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# Special Crash Investigations: Child Restraint System Crash Investigation; Vehicle: 2006 Honda CR-V; Location: Oregon; Crash Date: December 2017

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**15. Supplementary Notes**

Each crash represents a unique sequence of events, and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team on the date this report was submitted.


**16. Abstract**

This report documents the on-site investigation of the child restraint systems (CRSs) used by two occupants of a 2006 Honda CR-V involved in a crash with another vehicle, and the disparate injuries sustained by the occupants of the Honda. The crash occurred during the afternoon in December 2017 on an undivided highway in the state of Oregon. The Honda was traveling westbound driven by a belted 27-year-old female and occupied by a belted 28-year-old male in the front right seat position, a 7-year-old male in the second-row left seat position and a 15-month-old female in the second-row right seat position. The second-row left occupant was belted using a backless booster seat (BSS) and the second-row right occupant was using a CRS with a 5-point harness system. The other vehicle was a 2006 Dodge Ram traveling eastbound driven by a 35-year-old male. The Dodge crossed over the center line and struck the left plane of the Honda. The Honda departed the roadway, overturned on the roadside and, following a four quarter-turn rollover, came to rest in an upright orientation on the roadside. The 7-year-old male occupant of the Honda sustained "K" (fatal) injuries, and he was declared deceased on scene. The driver and front-right occupant sustained "B" (non-incapacitating) injuries, and the second-row right occupant was not injured. The surviving occupants were transported by ambulance to a local hospital where they were treated and released. The occupants of the Dodge were not injured.


| 17. Key Words | 18. Distribution Statement |
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| child restraint system, CRS, backless booster seat, BSS, air bag, deployment, injury, fatality, rollover | Document is available to the public from the National Technical Information Service, www.ntis.gov. |

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# Table of Contents

**Special Crash Investigations**
**Child Restraint System Crash Investigation**
**Case Number: DS18001**
**Vehicle: 2006 Honda CR-V**
**Location: Oregon**
**Crash Date: December 2017**

## BACKGROUND

**Figure 1**. The 2006 Honda CR-V.

This report documents the on-site investigation of the child restraint systems (CRSs) used by two occupants of a 2006 Honda CR-V (**Figure 1**) involved in a crash with another vehicle, and the disparate injuries sustained by the occupants of the Honda. A 7-year-old male seated in a backless booster seat (BSS) sustained fatal injuries, the driver and front right occupant sustained minor to moderate severity injuries, and a 15-month-old female restrained in a forward-facing CRS was not injured. The investigation examined the role CRS usage played in occupant kinematics and injury mitigation. The investigation was initiated by the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration in January 2018. The SCI team contacted the investigating police agency, which allowed inspections of both involved vehicles and the CRSs at its evidence facilities in January 2018. An exterior inspection was completed on the Dodge with police officers present. The Dodge was supported by the Bosch Crash Data Retrieval (CDR) system, and since the police investigation was ongoing, access to the interior of the vehicle as well as electronic data collection was not allowed. The police later imaged the EDR and stated in the report that it contained no data, most likely because the vehicle's supplemental restraints system (SRS) did not deploy any air bags. The Honda was not a CDR-supported vehicle and no crash data was obtained.

The crash occurred during the afternoon in December 2017 on an undivided highway in Oregon. The Honda was traveling westbound at a police-estimated speed of 72-80 km/h (45-50 mph). It was driven by a 27-year-old female and occupied by a 28-year-old male in the front right seat position, a 7-year-old male in the second-row left seat position, and a 15-month-old female in the second-row right seat position. The front-row occupants were belted, the second-row left occupant was belted in combination with a BSS, and the second-row right occupant was using a forward-facing CRS with a 5-point harness system. The Dodge was traveling eastbound at a speed deemed by the police as being too fast for conditions. It was driven by a belted 35-year-old male and was occupied by a belted 30-year-old female in the front-right seat position. Conditions were daylight, and the roads were wet from snow melt with snow berms along the roadside. The Dodge crossed over the center line, entering the westbound lane, where the front plane of the Dodge struck the left plane of the Honda. The Honda departed the roadway, rolled four quarter-turns on the roadside, and came to rest in an upright orientation. The Dodge came to rest on the north edge of the roadway.

The 7-year-old male occupant of the Honda sustained police-reported "K" (fatal) injuries and was declared deceased on-scene. The driver and front-right occupant sustained "B" (non-incapacitating) injuries, and the second-row right occupant was not injured. The surviving occupants of the Honda were transported by ambulance to a local hospital where they were treated and released. The occupants of the Dodge were not injured. The Honda was towed to a local lot and placed on police hold. The Dodge was towed to a police facility and placed into evidence.

