Child Safety Seat Serious Injury Investigation / Vehicle to Vehicle
Dynamic Science, Inc. / Case Number: DS06029
1986 Honda Accord
Oregon
December 2006

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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.

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16. Abstract

This on-site investigation focused on a child safety seat that was installed forward facing in the second row left seating position in a two-door hatchback. The case vehicle was a 1986 Honda Accord being driven by a 22-year-old restrained female. In the second row left seating position, there was a 2-1/2 year old female restrained in a child safety seat. The other vehicle was a 2006 Dodge Ram 3500 pickup being driven by a restrained 35-year-old male. This crash occurred on a two lane, two way, undivided state freeway. The case vehicle was traveling south and the Dodge Ram was traveling north. According to police and the mother of the driver, the driver of the Accord may have fallen asleep while driving, causing the case vehicle to drift into the northbound traffic lane. The Accord's front end struck the front left of the Dodge Ram. The Accord's driver and passenger sustained serious injuries in the crash. They were transported by ambulance to a hospital for treatment. The driver was treated and released from the hospital. The child was cleared by hospital personnel but the child's grandmother, who was present in the emergency room, felt the 2-1/2 year old was acting strangely. Hospital personnel gave the child a CAT scan and discovered she had a cervical fracture. She was flown to another hospital where she was hospitalized for seven days. The driver of the Dodge pickup was checked by paramedics and was released at the scene. Both vehicles were towed from the scene due to damage and the case vehicle was later declared a total loss. Attempts to locate the Dodge Ram were made prior to scheduling and completing the field work for this case, but the pickup was unable to be located.

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Dynamic Science, Inc.
Crash Investigation
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Background

This on-site investigation focused on a child safety seat that was installed forward facing in the second row left seating position in a two-door hatchback.

The case vehicle was a 1986 Honda Accord being driven by a 22-year-old restrained female (see Figures 1-2). In the second row left seating position, there was a 2-1/2 year old female restrained in a Dorel Juvenile Group Alpha Omega child safety seat. The other vehicle was a 2006 Dodge Ram 3500 pickup being driven by a restrained 35-year-old male (see Figure 3).

Figure 1. Front - 1986 Honda Accord

This crash occurred on a two lane, two way, undivided state freeway. The case vehicle was traveling south and the Dodge Ram was traveling north. According to police and the mother of the driver, the driver of the Accord may have fallen asleep while driving, causing the case vehicle to drift into the northbound traffic lane. The Accord's front end struck the front left of the Dodge Ram. The impact resulted in sufficient longitudinal deceleration to command the deployment of the Dodge Ram's front air bag system.

Figure 2. LF damage - 1986 Honda Accord

After the initial impact, the Accord rotated nearly 360 degrees before coming to final rest facing southwest on the dirt and gravel area adjacent to the east shoulder. The pickup came to final rest in a field, a fair distance from the roadway, facing northeast. The Dodge Ram's left front tire and driveline were ripped off the vehicle and came to rest in the field behind the pickup.

Figure 3. Damaged 2006 Dodge Ram (police photo)

According to police and the driver of the Dodge Ram, the Honda Accord's engine was on fire post-crash. The driver of the Dodge pickup reported that he carefully removed the child from her safety seat and held her in a fixed and stable position until paramedics arrived. Several people stopped at the scene and helped put out the fire with fire extinguishers. Police reported that the driver's

seat was found “slammed forward” with the driver leaning over the steering wheel. Police reported that the driver was able to unbuckle her seat belt and slide her body between the two front row seats. According to the driver of the Dodge Ram, the driver of the Accord was entrapped in her seating area and was eventually removed by a passerby, who used a metal bar to pry an opening in the left front window frame.

The Accord’s driver and passenger sustained serious injuries in the crash. They were transported by ambulance to a hospital for treatment. The driver was treated and released from the hospital. The child was cleared by hospital personnel but the child’s grandmother, who was present in the emergency room, felt the 2-1/2 year old was acting strangely. Hospital personnel gave the child a CAT scan and discovered she had a cervical fracture. She was flown to another hospital where she was hospitalized for seven days.

