

Remote, Redesigned Air Bag Special Study

**FOR NHTSA'S INTERNAL USE ONLY**

Dynamic Science, Inc., Case Number ( 1998-74-801E)

1998 Honda Accord

Nebraska

August/1998

**Technical Report Documentation Page**

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16. Abstract  This remote investigation was focused on the redesigned air bag system deployment of a 1998 Honda Accord four-door sedan. This three-vehicle crash occurred during the afternoon hours of a summer weekday in August, 1998. The crash took place within a four-leg intersection and the level bituminous roadway surface was dry. The north and southbound roadway is an undivided four-lane roadway, consisting of two northbound lanes and two southbound travel lanes. A double solid yellow centerline delineates the north and southbound travel lanes. The eastbound leg of the intersection is an undivided roadway with two westbound travel lanes and one eastbound travel lane. The westbound leg of the intersection also consists of three travel lane (two westbound and one eastbound). There are overhead traffic signals present and they were functioning properly. The entire intersection is bordered by curbing and the posted speed limit for both roadways is 56 km/h (35 mph). Vehicle 2, a 1998 Honda Accord four-door sedan, was driven by an 18 year-old-female (168 cm/ 66 in., 61 kg/134 lbs.) who was in an upright position and <u>not</u> wearing the available three-point lap and shoulder belt. The front seat, right side position was occupied by an unrestrained 19-year-old female (160cm/63 in., 54 kg/ 119 lbs.). The driver of Vehicle 2 (Honda) was traveling westbound in lane 1 approaching the four-legged intersection at a driver estimated speed of 56-64 km/h, 35-40 mph). She entered the intersection while the overhead traffic signal was in the green signal phase. Vehicle 1, a 1982 Pontiac 6000 four-door sedan was being operated by a male teenager. The front, right seat was also occupied by a second male teenager. Vehicle 1 was traveling northbound in lane two and had entered the intersection while the overhead traffic signal was in the red phase. Vehicle 3, a 1995 GMC pickup truck was stopped in traffic and was in lane 1 of the southbound travel lanes. Vehicle 3 was driven by a 41 year-old-male and it is unknown whether he was restrained. As Vehicle 1 & 2 entered the intersection, the frontal plane of Vehicle 2 (71FDEW2) impacted the right fender area of Vehicle 1 (02RYEW3) at a right angle "L"-type impact configuration. Vehicle 2 (Honda) rotated in a rapid clockwise direction while Vehicle 1 was deflected to the left. The left rear door panel of Vehicle 2 side slapped (09LZEW2) the right quarter-panel of Vehicle 1 (03RBEW2). As the involved vehicles separated, the front of Vehicle 1 (12FDEW1) subsequently impacted the front of Vehicle 3 which was stopped at the intersection. Upon the initial front to side impact, the redesigned air bags in Vehicle 2 deployed. The calculated delta V was 15.7 km/h (9.8 mph) with a longitudinal delta V of -12 km/h (7.5 mph) which is at the low end of the threshold necessary for deployment. The secondary sideslap impact to Vehicle 2 (1998 Honda) generated a calculated delta V of 5.2 km/h (3.2 mph). The delta V for Vehicle 1's initial right fender impact was calculated at 15.1 km/h (9.4 mph) while the secondary right quarter-panel impact generated a calculated delta V of 5.0 km/h (3.1 mph). Vehicle 1 was facing northwest at final rest with its frontal plane still in contact with the front of Vehicle 3. Vehicle 2 rotated approximately 102 degrees in a clockwise direction before coming to rest facing northeast in lane two of the northbound travel lane. The driver of Vehicle 2 sustained a left, parietal scalp contusion due to impacting the left side glass/roof side rail. She also sustained a minor left forearm abrasion (AIS-1) due to her interaction with the deploying air bag. The front, seated occupant of Vehicle 2 sustained a left elbow abrasion and left knee abrasion (AIS-1) due to impacting the instrument panel. She also sustained a right forehead contusion due to impacting the center, instrument panel. The front, right passenger air bag did not fully deploy allowing the unrestrained passenger to contact the instrument panel. The driver and passenger of Vehicle 1 exited their vehicle and fled the scene on foot. One of the young males was reportedly bleeding from facial injuries. It is unknown if the driver of Vehicle 3 was injured in the crash.					
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**Summary**

