

Child Safety Seat Investigation
Dynamic Science, Inc. (DSI), Case Number DS08025
1997 Honda Accord SE
California
June 2008

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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 investigation focused on a child occupant and child restraints in a 1997 Honda Accord, which was involved in a crash with a 2006 Ford F250 Super Duty pickup. A 4-month-old male child was seated in a Baby Trend Flex-Loc rear facing infant safety seat in the second row center position of the subject vehicle. The Honda was traveling eastbound on an undivided two-lane east/west roadway. The Ford was traveling westbound on the same roadway. For unknown reasons, the Honda crossed the centerline and entered the westbound travel lane. The driver of the Ford observed the Honda's approach and steered to his right in an attempt to avoid contact. The front end of the Honda impacted the front end of the Ford. The driver and the child occupant of the Honda were fatally injured.			
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TABLE OF CONTENTS

BACKGROUND	1
SUMMARY	1
Crash Site	1
Pre Crash	2
Crash	2
Post Crash	3
Vehicle Data - 1997 Honda Accord SE	3
Vehicle Damage	4
Exterior Damage	4
Interior Damage	5
Manual Restraint Systems	6
Supplemental Restraint Systems	7
Child Safety Seat Discussion	7
Vehicle Data - 2006 Ford F250 Super Duty	8
Vehicle Damage	9
Exterior Damage	9
Occupant Demographics	10
Occupant Injuries	10
Occupant Kinematics	13
Attachment 1. Scene Diagram	15

BACKGROUND

This investigation focused on a child occupant and child restraint in a 1997 Honda Accord (**Figure 1**), which was involved in a crash with a 2006 Ford F250 Super Duty pickup. A 4-month-old male child was seated in a Baby Trend Flex-Loc rear facing infant safety seat in the second row center position of the subject vehicle (**Figure 2**).

The Honda was traveling eastbound on an undivided two-lane east/west roadway. The Ford was traveling westbound on the same roadway. For unknown reasons, the Honda crossed the centerline and entered the westbound travel lane. The driver of the Ford observed the Honda's approach and steered to his right in an attempt to avoid contact. The front end of the Honda impacted the front end of the Ford. The driver and the child occupant of the Honda were fatally injured.

This on-site child safety seat (CSS) investigation was initiated in response to an online news article that was identified by a DSI investigator. The article stated that a child who was seated in a CSS died as a result of injuries sustained in a two-vehicle crash. On June 23, 2008, DSI was instructed to locate the subject vehicle and the CSS. On June 28, 2008, DSI obtained a copy of the police report; the subject vehicle and the other vehicle were being held in evidence by the police and the CSS was still in the subject vehicle. The vehicles and the CSS were inspected on July 31, 2008.

SUMMARY

Crash Site

The crash occurred on an undivided two-lane, east/west roadway. The crash occurred during daylight. Weather conditions were clear with no precipitation and the asphalt roadway was dry. The roadway alignment was straight and the profile for each direction of travel was level. The posted speed limit was 89 km/h (55 mph). The roadway surface was asphalt and there were paved shoulders on either side of the roadway. The centerline was a single yellow dashed stripe. At the area of impact, there were metal guard rails to the north and south of the roadway (**Figure 3**). There were no traffic controls present in the area of the crash.



Figure 1. Subject vehicle, 1997 Honda Accord SE



Figure 2. Baby Trend Flex-Loc infant safety seat

Pre Crash

The Honda was being driven eastbound by a 21-year-old female and the second row center seat position was occupied by a 4-month-old male child who was seated in a rear-facing child safety seat. As the Honda approached the crash area, the vehicle traveled across the centerline and entered the westbound travel lane (**Figure 4**). Based on the post-crash position of the speedometer needle, the Honda was traveling approximately 97 km/h (60 mph). Based on the scene inspection, it was determined that the vehicle was tracking to the point of impact, and there was no braking.



Figure 3. Pre crash approach, subject vehicle

The Ford was being driven westbound at a driver reported speed of 80 km/h (50 mph) by a 46-year-old male, and the front right seat was occupied by a 46-year-old male. The driver of the Ford stated that the Honda approaching from the opposite direction and encroached into the westbound travel lane. He attempted to avoid the crash by steering to the right and braking.