## SUMMARY

### *Crash Site*

The crash occurred on an east/west, three-lane State highway in rural Oregon (**Figure 2**). The roadway was paved with asphalt in fair condition. The roadway was configured with one westbound and two eastbound lanes each measuring 3.7 m (12.0 ft) in width. The westbound lane was bordered by a double solid yellow painted stripe on the left, and a solid white painted fog line on the right. The eastbound lanes were separated by a dashed white painted stripe and bordered by a double solid yellow painted stripe on the left, and a solid white painted fog line on the right. On the south side a metal and wood guardrail followed the curvature of the roadway. Traveling westbound, the roadway curved right in a radius measuring 402.5 m (1,320.5 ft) at the north fog line. At the area of impact, the roadway slope measured -0.9 percent traveling west and the superelevation measured -5.5 percent.

**Figure 2**. The crash site looking west.

Conditions at the time of the crash were daylight and clear. The roadway was wet from snow melt and sand had been deposited on the roadway by the highway department to improve traction. Local weather services reported a temperature of 9.39 degrees C (48.9 degrees F), 80 percent humidity, 6.2 km (10.0 mi) visibility, and winds north at 14.8 km/h (9.2 mph). The posted speed limit for this highway was 89 km/h (55 mph).

### *Pre-Crash*

The Honda was traveling westbound while the driver was negotiating a right curve on wet asphalt. The Dodge was traveling eastbound at a speed deemed by the police as too fast for conditions while the driver was negotiating a left curve on wet pavement. The driver of the Dodge lost control as the vehicle initiated a counter-clockwise yaw, crossing over the center line and entering the westbound lane. Police documentation of evidence suggested the driver of the Honda likely observed the other vehicle and steered right in an avoidance maneuver.

### *Crash*

The crash included two events. Event 1 was a vehicle-to-vehicle impact and Event 2 was a rollover involving the Honda. Initially, the front plane of the Dodge struck the left plane of the Honda, causing an elongated direct contact down the left side. Following the impact and disengagement, both vehicles rotated counterclockwise. The Honda departed the roadway on the

north edge where the vehicle's right side tires contacted the ground and snow berm, causing a right-side-leading trip rollover. It rolled four quarter-turns along its longitudinal axis and came to rest in an upright orientation on the roadside facing south. The Dodge came to rest at the north edge of the roadway facing west. A crash diagram is included at the end of this report.

For the Honda in Event 1, the standard algorithm of the WinSMASH program calculated a total delta V of 14 km/h (9 mph), a longitudinal delta V of -14 km/h (-9 mph), a lateral delta V of 3 km/h (2 mph), and a barrier equivalent speed (BES) of 18 km/h (11 mph). The reconstruction fit the model and was considered to be reasonable.

For the Dodge in Event 1, WinSMASH calculated a total delta V of 11 km/h (7 mph), a longitudinal delta V of -7 km/h (-4 mph), a lateral delta V of -9 km/h (-6 mph) and a BES of 9 km/h (6 mph). The reconstruction was considered to be reasonable.

***Post-Crash***

Following the crash, the 7-year-old male occupant of the Honda remained in the vehicle and was declared deceased on scene. The front-row occupants exited the vehicle unassisted, presumably through the right-front door since the left-front door was jammed shut. The 15-month-old female occupant was likely removed from the vehicle through the right-rear door but it was undetermined by whom. The EMS report stated that, upon their arrival, the child was out of the vehicle and being held by her mother in another vehicle. At some point, her CRS LATCH straps were cut, the CRS was removed, and the vehicle's seat belt for that seat position was cut. Following the arrival of emergency responders, the three surviving occupants of the Honda were transported by ambulance to a local hospital where they were treated and released. The 7-year-old boy was taken by the coroner and an external examination was performed. The occupants of the Dodge were not injured and refused aid and transport. Both vehicles were towed due to damage and the Dodge was placed into evidence by the police.

**2006 HONDA CR-V**

***Description***

The 2006 Honda CR-V was identified by the Vehicle Identification Number (VIN) JHLRD77876Cxxxxxx. The date of manufacture was February 2006 and the mileage at the time of the crash was unknown. The Honda was a 4-door sport utility vehicle (SUV) with a hatchback configured with a 4-cylinder, 2.4-liter gasoline engine, automatic transmission, all-wheel drive, tilt steering column functionality, antilock brakes, and power moon roof.

