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Special Crash Investigations On-Site Frontal Air Bag Non-Deployment Investigation Vehicle: 2008 Honda Accord Location: Florida Crash Date: March 2015

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15. Supplementary Note An investigation of the multiple event/fixed object crash involving a 2008 Honda Accord and the non-deployment of its frontal air bag system. Each crash represents a unique sequence of events, and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicles or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team.			
16. Abstract This report documents the on-site investigation of the non-deployment of the frontal air bags in a 2008 Honda Accord that was involved in a single-vehicle, road departure/fixed object crash. The Honda was equipped with certified advanced 208-compliant (CAC) frontal air bags for the driver and the first row right occupant, front-seat-mounted side impact air bags and side impact-sensing inflatable curtain (IC) air bags. The magnitude of the impact should have warranted a deployment frontal air bag system. None of the air bags deployed in the crash. The 19-year-old unbelted driver sustained police-reported A-level (incapacitating) injuries, was transported by ambulance, and admitted to a regional trauma center. This investigation was conducted as part of NHTSA Action PE15-0029. This investigation involved the potential failure of the air bag control module in certain 2008-2010 model year Honda Accord vehicles. It was identified that the failure of the control module due to water/moisture ingress resulted in the supplemental restraint system becoming disabled. If this condition existed, the air bag warning lamp in the instrument cluster would have been illuminated as a warning to the driver. The action prompted NHTSA Recall 16-V056.			
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LOCATION: FLORIDA
CRASH DATE: MARCH 2015

BACKGROUND

This report documents the on-site investigation of the non-deployment of the frontal air bags in a 2008 Honda Accord (**Figure 1**) that was involved in a single-vehicle, road departure/fixed object crash. The Honda was equipped with certified advanced 208-compliant (CAC) frontal air bags for the driver and the first row right occupant, front-seat-mounted side impact air bags and side impact-sensing inflatable curtain (IC) air bags. The crash occurred when the Honda, driven by a 19-year-old belted male, departed the road at a four-way intersection. The vehicle's front tires/wheels struck and overrode the curb and its front plane struck a landscape wall constructed of solid concrete blocks. None of the air bags deployed in the crash. The driver sustained police-reported A-level (incapacitating) injuries, was transported by ambulance, and admitted to a regional trauma center.

Figure 1: Front right oblique view of the 2008 Honda Accord.

Crash notification was provided to the National Highway Traffic Safety Administration in May 2015 by the owner of the Honda. Further research of this crash was requested from the Crash Investigation Division (CID) and an on-site investigation was assigned to the Special Crash Investigations (SCI) team. The SCI team contacted the vehicle's insurer on that same day and established cooperation to inspect the Honda that was located an at insurance vehicle salvage facility. The owner of the Honda did not return telephone or e-mail messages left by the SCI team. The on-site inspection occurred in May 2015. Those activities included the exterior and interior inspection of the Honda, identification of occupant contact points and an assessment of the vehicle's supplemental and manual restraints. The Honda was equipped with an air bag control module (ACM) that was not supported by the Bosch Crash Data Retrieval (CDR) tool. The ACM was removed from the vehicle and forwarded to the NHTSA, which then forwarded it to its manufacturer. During its examination, the module would not fully boot and no crash data was recoverable from the unit.

This investigation was conducted as part of NHTSA Action PE15-0029. This investigation involved the potential failure of the air bag control module in certain 2008-2010 model year Honda Accord vehicles. It was identified that the failure of the control module due to water/ moisture ingress resulted in the supplemental restraint system becoming disabled. If this

condition existed, the air bag warning lamp in the instrument cluster would have been illuminated as a warning to the driver. The action prompted NHTSA Recall 16-V056.

CRASH SUMMARY

Crash Site

The crash occurred during nighttime of March 2015 at the angular four-way intersection of a three-lane divided roadway and a six-lane (undivided) roadway in a suburban commercial setting (**Figure 2**). The police-reported environmental conditions at the time of the crash were clear, dry, and dark with overhead lighting. The conditions reported by the National Weather Service were a temperature of 18.3 °C (65 °F), 59 percent relative humidity, west winds at 12.8 km/h (8.0 mph) and clear skies. The three-lane divided roadway was aligned northeast/southwest and intersected the six-lane north/south road at a 30-degree angle. The intersection was controlled by overhead traffic signals. The roadways were bordered by 15 cm (6 in) tall concrete curbs and sidewalks. A 1.5 m (5.0 ft) tall landscape wall, constructed of solid concrete blocks, was located in the southwest quadrant of the intersection and followed the curvature of the sidewalk (**Figure 3**). The concrete wall was backed up by soil filled above the level of the impact. A 20 cm (8 in) square concrete post supporting the pedestrian cross walk signal was positioned in sidewalk at the southwest quadrant. The posted speed limit was 72 km/h (45 mph).