Figure 4. Area of impact, subject vehicle

Crash

The front end of the Honda impacted the front end of the Ford in the westbound lane. The Damage Only algorithm of WinSmash computed a total delta V of 68 km/h (42 mph) for the Honda. The longitudinal and lateral components were -64 km/h (-39 mph) and -23 km/h (-14 mph), respectively. WinSmash computed a total delta V of 36 km/h (22 mph) for the Ford. The longitudinal and lateral components were -36 km/h (-22 mph) and 6 km/h (4 mph), respectively. After the impact, the Honda initiated a counterclockwise rotation and came to rest heading south in eastbound lane. The Ford initiated a slight counterclockwise rotation, entered the shoulder, impacted the guardrail with the right rear fender, and came to rest facing west on the north shoulder.

Post Crash

The first responding witness proceeded to the left front door of the Honda. He found the driver unconscious and unresponsive. At this time he noticed the CSS in the rear seat. This witness and another male went to the right side of the vehicle and unsuccessfully attempted to open the door with a small pry bar. He went to his vehicle and retrieved additional tools and with the assistance of a responding police officer was able to open the door. The officer removed the child from the CSS and began administering first aid.

The driver of the Ford tried to exit the vehicle but was having difficulty opening the door. The front right occupant was able to exit the vehicle under his own power. He went to the driver's door and assisted him in opening the door and exiting the vehicle. The driver sustained foot fractures and multiple abrasions and contusions. He also complained of pain to his neck, shoulders, and left hip. He was transported by ground ambulance to a local hospital for treatment. The front right occupant sustained multiple contusions and abrasions. He also complained of pain to his left ribs and left elbow. He was transported to a local hospital by ground ambulance for treatment.

After the occupants exited the Ford, the vehicle began to smoke and eventually a fire began in the engine compartment. The fire spread through the vehicle's cab and portions of the bed before being extinguished by responding firefighters.

After the fire began, other persons on scene thought that the driver of the Honda might still be alive so they removed her from the vehicle to a safer location on the east shoulder of the road. One witness who was interviewed stated that she the driver's door was open immediately post-crash and the driver was removed through that door. The driver was declared deceased at the scene. She sustained multiple blunt force injuries to her head, chest, abdomen, and extremities. The 4-month-old child was transported by ambulance to a local hospital and was declared deceased thirty-nine minutes post crash.

Both vehicles were towed due to damage to a police facility and placed in evidence. The child seat remained in the second row of the subject vehicle.

Vehicle Data - 1997 Honda Accord SE

The Honda was identified by the Vehicle Identification Number (VIN):1HGCD5608VAxxxxxx. The vehicle's odometer reading was 441,891 km (173,973 mi). The vehicle was a 4-door sedan that was equipped with a 2.2 liter, 4- cylinder engine, an automatic transmission, and front wheel drive. The vehicle manufacturer's recommended tire size was P185/65R15 for the front and rear, and the recommended tire pressure was 221 kPa (32 psi) for the front and rear. The vehicle was equipped with Geostar Radial NST tires for the front left and right, a Firestone Firehawk GTA for the left rear, and a Nitto NT460 Premium Touring for the right rear. All the tires were size P195/60R15. The specific tire information was as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	Tire flat	3 mm (4/32 in)	Yes	Sidewall torn, tire debanded
LR	234 kPa (34 psi)	2 mm (3/32 in)	No	None
RR	241 kPa (35 psi)	2 mm (3/32 in)	No	None
RF	228 kPa (33 psi)	3 mm (4/32 in)	No	None

The Honda's front row seating was configured with fabric-covered bucket seats and adjustable head restraints for the two outboard seating positions. The second row seating was configured with a fabric-covered bench seat and integral head restraints for the outboard seating positions.

Vehicle Damage - 1997 Honda Accord SE

Exterior Damage

The Honda sustained severe front end damage as a result of the impact with the Ford. The bumper fascia was detached from the vehicle at the time of the inspection. There was direct damage across the front bumper fascia which began at the front left bumper corner, extended 152 cm (59.8 in) to the right, and ended at the front right bumper corner. The bumper backing bar consisted of a composite material and was fractured on its left aspect midway between the bumper midpoint and the left bumper mount. The left side wheelbase was shortened by 101 cm (39.8 in). The left front axle and suspension were deformed and the tire was negatively cambered to a 45 degree angle.

