CRASH DATA RESEARCH CENTER

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CALSPAN ON-SITE ROLLOVER CRASH INVESTIGATION
SCI CASE NO.: CA09028

VEHICLE: 2008 HONDA ACCORD EX-L V6 SEDAN

LOCATION: NORTH CAROLINA

CRASH DATE: APRIL 2009

Contract No. DTNH22-07-C-00043

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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 are 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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BACKGROUND

This on-site investigation focused on the rollover dynamics for this on-road rollover crash of a 2008 Honda Accord **(Figure 1)**. The vehicle was equipped with four-wheel anti-lock brakes, Electronic Stability Control (ESC), a Certified Advanced 208-Compliant (CAC) frontal air bag system, and side impact and inflatable curtain air bags. The manufacturer of the Accord has certified that the vehicle is compliant to the advanced air bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The CAC system consisted of dual-stage frontal air bags for the driver and right front passenger positions, seat track positioning sensors, retractor pretensioners, and a front right occupant presence sensor. The front right of the Honda impacted the rear left of a Jeep Grand Cherokee that was stopped for traffic on a five-lane interstate highway. The Grand Cherokee was displaced to the right and the front right of the Honda impacted the rear left of a Nissan Altima that was stopped forward of the Jeep. The Honda then rotated clockwise and initiated a rollover event. The driver's frontal air bag; the inflatable curtains, and side air bags on both sides deployed. The 35-year old restrained driver of the Honda sustained soft tissue injuries of the neck and hand and was not medically treated.

Figure 1. 2008 Honda Accord case vehicle

The crash was identified through a visit to a regional salvage facility on May 7, 2009. The Police Accident Report (PAR) was obtained using information from the insurance company. Based on the rollover of the late model year vehicle and the deployment of the curtain air bags, this case was assigned for on-site investigation on May 11, 2009. The on-site investigation was conducted on May 12-13, 2009 and involved the inspection of the Honda, an interview with the father of the Honda driver, and documentation of the crash scene. The driver of the Honda refused to be interviewed.

SUMMARY

Crash Site

This crash occurred during the evening hours of April 2009 in the eastbound travel lanes of a five-lane east/west interstate. The interstate consisted of five travel lanes in the eastbound direction and four travel lanes in the westbound direction. In the eastbound direction of travel, the roadway curved to the left with a radius of curvature of 698 m (2290 ft). The traffic lanes were 3.7 m (12.1 ft) in width and were surfaced with asphalt. The east/westbound lanes were physically separated by a grass median and a W-beam guardrail median barrier. The inboard (north) shoulder was 3 m (9.8 ft) in width. The outboard (south) shoulder measured 1.2 m (3.9 ft) in width. This asphalt shoulder transitioned to a grass shoulder that was 1.9 m (6.1 ft) in width and was bordered on the south side by a W-beam guardrail. This crash occurred within an interchange area of a single lane on-ramp.

The conditions were police-reported as clear, dry and dark (area not lighted). The posted speed limit was 105 km/h (65 mph). Prior to the crash site, the roadway had a negative grade of 3.2 percent. At the crash site, the grade transitioned to a negative grade of 1.6 percent. The Crash Schematic is included as **Figure 15** of this report.

Vehicle Data

2008 Honda Accord

The case vehicle was a 2008 Honda Accord EX-L sedan. The Honda was manufactured in April 2008 and was identified by the Vehicle Identification Number (VIN) 1HGCP36898A (production number deleted). The front-wheel drive Accord was powered by a transversely mounted 3.5-liter V6 engine linked to a five-speed automatic transmission. The braking system consisted of power-assisted ventilated front and solid rear disc brakes with anti-lock, brake-assist and electronic brakeforce distribution. The Honda was also equipped with Electronic Stability Control (ESC), traction control, and a Tire Pressure Monitoring System (TPMS). All four windows were closed at the time of the crash. The windshield glazing was OEM AS-1 and the side and backlight glazing was AS-2. The sunroof was AS-3 deep tint. The vehicle manufacturer recommended tire size was P225/50R17 with a recommended cold tire pressure of 221 kPa (32 PSI), front and rear. The Accord was equipped with Michelin Pilot HX tires mounted on seven-spoke alloy wheels. The tire size was P225/50R17. The specific tire data at the time of the SCI inspection was as follows:

Position	Measured Tire Pressure	Measured Tread Depth	Damage
Left Front	193 kPa (28 PSI)	6 mm (7/32 in)	None
Left Rear	200 kPa (29 PSI)	8 mm (10/32 in)	None
Right Rear	193 kPa (28 PSI)	6 mm (8/32 in)	None
Right Front	Tire Flat	4 mm (5/32 in)	None