This remote investigation was focused on the redesigned air bag system deployment of a 1998 Honda Accord four-door sedan. This three-vehicle crash occurred during the afternoon hours of a summer weekday in August, 1998. The crash took place within a four-leg intersection and the level bituminous roadway surface was dry. The north and southbound roadway is an undivided four-lane roadway, consisting of two northbound lanes and two southbound travel lanes. A double solid yellow center lines delineates the north and southbound travel lanes. The eastbound leg of the intersection is an undivided roadway with two westbound travel lanes and one eastbound travel lane. The westbound leg of the intersection also consists of three travel lane (two westbound and one eastbound). There are overhead traffic signals present and they were functioning properly. The entire intersection is bordered by curbing and the posted speed limit for both roadways is 56 km/h (35 mph).

Vehicle 2, a 1998 Honda Accord four-door sedan, was driven by an 18 year-old-female (168 cm/ 66 in., 61 kg/134 lbs.) who was in an upright position and not wearing the available three-point lap and shoulder belt. The front seat, right side position was occupied by an unrestrained 19-year-old female (160cm/63 in., 54 kg/ 119 lbs.). The driver of Vehicle 2 (Honda) was traveling westbound in lane 1 approaching the four-legged intersection at a driver estimated speed of 56-64 km/h, 35-40 mph). She entered the intersection while the overhead traffic signal was in the green signal phase.

Vehicle 1, a 1982 Pontiac 6000 four-door sedan was being operated by a male teenager. The front, right seat was also occupied by a second male teenager. Vehicle 1 was traveling northbound in lane two and had entered the intersection while the overhead traffic signal was in the red phase.

Vehicle 3, a 1995 GMC pickup truck

was stopped in traffic and was in lane 1 of the southbound travel lanes.

Vehicle 3 was driven by a 41 year-old-male and it is unknown whether he was restrained.



**Figure 1.** Pre-impact trajectory of Vehicle 1 showing point of impact in foreground



**Figure 2.** Pre-impact trajectory of Vehicle 2 and area of impact



**Figure 3.** Front view of Vehicle 2 (Honda)



**Figure 4.** View showing right fender damage to Vehicle 1 (Impact #1)

## Crash Events

As Vehicle 1 & 2 entered the intersection, the frontal plane of Vehicle 2 (71FDEW2) impacted the right fender area of Vehicle 1(02RYEW3) at a right angle “L”-type impact configuration. Vehicle 2 (Honda) rotated in a rapid clockwise direction while Vehicle 1 was deflected to the left. The left rear door panel of Vehicle 2 side slapped (09LZEW2) the right quarter-panel of Vehicle 1 (03RBEW2). As the involved vehicles separated, the front of Vehicle 1(12FDEW1) subsequently impacted the front of Vehicle 3, which was stopped at the intersection. Upon the initial front to side impact, the redesigned air bags in Vehicle 2 deployed.

The calculated delta V was 15.7 km/h (9.8 mph) with a longitudinal delta V of -12 km/h (7.5 mph) which is at the low end of the threshold necessary for deployment<sup>1</sup>. The secondary sideslap impact to Vehicle 2 (1998 Honda) generated a calculated delta V of 5.2 km/h (3.2 mph)<sup>2</sup>. The delta V for Vehicle 1's initial right fender impact was calculated at 15.1 km/h (9.4 mph) while the secondary right quarter-panel impact generated a calculated delta V of 5.0 km/h (3.1 mph).

Vehicle 1 was facing northwest at final rest with its frontal plane still in contact with the front of Vehicle 3. Vehicle 2 rotated approximately 102 degrees in a clockwise direction before coming to rest facing northeast in lane two of the northbound travel lane.

The driver of Vehicle 2 sustained a left, parietal scalp contusion due to impacting the left side glass/roof side rail. She also sustained a minor left forearm abrasion (AIS-1) due to her interaction with the deploying air bag. The front, seated occupant of Vehicle 2 sustained a left elbow abrasion and left knee abrasion (AIS-1) due to impacting the instrument panel. She also sustained a right forehead contusion due to impacting the center, instrument panel. The front, right passenger air bag did not fully deploy allowing the unrestrained passenger to contact the instrument panel.

The driver and passenger of Vehicle 1 exited their vehicle and fled the scene on foot. One of the young males was reportedly bleeding from facial injuries. It is unknown if the driver of Vehicle 3 was injured in the crash.