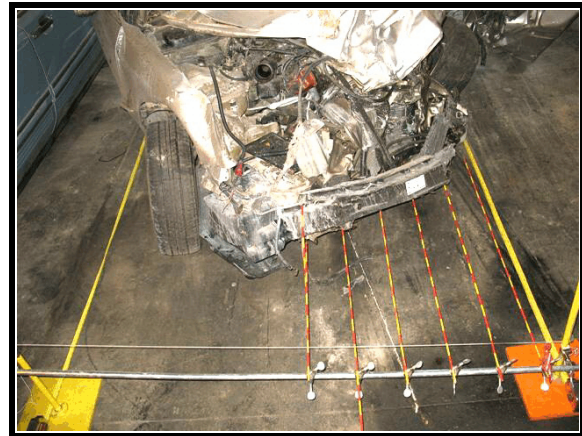


Figure 5. Crush measurements at mid bumper level, subject vehicle

Six crush measurements were taken at bumper level (**Figure 5**). The crush measurements were as follows: C1 = 108 cm (42.5 in), C2 = 94 cm (37.0 in), C3 = 88 cm (34.7 in), C4 = 63 cm (24.8 in), C5 = 37 cm (14.6 in), C6 = 29 cm (11.4 in). Maximum crush was located at C1 and measured 108 cm (42.5 in). There was also significant crush to the grille and hood. Based on National Automotive Sampling System (NASS) protocols for underride impacts, above bumper crush measurements were taken at the upper radiator support (**Figure 6**) and were as follows: C1 = 115 cm (45.3 in), C2 = 108 cm (42.5 in), C3 = 103 cm (40.6

in), C4 = 93 cm (36.6 in), C5 = 76 cm (29.9 in), C6 = 46 cm (18.1 in). Maximum crush was located at C1 and measured 115 cm (45.3 in). Per NASS protocol, the two sets of measurements were then averaged, the results of which follow: C1 = 108 cm (42.5in), C2 = 101 cm (39.8 in), C3 = 96 cm (37.8 in), C4 = 78 cm (30.7 in), C5 = 57 cm (22.4 in), C6 = 38 cm (15.0 in). The Collision Deformation Classification (CDC) for the impact was 01FDEW5.

Interior Damage

The Honda sustained severe interior damage as a result of passenger compartment intrusion and integrity loss. The vehicle sustained integrity loss of the windshield, roof, roof glass, side door, and side window. The left front door sustained damage to the hinges and structure, and came open during the crash. The left rear, right front, and right rear doors were jammed shut. The windshield was out of place and holed. The left front and rear side window glazing disintegrated. The steering column was displaced downward and the steering wheel rim was deformed an indeterminate distance in all four quarters. The upper aspect of the steering wheel rim was 25 cm (9.8 in) from the seat back (Figure 7).

The front row seats were deformed due to passenger compartment intrusion. The front row floor was deformed upward and rearward. The driver's seat was displaced rearward 29 cm (11.4 in), and the front right seat was displaced rearward 6 cm (2.4 in). The second row seat cushion was displaced vertically upward at the seat bight. The specific passenger compartment intrusions were as follows:

Row	Position	Intruded Component	Magnitude of Intrusion	Direction
1	Left	Instrument panel left	74 cm (29.1 in)	Longitudinal
1	Left	Steering assembly	66 cm (26.0 in)	Longitudinal
1	Left	Windshield header	52 cm (20.5 in)	Longitudinal
1	Left	Toe pan	45 cm (10.0 in)	Longitudinal
1	Middle	Instrument panel center	40 cm (15.8 in)	Longitudinal

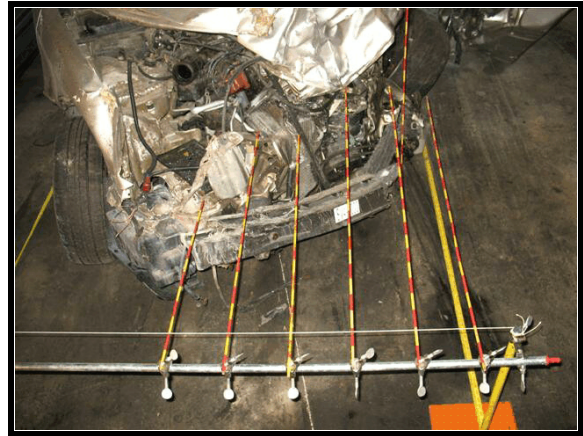


Figure 6. Crush measurements at above bumper level, subject vehicle



Figure 7. Intrusion and deformation of steering wheel and column

2	Left	Door forward/upper quadrant	35 cm (13.8 in)	Lateral
1	Middle	Windshield header	33 cm (13.0 in)	Longitudinal
2	Left	Front seat back	29 cm (11.4 in)	Longitudinal
2	Left	B-pillar	18 cm (7.1 in)	Lateral
1	Left	Roof side rail	6 cm (2.4 in)	Vertical
2	Right	Front seat back	6 cm (2.4 in)	Longitudinal