Figure 2: Southwest trajectory view into the intersection where the crash occurred.

Figure 3: Image showing the point of impact in the southwest intersection quadrant.

Pre-Crash

The Honda was traveling southwest in an unknown lane as it approached the intersection. The vehicle was operated by the unbelted 19-year-old male. Several witnesses were stopped at a red traffic signal facing south on the intersecting roadway. These witnesses reported to the police that as the Honda began to travel through the intersection, the vehicle drifted to the right. The Honda departed the road at the southwest quadrant of the intersection. There was no physical evidence at the scene that defined the pre-crash trajectory of the vehicle. A crash diagram is included at the end of this technical report.

Crash

The crash sequence began with the right front tire/wheel (Event 1) and then the left front tire/wheel (Event 2) impacting the curb (**Figure 4**). Based on the observations and measurements of the SCI scene inspection, the relative angle between the front axle of the approaching Honda and the curb was approximately 30 degrees. The force of these impacts probably resulted in an air-out of both tires.

Figure 4: Image showing the Honda's impacts with the curb and concrete block wall.

The Honda overrode the curb and struck the concrete block wall with the center and right aspects of the front plane (Event 3). The force of the impact fractured the wall over a length of 2.4 (8.0 ft). The front plane/right aspect of the Honda crushed to the A-pillar. The severity of the impact was calculated by the barrier algorithm of the WinSMASH program. This calculation resulted in a total velocity change (delta V) of 71 km/h (44 mph). The calculation was considered borderline due to the yielding properties of the concrete block wall.

The Honda was redirected southward with a counterclockwise rotation due to its impact-orientation coupled with the curvature of the wall. The Honda separated from the block wall and travelled 7.4 m (24.3) ft at which time the right rear wheel and quarter panel of the vehicle struck the 20 cm (8 in) square concrete post (Event 4). This impact stopped the vehicle's counterclockwise rotation. The Honda separated from the post with a clockwise rotation and slid to its final rest position facing southward. **Figure 5** is a south looking view of the concrete post and the final rest location of the Honda. At rest, the vehicle was in the roadway 9.3 m (30.5 ft) from its impact with the block wall.

Figure 5: Image showing the Event 4 impact with the concrete post and the Honda's final rest location.

Post-Crash

The police were notified of the crash by the witnesses and responded to the scene. An ambulance was dispatched to aid the injured driver. The police report indicated that the lower extremities of the unrestrained 19-year-old driver were wedged under the instrument panel, effectively causing him to be trapped. He was removed by the first responders and transported to a regional trauma center with police reported A-level (incapacitating) injuries. The Honda was removed from the crash site and transferred to an insurance vehicle salvage facility where it was located for this SCI inspection.

2008 HONDA ACCORD

Description

Figure 6: Overhead front view of the Honda.

The 2008 Honda Accord (**Figure 6**) was identified by the Vehicle Identification Number JHMCP26828Cxxxxxx and it was equipped with the EXL trim package. The Honda was manufactured in May 2008. The odometer reading was unknown due to a damaged electrical system. The 4-door sedan was built on a 280 cm (110.2 in) wheelbase. The gross vehicle weight rating was 2,010 kg (4,431 lb) with a front axle and rear axle rating of 1,090 kg (2,403 lb) and 935 kg (2,061 lb), respectively. The vehicle's curb weight was 1,520 kg (3,351 lb). The powertrain consisted of a 2.4-liter, I-4 gasoline engine linked to a 5-speed automatic transmission with front-wheel drive. The brake system was a 4-wheel disc system with electronic brakeforce distribution, emergency brake assist and ABS. Additional features included stability control, traction control, and a tire pressure monitoring system (TPMS). The vehicle manufacturer's recommended tire size was P225/50R17 front and rear, with cold tire pressures of 221 kPa (32 PSI). The left front and right front tires were Bridgestone Turanza, the left rear tire was a Mile Star MS932 Sport and the right rear tire was a Michelin HXMXM4. All four tires were the recommended size. Specific tire data measured during the SCI inspection was as follows:

Position	Measured Pressure	Measured Tread Depth	Restriction	Damage
LF	Tire Flat	2 mm (2/32 in)	No	Hole in sidewall, rim surface abraded
LR	269 kPa (39 PSI)	5 mm (6/32 in)	No	None
RR	Tire Flat	2 mm (3/32 in)	No	None
RF	Tire Flat	1 mm (1/32 in)	Yes	Hole in sidewall, rim fractured

The leather interior of the Honda was configured for the seating of five occupants (2/3). The front row consisted of bucket seats with adjustable head restraints. The driver seat was adjusted in a mid-to-rear track position. At inspection, the seatback was reclined 10 degrees aft of vertical. The front right seat was in a mid-to-rear track adjustment with the seatback reclined 12 degrees at inspection. The front head restraints had been removed from the seats. The second row consisted of a forward-folding bench seat with adjustable head restraints in all three positions. Manual safety features included 3-point lap and shoulder seat belts in all seat positions. The front seat belts were equipped with retractor pretensioners and buckle switch sensors. The Honda was equipped with supplemental restraint systems consisting of the CAC frontal air bags for the driver and front right passenger positions, front seat-mounted side impact air bags and side impact-sensing IC air bags.

NHTSA Recalls and Investigations

This investigation was conducted as part of NHTSA Action PE15-0029. This investigation was open from August 2015 to June 2016 and involved the potential failure of the air bag control module in certain 2008-2010 MY Honda Accord vehicles. It was identified that the failure of the control module resulted in the supplemental restraint system becoming disabled. If this condition existed, the air bag warning lamp in the instrument cluster would have been illuminated as a warning to the driver. The control module failure was related to water infiltration. The action prompted NHTSA Recall 16-V056. Refer to the NHTSA website www.safercar.gov for further information.

Vehicle History

A history report stated that the current owner had purchased the Honda as a used vehicle in November 2013. At the time of purchase, the odometer reading was 35,840 km (22,270 miles). The Honda had two previous owners and had had a Florida registration throughout its service life. Apart from this March 2015 crash, the Honda had one reported prior crash. In February 2015, the Honda was struck on the back plane in a minor front-to-rear in-line crash that resulted in an estimated $400 in damage.

Exterior Damage

The exterior damage to the Honda consisted of severe impact damage to the front plane (Event 3) and moderate severity damage to the right plane (Event 4). The right front and left front tire/wheels sustained minor impact damage as a result of the curb strikes (Events 1 and 2).

Events 1 and 2

During its pre-crash trajectory, the Honda drifted to the right and departed its travel lane as it traveled through the intersection. Based on the physical evidence observed during the SCI scene inspection, the relative angle between the face of the curb and the vehicle's front axle was 30 degrees. The right front tire/wheel struck and mounted the curb, followed closely in time by the curb impact of the left front tire/wheel. Abrasions to the concrete surface evidenced these impacts. The sidewalls of both front tires were holed. The right front wheel rim was fractured and the bead edge and surface of the left front rim was abraded. The Collision Deformation Classification (CDC) assigned to the right front curb impact was 12FRWN3 and the corresponding CDC for the left front curb impact was 12FLWN3.

Event 3

The right and center aspects of the Honda's front plane struck the concrete block wall (Event 3). The extent of the damage is shown in **Figures 7 and 8**. The direct contact damage began 25 cm (10.0 in) left of center and extended 102 cm (40.0 in) to the right front bumper corner. The front bumper fascia was separated and missing at inspection. The force of the impact coupled with the angled orientation of the block wall relative to

Figure 7: Front view of the Honda showing the Event 3 damage.

the Honda's trajectory resulted in the deformation pattern and subsequent compression of the engine compartment. The right front wheel assembly was displaced rearward under the right A-pillar. The right wheelbase was reduced 50 cm (19.5 in). The left wheelbase was unchanged. The A-pillar buckled and deformed rearward 8 cm (3.0 in) to a near-vertical orientation. The A-pillar sustained direct contact 20 cm (8 in) above the beltline. The right front door compressed 10 cm (4.0 in) and buckled outward 15 cm (6.0 in). Direct contact damage was noted on the right door panel extending 61 cm (24.0 in) from its leading edge. The windshield completely fractured across its width and height due to contact with the deformed hood. Over the time between the crash date and the SCI inspection, the windshield sagged and separated around the perimeter and fell onto the instrument panel. The frontal crush was measured along the deformed front bumper reinforcement bar. The residual crush was as follows: C1 = 14 cm (5.5 in), C2 = 48 cm (19.0 in), C3 = 70 cm (27.5 in), C4 = 74 cm (29.0 in), C5 = 78 cm (30.5 in), C6 = 79 cm (31.0 in). The maximum crush was located at right corner. The left front door was forced open and removed by the emergency responders. The left rear door was operational at inspection. The right front door was forced open and could not be closed due to deformation. The right rear door was removed and missing. The assigned CDC was 01FZAW6. The total delta V calculated by the WinSMASH program was 71 km/h (44 mph). The longitudinal and lateral components of the delta-V were -62 km/h (-39 mph) and -36 km/h (-22 mph), respectively.