The interior of the Honda was configured with leather surfaced five-passenger seating. The front bucket seats were separated by a center console and equipped with adjustable head restraints. Both front head restraints were found in the full-down position. The front left seat track was adjusted to the full-rear position. The front right seat track was adjusted 4 cm (1.6 in) forward of the full-rear position. The front left seat back was adjusted 32 degrees rear of vertical. The front right seat back was adjusted 35 degrees rear of vertical. The second row has a bench seat with 60/40 split folding seat backs and adjustable head restraints for all three seating positions. The rear left and rear center head restraints were found to be 4 cm (1.6 in) above the full-down position. The rear right head restraint was adjusted 3 cm (1.2 in) above the full-down position.

The interior occupant safety systems consisted of three-point lap and shoulder belts for the five designated positions, front retractor pretensioners, dual stage frontal air bags, front seat back mounted side impact air bags and inflatable curtain air bags that provided protection to the four outboard positions. The rear outboard seats were equipped with Lower Anchors and Tethers for CHildren (LATCH).

1996 Jeep Grand Cherokee Laredo 4x4

The second vehicle in this crash was a 1996 Jeep Grand Cherokee Laredo four-door Sport Utility Vehicle (SUV). The Jeep was identified by the VIN: 1J4GZ58S7TC (production number deleted). The four-wheel drive Jeep was powered by a 4.0-liter inline six-cylinder engine linked to a four-speed automatic transmission and a Quadra-trac transfer case. The braking system consisted of power assisted front and rear disc brakes with four-wheel anti-lock. All four windows were closed at the time of the crash. The windshield glazing was OEM AS-1. The front side windows were AS-2. The rear side and backlight glazing were AS-3 deep tint. The Jeep was equipped with Michelin XCX/APT tires mounted on five-spoke OEM alloy wheels. The tire size was P225/75R15, consistent with the manufacturer recommended tire size. The vehicle manufacturer recommended cold tire pressure was 248 kPa (36 PSI) for the front and rear. The specific tire data at the time of the SCI inspection was as follows:

Position	**Measured Tire Pressure**	**Measured Tread Depth**	**Tire/Wheel Damage**
Left Front	200 kPa (29 PSI)	10 mm (12/32 in)	None
Left Rear	110 kPa (16 PSI)	10 mm (13/32 in)	Rim fractured
Right Rear	186 kPa (27 PSI)	10 mm (13/32 in)	None
Right front	186 kPa (27 PSI)	10 mm (12/32 in)	None

The interior of the Jeep was configured with cloth surfaced five-passenger seating. The front bucket seats were separated by a center console and equipped with adjustable head restraints. Both front head restraints were in the full-down position. The second row was a 60/40 split bench seat with folding seat backs and adjustable head restraints for the outboard seating positions.

The interior occupant safety systems consisted of three-point lap and shoulder belts for the four outboard seating positions, a lap belt for the center rear position, and frontal air bags.

2003 Nissan Altima SL

The third vehicle in this crash was a 2003 Nissan Altima SL four-door sedan. The Altima was manufactured in March 2003 and was identified by the VIN: 1N4AL11E53C (production number deleted). The front-wheel drive Altima was powered by a 2.5-liter inline four-cylinder engine linked to a four-speed automatic transmission. The braking system consisted of power-assisted front and rear disc brakes with four-wheel anti-lock. The windshield was OEM AS-1 laminated. The side windows and backlight glazing were AS-2 tempered glass. The Nissan was equipped with Dunlop Signature tires on the front, a Hankook Radial H714 tire on the left rear, and a Bridgestone Turanza EL42 tire on the right rear. All tires were size P205/65R16, consistent with the manufacturer recommended tire size, and were mounted on six-spoke OEM alloy wheels. The manufacturer recommended cold tire pressure was 200 kPa (29 PSI) for the front and rear tires. The specific tire data at the time of the SCI inspection was as follows:

Position	Measured Tire Pressure	Measured Tread Depth	Tire/Wheel Damage
Left Front	186 kPa (27 PSI)	8 mm (10/32 in)	None
Left Rear	172 kPa (25 PSI)	3 mm (4/32 in)	None
Right Rear	186 kPa (27 PSI)	2 mm (3/32 in)	None
Right front	207 kPa (30 PSI)	8 mm (10/32 in)	None

The interior of the Nissan was configured with cloth surfaced five-passenger seating. The front bucket seats were separated by a center console and equipped with adjustable head restraints. The front left head restraint was adjusted 3 cm (1.2 in) above the full-down position. The front right head restraint was in the full-down position. The front left seat track was adjusted to the full-rear position. The second row bench seat was a 60/40 split with folding seat backs and integral head restraints for the outboard seating positions.

