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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 on the date this report was submitted.

16. Abstract

This report documents the on-site investigation of a front-to-rear crash involving a 2019 Honda Pilot EXL and a 2006 Isuzu NPR single-unit delivery truck. The Honda had several crash avoidance systems, which included derivations of forward collision warning with crash imminent braking, lane departure warning with lane keeping assist, and adaptive cruise control. The crash occurred while the Honda was following the Isuzu on a limited-access roadway. The Isuzu was traveling at a slower speed than the Honda when it began to decelerate further in response to merging traffic in front of it. The belted 32-year-old female driver of the Honda did not detect the slower moving Isuzu, and the Honda was unable to avoid the crash. The front of the Honda struck and underrode the rear, left corner of the Isuzu. No injuries resulted from the crash.

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Table of Contents

Special Crash Investigations
On-Site Crash Avoidance Technology Crash Investigation
Case Number: CR20002
Vehicle: 2019 Honda Pilot EXL
Location: Florida
Crash Date: December 2019

Background

This report documents the on-site investigation of a front-to-rear crash involving a 2019 Honda Pilot EXL (Figure 1) and a 2006 Isuzu NPR single-unit delivery truck. The Honda had several crash avoidance (CA) systems, which included derivations of forward collision warning (FCW) with crash imminent braking (CIB), lane departure warning (LDW) with lane keeping assist, and adaptive cruise control (ACC). The crash occurred while the Honda was following the Isuzu on a limited-access roadway. The Isuzu was traveling at a slower speed than the Honda when it began to decelerate further in response to merging traffic in front of it. The belted 32-year-old female driver of the Honda did not detect the slower moving Isuzu, and the Honda was unable to avoid the crash. The front of the Honda struck and underrode the rear, left corner of the Isuzu. No injuries resulted from the crash.

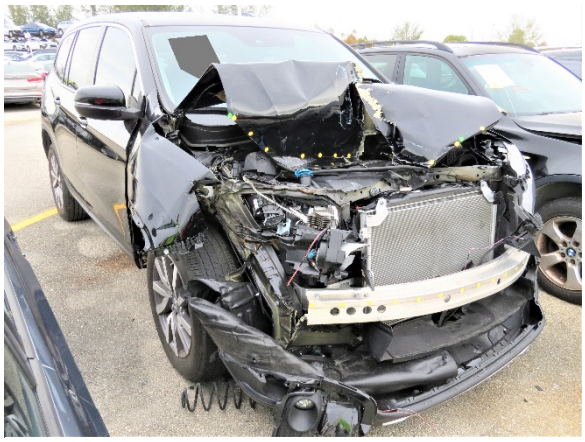


Figure 1. Right front oblique view of the Honda

The crash was identified by the Special Crash Investigations (SCI) team at Crash Research & Analysis in January 2020. A police crash report documenting the crash was obtained from an online commercial service and forwarded with the crash notification to the National Highway Traffic Safety Administration. The crash was then assigned for an on-site investigation, and the on-site portion of this investigation took place in January 2020. On-site activities included the exterior and interior inspections of the Honda to measure the exterior deformation and interior damage, document occupant contact, examine the manual and supplemental restraint systems, and verify the equipped CA systems. The Honda had an Event Data Recorder (EDR), which was imaged during the inspection process using the current version of the Bosch Crash Data Retrieval tool and software. The crash site was photographed. Additionally, a photographic inspection of the Isuzu was conducted. The driver of the Honda did not respond to requests for interview. An in-person interview of the commercial owner of the Isuzu was conducted by the SCI investigator.

Summary

Crash Site

This crash occurred on a multi-lane limited-access roadway in an urban setting at night with no artificial illumination. Reported weather conditions included clear skies, a temperature of 20 ºC (68 ºF), 63-percent relative humidity, and calm winds. In the eastbound travel direction, the roadway was straight and level for a continuous distance, with scattered overpasses and interchanges. It had four primary travel lanes, each approximately 3.3 m (10.8 ft) wide. They were delineated by broken white lines, with a single solid yellow median line and a single solid white fog line. A concrete Jersey-type barrier physically divided the eastbound and westbound traffic.

Figure 2. Eastbound view of the Honda's pre-crash approach to the crash site

At the time of the crash, construction work in the area was ongoing and caused closure of at least one exit interchange and the rightmost travel lane. To identify this closure, round orange traffic barrels were positioned along the left side of the travel lanes immediately left of the single solid yellow median line, as well as along the right side of the travel lanes in the left aspect of the rightmost travel lane (adjacent to the rightmost broken white lane line). This effectively reduced the four-lane roadway to a three-lane roadway at the time of the crash. Figure 2 shows an east-facing view of the roadway on approach to the crash site (without the active construction zone/lane closure present). Speed was regulated by a posted limited of 89 km/h (55 mph). No adjustment to the speed limit was in effect at the time of the crash, despite the active construction zone. A crash diagram is included at the end of this report.

Pre-Crash

The Honda traveled east on the limited-access roadway, driven by a belted 32-year-old female. Specifics concerning her pre-crash activities and route of travel are unknown. The Isuzu traveled east on the same roadway in advance of the Honda, driven by a belted 33-year-old male. Specifics concerning his pre-crash activities and route of travel are also unknown. Both vehicles entered the active construction zone and maintained travel in the rightmost open/active travel lane (second from the right).

According to law enforcement documentation of the crash, a non-contact vehicle had been traveling east well in advance of the Honda and the Isuzu. Its driver had become confused by the construction zone and the closed interchange and then traveled around or through the orange construction barrels intending to take the exit ramp. The driver of the non-contact vehicle, who had found the exit completely blocked by construction equipment, was caught in the closed-off area of the roadway.

The non-contact vehicle drove back toward the perimeter of orange construction barrels and abruptly re-entered the roadway from the right in front of the Isuzu. The Isuzu driver saw the non-contact vehicle re-enter the roadway and braked to a slower travel speed.

The Honda's driver apparently did not see the non-contact vehicle or Isuzu maneuvers. Data imaged from the vehicle's EDR indicated that the Honda traveled at a constant speed of 105 km/h (65 mph) from -4.5 seconds to -1.5 seconds prior to algorithm enable (AE), with the accelerator pedal partially depressed. The FCW, ACC, and lane keeping assist systems were all "On," but the road departure mitigation/LDW system was "Off." As the Honda rapidly approached the significantly slower-moving Isuzu, the driver suddenly detected the slower moving Isuzu and attempted to avoid it by braking and steering left. The data indicated she released the accelerator pedal and steered 20-degrees left at the 1-second pre-crash interval, then braked by the 0.5-second pre-crash interval. A corresponding 20 km/h (13 mph) reduction in the Honda's speed occurred over the final pre-crash second, with the speed of the Honda at time zero reported as 84 km/h (52 mph). According to the data, the FCW system was "not warning" and the collision mitigation braking system was "not engaged" for all recorded pre-crash data samples, inclusive of time zero (AE).

Crash

The front of the Honda struck the back, left aspect of the Isuzu in an off-set configuration. Directions of force were within the 12 o'clock sector (0-degree) for the Honda and 6 o'clock sector (180-degrees) for the Isuzu. The front of the Honda underrode the enclosed cargo portion of the Isuzu truck where the centerline of the Honda was aligned with the left corner of the Isuzu's cargo body, outside of the dimensional protection area of the Isuzu's rear underride guard. The Honda's hood was deformed by the sill/undercarriage of the Isuzu's cargo body, while the underride guard of the Isuzu contacted soft front fascia and body trim components of the Honda. The Honda rapidly decelerated as the driver maintained braking and came to final rest straddling the broken white lane line on the left side of her pre-crash travel path. The Isuzu came to a controlled stop in advance of the Honda, in its original travel lane. Both vehicles were facing east at final rest.

Post-Crash

The local emergency response system received calls reporting the crash and law enforcement personnel responded. The Honda driver exited her vehicle without assistance. Although law enforcement documentation of the crash reported that the Honda driver sustained non-incapacitating (B-level) injuries, no emergency medical care was requested or provided on-scene. The Honda driver was not medically transported from the scene. The Isuzu driver was not injured. A local recovery service towed the Honda from the crash scene to a local yard, where it was deemed a total loss by its insurer and then transferred to a regional salvage facility. The Isuzu was driven from the scene (non-towed).

2019 Honda Pilot

Description

The 2019 Honda Pilot (Figure 3) was manufactured in September 2018 and identified by the Vehicle Identification Number (VIN) 5FNYF5H57KBxxxxxx. The digital odometer reading was 15,886 km (9,871 miles) at the time of the SCI inspection. The Honda was a front-wheel drive platform, powered by a 3.5-liter, V-6, gasoline engine linked to a 6-speed automatic transmission. Its service brakes were power-assisted 4-wheel disc with antilock (ABS). The gross vehicle weight rating (GVWR) was 2,515 kg (5,545 lb), with gross axle weight ratings of 1,240 kg (2,734 lb) front and 1,345 kg (2,965 lb) rear. The vehicle manufacturer's recommended tire size was P245/60R18, with recommended cold tire pressures of 220 kPa (32 PSI) for all four axle positions. At the time of the SCI inspection, the Honda had Bridgestone Dueller H/P Sport A/S tires of the recommended size at all four axle positions. All four tires had at least 5 mm (6/32 in) of tread, remained inflated, and were not damaged.