The driver of the Dodge pickup was checked by paramedics and was released at the scene. He began to feel worse a few hours after the crash, so a friend took him to a medical clinic to get checked. It was discovered that he had a torn right rotator cuff.

Both vehicles were towed from the scene due to damage and the case vehicle was later declared a total loss. Attempts to locate the Dodge Ram were made prior to scheduling and completing the field work for this case, but the pickup was unable to be located.

This Child Safety Seat Serious Injury case was identified by DSI personnel and provided to NHTSA on December 6, 2006. On December 8, 2006, NHTSA requested that the vehicle and child safety seat be inspected. On December 12, 2006 DSI secured permission to inspect both the vehicle and child safety seat and NHTSA assigned the case later the same day. The scene and case vehicle inspections were completed on December 19, 2006. A copy of the police report was obtained on January 19, 2007.

SUMMARY

Crash Site

This two vehicle crash occurred in December 2006 at 1430 hours a few miles outside of a small town in Oregon. The crash occurred on a two-way, undivided north-south state highway. In the area where the crash occurred, the one north and one southbound lane were separated from one another by painted broken yellow lane lines.

Figure 4. Approach of case vehicle to crash location (south)

The asphalt travel lanes were level at this location and were dry at the time of the crash. Both lanes were bordered by painted solid white lines followed by asphalt shoulders. There are no curbs on either side of the roadway. Adjacent to both paved shoulders are dirt and gravel areas that slope downward away from the roadway. On the east side of the highway there is a field adjacent to this sloped area. The crash occurred during daylight hours under clear weather conditions. The posted speed limit on this section of roadway was 89 km/h (55 mph).

Pre-Crash

The case vehicle was occupied by a restrained 22-year-old female driver and a 2-1/2 year old female passenger, who was secured in the second row left seating position. The child was in an Alpha Omega child safety seat (CSS), but she was not secured by the available 5-point harness. Instead of routing the available 3-point manual lap and shoulder belt through the correct belt path, the CSS was being used as a belt positioning booster seat.

Figure 5. Approach of Dodge Ram to crash location (north)

The other vehicle, a 2006 Dodge Ram 3500 pickup, was being driven by a restrained 35-year-old driver. There were no other occupants in the vehicle.

The case vehicle was traveling south (see Figure 4) and the Dodge Ram was traveling north (see Figure 5). According to police and the driver's mother, the driver of the Accord may have fallen asleep, causing the Accord to drift into the northbound traffic lane.

Crash

The front of the Honda Accord (52FDEW4) struck the front left of the Dodge Ram. The impact severity to the case vehicle was severe. The barrier routine of the WinSmash program computed a total delta V of 65.0 km/h (40.4 mph) for the case vehicle. The longitudinal and lateral components were -64.0 km/h (-39.8 mph) and 11.3 km/h (7.0 mph), respectively. The Accord rotated counterclockwise as it was pushed north by the Dodge Ram. The vehicle rotated nearly 360 degrees before coming to final rest facing southwest on the dirt and gravel area adjacent to the east shoulder. After the initial impact, the Dodge Ram continued north and departed the roadway to the right. The pickup came to final rest in a field, a fair distance from the roadway, facing northeast (see Figure 6). The Dodge Ram's left front tire and driveline were ripped off the vehicle and both came to rest in the field behind the pickup (see Figure 7).

Figure 6. Vehicles at final rest (police photo)

Figure 7. Vehicles & Dodge Ram's LF tire at final rest (police photo)

Post-Crash

According to police and the driver of the Dodge Ram, the Honda Accord's engine was on fire post-crash. The driver of the Dodge pickup reported that he carefully removed the child from her safety seat and held her in a fixed and stable position until paramedics arrived. Several people stopped at the scene and helped put out the fire with extinguishers. Police reported that the driver's seat was found "slammed forward" with the driver leaning over the steering wheel. Police also reported that the driver was able to unbuckle her seat belt and slide her body between the two front row seats. According to the driver of the Dodge Ram, the driver of the Accord was entrapped in her seating area and was eventually removed by a passerby, who used a metal bar to pry an opening in the left front window frame.