Manual Restraint Systems

The Honda was equipped with 3-point manual lap and shoulder belts for the four outboard seating positions. The belts were configured with sliding latch plates, all of which showed evidence of historical use. The driver's belt was equipped with an Emergency Locking Retractor (ELR). The remaining outboard belts were equipped with switchable ELR/Automatic Locking Retractors (ALR). The front row belts had adjustable D-rings.

The driver's belt was used to restrain the driver and the D-ring was in the full down position. The anchorage assembly at the B-pillar was fractured during the crash (**Figure 8**). The retractor was broken and the belt was unretracted. The belt was scuffed and abraded over a 12 cm (4.7 in) long section of the belt webbing. The fractured B-pillar cover was determined to be the source of the damage to the belt. The belt was soiled and contained dried body fluids.

The second row middle seat was equipped with a manual lap belt and a locking latch plate (**Figure 9**). The lap belt was used to secure a rear facing CSS. The belt was routed through rear facing slots in the seat's frame. The SCI investigator found the belt routed through the CSS and buckled at the time of the vehicle inspection. There was significant slack in the belt and the CSS was leaning toward the right side of the vehicle.



Figure 8. Driver's safety belt showing fracture of B-pillar cover



Figure 9. Second row center lap belt, used to secure a Baby Trend infant safety seat

The belt had an uneven cut or tear along one edge where it was routed through the CSS belt path. The belt was creased and folded where it passed through a positioning collar at the seat bight.

Supplemental Restraint Systems

The Honda was equipped with frontal air bags for the first row occupants. The bags deployed during the crash. The driver's frontal air bag deployed from the steering wheel hub through the cover flaps. The flaps opened at the tear points and were undamaged. The bag was circular in shape and measured 60 cm (23.6 in) in diameter. There was a circular stitching pattern on the bag's front center that measured 15 cm (5.9 in) in diameter. The bag was configured with two internal tethers and two circular vent ports located near the 11 and 1 o'clock positions on the bag's back panel.



Figure 10. Driver's frontal air bag, showing tear down left side

The driver's air bag sustained a tear on the forward aspect, near the outer seam. The tear began in the upper left quadrant near the 12 o'clock position, extended 45 cm (17.7 in) downward and to the left, and ended at the bag's lower left quadrant (**Figure 10**). There was a second tear located near the outer seam on the lower left quadrant which measured 3 cm (1.2 in) in length. The source of the damage was unknown. There was dried blood on the upper right quadrant of the air bag which was a suspected occupant contact. The blood covered an area of 3 cm by 5 cm (1.2 by 2.0 in) and was located 15 cm (5.9 in) from the bag's front center. There was a dark smear, which was suspected to be a makeup transfer, that measured 3 cm (1.2 in) in length and was located 20 cm from the bag's center in the upper left quadrant.

The right passenger's frontal air bag was housed within the top instrument panel. The bag deployed from a single rectangular cover flap that measured 32 cm (12.6 in) in length and 14 cm (5.5 in) in height. The bag was rectangular and measured 48 cm (18.9 in) in width and 58 cm (22.8 in) in height. There were no occupant contacts observed on the bag. There were dirt smudges on the bag from unknown sources.

Child Safety Seat Discussion

The second row middle occupant was a 4-month-old male child in a Baby Trend Flex-Loc rear facing infant CSS (**Figure 11**). The model number was 6364B and the date of manufacture was 12/04/2007. The seat was equipped with a 5-point harness, a retainer clip, and a lower buckle. The shoulder straps were routed through a single set of slots. The left strap was twisted where it passed through the slot. The seat was equipped with lower LATCH hardware but not an upper tether strap. The seat was equipped with an adjustable base and an adjustable headrest. There was an angle indicator on the side of the seat frame to assist in installation. The indicator was configured with separate markers for children weighing above or below 9 kg (20 lb). The seat had a pivoting carrier handle, which was found in the up position at the time of the inspection.