Figure 3. Left front oblique view of the 2019 Honda Pilot during the SCI vehicle inspection

The Honda interior was configured for the seating of eight occupants (2/3/3), with front-row bucket seats and second/third-row bench seats with split forward-folding seatbacks. All of the leather-surfaced seating positions had adjustable head restraints. Manual restraint systems consisted of 3-point lap and shoulder seat belts for all seat positions. Supplemental restraint systems included front seat belt retractor and lower anchor pretensioners, with six inflatable supplemental restraints. The driver's seat belt pretensioners actuated, and the driver's frontal and right inflatable curtain (IC) air bags deployed. During the SCI vehicle inspection process, the SCI investigator observed that the vehicle's electronic controls were programmed to display in the Spanish language with Imperial units.

Vehicle History

A commercially obtainable vehicle history for this specific 2019 Honda Pilot indicated that it had only one owner over its lifetime. It was registered and titled in Florida. There were routine maintenance reports but no reported service to or replacement of the vehicle's safety systems.

There were no prior crashes indicated; only the crash under investigation was identified in the vehicle history report.

Exterior Damage

This crash involved the front of the Honda, and the damage pattern resembled an off-set underride profile to the right front aspect of the vehicle. Although the bumper fascia and grille were completely separated from the vehicle, there was no discernable deformation or direct contact to the exposed bumper beam.

Extending almost exactly on the centerline of the vehicle was a distinct tear in the hood, where the right aspect was deformed and swiped rearward by the underside of the Isuzu truck's cargo box body. The right headlight assembly was disintegrated, and the right aspect of the upper radiator support and the right front fender were deformed by the underride impact. Figure 4 shows the damage pattern from a horizontal frontal perspective, while Figure 5 shows the underride front damage profile from an overhead perspective.

Figure 4. Front plane damage to the Honda as documented during the SCI vehicle inspection

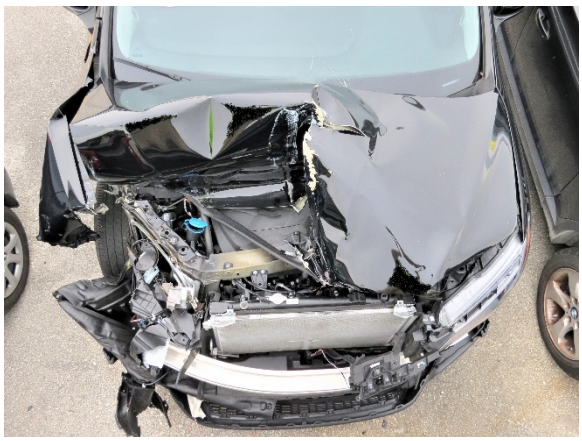


Figure 5. Underride profile to the Honda's front plane as observed from an overhead perspective

Direct contact on the hood began directly on the centerline and extended 73 cm (28.7 in) to the right front corner. A residual crush profile was documented to the front bumper beam, with a second profile documented to the leading edge of the Honda's hood. The corresponding direct and induced damage width (Field-L) was 146 cm (57.5 in). There was no crush at bumper level, and, accounting for free-space, the averaged resultant crush profile measurements included: C1 = 0 cm (0 in), C2 = 0 cm (0 in), C3 = 0 cm (0 in), C4 = 26 cm (10.2 in), C5 = 23 cm (9.1 in), and C6 = 18 cm (7.1 in). Maximum crush measured 51 cm (20.1 in) and was observed immediately right of the vehicle's centerline. A corresponding collision deformation classification of 12FZMW4 was assigned to the Honda's front plane damage profile.

The damage algorithm of the WinSMASH model was used to calculate the severity of the crash. The total calculated vehicle velocity change (delta V) was 25 km/h (16 mph), with specific longitudinal and lateral components of -25 km/h (-16 mph) and 0 km/h (0 mph), respectively. Based on SCI expertise and observed vehicle damage, these borderline results were slightly

underestimated. Of note, the WinSMASH results were only slightly less than the EDR-reported delta V data (see the Event Data Recorder section below).

Event Data Recorder

The 2019 Honda Pilot was equipped with a supplemental restraint systems (SRS) control unit. Commonly referred to as an air bag control module (ACM), it was mounted to the center tunnel of the vehicle, beneath the center instrument stack. The control unit monitored three-dimensional acceleration and commanded the actuation or deployment of pretensioners and inflatable supplemental restraint systems. It also had EDR capabilities.

During the SCI vehicle inspection, the Honda's EDR data were imaged using the Bosch CDR tool and software version 19.3, via a direct to module connection and using an external power supply. The data, later read using software version 21.2, are included in Appendix A.

The requirements for event recording included a change in longitudinal or lateral velocity of 8 km/h (5 mph) or greater over a 150-millisecond timeframe, or commandment of a non-reversible restraint device (air bag). The EDR typically would record only one event, unless the time zero values for multiple events occurred within five seconds of one another. In this manner, a non-deployment event could be recorded and locked if it occurred within five seconds of a deployment event. By definition, a deployment event was any recognized event in which the control unit commanded deployment of an air bag system. A non-deployment event did not deploy air bags, but it could include pretensioner actuation-only commanded events. Depending on the specific control unit type, it could record approximately 255 milliseconds of data associated with a deployment command. If power supply to the SRS control unit was lost during or following a crash event, all or part of the data may not have been recorded to the EDR's memory. System status data, inclusive of reported diagnostic trouble codes (DTCs), seat belt usage of front row occupants, and vehicle ignition cycle at the time of the event, were recorded. Associated to the recording of each respective event was an asynchronous 5-second pre-crash buffer that recorded pre-crash data points in 0.5-second intervals. Data recorded included vehicle speed (mph), accelerator pedal (% Full), service brake (On/Off) status, ABS activity (On/Off), stability control (On, Off, Engaged), steering input (+/- 5 degrees), and engine speed rpm data. Data for the vehicle's multiple CA systems, which were also recorded, are discussed in the Crash Avoidance Systems section of this report. The imaged data contained one recorded event, a deployment event type, recorded as Event Record 1. The data were imaged on ignition cycle counter 2,316, and the ignition cycle at event counter was 2,310. The discrepancy in ignition cycles was attributed to the post-crash movement of the vehicle from the scene to the salvage facility, and the recovered data were related to the crash under investigation. The following recorded pre-crash buffer data were reported with the recorded Event Record 1:

Time (sec)	Speed (km/h [mph])	Accel. Pedal (%)	Service Brake	ABS Activity	Steering Input	Engine rpm
-5.0	106 [66]	0	OFF	OFF	0	1,700
-4.5	105 [65]	19	OFF	OFF	0	1,800
-4.0	105 [65]	20	OFF	OFF	-5	1,900
-3.5	105 [65]	21	OFF	OFF	-5	1,700
-3.0	105 [65]	24	OFF	OFF	-5	1,700
-2.5	105 [65]	26	OFF	OFF	-5	1,800

Time (sec)	Speed (km/h [mph])	Accel. Pedal (%)	Service Brake	ABS Activity	Steering Input	Engine rpm
-2.0	105 [65]	25	OFF	OFF	0	1,700
-1.5	105 [65]	24	OFF	OFF	0	1,700
-1.0	105 [65]	0	OFF	OFF	20	1,700
-0.5	104 [65]	0	ON	OFF	0	1,500
0.0	84 [52]	0	ON	ON	0	1,500

The seat belt status of the driver (sole occupant) and the right front occupant positions were reported as "On" and "Off," respectively. The driver's seat track position was reported as not in a forward position. There were no DTCs active when the crash occurred, and no supplemental restraint system warning light(s) were illuminated. A complete file was recorded in association to the deployment event.

The maximum longitudinal delta V reported was -30 km/h (-19 mph) at 197.5 milliseconds after time zero. The maximum lateral delta V was -1 km/h (-1 mph), which occurred at 67.5 milliseconds after time zero. Associated with the frontal event were the following supplemental restraint system deployment/actuation commands relative to time zero: driver's retractor pretensioner at 18 ms, driver's lower anchor pretensioner at 26 ms, driver's frontal air bag first stage at 40 ms, driver's frontal air bag second stage at 70 ms, and right IC air bag at 95 ms.

Interior Damage

There was no loss of integrity to the interior occupant compartment of the Honda associative to the crash. All doors remained closed and were operational post-crash. Only the windshield was cracked by the displacement of the hood during the underride crash; all other glazing remained intact and was not damaged or contacted by the driver. The only discernable evidence in the Honda's interior from occupant contact was loading of the seat belt, as described in the Manual Restraint Systems section of this report. There was no discernable occupant contact to interior surfaces of the Honda at the time of the SCI vehicle inspection. Figure 6 shows the driver's position of the Honda and the surrounding components.