The Accord's driver and passenger sustained serious injuries in the crash. They were transported by ambulance to a hospital for treatment. The driver was treated for approximately six hours and was released from the hospital. The child was cleared by hospital personnel but the child's grandmother, who was present in the emergency room, felt the 2-1/2 year old was acting strangely. Hospital personnel gave the child a CAT scan and discovered she had a cervical fracture. She was flown to another hospital where she was hospitalized for seven days.

The driver of the Dodge pickup was checked by paramedics and was released at the scene. He began to feel worse a few hours after the crash, so a friend took him to a medical clinic to get

checked. It was discovered that he had a torn right rotator cuff. He also sustained some minor injuries.

Both vehicles were towed from the scene due to damage and the case vehicle was later declared a total loss.

Vehicle Data - 1986 Honda Accord LX-I

The 1986 Honda Accord was identified by the Vehicle Identification Number (VIN): JHMBA7349GCxxxxxx. The Honda Accord is a two-door hatchback, front wheel drive, compact passenger vehicle with seating for five. It was equipped with a 2.0 liter 4-cylinder engine, a four speed automatic transmission and a tilt steering wheel. The vehicle mileage at the time of the inspection was 276,933 km (172,083 miles).

The Accord was configured with Cooper Trendsetter SE P185/70R13 tires. The manufacturer's recommended cold tire pressure is 179 kPa (26 psi) for the front and rear. The specific tire information is as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	Flat	2 mm (2/32 in)	Yes	Tire debeaded; rim damaged (see Figure 8)
LR	165 kPa (24 psi)	4 mm (5/32 in)	No	No
RR	186 kPa (27 psi)	4 mm (5/32 in)	No	No
RF	89 kPa (13 psi)	2 mm (3/32 in)	No	No

The seating in the Honda Accord was configured with front row fabric covered bucket seats with folding backs and a rear bench seat with folding backs. The front row seats were equipped with adjustable head restraints that were not damaged. The second row seats were not equipped with any head restraints.

At the time of the inspection, both front row seats were adjusted to the fully rearward track position. The driver's mother reported that her daughter generally positioned the seat track between the center and forward most track setting. The driver's

Figure 8. Damage to LF tire/rim

seat back angle was found reclined 5 degrees from vertical and the seat bottom angle was 5 degrees from horizontal. The front right passenger's seat back angle was reclined 12 degrees from vertical and the seat bottom angle was 12 degrees from horizontal. The second row bench seat backs were at a 5 degree angle from vertical; the seat bottom was at a 6 degree angle from horizontal. Both second row seat backs were deformed due to contact with rear cargo.

Vehicle Damage

Exterior Damage - 1986 Honda Accord LX-I

Damage Description: The 1986 Honda Accord sustained severe front end damage as a result of the impact with the Dodge Ram (see Figures 9-10). The direct damage began at the front left bumper corner and extended laterally 120.0 cm (47.2 in) across the front end. The front bumper cover and foam were no longer attached. A portion of the foam was found inside the passenger compartment, but the bumper cover was no longer with the vehicle. The right frame rail was shifted laterally and the left frame rail was shifted vertically downward. The right fender was no longer attached and was not with the vehicle. The left wheelbase was shortened by 52.0 cm (20.5 in). The right wheelbase was lengthened by 12.0 cm (4.7 in).

Figure 9. Front crush profile

Figure 10. Front/Left - Case vehicle

Six crush measurements were documented at the bumper level as follows: C1=97.0 cm (38.2 in), C2=75.0 cm (29.5 in), C3=73.0 cm (28.7 in), C4=53.0 cm (20.9 in), C5=28.0 cm (11.0 in), C6=24.0 cm (9.4 in). An additional 9.0 cm (3.5 in) of freespace was subtracted from each C measurement to account for the missing bumper cover and foam. Since an exemplar 1986 Honda Accord LX-I could not be located, front bumper freespace had to be estimated from a 1989 Honda Accord. Further efforts to locate and measure a 1986 Accord LX-I continued but were not successful. The maximum longitudinal crush was located at C1, the left front bumper corner. There was crush located above the front bumper but there was not enough crush at any of the C measurements to require crush averaging.