The seat was equipped with a padded one-piece fabric cover.

The Baby Trend Flex-Loc was designed to be used rear facing only. The seat could be secured to the vehicle with or without the base, using either a lap belt or a lap and shoulder belt. The seat base was used during installation of the seat. The seat warning label stated the seat was to be used only with children who weighed between 2.2 and 10 kg (5 and 22 lb) and whose height was 72.4 cm (28.5 in) or less. The 4-month-old child occupant was 67 cm (26 in) in height and 7 kg (15 lb) in weight. The child was an appropriate height and weight for the seat.



Figure 11. Baby Trend Flex-Loc infant safety seat

An investigation of the CSS revealed stress and loading evidence in several locations, specifically on the right side belt paths of the base and the CSS. During the inspection it was observed that the fixed length lap belt remained buckled and the webbing was routed through the rear facing belt paths of the child seat base. However, the CSS moved significantly to the right during the impact. It is possible that this was the result of an unlocked latch plate. Historical evidence shows that when an CSS is used in combination with a locking latch plate, the most common misuse has been that the latch plate does not lock. This can be overcome by using a locking clip, which was not used in this crash, or by twisting the latch plate one revolution to allow the bar to lock in the webbing. Based on the post-crash investigation of the CSS, neither of these steps was followed. Associative loading marks were also present within the belt path and on the belt webbing, indicative of stress being placed on these components and a partial un-spooling of the webbing through the latch plate.

Additionally, the belt paths on the child seat itself revealed considerable loading evidence and a crack at the base of the right path. Due to the belt still being engaged within the belt paths of the base during the inspection, it was determined that the CSS belt paths were not used. However, considering the marked belt loading evidence to the CSS belt paths, it is probable that the CSS was involved in a prior crash.

Vehicle Data - 2006 Ford F250 Super Duty

The Ford was identified by the Vehicle Identification Number (VIN): KMHCM36C57Uxxxxxx. The VIN placards had been removed or destroyed in the fire; the VIN was verified by the vehicle's insurance company. The vehicle was a 4-door extended cab full size pickup that was equipped with a 5.4 liter, 8- cylinder gasoline engine and a 4-wheel drive transmission. The vehicle manufacturer's recommended tire size was LT245/75R14 for both front and rear, and the recommended cold tire pressure was 207 kPa (30 psi) for both front and rear. The vehicle was equipped with Continental Contitrac tires on the right side. The left side tires sustained burn damage from the fire and were not identifiable; however, it was presumed the left side tires matched the right side. The tire manufacturer's recommended maximum tire pressure was 552 kPa (80 psi). The specific tire information was as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	Tire flat	Tread melted	No	Tire burned
LR	Tire flat	5 mm (6/32 in)	No	Tire burned, debeaded
RR	Tire flat	6 mm (7/32 in)	No	None
RF	Tire flat	5 mm (6/32 in)	No	Tire burned

Vehicle Damage - 2006 Ford F250 Super Duty

Exterior Damage

The Ford sustained moderate front end damage as a result of the impact with the Honda. The front steel bumper and fascia were displaced and were not present for inspection. The crush damage began at the front left bumper mount at the forward aspect of the vehicle's frame, extended 117 cm (46.1 in) to the right, and ended at the front right bumper mount.

Two crush measurements were taken at mid-bumper level (**Figure 12**). The crush measurements were as follows: C1 = 87 cm (34.3 in), C6 = 0. There was crush distributed across the bumper; however, the bumper mount at the C6 measurement was displaced slightly forward of its original position. The CDC for the front end impact was 12FDEW4.

The Ford sustained minor damage to the right rear fender as a result of the impact with the guardrail (**Figure 13**). The CDC for the guardrail impact was 01RBEW1.

The Ford sustained major damage from a post-crash fire. The fire began in the engine compartment. There was burn damage to the hood, front fenders, cab, and forward area of the pickup bed. The entire vehicle interior was gutted by the fire.