Figure 6. View of the interior of the Honda during the SCI vehicle inspection

Manual Restraint Systems

The Honda had 3-point continuous loop lap and shoulder seat belt systems for all eight seat positions. They all used sliding latch plates, and the front row (driver's and front row right) systems were configured with adjustable D-rings. The driver's seat belt retracted onto an emergency locking retractor (ELR), while the other systems all used switchable ELR/automatic locking retractors (ALRs). Both front seat belt systems were equipped with retractor and lower anchor pretensioners. Data imaged from the Honda's EDR reported actuation commands for the driver's retractor and lower anchor (lap) pretensioners.

At the time of the inspection, the SCI investigator found the driver's seat belt system hanging loosely against the B-pillar, with the webbing extended in a used position. Both the retractor pretensioner and the lower anchor pretensioner were actuated.

An area of polymer transfer and apparent loading (Figure 7) was observed from 76-81 cm (29.9-31.9 in) below the D-ring. The SCI investigator also observed a polymer transfer on the webbing from the D-ring. There was 152 cm (59.8 in) of exposed webbing, representative of an excess of 90 cm (35.4 in) in comparison with the length of exposed webbing when the system was stowed (measurement comparison with unused/stowed right front system). Based on the post-crash condition of the driver's seat belt system, it was apparent that the driver was belted at the time of the crash.

Figure 7. Latch plate loading evidence on the driver's seat belt system in the Honda

Supplemental Restraint Systems

The Honda was equipped with several devices to provide for the supplemental restraint of its occupants. This included a Certified Advanced 208-Compliant frontal air bag system, front-seat-mounted side impact air bags, and dual-sensing (side impact and rollover) IC air bags. The CAC system consisted of dual-stage driver's and passenger's frontal air bags, front seat track position sensors, front seat belt buckle switch sensors, front lower anchor and retractor pretensioners, and a front right occupant classification sensor. The driver's frontal air bag was mounted in the hub of the four-spoke steering wheel, while the passenger's frontal air bag was a top-mounted design in the right instrument panel. The front seat-mounted side impact air bags, which were mounted in the outboard aspect of each front seat adjacent to the respective B-pillars, provided

supplemental protection for lateral (side) crash forces. The IC air bags, mounted to the roof side rails and concealed by the vehicle's headliner, were designed to provide outboard protection for both of the Honda's seating rows. Labeling molded into the polymer surfaces of the pillar trim panels identified the presence of the IC air bags. The supplemental restraints (air bags and pretensioners) were controlled and monitored by the SRS control unit. The driver's lower anchor and retractor pretensioners actuated, and the driver's frontal and passenger side IC air bags deployed.

The driver's frontal air bag deployed from the steering wheel hub-mounted module and through the cover flaps without damage. In its deflated state, the driver's frontal air bag measured approximately 60 cm (23.6 in) in overall diameter. It had an 11 cm (4.3 in) wide circular center stitch pattern, to which internal tethers were affixed. The air bag was vented on its rear aspect by a pair of 4 cm (1.6 in) diameter vent ports, located at the 11 o'clock and 1 o'clock positions. There was no discernable occupant contact evidence or other crash-related damage to the Honda's deployed driver's frontal air bag. The Honda's right IC air bag deployed downward from the roof side rail mounting location through the edge of the headliner. It extended the full length from the right A-pillar to the right D-pillar and provided outboard protection for the full glazing height from the roof side rail to below the beltline. A fabric tether attached the lower aspect to the A-pillar.

The right IC air bag had been cut post-crash by an unknown individual, presumably to gain unobstructed access to the vehicle's interior. There was no discernable occupant contact to the right IC air bag. Figure 8 shows the deployed driver's air bag at the time of the SCI inspection, while Figure 9 shows the deployed right IC air bag.

Figure 8. View of the deployed driver's frontal air bag in the Honda at the time of the SCI inspection

Figure 9. View from the second row of the deployed right IC air bag in the Honda

NHTSA Recalls and Investigations

A VIN-based query of NHTSA's recall database (www.nhtsa.gov/recalls) for the 2019 Honda Pilot indicated that there were no open recalls and no open investigations pertaining to this specific vehicle as of the date of this report.

Crash Avoidance Systems

The Honda was equipped with several crash avoidance (CA) systems that were designed to assist/support the driver in both avoiding a potential crash and/or reducing the severity of a crash event should a collision become imminent. The Honda's CA systems used two distinct sensors to support their functionality, including a radar sensor and an optical camera sensor. The radar sensor was located in the front grille (Figure 10), while the optical sensor was located on the interior of the windshield in front of the rearview mirror (Figure 11).

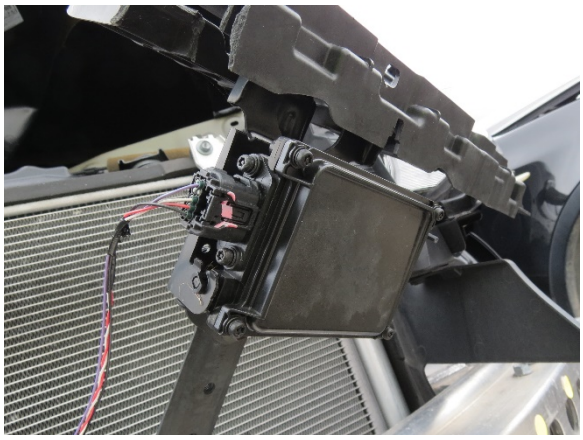


Figure 10. View of the Honda's front radar sensor for the FCW system

Figure 11. View of the Honda's optical sensor for the FCW and LDW systems

The Honda's CA systems included ACC, LKAS, RDM system, and CMBS. The LKAS and RDM systems were forms of LDW with lane keeping, while the CMBS was a form of FCW with CIB. The information discussed about the 2019 Honda Pilot's CA systems was derived from the vehicle owner's manual, a copy of which was included with the vehicle by its manufacturer at the time of original sale/delivery[1] and also was available electronically from the manufacturer's website at the time of this report.

The ACC system helped the driver maintain a consistent speed and pre-determined following distance behind other vehicles, without requiring driver input. It was operable only at speeds greater than 40 km/h (25 mph) and could accelerate or decelerate the vehicle to maintain the desired following distance. If the vehicle's speed dropped below 35 km/h (22 mph), the ACC automatically canceled. Warnings from the manufacturer stated that an improper use of the ACC system could lead to a crash.

The LKAS aided the driver in maintaining the travel lane and provided visual and tactile alerts when it sensed that the vehicle was drifting from the detected lane. It was functional from speeds of 72 to 145 km/h (45 to 90 mph). It was capable of providing torque to the steering wheel to allow the vehicle to maintain a detected lane without driver input. If the system sensed that the vehicle was drifting from a detected lane, it provided vibrations of the steering wheel and illuminated a warning display. Use of the vehicle's turn signals would suspend functionality of the LKAS, such that the driver could change lanes without receiving the system's alerts. The

[1] Honda Motor Co., Ltd. (2018). *Pilot: 2019 Owner's Guide*.

alert functionality of the system would return once the turn signal was off. In addition, the system would not work if the driver removed their hands from the steering wheel.

The RDM system functioned similar to the LKAS by providing alerts to prevent the vehicle from unintentionally departing a detected lane or leaving the roadway. It also was functional from speeds of 72 to 145 km/h (45 to 90 mph). Should the vehicle get too close to detected lane or roadway markings without activation of the turn signal, the system would provide visual/vibration alerts and apply torque to the steering wheel to help the driver maintain the lane/roadway. Braking was applied if the lane markings were solid/continuous. The manufacturer warned that over-reliance on the systems could result in a collision.

The CMBS could alert the driver of a potential collision with an object and was capable of reducing the vehicle's speed without driver input to help reduce the severity if a collision became unavoidable. There were three stages of warnings, which may or may not be progressive dependent upon circumstances and/or settings: (1) visual and audible warnings, (2) visual and audible warnings with light brake application, and (3) visual and audible warnings with strong brake application. A manufacturer warning stated that the system could reduce the severity of an unavoidable collision, but that it could not prevent collisions or stop the vehicle automatically.