The Collision Deformation Classification (CDC) for this impact was 52FDEW4. The principal direction of force was incremented due to the vertical shift of the left frame rail.

There was previous damage to the right sill (forward of the right rear tire) and to the area just below the left rear taillight that was not associated with this crash.

CDC:	52FDEW4	
Delta V:	Total	65.0 km/h (40.4 mph)
	Longitudinal	-64.0 km/h (-39.8 mph)
	Latitudinal	11.3 km/h (7.0 mph)
	Energy	218,981 Joules (161,512 ft lb)

Figure 11. Front/Left - Exemplar vehicle - 1986 Honda Accord (online photo)

Interior Damage - 1986 Honda Accord

The case vehicle sustained moderate interior damage as a result of occupant contacts and passenger compartment intrusion.

The top section of the steering wheel and the steering wheel hub were damaged due to occupant contact (see Figures 12-13). The deformation to the top half of the wheel measured 5.0 cm (2.0 in). There was blood and tissue found on the hub. The steering wheel was found completely separated from the column. The driver told her mother that the steering wheel broke off during the crash.

Figure 12. Steering wheel (cut out of vehicle)

A control lever mounted on the right side of the steering column and a control knob mounted on the left center instrument panel were displaced due to occupant contact. The lower steering column panel was cracked and deformed in two areas due to contact from the driver's knees. There was blood found on the upper right instrument panel and on the left side of the front right seat back (see Figure 14) that was likely due to post-crash driver contact.

Figure 13. Deformed steering wheel rim

Both the driver and left rear passenger seat belts showed signs of being used during the crash. The driver's shoulder belt had bloodstains on a section that would have been retracted into the B-pillar had it not been in use. The left rear seat belt webbing showed signs of loading in several areas. The driver reported that her seat belt "broke" during the crash, but there were no obvious failures found during the vehicle inspection. It is possible that the driver's seat belt emergency locking retractor did not hold her in place during the impact. Police reported that the driver's seat was found "slammed forward" with the driver leaning over the steering wheel. According to the driver of the Dodge Ram, a passerby had to "break" the driver's seat back while he was helping get her out of the vehicle, but further details were not able to be obtained.

Figure 14. Blood on the left side of the RF seat back

The second row center seat belt webbing had a visible bloodstain with several white hairs embedded in the blood (see Figure 15). There were bloodstains on the center seat cushion as well. It is possible that the blood was from the injured child that was seated in the left rear seating position. According to the driver of the Dodge Ram, the child had a bloody lip post-crash. The blood may have also come from the injured driver, who may have reached back into the second row in order to assist her child.

Figure 15. Location of blood stains on second row seat cushion and center lap belt

The left front door was jammed shut due to damage. The right front door remained closed and operational. The hatchback came open during the crash. There was no visible damage to the latch or striker, but the hatch had obviously come open at some point during the collision. A can of pink paint that was in the rear cargo area spilled during the crash and paint was found outside of the cargo area (see Figure 16). According to the driver's mother, a portion of the child's clothing was stained with the pink paint following the crash.

Figure 16. Hatchback opened during crash - paint found outside of rear cargo area

There was integrity loss to the left front glazing area, leaving an opening that measured 85.0 cm (33.5 in) wide by 42.0 cm (16.5 in) high. The deformed left front window frame was due to post-crash driver extrication efforts. The windshield was cracked and in place post-crash. The case vehicle's hood impacted a portion of the windshield, causing it to intrude longitudinally into the passenger compartment (see Figure 17).

The second row seat backs were deformed from contact with rear cargo. The spare tire was out of its storage area and it is possible that it impacted the back of the second row seat backs during the collision. The other cargo was not large or heavy enough to have caused the deformation.