The interior occupant safety systems consisted of three-point lap and shoulder belts for the five designated positions, frontal air bags, and front seat back mounted side impact air bags.

2004 Ford Escape

The forth vehicle was a 2004 Ford Escape four-door SUV. The SUV was identified by the VIN: 1FMYU03124K (production number deleted). The front-wheel drive Escape was powered by a 3.0-liter V6 engine linked to a four-speed automatic transmission. The braking system consisted of power-assisted front and rear disc brakes with four-wheel anti-lock. The manufacturer recommended tire size was P235/70R16 with a recommended cold tire pressure of 207 kPa (30 PSI) for the front and rear tires. This vehicle was not available for inspection.

Crash Sequence

Pre-Crash

The restrained 35-year-old male driver of the Honda was traveling eastbound in the number two lane of the interstate roadway **(Figure 2)**. The Honda was traveling at a police estimated speed of 105 km/h (65 mph). Traffic ahead in the number two lane had come to a stop. According to the driver of the Altima, traffic in the number two lane had stopped due to vehicles merging left from the number one lane, an interchange on-ramp which ended a short distance ahead. The other vehicles were stopped in the following order, west to east: Jeep Grand Cherokee, Nissan Altima, and the Ford Escape. As the driver of the Accord approached the line of stopped vehicles, he detected the stopped vehicles in the traffic lanes and initiated a left steering input and a rapid brake application.

Figure 2: Accord's pre-crash trajectory

Crash

The front right of the Accord impacted the rear left of the Jeep. The direction of force for the Accord was within the 12 o'clock sector and within the 6 o'clock sector for the Jeep.

The Damage algorithm of the WINSMASH program calculated a delta V of 41 km/h (25.5 mph) for the Honda and 38 km/h (23.6 mph) for the Jeep.

The impact from the Honda displaced the Jeep forward and induced a clockwise rotation. As the Jeep continued forward and right, the vehicle rotated approximately 90 degrees within the roadway and tripped to the left. The Jeep rolled two-quarter turns, coming to rest on its roof. The distance between the trip point of the Jeep and its final rest was approximately 9 m (29.5 ft).

The Honda continued its forward and left trajectory within the number two lane of the interstate highway. The front right of the Honda impacted the rear left of the Nissan. The damage to the Honda was overlapped by the damage from the first impact. The damage to the Nissan was within the 6 o'clock sector. Due to the overlapping location of the damage to the Accord, the Missing Vehicle algorithm of the WINSMASH program was used to calculate a delta V of 11 km/h (6.8 mph) for the Honda and 14 km/h (8.7 mph) for the Nissan.

The Honda rotated clockwise and initiated a turn-over type rollover to the left. The Honda rolled two-quarter turns to the left, coming to rest on its roof. Based on the longitudinal scratching to the roof, the Honda slid an unknown distance before coming to final rest. Based on the PAR, the Honda traveled 37 m (122 ft) from the primary point of impact to final rest.

The rear left impact from the Honda displaced the Nissan forward and induced a clockwise rotation. As the Nissan traveled forward, the left front corner of the Nissan impacted the rear right corner of the Escape. This impact resulted in sideswipe damage to the front left corner and left side of the Altima. This damage was outside the scope of the WINSMASH program; therefore, a delta V was not calculated for this event.

This multiple impact sequence actuated the driver's safety belt pretensioner of the Honda, and deployed the driver's frontal air bag, both side impact air bags and both side curtain air bags. The front right passenger seat was not occupied at the time of the crash; therefore, the front right air bag was suppressed.

Post-Crash

Police, emergency medical and tow personnel responded to the crash site. The driver of the Honda exited the vehicle unassisted and walked to the side of the roadway. He sustained minor severity soft tissue injuries and was not medically treated. The driver and rear right passengers of the Jeep were police reported as having sustained moderate severity injuries. The front right and rear left passengers of the Jeep were police reported as having sustained minor injuries. All passengers of the Jeep Grand Cherokee were transported by ambulance to a regional trauma center. The drivers of the Nissan and the Ford were not injured.