The EDR component of the Honda's SRS control unit was capable of recording data concerning the vehicle's CA systems and their respective status/functionality. These data were contained in the imaged data (CDR report) only if the vehicle was equipped with the systems and data were recorded. The reported data included FCW (warning/not warning), CMBS (engaged/not engaged), CMBS/FCW status (On/Off), LDW (warning/not warning), RDM (engaged/not engaged), RDM/LDW status (On/Off), ACC (engaged/not engaged), ACC status (On/Off), lane keeping assist (engaged/not engaged), lane keeping assist status (On/Off), cruise control (engaged/not engaged), and cruise control status (On/Off). According to the data, the RDM system was "Off" for all recorded pre-crash intervals. However, the CMBS, ACC, and LKAS were all "On" leading up to the recorded crash event. The recorded data were as follows:

Time (sec)	FCW	CMBS	CMBS/ FCW	ACC	ACC	LKAS	LKAS
-5.0	Not warning	Not engaged	On	Not engaged	On	Not engaged	On
-4.5	Not warning	Not engaged	On	Not engaged	On	Not engaged	On
-4.0	Not warning	Not engaged	On	Not engaged	On	Not engaged	On
-3.5	Not warning	Not engaged	On	Not engaged	On	Not engaged	On
-3.0	Not warning	Not engaged	On	Not engaged	On	Not engaged	On
-2.5	Not warning	Not engaged	On	Not engaged	On	Not engaged	On
-2.0	Not warning	Not engaged	On	Not engaged	On	Not engaged	On
-1.5	Not warning	Not engaged	On	Not engaged	On	Not engaged	On
-1.0	Not warning	Not engaged	On	Not engaged	On	Not engaged	On
-0.5	Not warning	Not engaged	On	Not engaged	On	Not engaged	On
0.0	Not warning	Not engaged	On	Not engaged	Off	Not engaged	Off

The imaged data indicate that the Honda's CMBS system was on and operational prior to the crash. However, the system never activated to alert/warn the driver prior to the crash. This suggests that the system never detected the slower moving Isuzu truck, and therefore never provided a warning and could not engage to assist the driver or reduce the severity of the crash.

Several system limitations were described in the owner's manual that could account for the Honda CMBS not identifying the Isuzu truck:

- Driving at night or in a dark condition such as a tunnel.
- There is little contrast between objects and the background.
- The distance between your vehicle and the vehicle or pedestrian ahead of you is too short.
- The speed difference between your vehicle and a vehicle or pedestrian in front of you is significantly large.
- When the lead vehicle suddenly slows down.

No further specifics concerning this crash or the functionality of the Honda's CA systems specific to this crash were available at the time of this report.

2019 Honda Pilot Occupant

Driver Demographics

Age/sex:	32 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Forward-facing bucket seat with adjustable head restraint
Seat track position:	Rearmost
Manual restraint usage:	3-point lap and shoulder seat belt with retractor and lower anchor pretensioners (both actuated)
Usage Source:	Vehicle inspection, EDR data
Air bags:	Frontal, seat-mounted side impact, and IC air bags available; Frontal air bag deployed
Alcohol/drug data:	None (no test given)
Egress from vehicle:	Exited vehicle without assistance
Transport from scene:	Not medically transported
Type of medical treatment:	None reported

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
N/A	Unknown	N/A	N/A	N/A

Source: official records.

Driver Kinematics

The 32-year-old female driver was seated in the driver's seat of the Honda. She had adjusted the seat to its rearmost track position, with the seat back slightly reclined and the adjustable head restraint 6 cm (2.4 in) upward. The driver used the available 3-point lap and shoulder seat belt system for manual restraint. Her use of the seat belt system was determined by the post-crash SCI inspection of the Honda's manual restraints and corroborated by the data imaged from the vehicle's SRS control unit.

She drove the Honda eastbound on the limited access roadway. She did not see the other non-contact vehicle swerve out in front of the Isuzu, nor did she detect the slower moving Isuzu as she approached its back plane at a preset, constant speed of 105 km/h (65 mph). Despite the available CA equipment, including the FCW and CMBS systems which were turned on/operational, the Honda did not detect the Isuzu or provide a warning to the driver. Rather, the driver detected the Isuzu immediately prior to impact and provided a last-second left steering and braking in an attempt to avoid the crash.

Upon sensing the impact with the rear of the Isuzu, the SRS control unit commanded the actuation of the driver's retractor and lower pretensioners and the deployment of the driver's frontal air bag. The driver initiated a forward trajectory, and her body loaded the manual restraint system.

Her forward movement was restricted by the seat belt system, which provided the driver with a ride-down of the crash forces. It is likely that her head/face and chest contacted the deployed driver's frontal air bag, but the presence of the bag distributed the crash forces and mitigated injury. As the Honda came to final rest, the driver remained belted and in the driver's seat. She exited the vehicle without assistance and refused medical care/treatment at the crash scene. The driver was not medically transported from the scene. It remains unknown whether the driver sought medical evaluation after leaving the scene of the crash.

2006 Isuzu NPR Single-Unit Straight Truck

Description

The 2006 Isuzu NPR (Figure 12) was identified by the VIN JALB4B16867xxxxxx. It was a single-unit straight truck with a 447 cm (176.0 in) wheelbase. It was powered by a 5.2-liter, inline, 4-cylinder, diesel engine. The truck had a 6.1 m (20.0 ft) long enclosed cargo box 244 cm (96.0 in) wide and 213 cm (84.0 in) tall. The bottom of the cargo box was approximately 86 cm (34.0 in) above ground level. The truck was configured for local delivery and transport; it was not used for long-distance operation. It had a GVWR of 6,350 kg (14,000 lb).

Figure 12. Left front oblique view of the 2006 Isuzu NPR truck at the time of the SCI inspection

Figure 13. Back plane view of the Isuzu truck

Exterior Damage

The Isuzu truck was inspected at the facility of its owner. Figure 13 shows the back plane of the Isuzu. According to the owner, the rear impact guard of the truck had been "repaired" following the crash. However, the SCI investigator observed that the left taillight assembly was held in place by plastic ties, and there were minor scratches in the matte black paint. Additionally, the surface rust and color of the underride guard and rear plane components matched the surface rust and color of the overall vehicle and body. It was apparent to the SCI investigator that the truck had not sustained significant damage and that no work had been done to the truck since the crash, with the exception of using plastic ties to hold up the left taillight. Based on the dimensional height of the Isuzu and its back plane, the height of the bottom of the rear underride guard was higher in relation to the height of the bumper beam of the Honda. That is, the bumper beam of the Honda and the underride guard of the Isuzu were not in dimensional alignment.

The measurements obtained by the SCI investigator indicated that the Honda's front bumper beam would have passed directly below the Isuzu's rear underride guard when the crash occurred. This further supported the SCI investigator's conclusion that no repair to the Isuzu had occurred.

Figure 14 is a close-up of the area of impact to the Isuzu by the Honda, while Figure 15 shows the undercarriage and unrepaired left taillight. Note the scratching on the lower left edge of the underride guard in Figure 14, and the uniformity of the coloration and rust to the underride guard, sill, undercarriage, and frame in Figure 15.

Figure 14. Area of impact to the rear plane of the Isuzu

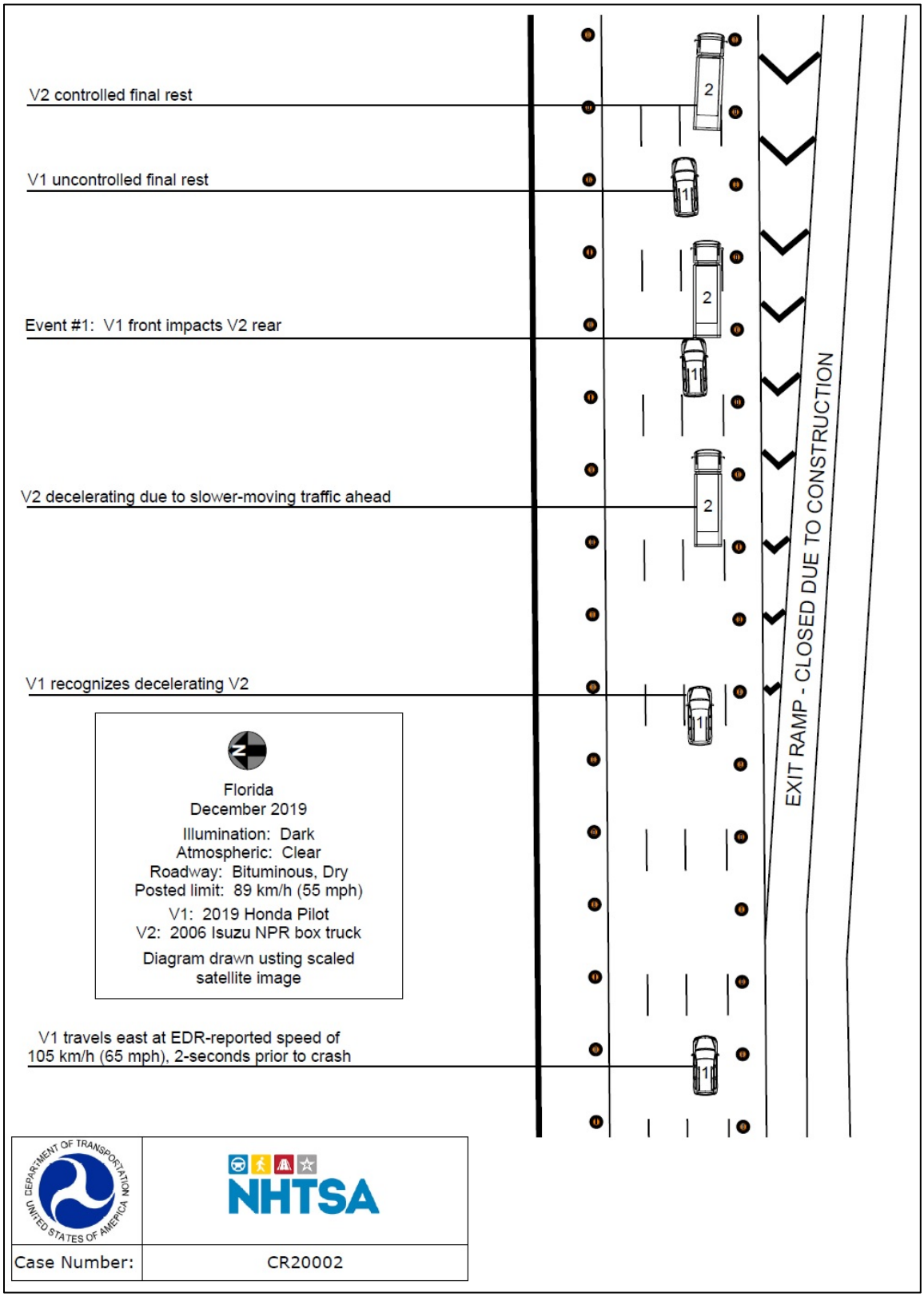
Figure 15. Damaged left rear taillight of the Isuzu