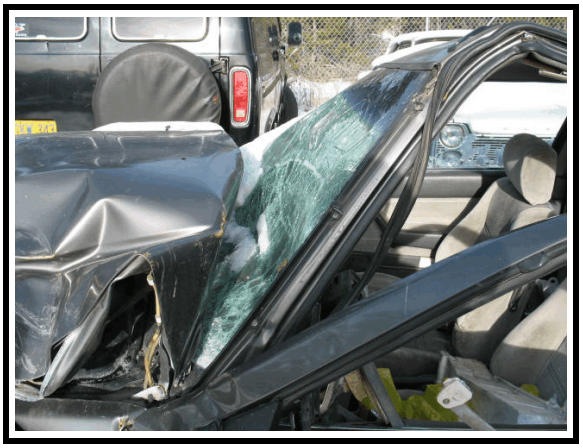

Figure 17. Windshield damage/intrusion

There were multiple longitudinal and lateral intrusions into the passenger compartment seating areas (see Figures 18-19). The magnitude of three intruded components had to be estimated. The specific passenger compartment intrusions were documented as follows:

Row/Position	Intruded Component	Magnitude of Intrusion	Direction
1L	Toe pan	Estimated 30.0 cm (11.8 in)	Longitudinal
1L	Left instrument panel	Estimated 18.0 cm (7.1 in)	Longitudinal
1L	Steering column/wheel	Estimated 18.0 cm (7.1 in)	Longitudinal
1L	Windshield	14.0 cm (5.5 in)	Longitudinal
1L	Floor pan	12.0 cm (4.7 in)	Vertical
1L	Door panel	9.0 cm (3.5 in)	Lateral
1C	Instrument panel	16.0 cm (6.3 in)	Longitudinal
1C	Windshield	8.0 cm (3.1 in)	Longitudinal
1R	Glove compartment door	10.0 cm (3.9 in)	Longitudinal
2L	Side panel	5.0 cm (2.0 in)	Lateral
2L	B Pillar (plastic cover)	4.0 cm (1.6 in)	Lateral
2L	Seat back	4.0 cm (1.6 in)	Longitudinal
2C	Seat back	12.0 cm (4.7 in)	Longitudinal
2R	Seat back	6.0 cm (2.4 in)	Longitudinal

Figure 18. Second row seat back deformed from impact of rear cargo

Figure 19. Damage/Intrusion to left rear side panel

Manual Restraint Systems - 1986 Honda Accord

The case vehicle was configured with manual 3-point lap and shoulder belts for the front and second row outboard seating positions. The second row center seat was equipped with a manual lap belt.

None of the seat belts were equipped with anchorage adjustments. The front row and the second row outboard seat belts were configured with sliding latch plates and emergency locking retractors. The second row center seat belt had a locking latch plate and no retractor.

The second row left seat belt was used to secure the child in the safety seat (see Figure 21). According to the driver of the Dodge Ram, the lap and shoulder belt were routed across the front of the child.

Figure 20. Driver's seat belt (blood on shoulder belt)

Figure 21. Scuffs and indentation on LR seat belt

Supplemental Restraint Systems - 1986 Honda Accord

The case vehicle was not equipped with any air bags.

Child Safety Seat - 1986 Honda Accord

Dorel Alpha Omega Child Safety Seat

A Dorel Juvenile Group Alpha Omega child safety seat was positioned in the second row left seat of the Honda Accord (see Figure 22). The model number was 22-150-BNP and the date of manufacture was August 31, 2004. The seat was configured with a five-point harness system. This CSS may be used forward or rearward facing. When used forward facing, it can be used as a convertible safety seat to be used with the available harness, but it may also be used as a belt positioning booster seat to be used without the harness.

Figure 22. Dorel Alpha Omega child safety seat as found in vehicle

At the time of this crash, the driver had secured the CSS forward facing as a belt positioning booster seat, with the manual 3-point lap and shoulder belt routed across the child.

The manufacturer recommends that the seat be used as a belt positioning booster only with children who weigh between 14-36 kg (30-80 lbs), whose height is between 73-132 cm (29–52 in), and who are greater than 1 year of age without harness. The manufacturer recommends to remove the harness and/or shield when using it as a belt-positioning booster seat, in order to avoid strangling young children. See Figure 23 for more information on the manufacturer's instructions on how to use the seat as a belt positioning booster. The child's reported weight on her official medical records was 13.5 kg (29.8 lb) which is just under the lowest recommended weight for this seat when it is used as a belt positioning booster seat. The child's height, 76 cm (30 in) was just above the lowest acceptable height to use this seat as a belt positioning booster. The harness straps had not been removed from the CSS, as recommended by the manufacturer when using the seat as a booster seat.