The Honda, Jeep and Altima were towed from the scene due to disabling damage. The Escape was driven from the scene. The Honda and Nissan were stored at a police rotation tow facility until their transfer to a regional salvage facility for auction. The Jeep was stored at a police rotation tow facility where it was inspected.

Vehicle Damage

Exterior Damage

2008 Honda Accord

The exterior of the Honda sustained moderate severity damage to the front, left and top planes as a result of this multiple impact crash. The front plane sustained two impacts, both to the front right corner. The left side and top of the Accord sustained damage from the rollover event. A CDC and crush profile which combines the residual crush from the first two impacts was documented along the full frontal width of the front bumper beam. The Collision Deformation Classification (CDC) assigned to the frontal damage was 12-FZEW-1.

Figure 3: Overall view of the frontal damage

Figure 4: Front right view of the frontal damage

Both impacts occurred to the right aspect of the front plane. The direct damage measured 44 cm (17.3 in) and began 17 cm (6.7 in) right of the vehicle centerline, extending right. The maximum crush measured 17 cm (6.7 in) and was located at the right corner of the bumper beam. The crush profile was as follows: C1 = 1 cm (0.4 in), C2 = 2 cm (0.8 in), C3 = 6 cm (2.4 in), C4 = 9 cm (3.5 in), C5 = 10 cm (3.9 in), C6 = 17 cm (6.7 in). **Figures 3 and 4** depict the frontal damage sustained by the Honda.

The left and top planes sustained damage from the rollover event. The scratches on the roof were oriented in two directions, but due to the absence of rollover damage to the right plane, it is believed that the vertical scratching was a result of the rollover, and the longitudinal scratching was a result of the vehicle sliding to a stop after rolling onto its roof. The maximum vertical and lateral crush were at different locations. The maximum vertical crush was 11 cm (4.3 in) and was located on the roof 48 cm (18.9 in) left of the right roof side rail and 18 cm (7.1 in) forward of the backlight header. The top direct damage extended laterally from the right roof side rail to the left roof side rail a distance of 118 cm (46.5 in). The top direct damage extended longitudinally from the front edge of the hood rearward 372 cm (146.5 in) to the C-pillars. The maximum lateral crush was located at the junction of the left A-pillar and the windshield header and was 5 cm (2 in). The CDC assigned for the rollover event was 00-TYDO-3. **Figures 5 and 6** depict the rollover damage sustained by the Honda.

Figure 5: Rollover damage from front left

Figure 6: rollover damage from above, left rear

Exterior Damage

1996 Jeep Grand Cherokee

Figure 7: Rear damage from back left

The exterior of the Jeep sustained moderate severity damage to the back, left and top planes as a result of this multiple impact crash. The first impact occurred to the left aspect of the rear plane. The direct damage measured 64 cm (25.2 in) in width and began 12 cm (4.7 in) left of the vehicle centerline, extending left. The maximum crush measured 70 cm (27.6 in) and was located at C2, 42 cm (16.5 in) left of the vehicle centerline. The CDC assigned for this impact was 06-BYEW-4. A crush profile was documented along the full width of the rear bumper and was as follows: C1 = 64 cm (25.2 in), C2 = 70 cm (27.6 in), C3 = 50 cm (19.7 in), C4 = 34 cm (13.4 in), C5 = 23 cm (9.1 in), C6 = 0 cm. The CDC assigned for this impact was 06-BYEW-4. **Figure 7** depicts the rear plane damage to the Jeep.

The left and top planes sustained damage from the rollover event. The scratches on the roof were oriented in the same direction. The maximum vertical and lateral crush were at different locations. The maximum vertical crush measured 18 cm (7.1 in) and was located on the windshield header 30 cm (11.8 in) left of the right roof side rail. The top direct damage extended laterally from the right roof side rail to the left roof side rail a distance of 130 cm (51.2 in). The top direct damage extended longitudinally from the front edge of the hood rearward 254 cm (100 in) to a point between the B- and C-pillars. The maximum lateral crush was located at the junction of the right A-pillar and the windshield header which measured 4 cm (1.6 in) right of the left sideline formed by the window sill of the Jeep. The CDC assigned for the rollover event was 00-TYDO-3. **Figures 8 and 9** depict the rollover damage sustained by the Jeep.