**Figure 5.** Secondary Sideslap damage to right quarter panel of Vehicle 1 (1982 Pontiac 6000)



**Figure 6.** Secondary sideslap damage to the left rear door of Vehicle 2

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<sup>1</sup> Calculated utilizing the Damage Only mode of the WinSmash 1.2.1 program

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

**Table 1. Delta V (Primary Impact)**

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	15.6	9.7	15.0	9.3
Longitudinal	-11.9	-7.4	-9.6	-6
Lateral	10.0	6.2	-11.5	-7.1

**Table 2. Delta V (Secondary Impact)**

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	5.2	3.2	5.0	3.1
Longitudinal	0.0	0.0	0.0	0.0
Lateral	5.2	3.2	-5.0	-3.1

***Exterior of Case Vehicle***

**Table 3. Vehicle Information**

Model year, make and model	1998 Honda Accord
VIN	1HGCG5647WA
CDC (Primary)	11FDEW2



**Figure 7.** View showing frontal deformation to Vehicle 2 (1998 Honda Accord)

**Table 4. Crush Measurements (Primary Impact)**

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	143	19	13	12	10	8	20
	56.3	7.5	5.1	4.7	3.9	3.1	7.9

**Table 5. Vehicle Information**

Model year, make and model	1998 Honda Accord
VIN	1HGCG5647WA
CDC (Secondary Impact)	09LZEW2



**Figure 8.** View showing sideslap damage to Vehicle 2's left rear door

**Table 6. Crush Measurements (Secondary Impact)**

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.
Left Side	108	2	0	4	10	8	0
	42.5	.8	0	1.6	3.9	3.1	0

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

The interior of the 1998 Honda Accord was void of interior deformation due to intrusion or occupant contacts. The passenger compartment remained intact as no integrity was lost. All vehicle glazing remained intact and was undamaged. The case vehicle is equipped with front bucket seats with adjustable head restraints. The second seat consists of a bench seat with integral head restraints located at the outboard positions. The front, left seat track was adjusted at the middle position while the front, right seat was adjusted between the middle and rearmost track position.

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

The 1998 Honda accord four-door sedan 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.<sup>3</sup> The frontal air bag sensor is incorporated within the centrally located SRS unit. The SRS ready lamp indicator is located in the upper right instrumentation cluster, adjacent to the speedometer.

The driver's air bag is housed in the steering wheel hub and encases the nylon airbag 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 respectively. The rigid plastic knee bolster was undamaged and did not reveal any detectable occupant contacts.

The front, right passenger air bag is located on the instrument panel (top mount). 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 4.7cm in height). Upon deployment, the encased, folded air bag did not fully deploy. Some of the folds located in the right upper quadrant of the module remained folded. Approximately 3/4 of the air bag capacity was filled upon deployment. The non-tethered air bag was undamaged and was equipped with two vent port holes which are at the 10 and 2 o'clock positions.



**Figure 9.** Deployed driver's air bag



**Figure 11.** Deployed passenger air bag



**Figure 11.** Close-up view showing folds in passenger air bag that did not fill with air bag gases

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

## Case Vehicle Occupant Demographics

	Occupant 1	Occupant 2
Age/Sex:	18/Female	19/Female
Seated Position:	Front, Left	Front, Right
Seat Type:	Bucket, Fabric covered	Bucket, Fabric covered
Height (cm/in.):	168    66.14	160    62.99
Weight (kg/lbs):	61    134.5	54    119.1
Pre-existing Medical Condition:	None Reported	None Reported
Body Posture:	Normal/ Upright Details Unknown	Normal/ Upright Details Unknown
Hand Position:	Unknown	Unknown
Foot Position:	Right foot on accelerator pedal and left foot on floor	Both feet on floor
Restraint Usage:	Unrestrained	Unrestrained
Air bag:	Driver air bag deployed as a result of the initial frontal impact	Passenger air bag deployed as a result of the initial frontal impact

## Occupant Injuries

**Table 7. Injuries**

Injury	Injury Severity (AIS)	Injury Mechanism
<b>Driver--</b> Left parietal scalp contusion	1	Left roof side rail
Left forearm abrasion	1	Air bag
<b>Front, Right Passenger</b> Right forehead contusion	1	Instrument panel
Left elbow abrasion	1	instrument panel
Left knee abrasion	1	instrument panel



### **Occupant Kinematics**

The 18 year-old-female driver of the 1998 Honda Accord was not wearing the available three-point manual lap and shoulder belt. She was reportedly in an upright position and facing forward with her right foot depressing the accelerator pedal.