Figure 23. CSS label information

The CSS manufacturer recommends that the convertible seat be used forward facing (with the harness) only with children who weigh between 9-18 kg (20-40 lbs) and whose height is between 73-102 cm (29-40 in) and who are over one year of age. When used in this manner, the vehicle's seat belt is routed through the belt paths located at the back of the CSS. The CSS's LATCH components may also be used to secure the seat when it is used forward facing with the harness.

According to the police report, the child was "properly buckled into a car seat" in the second row left seating area. The report mentions that the "car seat was broken apparently from the impact". By the time police arrived on-scene, the child had already been removed from the CSS by the driver of the Dodge Ram.

On-scene police photos were obtained from the investigating jurisdiction but unfortunately there were no police photos showing the child safety seat (CSS). At the time of the vehicle inspection, the CSS was found sitting upright, forward facing in the second row seating area, between the left and center seating positions. The CSS was not anchored to the vehicle. The second row left seating position was equipped with a 3-point manual lap and shoulder belt with a sliding latchplate and an emergency locking retractor. The belt webbing showed signs of loading in two sections.

The harness straps were found buckled, with the top straps threaded through the top harness slots. The retainer clip was found connected and fairly low on the harness straps. There were pieces of padded fabric around the upper harness straps (original equipment). The harness straps were twisted on both sides (see Figure 24). The plastic shell showed signs of stress in several areas (see Figures 25-27). There were stress marks on the right center section and to the bottom center area of the seat. There were no signs of occupant loading or contact to the harness straps, retainer clip, or to the shell padding.

Figure 24. Twisted harness straps

Figure 25. Visible stress marks on bottom of the CSS

According to information contained in the child's official medical records, the CSS was "broken prior to this accident".

At the time of the CSS inspection there were no visible problems with the seat itself, other than the stress marks visible on several sections of the CSS's plastic shell. These stress marks are presumed to have occurred as result of this crash. The child's grandmother reported that she purchased the CSS new and it had never been involved in any other crashes.

This CSS was equipped with the LATCH system but the 1986 Honda Accord was not equipped with the necessary LATCH components. There was a locking clip found on the back of the CSS, in the locking clip's original storage location.

Figure 26. Stress mark on right side of CSS (highlighted with yellow tape)

Figure 27. Close-up – stress mark on right side of booster seat

Vehicle Data - 2006 Dodge Ram 3500 Quad Cab Pickup

The 2006 Dodge Ram pickup sustained moderate damage to its left side (see Figures 28-29). The direct damage from the impact with the Honda began at the Ram's left front bumper corner and extended down the left side of the pickup to the front section of the left rear door. The majority of the direct damage to the Ram's left side was to the lower to mid-door level. The left front tire and drive line were ripped off the vehicle during the collision. This damage description was based off of police on-scene photographs. Attempts were made to locate and inspect the pickup, but they were not successful.

VIN:	3D7LX38C46Gxxxxxx	
Odometer:	19,312 km (12,000 m) Source: Vehicle driver/owner	
Engine:	5.9L, 6 cylinder	
Reported Defects:	None	
Cargo:	None	
CDC:	12FLEE9	
Delta V:	Total	Unknown
	Longitudinal	Unknown
	Latitudinal	Unknown
	Energy	Unknown

Figure 28. 2006 Dodge Ram damage (police photo)

Figure 29. Damaged 2006 Dodge Ram (police photo)