Figure 8: Rollover damage from front

Figure 9: Rollover damage from above, right front

Exterior Damage

2003 Nissan Altima

The exterior of the Nissan sustained moderate severity damage to the rear left and the front left as a result of this multiple impact crash. The first impact occurred to the left aspect of the rear plane. The direct damage measured 53 cm (20.9 in) in width and began 20 cm (7.9 in) left of the vehicle centerline, extending left. The maximum crush measured 17 cm (6.7 in) and was located at C1, 73 cm (28.7 in) left of the vehicle centerline on the bumper. The CDC assigned for this impact was 06-BYEW-2. A crush profile was documented along the full width of the rear bumper. This crush profile was as follows: C1 = 17 cm (6.7 in), C2 = 6 cm (2.4 in) C3 = 7 cm (2.8 in), C4 = 6 cm (2.4 in), C5 = 4 cm (1.6”), C6 = 4 cm (1.6”). **Figure 10** depicts the rear end damage sustained by the Altima.

Figure 10: Back left view of the rear end damage.

The second impact occurred to the left aspect of the front plane. The direct damage measured 9 cm (3.5 in) in width and began 68 cm (26.8 in) left of the vehicle centerline, extending left. The maximum crush measured 1 cm (0.4 in) and was located at C1, 76 cm (29.9 in) left of the vehicle centerline on the bumper. The CDC assigned for this impact was 12-FLES-3 as the sideswipe damage traveled 64 cm (25.2 in) down the left front fender. A crush profile was documented along the full width of the front bumper. This crush profile was as follows: C1 = 1 cm (0.4in), C2 = 1 cm (0.4 in) C3 = 0 cm, C4 = 0 cm, C5 = 0 cm, C6 = 0 cm. **Figure 11** depicts the front end damage sustained by the Altima.

Figure 11: Front left view of the frontal damage.

Interior Damage

2008 Honda Accord

The Honda Accord sustained moderate severity interior damage that was attributed to occupant contact, occupant loading and passenger compartment intrusion. There was an abrasion on the left knee bolster attributed to the driver's right knee. This abrasion was located 10-18 cm (3.9-7.1 in) left of the center console and 1-12 cm (0.4-4.7 in) above the lower edge of the knee bolster. The windshield wiper control stalk on the right side of the steering column was fractured, attributed to the driver's right hand. There was a scuff on the parking brake handle attributed to the driver's upper right leg. This scuff was located 6-22 cm (2.4-8.7 in) rear of the front point of the parking brake handle. There was a scuff on the left side of the center console attributed to the driver's right hip. This scuff began at the upper left corner of the console and extended rearward 11 cm (4.3in) and down the left side 6 cm (2.4 in). There was a scuff on the sunroof shade attributed to the driver's head. This scuff was located 17-25 cm (6.7-9.8 in) right of the left edge of the sunroof shade, and 11-23 cm (4.3-9.1 in) rear of the front edge of the sunroof shade. There was a scuff on the roof also attributed to the driver's head. This scuff was located 14-22 cm (5.5-8.7 in) right of the left roof side rail and 21-38 cm (8.3-15 in) aft of the windshield header.

The intrusions to the Honda are listed on the following table:

Position	Component	Direction	Magnitude
Row 1 Left	Windshield header	Vertical	2 cm (0.8 in)
Row 1 Center	Windshield header	Vertical	5 cm (2 in)
Row 1 Right	Windshield header	Vertical	2 cm (0.8 in)
Row 1 Left	Windshield	Longitudinal	6 cm (2.4 in)
Row 1 Center	Windshield	Longitudinal	23 cm (9.1 in)
Row 1 Right	Windshield	Longitudinal	10 cm (3.9 in)
Row 1 Right	Toe pan	Longitudinal	11 cm (4.3 in)
Row 1 Left	Roof side rail	Lateral	5 cm (2 in)
Row 1 Right	Roof side rail	Lateral	3 cm (1.2 in)
Row 2 Left	Roof side rail	Lateral	3 cm (1.2 in)
Row 2 Right	Roof side rail	Lateral	3 cm (1.2 in)
Row 1 Left	B-pillar	Lateral	5 cm (2 in)
Row 1 Right	B-pillar	Lateral	4 cm (1.6 in)
Row 1 Left	Roof	Vertical	4 cm (1.6 in)
Row 1 Center	Roof	Vertical	10 cm (3.9 in)
Row 1 Right	Roof	Vertical	7 cm (2.8 in)
Row 2 Left	Roof	Vertical	7 cm (2.8 in)
Row 2 Center	Roof	Vertical	10 cm (3.9 in)
Row 2 Right	Roof	Vertical	5 cm (2 in)
Row 2 Left	Backlight header	Vertical	6 cm (2.4 in)
Row 2 Center	Backlight header	Vertical	11 cm (4.3 in)
Row 2 Right	Backlight header	Vertical	9 cm (3.5 in)