Figure 8: Right lateral view of the Honda at the front plane showing the extent of damage.

Event 4

The right rear wheel and right quarter panel struck the concrete post that was located on the sidewalk. The axle position was deformed 6 cm (2.5 in) rearward and the face of the wheel rim was abraded. The quarter panel exhibited a damage pattern at the wheelhouse indicative of the impact that measured 43 cm (17.0 in) in length. It extended vertically to the beltline (**Figure 9**). This pattern began 127 cm (50.0 in) forward of the rear bumper reference line [22 cm (8.5 in) forward of the deformed axle location]. The maximum crush measured 6 cm (2.3 in). As the Honda then separated from the post, this pattern extended rearward to the right rear corner along the lower aspect of the body panel. The total length of the contact measured 102 cm (40.1 in). The rear bumper fascia had separated in this contact and was missing. The CDC of this damage pattern was 03RBEW2.

Figure 9: Image showing the Event 4 damage to the Honda.

Interior Damage

The interior damage to the Honda consisted of longitudinal intrusion that was biased to the front right, floor pan deformation and driver contacts to the knee bolster area (**Figures 10 and 11**). The right toe pan intruded 28 cm (11 in). The intrusion of the right corner of the instrument panel was 16 cm (6.5 in). The floor pan deformation completely disrupted the center console. The leather upholstered, 8-way powered driver seat was adjusted in a mid-to-rear track position that measured 5 cm (2.0 in) forward of full rear. The seatback was reclined 10 degrees. The horizontal distance from the seatback to the driver air bag module in the center hub of the steering wheel measured 60 cm (23.5 in). This horizontal distance was measured 46 cm (18.0 in) above the seat bight. The floor pan forward of the second row seat was buckled vertically. This deformation caused both first row seats to roll to the right. The gap between the left B-pillar and the outer aspect of the driver seat measured 15 cm (6.0 in). The outer aspect of the front right seat was in contact with the right B-pillar.

Figure 10: Image showing the instrument panel deformation in the Honda**.**

Figure 11: Oblique view of the driver's position in the Honda and the knee bolster contacts.

The steering wheel was rotated approximately 80 degrees clockwise and jammed in that position. There was no deformation of the steering wheel rim; however, the steering column appeared to have been lifted vertically during the rescue activities.

Two areas of contact from the driver's lower extremities were identified on the knee bolster of the lower left instrument panel. The left lower extremity contact was located 5 cm (2.0 in) left of the steering column and 48 cm (19.0 in) above the floor. The right lower extremity contact was located 18 cm (7.0 in) right of the steering column at the bolster's intersection with the center instrument panel. This contact extended 51 cm (20.0 in) above the floor.

Event Data Recorder

The Honda Accord was equipped with an air bag control module (ACM) that performed the diagnostic, sensing and deployment functions for the vehicle's supplemental restraint systems. The ACM was located on the centerline of the vehicle below the center instrument stack. This module had EDR capabilities; however, the recorded data could only be retrieved by the manufacturer. The 2008 model year module was not supported by the Bosch Crash Data

Retrieval tool. CDR support for the Honda Accord did not begin until MY 2013.

The disrupted/fractured components of the center console exposed the ACM. It was accessible (**Figure 12**). The module was secured to the vehicle by three fasteners. It was observed that two of the module's cast-mounting locations fractured due to floor pan deformation. Loosening the third fastener allowed the module to be removed. The SCI investigator forwarded the ACM to NHTSA, which forwarded the module to Honda for imaging.

Figure 12: Image showing the ACM location in the 2008 Honda Accord.

A NHTSA representative attended the examination of the moduleat the module supplier's facility. During its examination, the module would not fully boot and no crash data was recoverable from the unit. This examination took place as part of NHTSA Action PE15-0029.