She responded to the 320 degree principle direction of force by moving forward and to her left. It is suspected that the left side of her head impacted the left roof side rail resulting in a left, parietal scalp contusion (AIS-1). Her unrestrained torso continued in a trajectory towards the left A-Pillar. Upon air bag deployment, her upper torso (chest) and face most likely impacted the nylon air bag surface. She sustained a left forearm abrasion (AIS-1) due to air bag contact.

As the case vehicle's left side impacted the right side of Vehicle 1 in the sideslap sequence, she responded by moving laterally to her left. Her left flank probably contacted the interior left side door panel, however, this could not be substantiated with occupant contact evidence.

The 19 year-old-female front, right seated passenger was also unrestrained. She responded to the 10 o'clock direction of force by moving forward and to her left. Her left knee loaded the center instrument panel resulting in a contusion (AIS-1). Her upper torso continued forward and pitching downward. Her left elbow possibly contacted the center instrument panel area resulting in an abrasion (AIS-1). At this same point in time, her right side and face probably came into contact with the partially deploying passenger air bag. It is suspected that her forehead contacted the center instrument panel region resulting in a contusion (AIS-1). There was no documented occupant contact evidence that could further substantiate her suspected kinematic pattern.

As the left side impacted the right side of Vehicle 1 (Pontiac 6000), she responded by moving laterally to her left. It is suspected that her left flank probably contacted the driver. She did not sustain additional injury due to her occupant to occupant interaction.