Manual Restraint Systems

2008 Honda Accord

The manual restraint systems in the Honda Accord consisted of three-point lap and shoulder belts in all five seating positions. The driver's restraint utilized a continuous loop of webbing, and Emergency Locking Retractor (ELR), a sliding latch plate and a height

adjustable D-ring in the full-down position. This restraint utilized a retractor pretensioner which actuated during the crash. Additionally, the front left belt was locked in the used position by the actuation of the retractor pretensioner. The total length of spooled out webbing was 215 cm (84.6 in). The webbing was jammed in the latch plate, located 98 cm (38.6 in) above the floor anchor. There were two contacts on the belt webbing. A 15 cm (5.9 in) frictional abrasion attributed to the latch plate D-ring located 92-107 cm (36.2-42.1 in) above the floor anchor, and a 6 cm (2.4 in) frictional abrasion attributed to the B-pillar D-ring, located 215-221 cm (84.6-87 in) above the floor anchor. Based on the observations made during the SCI inspection, the driver was restrained at the time of the crash.

The front right and all second row safety belt systems consisted of three-point lap and shoulder belts in all four positions. These restraints utilized a continuous loop of webbing, a switchable ELR/Automatic Locking Retractor (ALR), a sliding latch plate and a fixed height D-ring in the rear row. In addition, the front right restraint system contained a retractor pretensioner which did not actuate in this crash and a height adjustable D-ring in the full-down position. The webbing of the front right belt was 260 cm (102.4 in) fully extended. The second row outboard belts were 238 cm (93.7 in) fully extended and the second row center belt was 260 cm (102.4 in) fully extended.

Frontal Air Bag System
2008 Honda Accord

The Honda Accord was equipped with a CAC frontal air bag system that consisted of dual stage driver and front right passenger air bags, seat track positioning sensors, a front right occupant presence sensor, retractor pretensioners, and safety belt buckle switches.


Figure 12: Deployed driver's frontal air bag

The driver's air bag was concealed within the center hub of a three-spoke steering wheel by three asymmetrical cover flaps. The upper flap was 13 cm (5.1 in) in width at the horizontal tear seam and 8 cm (3.1 in) in height. The 2 lower flaps dimensions were mirrored symmetrically, the upper aspects measuring 7 cm (2.8 in) in width at the horizontal tear seam, the outboard sides measuring 7 cm (2.8 in) in height vertically and the lower aspects measuring 6.5 cm (2.6 in) horizontally. There was a Honda medallion in the center of the flaps that attached to the top cover flap and was 5 cm (2 in) in width and extended 2 cm (0.8 in) into the lower cover flaps. The air bag (**Figure 12**) measured 64 cm (25.2 in) in diameter in its deflated state. The air bag was vented by two vent ports located at the eleven and one o'clock positions. The air bag was tethered by two internal tethers located at the nine and three o'clock positions on a 9 cm (3.5 in) diameter circular seam sewn to the center face of the air bag. There were no occupant contacts to the driver's frontal air bag. The driver's air bag was identified with the stenciled number UEUS1V143.

The front right air bag was mounted within the top aspect of the right instrument panel. The front right seat was not occupied during the crash; therefore, the CAC system suppressed the deployment of the air bag, as designed.

Side Impact Air Bag System
2008 Honda Accord

The Honda was equipped with front seat back mounted side impact air bags and roof side rail mounted curtain air bags. Both side impact air bags and both inflatable curtain air bags deployed during this crash.

The side air bags deployed from the upper outboard aspect of the front seat backs. The air bags measured 57 cm (22.4 in) in height and 28 cm (11 in) in width. The air bag had one vent port on the outboard aspect at the one o'clock position. The side air bag deployed from a 44 cm (17.3 in) by 18 cm (7.1 in) panel at the front outboard edge of the seat back. The side air bags were free from occupant contact points and damage.

The left and right side curtain air bags deployed from their respective roof side rails (**Figures 13 and 14**). The air bag measured 202 cm (79.5 in) in length. The air bag measured 41 cm (16.1 in) in height at the front seating positions. In the rear seating position, the air bag measured 40 cm (15.7 in) in height. Vertically, the air bag extended below the belt line at each outboard position. The curtain air bags provided head protection from the roof side rail to the belt line and from the C-pillar to the A-pillar. The curtain air bags were free from occupant contact points and damage.

The left curtain air bag was stenciled with the identification number 2420364 0504081612 090408GL31. The right curtain air bag was stenciled with the identification number 2420364 0504081609 100408GL22.