Based on the observations of the SCI investigator, the truck deformation classification assigned to the Isuzu for the impact by the Honda was 06BLFWA. No WinSMASH calculations could be performed for the Isuzu because it was not a vehicle in the model's parameters.

Occupant Data

The Isuzu was driven by a 33-year-old male. According to the PCR and SCI interview, the driver used the 3-point lap and shoulder seat belt. He was not injured in the crash, did not receive any medical care or transport, and drove the Isuzu from the scene following the on-scene law enforcement investigation of the crash.

Crash Diagram



Appendix A: Event Data Recorder Report for 2014 Honda Pilot EXL[2]

[2] The EDR report contained in this technical report was imaged using the version of the Bosch CDR software current at the time of the vehicle inspection. The CDR report contained in the associated Crash Viewer application may differ relative to this report.

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	5FNYF5H57KB******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CR20002_V1_ACM.CDRX
Saved on	Monday, January 27 2020 at 16:54:59
Imaged with CDR version	Crash Data Retrieval Tool 19.3
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 21.2
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	1

Comments

No comments entered.

Data Limitations

General Information:

These limitations are intended to assist you in reading the event data that has been imaged from the vehicle's SRS control unit. They contain general information and are not specific to this particular event. Event data should be considered in conjunction with other available physical evidence from the vehicle and scene.

Honda and Acura passenger vehicles designated as 2013 or later model year production are designed to be compatible with the Bosch CDR tool. Only some 2012 model year vehicles are compatible with the Bosch CDR tool.

Recorded Crash Events:

Data for front, side, rear and rollover events can be recorded as either non-deployment or deployment events. Both types of events can contain pre-crash and crash data.

- A non-deployment event is recorded if the change in longitudinal or lateral velocity equals or exceeds 8km/h over a 150ms timeframe or another type of non-reversible deployable restraint device other than a front, side, or side curtain airbag (e.g. seatbelt pretensioner) is commanded to deploy. Except as indicated below, non-deployment events are not locked into memory and can be over-written by subsequent non-deployment or deployment events.
- A deployment event is recorded if front airbag(s), side airbag(s), or side curtain airbag(s) are commanded to deploy. Deployment events are locked into memory and cannot be over-written.

The SRS control unit typically records only one event. Two events can be recorded if the T0 (time zero) values for each event occur within 5 seconds of each other. Therefore, a non-deployment event can be recorded and locked if it occurs within 5 seconds of a deployment event.

T0 is established by whichever of the following occurs first: (1) the change in longitudinal velocity at the SRS control unit equals or exceeds 0.8km/h over a 20ms timeframe; or (2) the change in lateral velocity at the SRS control unit equals or exceeds 0.8km/h over a 5ms timeframe; or (3) the occupant restraint control algorithm is activated; or (4) a commanded deployment of any type of non-reversible deployable restraint device (e.g. airbag or seatbelt pretensioner). If the time to deploy equals 0, then the command to deploy occurred at T0 or the device was not commanded to deploy during the event.

TEnd (end of event) is established by whichever of the following occurs first: (1) the change in longitudinal and lateral Delta V equals or falls below 0.8km/h over a 20ms timeframe; or (2) the occupant restraint control algorithm resets; or (3) time from T0 exceeds 300ms.

Data:

- Data recorded by the SRS control unit and imaged by the CDR tool is displayed relative to T0, not the time at which the vehicle made contact with another vehicle or object.
- Pre-crash data is recorded at 2 samples per second within the 5 seconds before T0. The sampling point at 0.0 is taken at T0 and is asynchronous with the other sample points. The time between -0.5 and 0.0 is not recorded and is between 1 and 500ms.
- Delta V data is recorded at 100 samples per second from T0 to 250ms or T0 to TEnd plus 30ms.
- Acceleration data is recorded at 100 samples per second from T0 to 250ms.
- Delta V, longitudinal reflects the change in velocity that the SRS control unit experienced in the longitudinal direction during the recorded portion of the event and is not the speed the vehicle was traveling before the event.

- Depending on the severity of the event and the accelerometer characteristics, saturation of the SRS control unit longitudinal or lateral accelerometers may occur, decreasing the recorded Delta V value.
- Time, accelerometer range exceeded is recorded if saturation of the SRS control unit longitudinal, lateral and/or normal (vertical) accelerometer occurs. The recorded data is the time at which the sensor range is first exceeded.
- The maximum recording capability of Deployment Command Data is 254ms or 255ms depending on vehicle model. A recorded value of 254ms or 255ms may indicate that the recording maximum was exceeded. In this case, the deployment command may have occurred between the recorded time and TEnd.
- Speed, vehicle indicated data is the speed indicated to the driver by the speedometer, not actual vehicle ground speed. Data accuracy can be affected by various factors, including but not limited to the following:
    - Significant changes in tire size from the factory setting
    - Wheel lockup or spin
    - Data latency or filtering and hysteresis within the speedometer module
- Accelerator pedal position, percent full is the ratio of accelerator pedal position compared to the fully depressed position.
- PCM (Powertrain Control Module) derived accelerator pedal position, percent full may differ from the accelerator pedal position, percent full under circumstances such as brake override activation or cruise control system engagement. These circumstances are based on vehicle equipment application and vary by model.
- Steering input angle is recorded in 5 degree increments.
- Side air bag suppression system status, right front passenger is recorded when the vehicle is equipped with the Occupant Position Detection System (OPDS).
- Occupant size classification, right front passenger airbag suppressed data is recorded as yes (suppressed) if the front passenger seat weight sensor system determined the passenger seat was empty or occupied by a child-size occupant.
- EV mode data records the vehicle powertrain status, not a driver selected operation mode. EV mode is recorded as On when the vehicle is moving and the internal combustion engine is not operating. EV mode may be recorded as On or Off when the vehicle is stopped.
- If power to the SRS control unit is lost during an event, all or part of the data may not be recorded.

Roll Rate Data:
- Vehicle roll rate data is recorded separately from the non-deployment and deployment events as described above. Therefore, the T0 for the roll rate data may differ from the T0 for the other data in this report.
- Roll rate recording trigger (T0) is established by whichever of the following occurs first: (1) a rollover algorithm ON judgment (SRS control unit decision to command deployment);; or (2) a change in relative roll angle at the SRS control unit equal to or exceeding 30 degrees (roll angle is not measured, but is calculated from the roll rate data); or (3) the rollover algorithm is activated.
- Once a recording trigger has been met, roll rate data is recorded for one rollover event at 10 samples per second from 1 second before to 2 seconds after T0. If a roll angle trigger is satisfied without a rollover algorithm ON judgment, the recorded roll rate data is unlocked and can be over-written by a subsequent rollover event. Roll rate data triggered by or recorded during a rollover algorithm ON judgment is locked into memory and cannot be over-written.
- If roll rate is detected at the SRS control unit during a non-deployment or deployment event but the recording trigger has not been satisfied, no roll rate data will be recorded. A graph of roll rate data will only be present in this report if roll rate data is recorded.