The vehicle manufacturer's recommended tire size was P215/65R16 with a cold tire pressure of 200 kPa (29 psi) for the front and rear. The vehicle was equipped with Bridgestone Dueler tires of the recommended sizes manufactured in July 2015. The left rear wheel and tire were displaced from the vehicle during the crash. The tire was cut on the sidewall and de-beaded. The Honda's interior was equipped with two rows of seating for five occupants. The front row was configured with two bucket seats with adjustable head restraints. Both front row seats tracks were adjusted to the middle position. The second row was configured with 60/40 split bench seat with folding backs and adjustable head restraints.

***Exterior Damage***

The crash included one vehicle-to-vehicle impact causing direct damage to the left plane. Direct damage began at the front left bumper corner extending 385 cm (151.6 in) rearward and ending at the left rear bumper corner. The Field L was distributed over the same distance. Thirty-three measurements were taken at mid-door level (**Figure 3**) by the Nikon Total Station and the Faro Blitz program computed six crush measurements as follows: $C_1$ = 4 cm (1.6 in), $C_2$ = 16 cm (6.3 in), $C_3$ = 2 cm (0.8 in), $C_4$ = 10 cm (3.9 in), $C_5$ = 0 cm, and $C_6$ = 0 cm. The estimated Principal Direction of Force (PDOF) was 350 degrees, and the Collision Deformation Classification (CDC) for the Honda in Event 1 was 12LDAW2.

**Figure 3**. Left plane damage, the 2006 Honda CR-V.

This crash involved two vehicles having mismatched heights. The Dodge had a front bumper height of 63 cm (24.8 in) and beltline height of 130 cm (51.1 in). The Honda had a bumper height of 49 cm (19.3 in) and a beltline height of 90 cm (35.4 in). Direct damage to the front plane of the Dodge extended vertically from the bumper to the forward aspect of the hood. Corresponding damage to the Honda's left plane extended vertically from the sill to above the beltline and induced damage extended vertically to the upper left C-pillar (**Figure 4**).

**Figure 4**. Vertical damage measurement, the 2006 Honda CR-V.

The Honda sustained minor damage during the rollover. Direct damage to the top plane was distributed from roof side rail to roof side rail, and from the leading edge of the hood to the backlight header. Maximum vertical crush was located on the forward aspect of the left roof and measured 5 cm (2.0 in). There was no lateral crush. The CDC for Event 2 was 00TDDO2.

***Interior Damage***

The Honda's interior revealed damage from impact forces, deployed air bags, actuated seat belt pretensioners, occupant contacts, integrity loss, and post-crash activities. Both front-row seat belt pretensioners actuated and three air bags deployed. Occupant contacts were documented on the two front-row seat belts, the deployed left IC air bag, second-row left window frame. Both left side doors were jammed shut and later sprung open during post-crash activities. The windshield was fractured and in place, and the left side, backlight and right front window glazing was disintegrated. The left and right IC air bags were cut and the second-row center and right position seat belts were cut during post-crash activities.

In this crash the front grille and hood of the Dodge likely overrode the left side door beams and bottom window frames of the Honda, more so on the second-row door than on the first row. The

hood height of the Dodge measured 130 cm (51.2 in) and the beltline height of the Honda measured 112 cm (44.1 in). Damage caused by this impact in the area of the second-row left seat position included a door jammed shut, lateral intrusion of the door panel, window frame and C-pillar (post-crash damage precluded measurement). The 7-year-old seated in the position sustained injuries caused by contact with the other vehicle and possible contact with left side components, such as the glazing, window frame, door panel, and deployed IC air bag.

***Manual Restraint Systems***

The Honda's interior was equipped with forward seating for five occupants and all seats were configured with three-point lap and shoulder seat belts. The front row belts were equipped with retractor pretensioners, sliding latch plates and adjustable D-rings. Both belt latch plates revealed scratch marks caused by historical usage. All four occupants of the Honda were belted or using CRSs at the time of the crash. The front row occupants were restrained by the vehicle's lap and shoulder seat belts. The second-row left occupant was restrained by the vehicle's lap and shoulder seat belt in combination with a booster CRS. The second-row right occupant was restrained using the vehicle's lap and shoulder seat belt in combination with a CRS and Lower Anchors and Tethers for CHildren (LATCH).

The driver's belt was configured with an emergency locking retractor (ELR) and the D-ring was adjusted to the full-up position. The retractor pretensioner was locked and the belt unspooled in the used position. Evidence of occupant loading in the form stretch marks was present where it engaged the D-ring.