Occupant Demographics - 1986 Honda Accord

	Driver	Occupant 2
Age/Sex:	22/Female	2-1/2 year-old/Female
Seated Position:	Front left	Second row left
Seat Type:	Fabric covered bucket seat with a folding back	Fabric covered bench seat with folding backs
Height:	163 cm (64 in)	76 cm (30 in)
Weight:	52 kg (115 lb)	13.5 kg (29.8 lb) Source: Official medical records
Occupation:	Unemployed	Not applicable
Pre-existing Medical Condition:	ADHD	None noted
Alcohol/Drug Involvement:	None present	Not applicable
Driving Experience:	5 - 6 years	Not applicable
Body Posture:	Presumed to be sitting generally upright, forward facing	Presumed to be sitting reclined in child safety seat with her back against the CSS cushion
Hand Position:	Unknown	Unknown
Foot Position:	Presumed to be on the floorboards and/or foot controls	Presumed to be resting against the CSS's bottom cushion
Restraint Usage:	3-point manual lap and shoulder belt available - used	3-point manual lap and shoulder belt available. CSS used as a booster seat. Lap and shoulder belt routed across the child.
Air bag:	None available	None available

Occupant Demographics - 2006 Dodge Ram 3500

Age/Sex:	35/Male
Seated Position:	Front left
Seat Type:	Split bench seat with separate back cushions
Height:	178 cm (70 in)
Weight:	75 kg (165 lb)
Occupation:	Landscape contractor
Pre-existing Medical Condition:	None
Alcohol/Drug Involvement:	None noted
Driving Experience:	19 years
Body Posture:	Sitting upright, forward facing
Hand Position:	Both hands on steering wheel, bracing. Left hand at 10 o'clock position. Right hand at 2 o'clock position.
Foot Position:	Left foot on floorboards. Right foot on brake.
Restraint Usage:	3-point manual lap and shoulder belt available - used
Air bag:	Driver front air bag available - deployed

Occupant Injuries - 1986 Honda Accord

Driver: Injuries obtained from the Emergency Room records, radiology records, post-ER records and the driver interview.

Injury	OIC Code	Injury Mechanism	Confidence Level
Awake on Admission or Initial Observation at Scene; per EMS, driver had loss of consciousness en route to hospital, LOC known to be less than one hour	160414.2,0	Steering wheel	Certain
Fracture, comminuted, depressed and displaced, nose	251004.2,4	Steering wheel	Certain
Laceration, minor, lower lip	290602.1,8	Steering wheel	Certain
Sprain, left knee	850826.2,2	Lower left instrument panel	Certain
Abrasions, left knee	890202.1,2	Lower left instrument panel	Probable
Fracture, closed, left ankle NFS	852002.2,2	Intruded toe pan and/or floor pan	Probable
Abrasions, left ankle	890202.1,2	Intruded toe pan and/or floor pan	Probable

Second Row Left Occupant: Injuries obtained from the Emergency Room records, radiological records, post-ER records and the driver interview.

Injury	OIC Code	Injury Mechanism	Confidence Level
Fracture, transverse process, displaced 6-7 mm, C2	650220.2,6	Impact forces	Probable
Abrasion, left clavicle	790202.1,2	Seat belt webbing	Certain
Multiple contusions, minor, abdomen	590402.1,0	Seat belt webbing	Certain
Multiple contusions, minor, left shoulder	790402.1,2	Seat belt webbing	Certain
Bloody lip NFS	Unknown	Bit her lip at impact	Probable

Occupant Injuries - 2006 Dodge Ram 3500

Driver: Injuries obtained from the Emergency Room records, radiology records, post-ER records and the driver interview.

Injury	OIC Code	Injury Mechanism	Confidence Level
Head injury NFS, without concussion; driver complained of pain to left side of forehead, dizziness and vertigo	115099.7,0	Deployed driver front air bag and/or left front window glazing	Probable
Contusion, left knee	890402.1,2	Left front door panel	Probable
Sprain, left hip	850606.1,2	Left front door panel	Probable
Cervical, thoracic and lumbar strains, acute with no fracture or dislocation	640278.1,6 640478.1,7 640678.1,8	Impact forces	Probable
Multiple minor lacerations, NFS	990600.1,9	Flying glass	Possible
Complaints of pain to right arm	Not codable	Impact (driver was bracing his hands against the wheel at impact)	Probable

Occupant Kinematics - 1986 Honda Accord

Driver Kinematics

The 22-year-old female driver was likely seated in a generally upright posture and was restrained by the available 3-point manual lap and shoulder belt. At the vehicle inspection, the driver's seat was adjusted to the fully rearward track position, but it was likely moved during driver extrication efforts. The driver's mother reported that her daughter generally positioned the seat track between the center and forward most track setting. The driver's seat back angle was found reclined 5 degrees from vertical and the seat bottom angle was 5 degrees from horizontal.