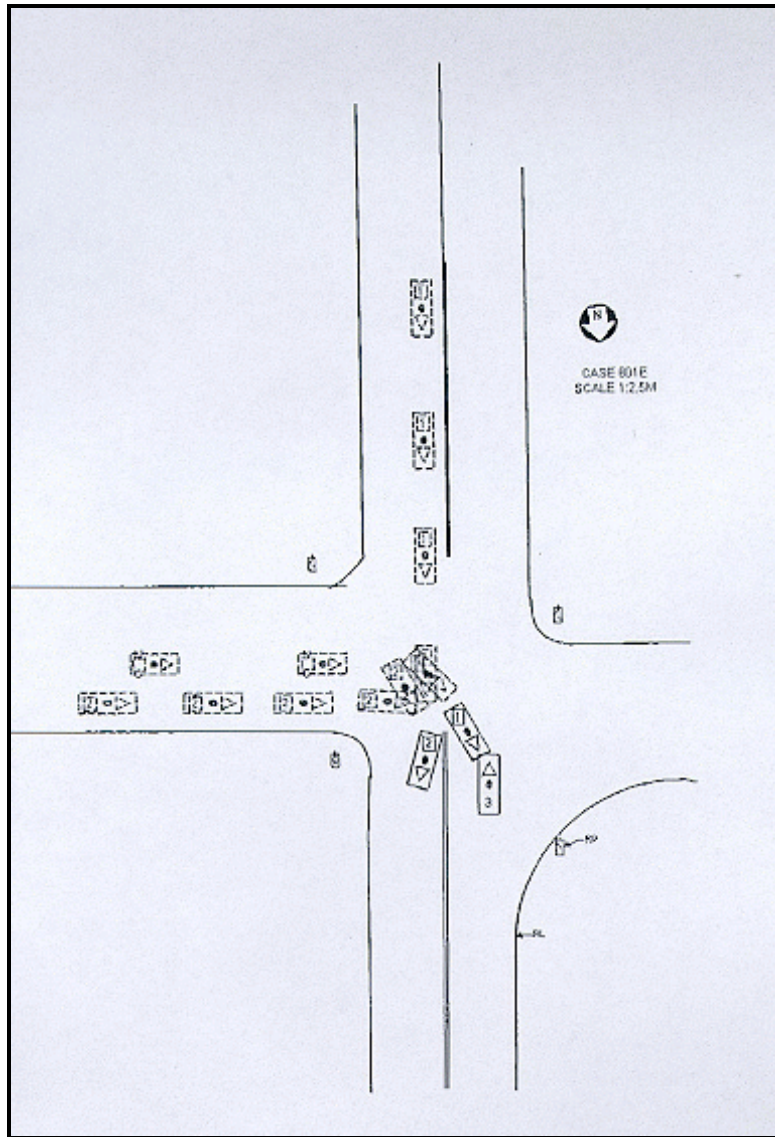


**Figure 12.** Driver's seated position



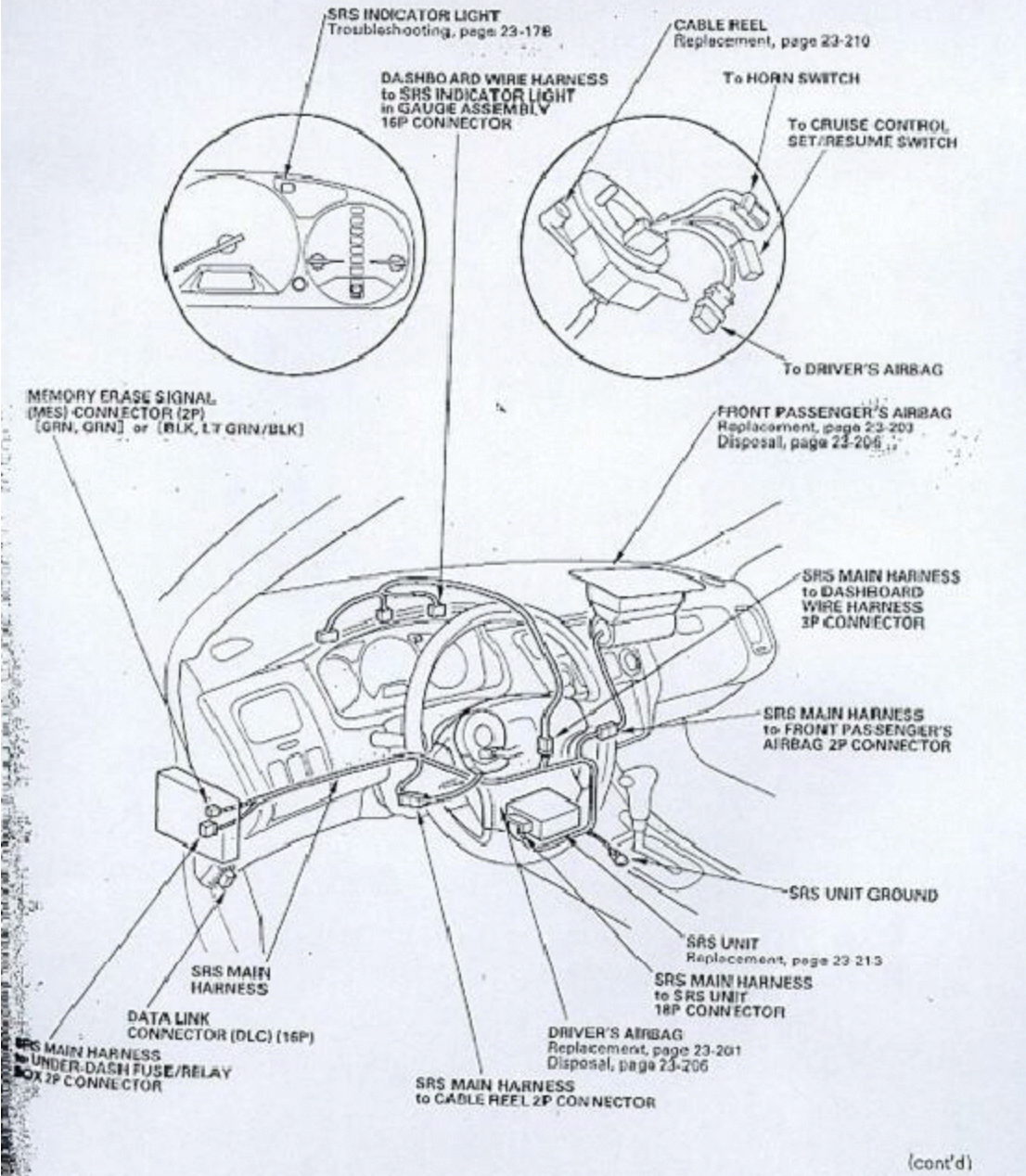
**Figure 13.** Passenger's seated position

*Scene Diagram*



# Component Location Index

'98-'00 Models (without side airbags)



(cont'd)