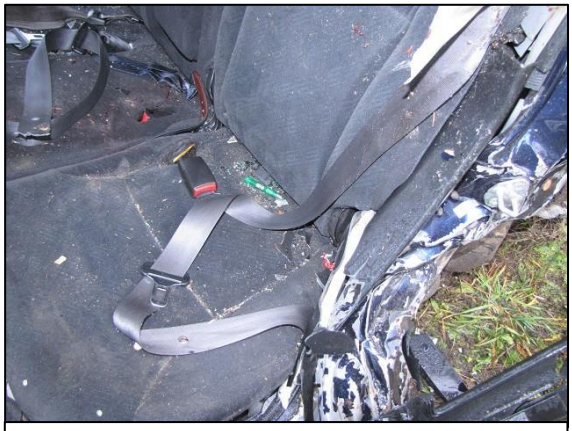


**Figure 5**. Seat belt, second-row left seat position, the 2006 Honda CR-V.

The front passenger's belt was configured with a switchable ELR/automatic locking retractor (ALR) and the D-ring was adjusted to the full-up position. The retractor pretensioner was locked and the belt unspooled in the used position. Evidence of occupant loading in the form stretch marks was present where it engaged the D-ring. The second- row left occupant's seat belt was configured with a switchable ELR/ALR retractor. The belt was unspooled in the used position (**Figure 5**). Intrusion of the left C-pillar prevented the belt from retracting by holding it against the left seat back. The belt and latch plate exhibited evidence of historical usage. The belt revealed blood deposits as evidence of usage. CRS usage is covered in greater detail in the CRS discussion of this report.

**Figure 6**. Seat belt and LATCH, second-row right seat position, the 2006 Honda CR-V.

The second-row right occupant's seat belt was configured with a switchable ELR/ALR retractor. The belt was cut through in two areas by

responders during post-crash activities. A cut section of belt remained threaded through the latch plate that was still inserted into the buckle. This seat position was configured with LATCH. The lower anchor connector from a CRS was inserted in the left LATCH lower anchor and a tether strap was inserted in the right anchor (**Figure 6**). CRS and LATCH usage are discussed in greater detail in the CRS discussion of this report.

The second-row center seat belt latch plate was configured with a retractor located on the middle roof header and a detachable anchor consisting of a small latch plate and buckle. The vehicle owner's manual stated the anchor assembly should be latched during times when the seat back is upright and it was latched in that way at the time of the crash. The belt webbing for this position was cut in two places during post-crash activities.

***Supplemental Restraint Systems***

The Honda's SRS included six air bags in the following configuration: frontal dual-stage air bags for the driver and front passenger, seat- mounted side impact air bags for the front row outboard seat positions, and combination side impact/rollover-sensing IC air bags for the front and second row outboard seat positions. Three air bags deployed during the crash.

The left seat-mounted side air bag likely deployed at impact with the other vehicle. This air bag deployed from the driver's seat back and measured 36 cm (14.2 in) in width and 24 cm (9.5 in) in height and was rectangular shaped with rounded corners. It was configured with two vent ports at the leading edge. The air bag appeared to have deployed normally and was unremarkable.

The left IC air bag deployed from the roof side rail above the front and second row seats. It likely deployed at impact with the other vehicle. The air bag measured 146 cm (57.5 in) in width and 46 cm (18.1 in) in length and was configured with tethers attached to the A-pillar and roof side rail aft of the C-pillar. Sections of the air bag were cut away from the forward and rearward aspects during post-crash activities. The section cut away from the forward aspect was examined and revealed no other damage or contact evidence. The section of IC air bag still in place over the second row exhibited blood splatter deposited by the second row left occupant. This occupant space sustained integrity loss of the side glass and was reduced by lateral intrusion of multiple components. The occupant likely contacted this air bag during the crash.

The right IC air bag deployed from the roof side rail above the front and second rows. It likely deployed during the rollover. It was sized and configured identically to the left IC air bag. The forward section of this air bag was cut away during post-crash activities and the rearward portion remained in place. The rearward aspect exhibited blood splatter and was otherwise unremarkable.