Figure 13: Left curtain air bag.

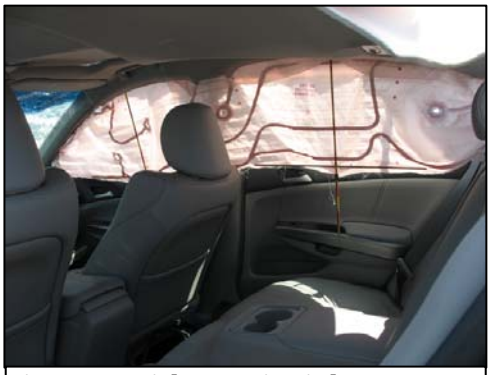


Figure 14: Right curtain air bag.

Occupant Demographics/Data
2008 Honda Accord

Driver Age/Sex:	35-year-old/Male
Height:	170 cm (67 in)
Weight:	68 kg (150 lb)
Eyewear:	None
Seat Track Position:	Full-rear
Manual Safety Belt Use:	Lap and shoulder belt
Usage Source:	Vehicle Inspection
Egress from Vehicle:	Exited without assistance
Mode of Transport from Scene:	Not medically transported
Type of Medical Treatment:	No treatment

Driver Injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Source
Left neck abrasion	Minor (390202.1,2)	Safety belt webbing
Left hand contusion	Minor (790402.1,2)	Left front window