Data Element Sign Convention:
Except as noted below, all data is displayed in SAE J211 sign convention. The following table provides an explanation of the sign notation for data elements that may be included in this CDR report. All directional references to sign notation are from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Data element name	Positive sign indicates
Longitudinal Acceleration	Forward direction acceleration
Delta-V, Longitudinal	Forward direction acceleration
Lateral Acceleration	Left to right direction acceleration
Delta-V, Lateral	Left to right direction acceleration
Normal (Vertical) Acceleration	Downward direction acceleration
Vehicle Roll Rate*	See roll rate graph and data (if recorded)
Steering Input Angle*	Left Turn

*Not SAE J211 sign convention

Data Source:
All recorded data is measured and calculated within the SRS control unit except for the following parameters (if applicable) which are transmitted via the vehicle's communication network to the SRS control unit:
- Speed, vehicle indicated
- Accelerator pedal position, percent full
- Service brake
- ABS activity
- Stability control
- Steering input angle
- Engine RPM
- PCM derived accelerator pedal position, percent full
- EV mode
- Forward Collision Warning
- Collision Mitigation Braking System information
- Lane Keeping Assist System information
- Lane Departure Warning
- Road Departure Mitigation information
- Cruise Control status

- Adaptive Cruise Control status

Depending on vehicle feature content, capability, or conditions described above, the following items may not be recorded. If these items are not recorded, they will not be present in this document.
- EV mode
- Forward Collision Warning
- Collision Mitigation Braking System information
- Lane Keeping Assist System information
- Lane Departure Warning
- Road Departure Mitigation information
- Cruise Control status
- Adaptive Cruise Control status

Hexadecimal Data:
All data that has been specified for imaging is shown in the hexadecimal data section of this report. However, not all of this data is translated by the CDR tool. The SRS control unit may contain additional data that is not retrievable by the CDR tool.

Data Imaging:
If the SRS control unit is imaged outside of the vehicle, ensure that it is not moved, tilted or turned while connected to the CDR tool. Also, after imaging is complete, wait 3 minutes after removing the CDR tool before moving the SRS control unit. Not following this guideline could cause current non-deployment event data to be overwritten and a new event to be recorded. Current fault status could also be altered if the SRS control unit is imaged outside of the vehicle.

04002_HondaSRS_GEN2_r002

System Status at Retrieval

EDR Version	1.3.2.0

System Status at Event (Event Record 1)

Multi-Event, Number of Events (1, 2)	1
Complete File Recorded (Yes/No)	Yes
Ignition Cycle, Download	2316
Maximum Delta-V, Longitudinal (MPH [km/h])	-19 [-30]
Time, Maximum Delta-V, Longitudinal (msec)	197.5
Maximum Delta-V, Lateral (MPH [km/h])	-1 [-1]
Time, Maximum Delta-V, Lateral (msec)	67.5
Time, Maximum Delta-V, Resultant (msec)	197.5
Time, Accelerometer Range Exceeded, Longitudinal (msec)	0
Time, Accelerometer Range Exceeded, Lateral (msec)	0
Time, Accelerometer Range Exceeded, Normal (msec)	0

Deployment Command Data (Event Record 1)

Pretensioner Deployment, Time to Fire, Driver (msec)	18
Pretensioner Deployment, Time to Fire, Right Front Passenger (msec)	0
Lap Pretensioner Deployment, Time to Fire, Driver (msec)	26
Lap Pretensioner Deployment, Time to Fire, Right Front Passenger (msec)	0
Frontal Air Bag Deployment, Time to Deploy First Stage, Driver (msec)	40
Frontal Air Bag Deployment, Time to Deploy First Stage, Right Front Passenger (msec)	0
Frontal Air Bag Deployment, Time to 2nd Stage, Driver (msec)	70
Frontal Air Bag Deployment, Time to 2nd Stage, Right Front Passenger (msec)	0
Side Air Bag Deployment, Time to Deploy, Driver (msec)	0
Side Air Bag Deployment, Time to Deploy, Right Front Passenger (msec)	0
Side Curtain/Tube Air Bag Deployment, Time to Deploy, Driver Side (msec)	0
Side Curtain/Tube Air Bag Deployment, Time to Deploy, Right Side (msec)	95
Frontal Air Bag Deployment, 2nd Stage Disposal, Driver (Yes/No)	No
Frontal Air Bag Deployment, 2nd Stage Disposal, Right Front Passenger (Yes/No)	No

Pre-Crash Data -1 sec (Event Record 1)

Safety Belt Status, Driver	On
Safety Belt Status, Right Front Passenger	Off
Seat Track Position Switch, Foremost, Status, Driver	No
Occupant Size Classification, Right Front Passenger Airbag Suppressed (Yes/No)	Yes
Frontal Air Bag Warning Lamp (On, Off)	Off
Ignition Cycle, Crash	2310

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1) - Table 1 of 3

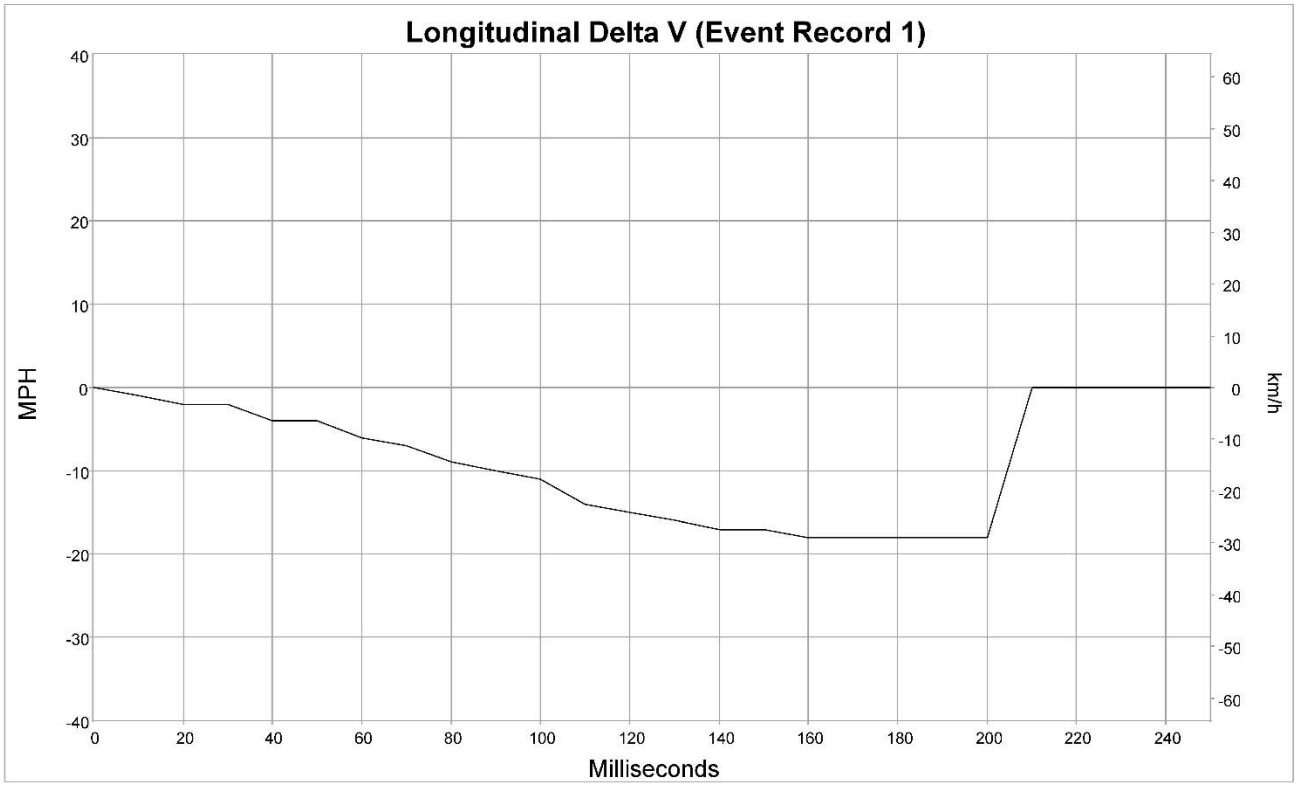
Time Stamp (sec)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal Position, % full	Service Brake (On, Off)	ABS Activity (On, Off)	Stability Control (On, Off, Engaged)	Steering Input (deg)	Engine RPM
-5.0	66 [106]	0	Off	Off	On Non-Engaged	0	1,700
-4.5	65 [105]	19	Off	Off	On Non-Engaged	0	1,800
-4.0	65 [105]	20	Off	Off	On Non-Engaged	-5	1,900
-3.5	65 [105]	21	Off	Off	On Non-Engaged	-5	1,700
-3.0	65 [105]	24	Off	Off	On Non-Engaged	-5	1,700
-2.5	65 [105]	26	Off	Off	On Non-Engaged	-5	1,800
-2.0	65 [105]	25	Off	Off	On Non-Engaged	0	1,700
-1.5	65 [105]	24	Off	Off	On Non-Engaged	0	1,700
-1.0	65 [105]	0	Off	Off	On Non-Engaged	20	1,700
-0.5	65 [104]	0	On	Off	On Non-Engaged	0	1,500
0.0	52 [84]	0	On	On	On Non-Engaged	0	1,300