***Child Restraint Systems***

*Graco TurboBooster Backless Booster Seat (BSS):* The 7-year-old male occupant was restrained in a Graco TurboBooster BSS (**Figure 7**) used in combination with the vehicle's lap and shoulder seat belt. The BSS was placed forward-facing on the seat cushion in the second row left seat position. The model

number was 1828756 and the date of manufacture was May 10, 2013. The history of this BSS booster seat was unknown. The Graco was intended to be used as a belt-positioning booster seat. It was configured with a removable padded seat cushion, dual adjustable armrests with removable padded cushions, and dual retractable cup holders. The labeling on the seat said the following parameters should be met when using it without a back support.

- Age: approximately 4 - 10 years old
- Weight: 18 - 45 kg (40 - 100 lbs)
- Height: 101 - 145 cm (40 - 57 in)
- Ears are below the top of the vehicle's seat back or headrest

**Figure 7**. Graco TurboBooster CRS, the 2006 Honda CR-V.

The occupant using the BSS booster seat met the age, weight, and height requirements. The vehicle's second-row seat position was configured with an adjustable head restraint that was in place and set in the lowest position at the time of the inspection. The seat cushion revealed body fluid deposits. The seating area of the shell was not damaged. The shell was fractured where the right armrest was inserted into it and the right armrest was deformed outward at a 45-degree angle. This damage was likely caused at impact of the other vehicle when the occupant was displaced to the right loading the armrest.

**Figure 8**. Graco Nautilus CRS, the 2006 Honda CR-V.

*Graco Nautilus CRS:* The 15-month-old female occupant was restrained in a Graco Nautilus CRS. The Graco was a 3-in-1 combination safety seat. It was placed forward-facing on the seat cushion in the second-row right seat position. The model number was 1829467 and the date of manufacture was September 3, 2012. The history of this CRS was unknown.

The Graco (**Figure 8**) was configured with a removable back support, removable padded seat cushion, headrest height adjustment, 5-point harness system, recline adjustment, armrests, cup holder, shoulder belt guide, vehicle belt guide and LATCH. The CRS user manual states all the following parameters should be met when using it with the back support and harness system.

- Age: at least 1-year old and can sit upright unassisted
- Weight: 9.0 - 29.5 kg (20 - 65 lbs)
- Height: 69 - 132 cm (27 - 52 in)
- Shoulders are below the top harness slots

The occupant using the CRS met the age requirement. It is not known if she met the height and weight requirements.

This CRS appeared to have been installed using the LATCH system and possibly in combination with the vehicle's lap and shoulder seat belt. At the time of the inspection, the lower left anchor strap was attached to the left LATCH anchor and the upper tether strap was attached to the right LATCH anchor. The seat belt for this seat position was buckled and the webbing was cut in two places. The CRS user manual states that either LATCH anchors or a lap and shoulder seat belt can be used for installation. The upper tether anchors in the Honda are located on the roof header in the cargo area behind the second row. Given the placement of the LATCH components and the buckled status of the seat belt, it was determined that the CRS was installed using both systems.

The headrest was adjusted to the lowest position. The harness system was intact and appeared to be unremarkable. The seat cushion, shell, and other components revealed body fluid deposits. The shell was not damaged. The LATCH straps had been cut from the CRS by responders during post-crash activities. The harness system remained in place and appeared unremarkable. A NHTSA recall for Graco safety seats included this CRS. An online news article stated the voluntary recall affects harness buckles used on all Graco toddler convertible car seats and harnessed booster seats manufactured from 2009 to July 2013. At issue was the red release button in the center of the harness, which NHTSA said can become difficult to unlatch, or can become stuck. That can make it difficult or impossible to remove the child quickly in an emergency. Graco explained that it found that food and dried liquids can make some harness buckles progressively more difficult to open over time or become stuck in the latched position. It is unknown whether this harness buckle had been replaced in response to the recall.

***NHTSA Recalls and Investigations***

A query using the Honda's VIN revealed one unrepaired safety recall associated with this vehicle as of January 2020. Honda is conducting this recall because it has been determined that a defect may exist in the driver's front-air-bag inflator. It was unknown if the owner was notified or if action was taken in response to the recall, as described below.

| NHTSA Campaign No. | Manufacturer Recall No. | Recall Date | Components |
|---|---|---|---|
| 15V-320 | JR1 | 05/27/2015 | Air Bag |

**2006 HONDA CR-V OCCUPANTS**

***Driver Demographics***

| | |
|---|---|
| Age/sex: | 27 years/female |
| Height: | Unknown |
| Weight: | Unknown |
| Eyewear: | Unknown |
| Seat type: | Bucket seat with adjustable head restraint |
| Seat track position: | Unknown |
| Manual restraint usage: | Lap and shoulder seat belt used |
| Usage source: | Vehicle inspection |
| Air bags: | IC and seat-mounted side air bags deployed, frontal air bag not deployed |
| Alcohol/drug data: | None |

| | |
|---|---|
| Egress from vehicle: | Exited under own power |
| Transport from scene: | Ambulance to hospital |
| Type of medical treatment: | Treated and released |