Manual Restraint Systems

The front row of the Honda was equipped with 3-point lap and shoulder seat belts. Each belt system consisted of continuous loop webbing, a sliding latch plate, an adjustable D-ring and a pretensioner-equipped retractor mounted in the lower B-pillar. The driver D-ring was adjusted to the lowest position. The driver retractor was an emergency locking retractor (ELR). The front right D-ring was in the full-up position and the retractor was a switchable automatic locking retractor/emergency locking retractor (ALR/ELR). The safety belt buckles were mounted to the inner aspect of the seats on a fixed-length stalk and were equipped with sensors to detect the presence of the buckle.

At inspection the driver's safety belt webbing was stowed and freely extended from the retractor. Visual and tactile inspection of the webbing was unremarkable; no crash related evidence was identified. Examination of the latch plate revealed minimal indicators of historical use. The friction surface of the latch plate was smooth and absent of crash related evidence (**Figure 13**). Based on the observations of the inspection, the driver was not restrained by the manual safety belt at the time of the crash. This determination was consistent with the observations of the police investigation.

Figure 13: Image showing the Honda driver's latch plate.

Supplemental Restraint Systems

The Honda Accord was equipped with CAC frontal air bags for the driver and front right passenger, front seat-mounted side impact air bags and side impact sensing IC air bags. None of the air bags deployed in this crash. The pretensioners did not actuate.

The driver air bag module (**Figure 14**) was mounted in the center hub of the steering wheel.
This air bag module was removed and examined. It was secured to the steering wheel by two fasteners. Removal of these fasteners allowed for examination of the wiring and the manufacturer's labeling on the back side of the module. All the wiring appeared intact and connected. The following alpha-numeric sequence identified the driver air bag assembly: *H0VS51BD2U 77800-TA0-A810 00*. The following alpha-numeric sequence identified the inflator: Z35M8074978.

Figure 14: Image showing the driver air bag module in the Honda.

Frontal Air Bag Non-Deployment Discussion

The CAC frontal air bags of the Honda did not deploy during the multi-event crash sequence. Based on the SCI reconstruction, the Honda experienced three closely-spaced impact events. The first two events were the curb impacts of the right front wheel and the left front wheel, respectively. These events occurred nearly simultaneously when the Honda struck the curb at a relative angle of 30 degrees between the curb face and the front axle. The force of these impacts cut the side walls of the front tires and fractured the right front wheel rim. Based on SCI field experience, the impact severity should have been sufficient to cause event-recognition by the vehicle's ACM. The acceleration pulses would have appeared as closely spaced, short-duration spikes. The front plane of the Honda then struck the concrete block wall (Event 3). The calculated borderline delta-V of frontal impact was 71 km/h (44 mph). An impact of this magnitude (when considered as a singular event) should have warranted a deployment frontal air bag system.
The supplier of the air bag control module determined that there was a fault with the module during testing. The module would not fully boot. Crash data could not be recovered. It was subsequently determined that a faulty module resulted in the supplemental restraint system to become inoperative.

2008 HONDA ACCORD OCCUPANT

Driver Demographics

Age / Sex:	19 years / Male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat Type:	Bucket
Seat Track Position:	Mid-to-rear track
Manual Restraint Usage:	None
Usage Source:	SCI vehicle inspection, PAR
Air Bags:	Frontal, side impact and IC air bags available, None deployed
Alcohol/Drug Involvement:	Unknown

Egress from Vehicle:	Assisted due to perceived serious injury
Transport from Scene:	Ambulance to a trauma center
Medical Treatment:	Admitted for treatment

Driver Injuries

Injury No.	Injury	AIS 2015	Involved Physical Component (IPC)	Confidence Level
1	Unknown incapacitating injuries	Unknown	Unknown	Unknown