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1) - Table 2 of 3

Time Stamp (sec)	PCM Derived Accelerator Pedal Position, % full	Forward Collision Warning (Not Warning/ Warning)	Collision Mitigation Braking System (Not Engaged/ Engaged)	Collision Mitigation Braking System, Forward Collision Warning (On/Off)	Lane Departure Warning (Not Warning/ Warning)	Road Departure Mitigation (Not Engaged/ Engaged)	Road Departure Mitigation, Lane Departure Warning (On/Off)
-5.0	0	Not warning	Not engaged	On	Not warning	Not engaged	Off
-4.5	19	Not warning	Not engaged	On	Not warning	Not engaged	Off
-4.0	20	Not warning	Not engaged	On	Not warning	Not engaged	Off
-3.5	21	Not warning	Not engaged	On	Not warning	Not engaged	Off
-3.0	24	Not warning	Not engaged	On	Not warning	Not engaged	Off
-2.5	26	Not warning	Not engaged	On	Not warning	Not engaged	Off
-2.0	25	Not warning	Not engaged	On	Not warning	Not engaged	Off
-1.5	24	Not warning	Not engaged	On	Not warning	Not engaged	Off
-1.0	0	Not warning	Not engaged	On	Not warning	Not engaged	Off
-0.5	0	Not warning	Not engaged	On	Not warning	Not engaged	Off
0.0	0	Not warning	Not engaged	On	Not warning	Not engaged	Off

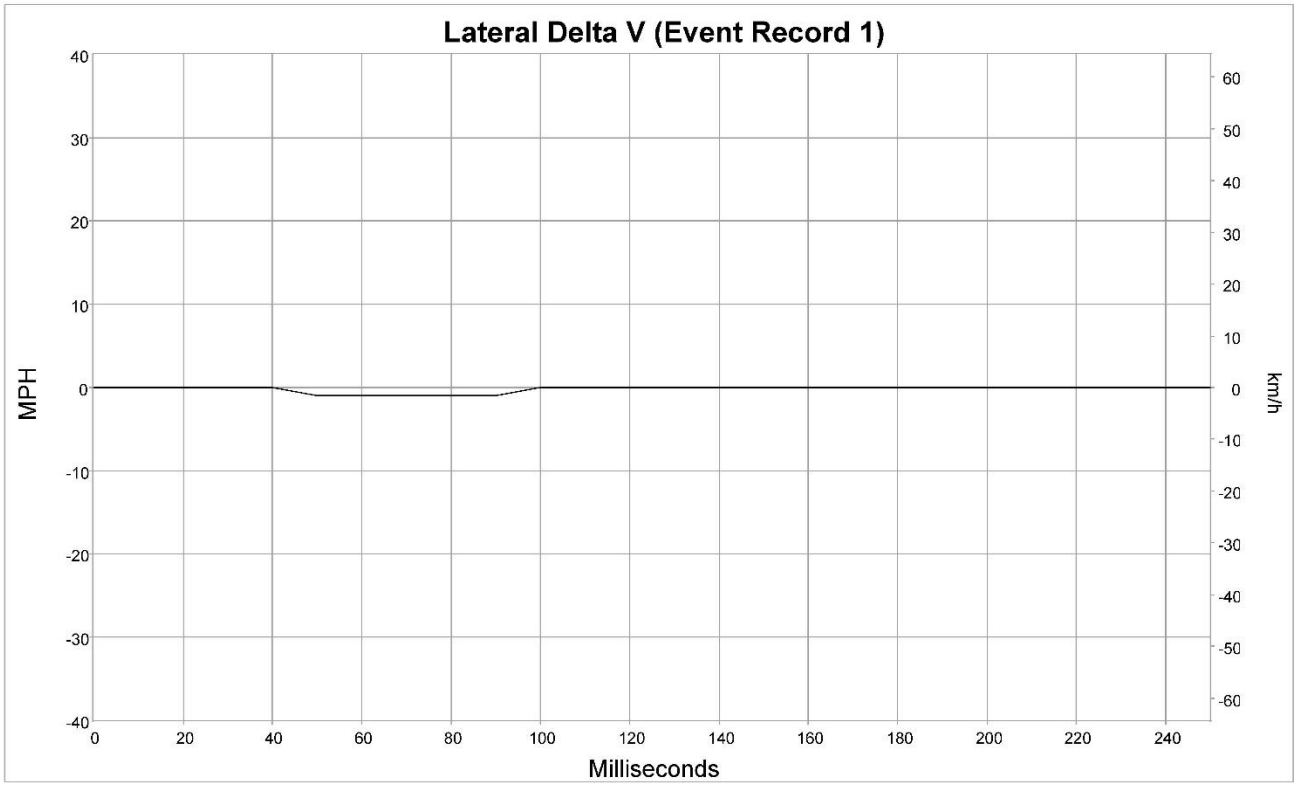
Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1) - Table 3 of 3

Time Stamp (sec)	Adaptive Cruise Control (Not Engaged/ Engaged)	Adaptive Cruise Control (On/Off)	Lane Keeping Assist (Not Engaged/ Engaged)	Lane Keeping Assist (On/Off)	Cruise Control (Not Engaged/ Engaged)	Cruise Control (On/Off)
-5.0	Not engaged	On	Not engaged	On	Not Engaged	On
-4.5	Not engaged	On	Not engaged	On	Not Engaged	On
-4.0	Not engaged	On	Not engaged	On	Not Engaged	On
-3.5	Not engaged	On	Not engaged	On	Not Engaged	On
-3.0	Not engaged	On	Not engaged	On	Not Engaged	On
-2.5	Not engaged	On	Not engaged	On	Not Engaged	On
-2.0	Not engaged	On	Not engaged	On	Not Engaged	On
-1.5	Not engaged	On	Not engaged	On	Not Engaged	On
-1.0	Not engaged	On	Not engaged	On	Not Engaged	On
-0.5	Not engaged	On	Not engaged	On	Not Engaged	On
0.0	Not engaged	Off	Not engaged	Off	Not Engaged	Off



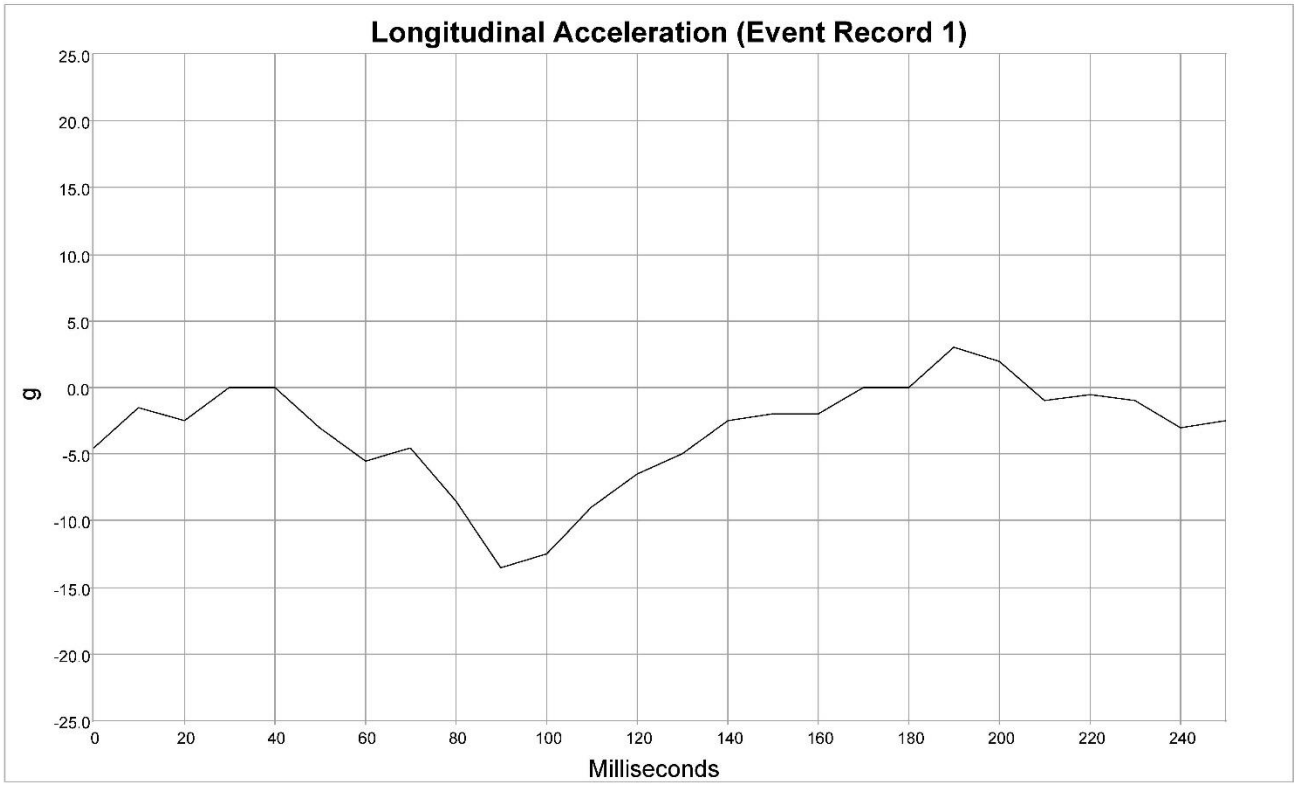
Longitudinal Delta V (Event Record 1)