***Driver Injuries***

| Injury No. | Injury | Injury Severity AIS 2015 | Involved Physical Component (IPC) | IPC Confidence Level |
|---|---|---|---|---|
| 1 | Nondisplaced transverse | 650620.1 | Shoulder portion | Possible |
| 2 | Process fractures, L2-L3 | 650620.1 | Seat belt | |

*Source: medical records.*

***Driver Kinematics***

The belted 27-year-old female driver of the Honda was seated in an unknown posture and was negotiating a right curve. At impact with the other vehicle, she was displaced forward and left in response to the direction of force. The left IC air bag deployed and the driver's seat belt pretensioner actuated. The driver was held in her seated position by the restraints. The Honda initiated a counterclockwise rotation and the driver was displaced to the right in response to the rotational forces. The vehicle rolled four quarter-turns to the right and came to rest on the roadside. The driver remained in her seated position throughout the crash. During the crash she sustained nondisplaced transverse process fractures of the lumbar vertebrae. Following the crash, the driver exited the vehicle under her own power through a side door. She was transported to a local hospital where she was treated and released.

***Front-Row Right Occupant Demographics***

| | |
|---|---|
| Age/sex: | 28 years/male |
| Height: | Unknown |
| Weight: | Unknown |
| Eyewear: | Unknown |
| Seat type: | Bucket seat with adjustable head restraint |
| Seat track position: | Unknown |
| Manual restraint usage: | Lap and shoulder seat belt used |
| Usage source: | Vehicle inspection |
| Air bags: | IC air bag deployed, frontal and seat-mounted side impact air bag not deployed |
| Egress from vehicle: | Exited under own power |
| Transport from scene: | Ambulance to hospital |
| Type of medical treatment: | Treated and released |

***Front-Row Right Occupant Injuries***

| Injury No. | Injury | Injury Severity AIS 2015 | Involved Physical Component (IPC) | IPC Confidence Level |
|---|---|---|---|---|
| 1 | Fracture, closed, left radius | 752311.2 | Unknown | Unknown |

*Source: medical records.*

***Front-Row Right Occupant Kinematics***

The belted 28-year-old male front row right occupant of the Honda was seated in an unknown posture. At impact with the other vehicle, he was displaced forward and left in response to the direction of force. The occupant was held in his seated position by the restraints. The Honda initiated a counterclockwise rotation and he was displaced to the right in response to the rotational forces. During the rollover the occupant's IC air bag deployed and his seat belt pretensioner actuated. He was held in his seated position throughout the crash by the lap and shoulder seat belt. He sustained a closed fracture to the left distal radius caused by an unknown source. Following the crash, he exited the vehicle under his own power through a side door. He was transported to a local hospital where he was treated and released.

***Second-Row Left Occupant Demographics***

| | |
|---|---|
| Age/sex: | 7 years/male |
| Height: | 129 cm (51 in) |
| Weight: | 18 kg (40 lb) |
| Eyewear: | None |
| Seat type: | Split bench seat with folding backs and adjustable head restraint |
| Seat track position: | Not adjustable |
| Manual restraint usage: | Lap and shoulder seat belt used with CRS |
| Usage source: | Vehicle inspection |
| Air bags: | IC air bag deployed |
| Egress from vehicle: | Occupant fatal before being removed from vehicle |
| Transport from scene: | Not transported |
| Type of medical treatment: | None |

***Second-Row Left Occupant Injuries***

| Injury No. | Injury | Injury Severity AIS 2015 | Involved Physical Component (IPC) | IPC Confidence Level |
|---|---|---|---|---|
| 1 | Multiple complex and comminuted vault and basilar skull fractures with avulsion of cerebrum | 150408.4 | Tandem - left IC air bag and exterior of other vehicle, hood edge | Probable |
| 2 | Lacerations NFS, forehead, left face | 210602.1 | Exterior of other vehicle, hood edge | Probable |
| 3 | Abrasions, left neck | 310202.1 | Seat belt webbing | Probable |
| 4 | Abrasion, right upper back | 410202.1 | Seat back | Probable |
| 5 | Abrasion, left anterior hip | 810202.1 | Seat belt webbing | Probable |

| Injury No. | Injury | Injury Severity AIS 2015 | Involved Physical Component (IPC) | IPC Confidence Level |
|---|---|---|---|---|
| 6 | Contusions, left knee, leg and ankle | 810402.1 | Left door panel | Probable |
| 7 | Contusion, right knee | 810402.1 | Same occupant, left knee | Probable |