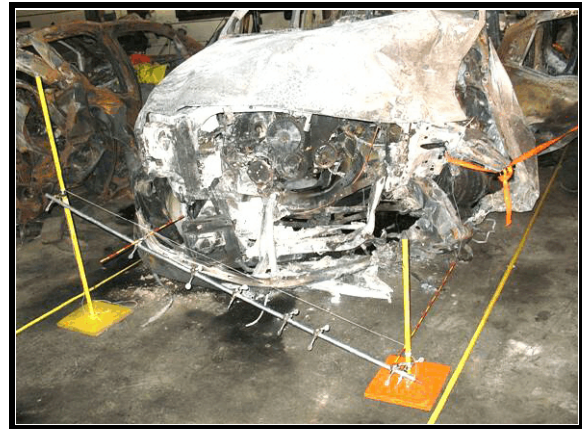


Figure 12. Crush measurements taken at mid bumper level, 2006 Ford F250 SD



Figure 13. Right side damage

OCCUPANT DEMOGRAPHICS

	Driver	Second Row Center Occupant
Age/Sex:	21/Female	4 months/Male
Seated Position:	Front left	Second row center
Seat Type:	Bucket	Bench
Seat track position:	Unknown; deformed, could not be moved	N/A
Height:	157 cm (62 in)	67 cm (26 in)
Weight:	90 kg (199 lbs)	7 kg (15 lbs)
Alcohol/Drug Involvement:	None	N/A
Body Posture:	Unknown	Unknown
Hand Position:	Unknown	Unknown
Foot Position:	Unknown	Unknown
Restraint Usage:	Lap and shoulder belt used	Lap belt used to secure CSS

OCCUPANT INJURIES

Driver Injuries: Injuries obtained from autopsy report.

<u>Injury</u>	<u>OIC Code</u>	<u>Injury Mechanism</u>	<u>Confidence Level</u>
Superficial lacerations, left eyebrow,	290602.1,2	Air bag	Probable
Superficial lacerations, nose, central	290602.1,4	Air bag	Probable
Abrasion, inferior/lower upper lip	290202.1,8	Air bag	Probable
Abrasions, bilateral chest	490202.1,3	Steering wheel rim	Probable
Contusions, right chest	490402.1,1	Steering wheel rim	Possible
Abrasions, right abdomen	590202.1,1	Safety belt webbing	Possible
Abrasions, left abdomen	590202.1,2	Safety belt webbing	Possible

Laceration, minor, right abdomen	590602.1,1	Safety belt webbing	Possible
Laceration, minor, left abdomen	590602.1,2	Safety belt webbing	Possible
Abrasion, right anterior upper arm	790202.1,1	Unknown	Unknown
Contusions, right anterior forearm	790402.1,1	Unknown	Unknown
Laceration, minor, right anterior wrist	790602.1,1	Unknown	Unknown
Abrasions and lacerations, minor, left anterior extending to lateral upper arm, left hand	790202.1,2 790602.1,2	Flying glass	Possible
Abrasions and contusions, left posterior forearm	790202.1,2 790402.1,2	Air bag	Possible
Open fracture with dislocation, distal left radius and ulna	752804.3,2 753204.3,2	Steering wheel rim	Possible
Superficial laceration, distal left forearm	790602.1,2	Door panel, left forward upper quadrant	Possible
Abrasions and contusions, right thigh	890202.1,1 890402.1,1	Center console	Possible
Major laceration, right lower leg, beginning at patella extending to medial calf	890604.2,1	Lower instrument panel	Possible
Minor lacerations, left hip	890604.2,2	Door panel, left rear lower quadrant	Possible
Minor lacerations, left anterior thigh	890602.1,2	Door panel, left forward upper quadrant	Possible
Contusions, right lower leg	890402.1,1	Lower instrument panel	Possible
Open/displaced fracture, right tibia, medial malleolus	853414.2,1	Foot controls	Possible
Displaced fracture, right fibula	851610.2,1	Foot controls	Possible
Contusions, right foot	890402.1,1	Foot controls	Probable
Fracture, femur, condylar, left	851804.3,2	Lower instrument panel	Possible