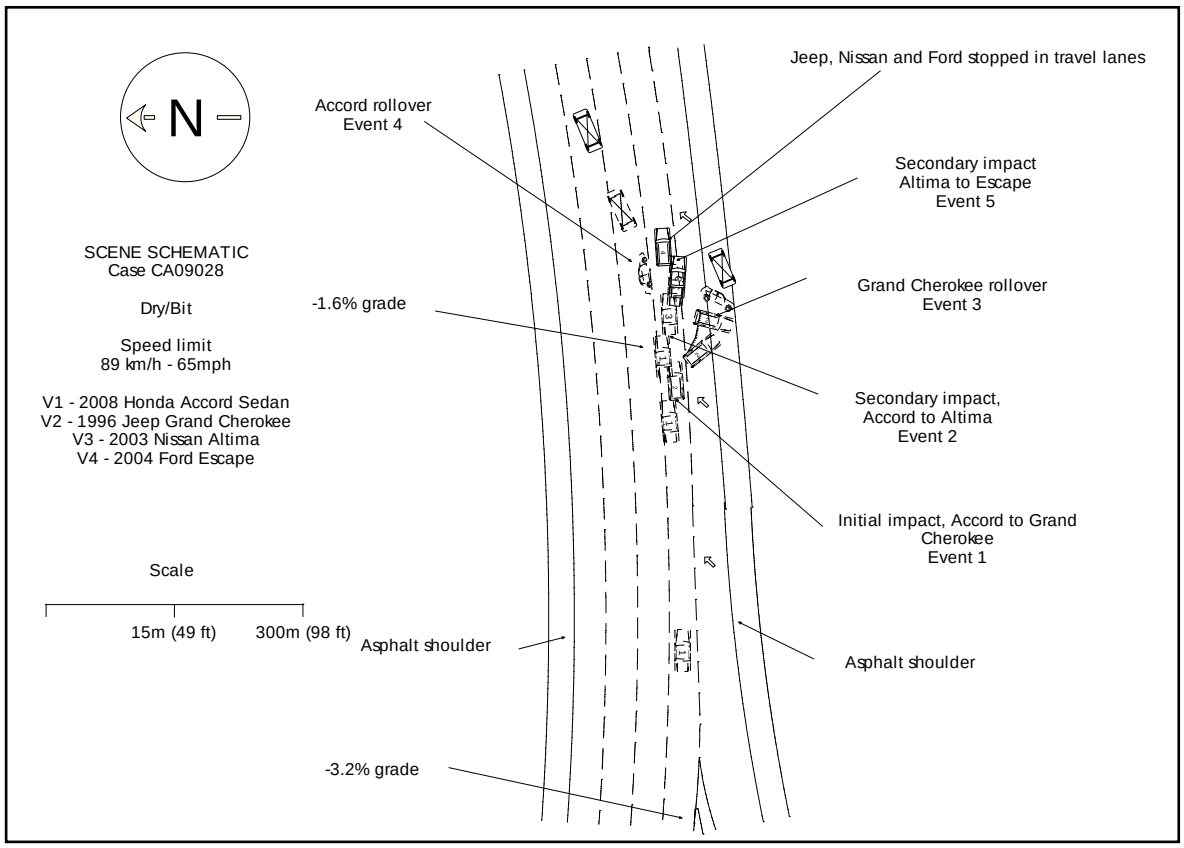
Source = Driver interview

Driver Kinematics

The 35-year-old male driver was seated in a full-rear track position and was restrained by the manual three-point lap and shoulder belt system. The frontal impact actuated the driver's retractor pretensioner and deployed the driver's frontal air bag. In response to the frontal impact force, the driver initiated a forward trajectory and loaded the safety belt system. During his forward trajectory, the driver's right knee contacted the left knee bolster. As the driver's air bag deployed and expanded against his left forearm, his left hand was displaced from the steering wheel rim and contacted the left front window, resulting in the left hand contusion. His right hand traveled forward and fractured the wiper control arm on the right side of the steering column.

As the Honda impacted the Nissan and began to roll to the left, the driver initiated a left trajectory within the front left seating position. As the rollover continued, the driver initiated an upward and right trajectory. The driver loaded the belt system and his head contacted the roof and sunroof cover. He also loaded the center console and parking brake lever. The driver exited the vehicle without assistance and did not seek medical treatment.

This multiple impact sequence actuated the driver's safety belt pretensioner of the Honda, and deployed the driver's frontal air bag, both side impact air bags and both side curtain air bags. The combination of safety belt use and the deployment of the multiple air bags prevented the driver from possible ejection and potential serious injury.



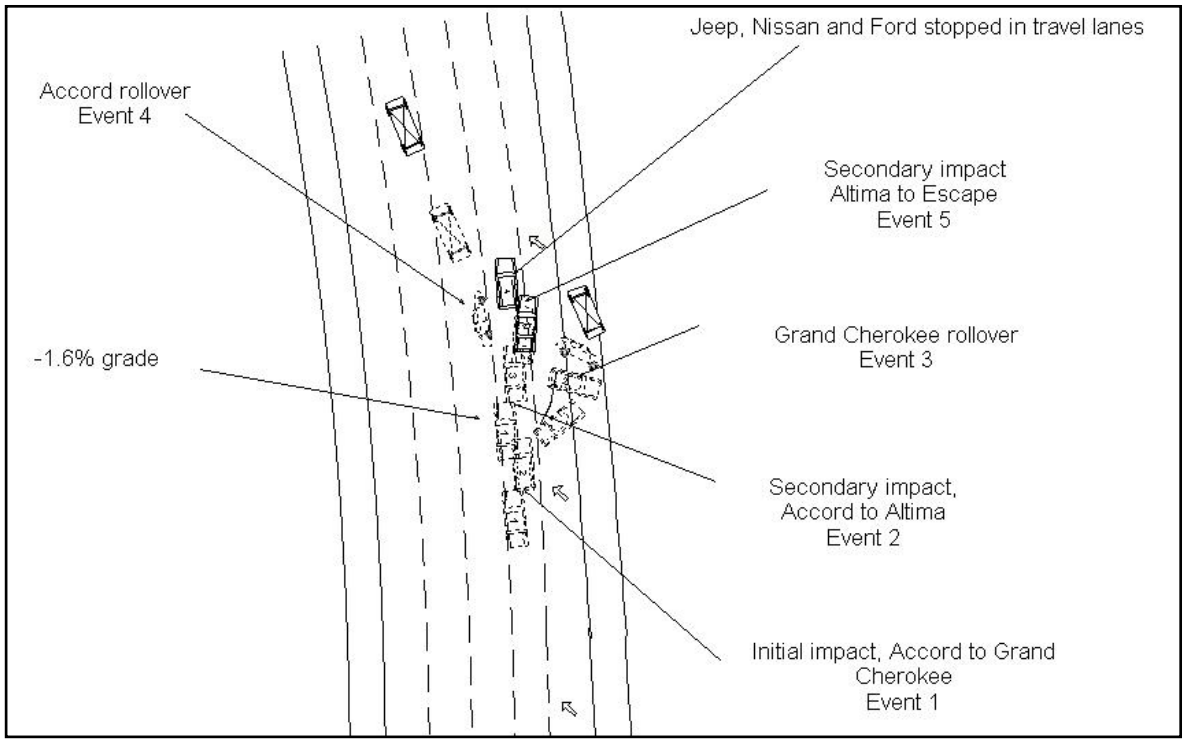


Figure 15: Crash Schematic