*Source: autopsy, medical examiner report.*

***Second-Row Left Occupant Kinematics***

The restrained 7-year-old male second row left occupant of the Honda was seated forward-facing on a BSS and was using the vehicle's lap and shoulder seat belt. The medical examiner's report stated this occupant appeared to have been asleep with his head resting against the left C- pillar and window. At impact with the other vehicle, the occupant was displaced forward and left in response to the direction of force and the left IC air bag deployed. The other vehicle's front plane contacted the occupant's side door fracturing the side glass and deforming the side door and window frame before entering the left aspect of the second-row occupant compartment. The other vehicle's hood edge and grille contacted the occupant's head and face causing complex skull fractures with avulsion of the cerebrum as well as a laceration to the forehead. The contact with the other vehicle likely displaced the occupant rearward toward the seat back. The vehicle rolled four quarter-turns to the right and the occupant was held in his seated position by the lap and shoulder seat belt that caused abrasions to his left neck and hip. Following the crash, the occupant was pronounced deceased and removed from the vehicle by emergency responders.

***Second-Row Right Occupant Demographics***

| | |
|---|---|
| Age/sex: | 15 months/female |
| Height: | Unknown |
| Weight: | Unknown |
| Eyewear: | None |
| Seat type: | Split bench seat with folding backs and adjustable head restraint |
| Seat track position: | Not adjustable |
| Manual restraint usage: | Lap and shoulder seat belt used with CRS |
| Usage source: | Vehicle inspection |
| Air bags: | IC air bag deployed |
| Egress from vehicle: | Removed through side door by an unknown person |
| Transport from scene: | Ambulance to a hospital |
| Type of medical treatment: | Not injured |

***Second-Row Right Occupant Injuries***

She was not injured, according to the occupant's EMS and medical records.

***Second-Row Right Occupant Kinematics***

The restrained 15-month-old female second-row right occupant of the Honda was seated in an unknown posture in a forward-facing CRS. At impact with the other vehicle, the occupant was displaced forward and left in response to the direction of force. She was held in place by the 5-

point harness. The Honda initiated a counterclockwise rotation and she was displaced to the right in response to the rotational forces. The vehicle rolled four quarter-turns to the right and the right IC air bag deployed. The occupant remained in her CRS until the vehicle came to rest. She was removed through a side door, most likely by one of the front row occupants. Following the arrival of emergency responders, she was transported to a local hospital for evaluation and released. This occupant was not injured.

## 2006 DODGE RAM 1500

### *Description*

The 2006 Dodge RAM 1500 was identified by the VIN 1D7HU18226Sxxxxxx. It was a full-size light truck configured with a 4-door cab and short cargo bed and equipped with an 8-cylinder, 5.7-liter gasoline engine, automatic transmission, 4-wheel drive, tilt steering column functionality and antilock brakes. The date of manufacture and the mileage at the time of the crash was unknown. The vehicle manufacturer's recommended tire size was P265/70R17. The recommended tire pressure was unknown. The vehicle was equipped with Toyo R/T Open Country size LT125/35R18 tires manufactured in 2015 and aftermarket wheels.

### *Exterior Damage*

The crash included one vehicle-to-vehicle impact causing direct damage to the front plane (**Figure 9**). Direct damage began at the front left bumper corner extending 110 cm (43.3 in) to the right. The front grille and both headlamp assemblies were displaced during the crash. Direct damage extended vertically from the bumper to the leading edge of the hood and measured 67 cm (26.4 in). The Field L was distributed from bumper corner to bumper corner and measured 180 cm (70.9 in). Twenty-one measurements were taken at bumper level by the Nikon Total Station and the Faro Blitz program computed crush measurement in six increments as follows: $C_1$ = 6 cm (2.4 in), $C_2$ = 2 cm (0.8 in), $C_3$ = 7 cm (2.8 in), $C_4$ = 1 cm (0.4 in), $C_5$ = 1 cm (0.4 in), and $C_6$ = 0 cm. The estimated PDOF was 50 degrees and the CDC for the Dodge in Event 1 was 02FYEW1.