Abrasions, beginning at left knee, extending to lower leg	890202.1,2	Lower instrument panel	Possible
Contusions, left ankle and dorsal foot	890402.1,2	Foot controls	Possible
Contusion (hemorrhage), right scalp	190402.1,1	Unknown	Unknown
Subdural hemorrhage, small, cerebrum	140652.4,9	Unknown	Unknown
Subarachnoid hemorrhage, cerebellum	140466.3,6	Unknown	Unknown
Bilateral rib fractures, right flail NFS with bilateral lung contusions and hemothoraces	450264.4,1	Steering wheel rim, hub/spoke	Probable
Laceration, major (transection), thoracic aorta	420210.5,4	Steering wheel rim, hub/spoke	Probable
Lacerations (2), diaphragm	440604.3,8	Steering wheel rim, hub/spoke	Probable
Laceration, spinal cord, with fracture at T4	640446.5,7	Unknown	Unknown
Laceration NFS, colon	540420.2,8	Unknown	Unknown
Lacerations (2), minor, spleen	544222.2,2	Steering wheel rim, hub/spoke	Possible
Lacerations, ranging from minor to moderate, liver	541824.3,1	Steering wheel rim, hub/spoke	Possible
Pelvis fracture NFS, displaced, right pubic ramus	852604.3,1	Unknown	Unknown
Pelvis fracture NFS, displaced, left ilium	852604.3,2	Unknown	Unknown
Laceration, no perforation, heart	441010.3,4	Steering wheel rim, hub/spoke	Probable
Contusions (hemorrhages), esophagus	440802.2,4	Steering wheel rim, hub/spoke	Probable

Second Row Center Occupant Injuries: Injuries obtained from autopsy report.

<u>Injury</u>	<u>OIC Code</u>	<u>Injury Mechanism</u>	<u>Confidence Level</u>
Abrasion, right scalp	190202.1,1	Child safety seat shell	Probable
Contusion, posterior scalp	190402.1,6	Child safety seat shell	Probable
Vault fractures, displaced; involving frontal, temporal, parietal and occipital bones	150404.3,9	Child safety seat shell	Probable
Basilar fractures NFS, occipital bone	150200.3,8	Child safety seat shell	Probable
Epidural NFS, subdural NFS, subarachnoid, and intraventricular hemorrhages cerebrum	140630.4,9 140650.4,9 140684.3,9	Child safety seat shell	Probable
Laceration, brain stem; complete separation of the brain stem at a level between the mid-brain and pons	140212.6,8	Impact forces	Probable
Dislocation, atlanto-axial (odontoid)	650206.3,6	Impact forces	Probable
Fracture NFS, C7	650216.2,6	CSS	Probable
Contusions, lungs, bilateral	441410.4,3	CSS	Probable

OCCUPANT KINEMATICS**Driver Kinematics**

The driver's pre-crash posture was unknown. She was restrained by the 3-point manual lap and shoulder belt. At impact, the driver was rapidly displaced forward and to the right. The driver's frontal air bag deployed and there was significant longitudinal intrusion of the steering column into the passenger compartment. The driver contacted the air bag and loaded the steering wheel rim and steering column, causing the multiple chest and abdominal injuries. The vehicle's toe pan and foot controls intruded longitudinally and the floor intruded vertically. These intrusions displaced the driver's feet and legs, which resulted in injuries to the driver's right ankle, and left femur, thigh and lower leg. The Honda initiated a post-impact counterclockwise rotation, during which time the driver was displaced further to the left. The front row left door panel sustained severe damage and the driver probably contacted the fractured door components during the crash. She sustained deep lacerations to the left thigh and lower leg. The driver was removed from the vehicle while unresponsive by on-scene responders. She was declared deceased twelve minutes post-crash.

Second Row Center Occupant Kinematics

The 4-month-old male child was seated in a rear facing CSS. The seat was secured to the vehicle using the manual lap belt. The SCI investigator found the lap belt routed through the seat's rear facing belt paths and buckled. The child was secured by the seat's 5-point harness. The child's torso stayed generally in place within the infant seat. At impact, the child was rapidly displaced forward and to the right. His head engaged the interior shell of the CSS during the impact and sustained multiple skull fractures. The child was displaced forward and upward while his torso was being held in place by the harness webbing. His head continued this motion and he sustained an atlanto-occipital dislocation and a brain stem laceration. The autopsy report did not include any injuries to the child's extremities. The child was removed from the infant seat by on-scene responders, and then was transported to a local hospital. He was declared deceased at a local hospital ER thirty-nine minutes post crash.

During the impact, it is probable that the belt webbing spooled through the latch plate, allowing the CSS to pivot clockwise about the webbing and to the right side of the vehicle.

Attachment 1. Scene Diagram

