger air bag (lower half)

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<sup>3</sup> Refer to the 1998-1999 Honda CR-V Supplemental Restraint Systems and Wiring Mapping Views

## Case Vehicle Occupant Demographics

Occupant 1

Age/Sex: 25/Female

Seated Position: Front, Left

Seat Type: Bucket

Height (cm/in.): 165 64.96

Weight (kg/lbs): 61 134.5

Pre-existing Medical Condition: None Reported

Body Posture: Normal posture reported, particulars unknown

Hand Position: At least one hand on steering wheel rim, however, location is unknown

Foot Position: Right foot on accelerator pedal and left foot on floor

Restraint Usage: Manual, three-point lap and shoulder belt

Air bag: Driver's air bag deployed as a result of the frontal impact

## Occupant Injuries

**Table 5. Injuries**

Injury	Injury Severity (AIS)	Injury Mechanism
Left knee and lower leg abrasion	1	knee bolster
Left shoulder abrasion	1	Shoulder belt webbing
Left shoulder contusion	1	Shoulder belt webbing
Facial abrasion (left side)	1	Air bag
Neck Abrasion (left side)	1	Air bag
Cervical strain	1	Air bag
Abdominal contusion (whole region)	1	Lap belt webbing



### *Occupant Kinematics*

The 25 year-old-female driver of the 1998 Honda CR-V was fully restrained and was wearing the available three-point manual lap and shoulder belt in a normal fashion. She was reportedly in an upright and normal position with her right foot depressing the accelerator pedal.

She responded to the 360 degree impact force by moving directly forward. Her knees loaded the knee bolster as evidenced by several dents that were documented in the panel. She sustained a left knee and lower leg abrasion (AIS-1) due to this contact. As her lower knees loaded the knee bolster, the applied lap belt rode up onto her abdominal region resulting in a large area of contusion (AIS1). She heavily loaded the shoulder belt webbing which resulted in a left shoulder abrasion and contusion (AIS-1). This prohibited her upper torso from extended forward movement. As the driver's air bag deployed, her head extended forward and pitched downward impacting the nylon air bag surface. She sustained a left facial abrasion (AIS-1) and left neck abrasion (AIS-1) due to her involvement with the air bag.

Driver 1 was maintained in her respective seated position and did not sustain any fractures or internal injuries.



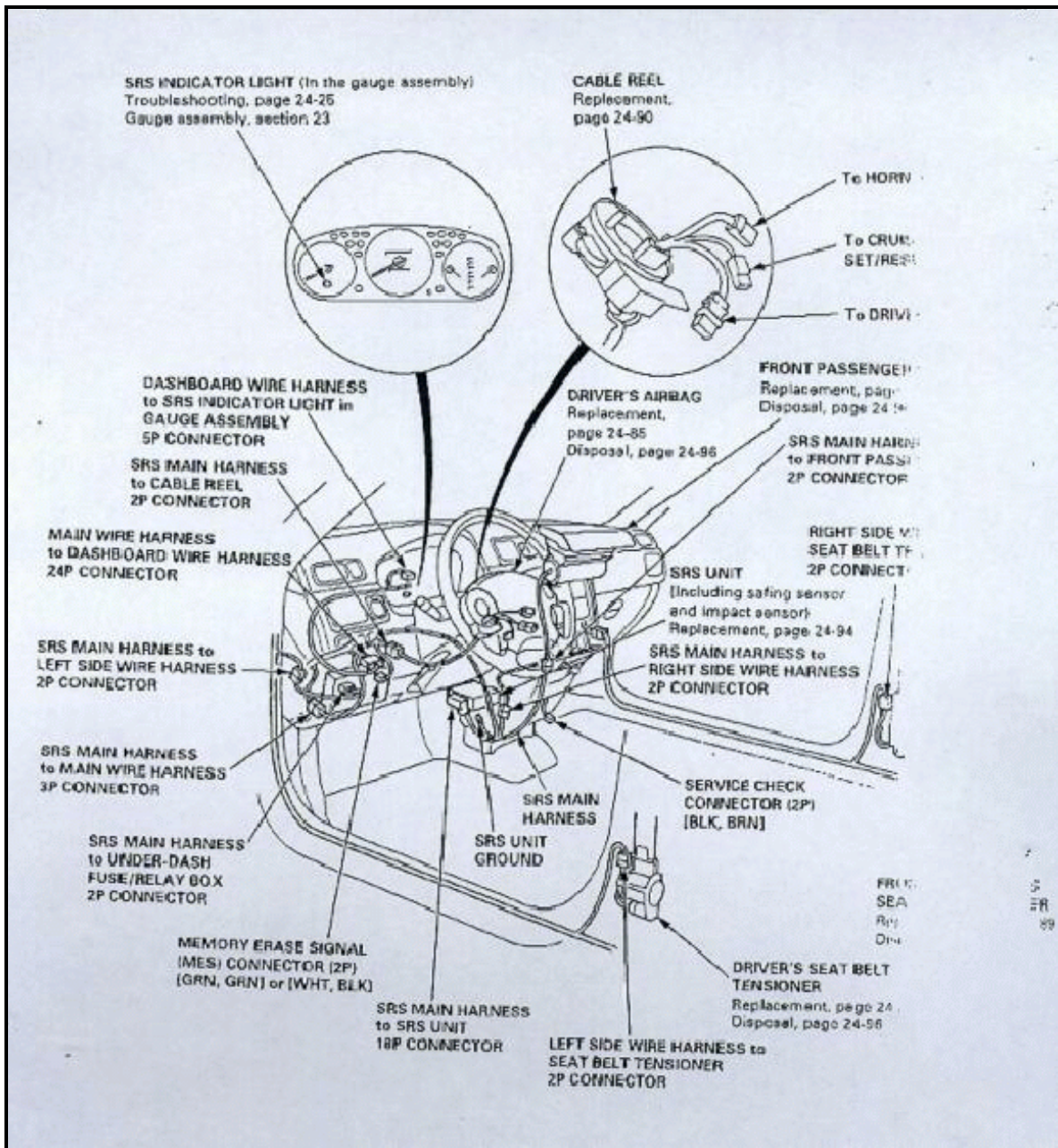


Figure 12. SRS wiring diagram