Source: Records request denied

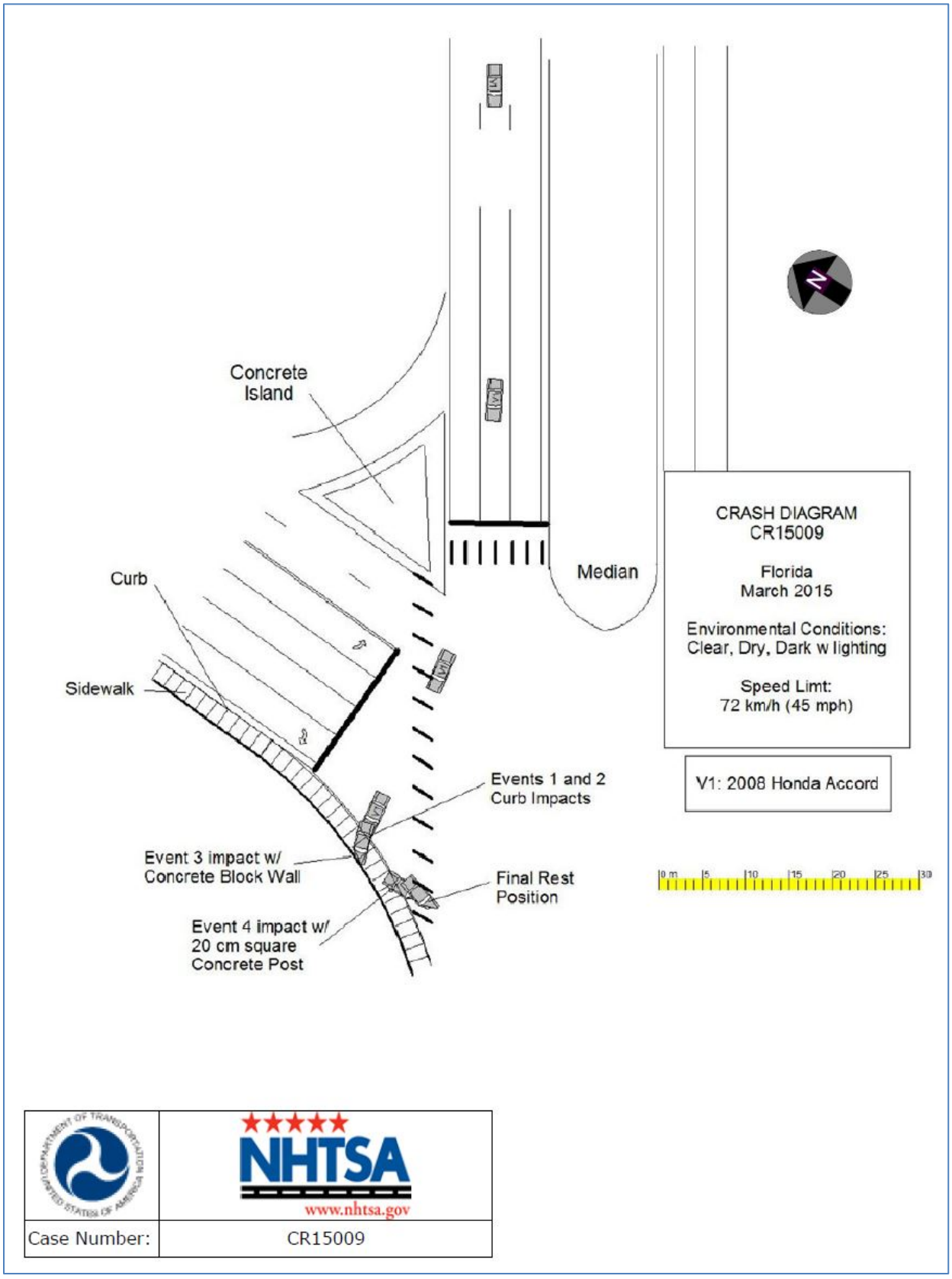
Driver Kinematics

The Honda driver was operating the vehicle with the seat adjusted in a mid-to-rear track position with the seatback slightly reclined. His posture pre-crash and at crash is unknown. He was not using the manual safety belt system.

The two front plane impacts with the curb were short duration impulses and most likely did not influence the position of the driver. The driver responded to the 12 o'clock direction of the concrete wall impact by initiating a forward trajectory. The driver translated forward on the relatively low-friction surface of the leather driver seat. The driver's lower extremities struck the knee bolster. As the driver's lower extremities decelerated and engaged the bolster, his torso continued forward flexing the legs at his knees and hips. His buttock likely slid off the driver seat and the driver came to rest in the foot well. The police report indicated that the driver was wedged between the seat and instrument panel, effectively trapping him in the vehicle. The driver's face contacted an unidentified interior component and was bleeding. Due to the proximity of its location to the driver, it was probable that his face contacted the steering wheel rim. At his arrival, the police officer observed a large amount of bleeding from the driver's face.

The first responders removed the left front door and cut the left A-pillar to release tension in the deformed occupant compartment. Based on its residual location at inspection, it was probable that the steering wheel was lifted vertically. The driver was assisted from the vehicle and transported by ambulance to a regional trauma center with police-reported incapacitating injuries.

CRASH DIAGRAM



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