Figure 30. Close-up - blood and tissue transfers on steering wheel hub

According to police and the driver's mother, this driver may have fallen asleep during the precrash phase, so it is possible that the driver may have been slightly out of position at impact.

As the front of the Accord struck the front left of the Dodge, the driver initiated a forward trajectory. She loaded the lap and shoulder belt with her chest and abdomen and her knees and lower legs impacted the lower steering column. The left toe pan intruded longitudinally and the floorpan intruded vertically into the driver's area, likely resulting in the driver's fractured and abraded left ankle.

Figure 31. Occupant contacts to steering column and left instrument panel

The driver's face and chest struck the steering wheel (see Figure 30), breaking the driver's nose and deforming the wheel. According to the driver, the steering wheel broke off during the crash. A control lever mounted on the right side of the steering column and a control knob mounted on the left center instrument panel (see Figure 31) were also displaced due to occupant contact.

After the impact, the case vehicle rotated counterclockwise as it was pushed north by the Dodge Ram. During the rotation, the driver pitched to her right. The Accord rotated nearly 360 degrees before coming to final rest, facing southwest on the dirt and gravel strip adjacent to the freeway.

According to the driver of the other vehicle, the Honda Accord's engine was on fire post-crash. Several people stopped at the scene and helped put it out with fire extinguishers. Police reported that the driver's seat was found "slammed forward" with the driver leaning over the steering

wheel. The left front door was jammed shut due to damage. According to police, the driver was able to remove her seat belt and slid her body to the area between the front row seats. According to the driver of the Dodge Ram, the Accord's driver was entrapped in her seating position. He reported that a passerby used a metal bar to pry an opening in the left front door window frame and removed the driver through this opening.

The driver sustained serious injuries in the crash. She was transported by ambulance to a hospital for treatment. She was treated in the emergency room for approximately six hours and then was released. According to the driver's mother, the fracture to the left ankle was not discovered by medical personnel until two weeks after the crash.

The case vehicle was towed from the scene due to damage and was later declared a total loss by the insurance company.

Second Row Left Seat Occupant Kinematics

The 2-1/2 year female second row left passenger was seated with a generally upright posture in a forward facing Dorel Juvenile Group Alpha Omega belt positioning booster seat (see Figure 32). According to police, the child was "properly buckled into a car seat". At the time of the inspection, the child seat was not anchored to the vehicle, the harness straps were buckled together while twisted and the retainer clip was found in the latched position.

Figure 32. Dorel Juvenile Group Alpha Omega CSS

As the front of the Accord struck the front left of the Dodge Ram, this passenger initiated a forward trajectory. There were no signs of occupant contact to the child safety seat harness straps, retainer clip or padded shell. The seat belt webbing showed signs of loading in several areas (see Figure 33) and the child safety seat showed signs of stress on the right side and bottom.

Figure 33. Evidence of loading to the second row left seatbelt

As the vehicle rotated counterclockwise and was pushed north by the Dodge Ram, the child pitched to her right but remained within the child safety seat. The vehicle rotated nearly 360 degrees before coming to final rest. At final rest, the Honda Accord was facing southwest on the dirt and gravel area adjacent to the east shoulder.

Because the Honda Accord's engine was smoking and catching fire, the driver of the Dodge carefully removed the child from her safety seat and held her in a fixed and stable position until paramedics arrived. She was transported by ambulance to a hospital for treatment. The child was cleared by hospital personnel but the child's grandmother, who was present in the emergency room, felt that the 2-1/2 year old was acting strangely. Hospital personnel gave the child a CAT scan and discovered she had a cervical fracture. She was flown to another hospital where she was hospitalized for seven days. According to the grandmother, the child was in a halo for approximately two months, then wore a collar for approximately one month. At the time of the interview, approximately four months after the crash, the grandmother reported that the child is able to do everything a child of her age would normally do, and seems to have no residual effects from her injuries.

Attachment 1. Scene Diagram