**Figure 9**. The 2006 Dodge RAM 1500.

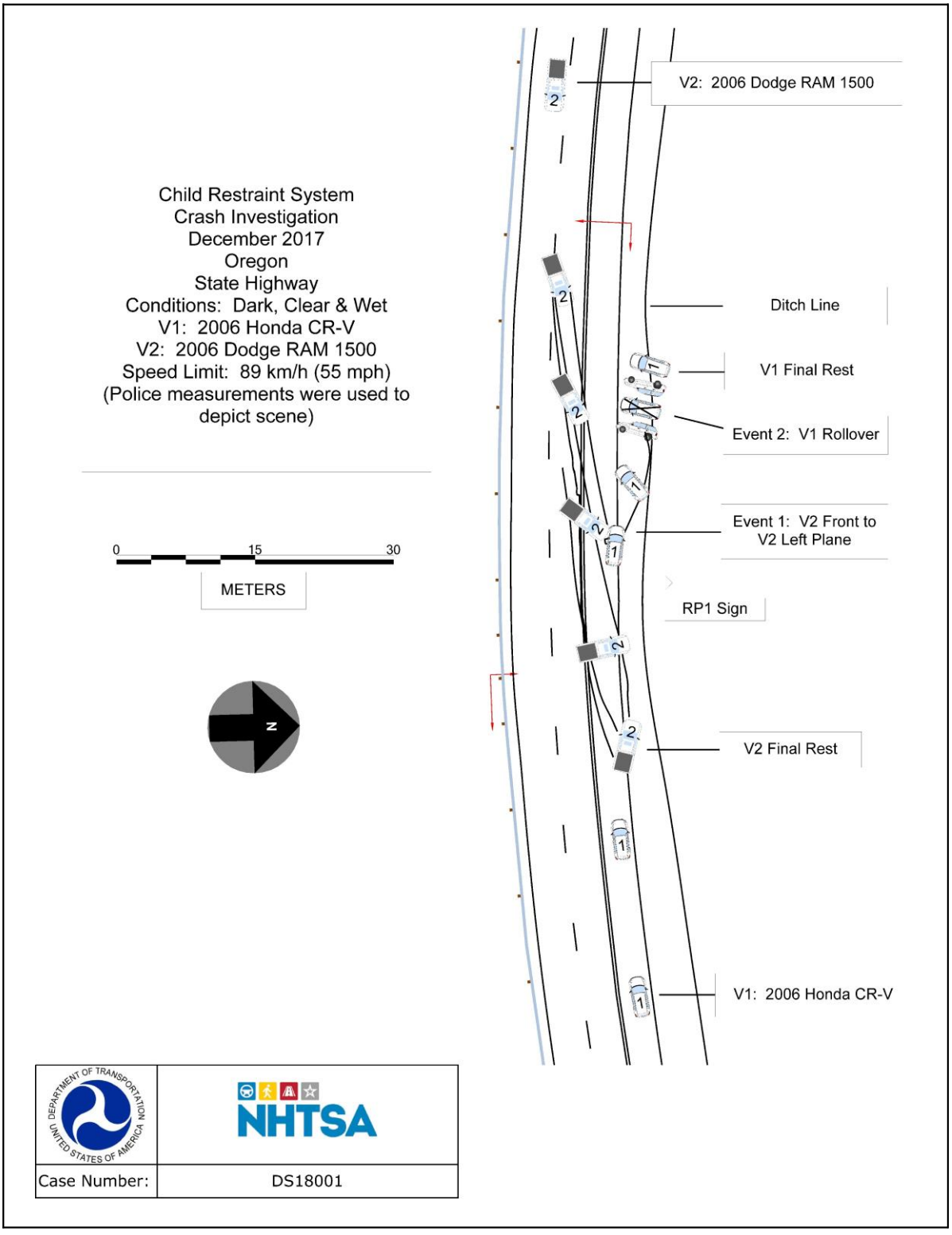
### *Event Data Recorder*

The Dodge was configured with an air bag control module (ACM) that had an Event Data Recorder (EDR) capability supported by the Bosch Crash Data Retrieval tool. The investigating police department imaged the vehicle's EDR for the purpose of obtaining crash data. The police report stated that the EDR report revealed no data, probably because the vehicle did not deploy any air bags during the crash.

### *Occupant Data*

According to the police report, the driver of the Dodge was a belted 35-year-old male and the front-right occupant was a belted 30-year-old female. The police report stated that neither occupant was injured. An EMS report for another occupant stated that the occupants of the Dodge refused treatment and transport.

## CRASH DIAGRAM



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**National Highway
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