Time (msec)	MPH [km/h]
0	0 [0]
10	-1 [-1]
20	-2 [-3]
30	-2 [-4]
40	-4 [-6]
50	-4 [-7]
60	-6 [-9]
70	-7 [-11]
80	-9 [-14]
90	-10 [-16]
100	-11 [-18]
110	-14 [-22]
120	-15 [-24]
130	-16 [-26]
140	-17 [-27]
150	-17 [-28]
160	-18 [-29]
170	-18 [-29]
180	-18 [-29]
190	-18 [-29]
200	-18 [-29]
210	0 [0]
220	0 [0]
230	0 [0]
240	0 [0]
250	0 [0]



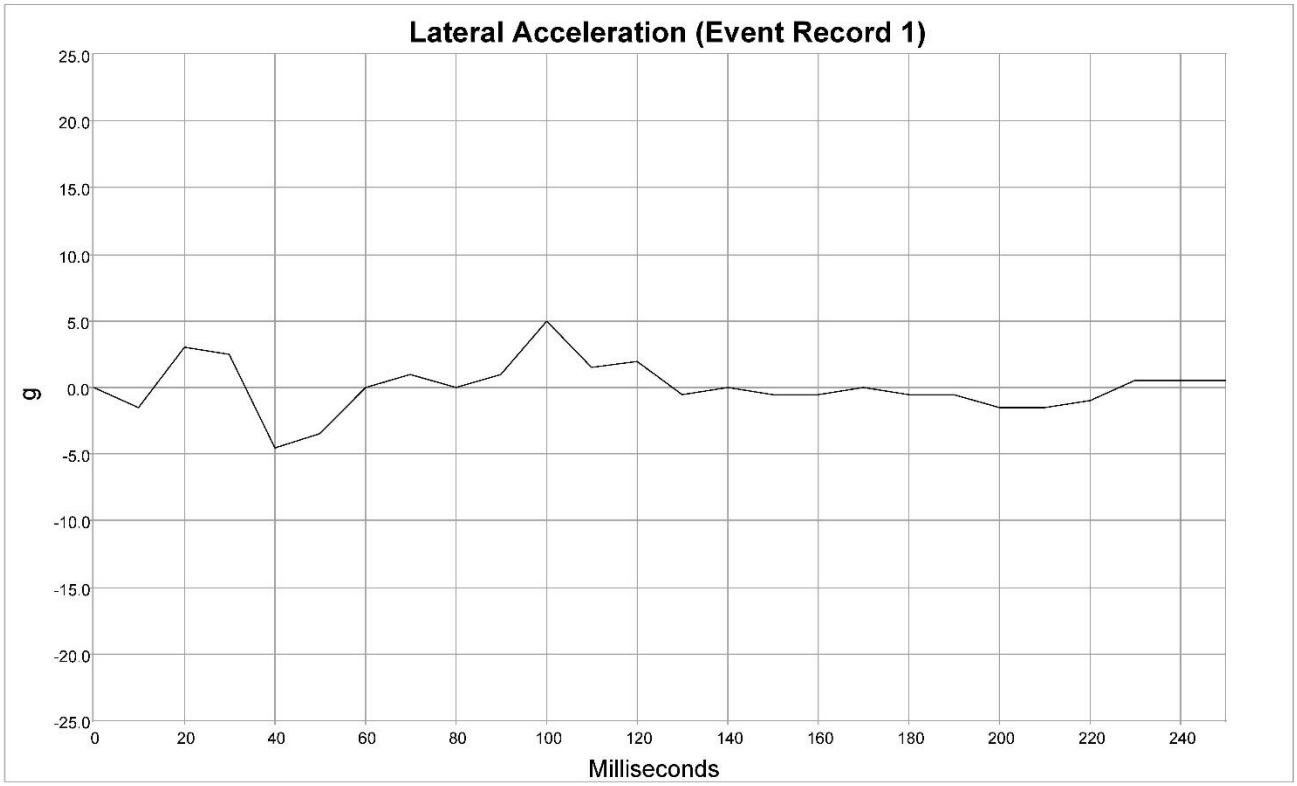
Lateral Delta V (Event Record 1)

Time (msec)	MPH [km/h]
0	0 [0]
10	0 [0]
20	0 [0]
30	0 [0]
40	0 [0]
50	-1 [-1]
60	-1 [-1]
70	-1 [-1]
80	-1 [-1]
90	-1 [-1]
100	0 [0]
110	0 [0]
120	0 [0]
130	0 [0]
140	0 [0]
150	0 [0]
160	0 [0]
170	0 [0]
180	0 [0]
190	0 [0]
200	0 [0]
210	0 [0]
220	0 [0]
230	0 [0]
240	0 [0]
250	0 [0]



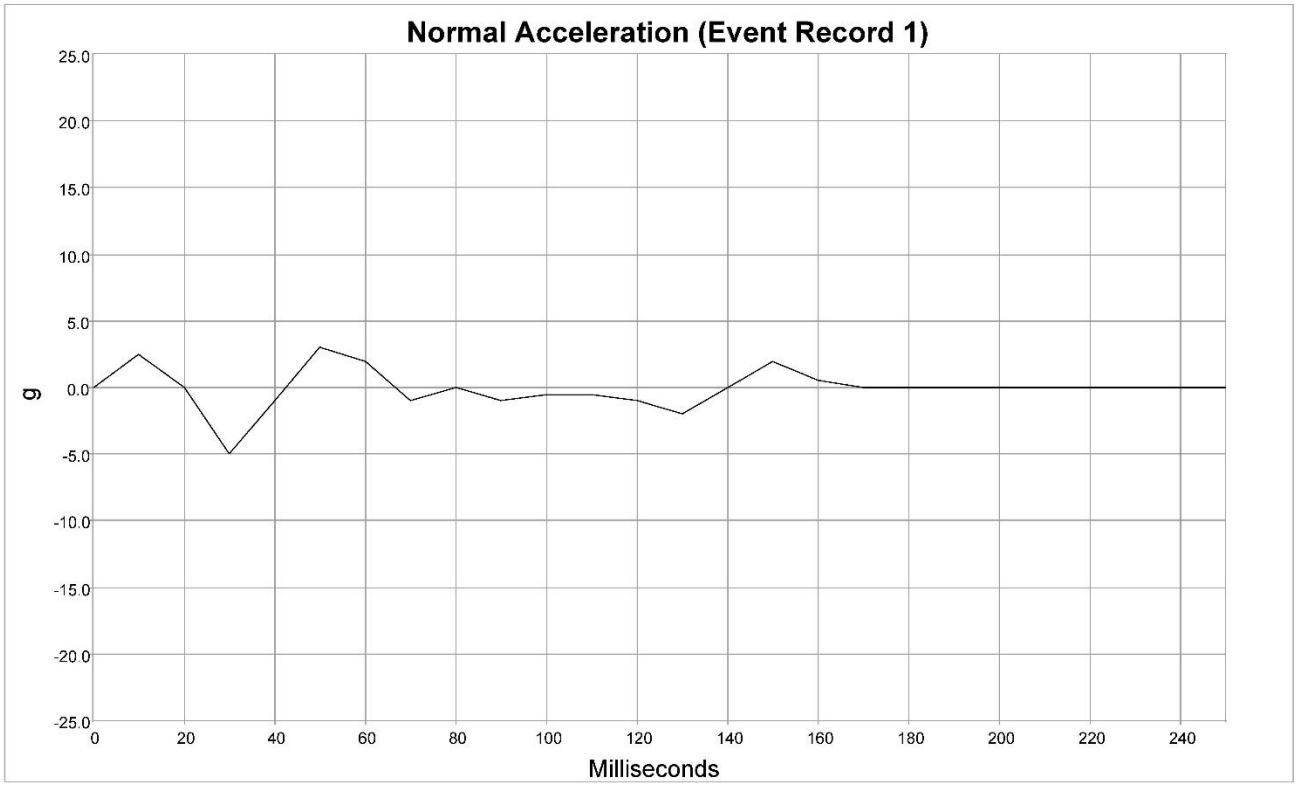
Longitudinal Acceleration (Event Record 1)

Time (msec)	g
0	-4.5
10	-1.5
20	-2.5
30	0.0
40	0.0
50	-3.0
60	-5.5
70	-4.5
80	-8.5
90	-13.5
100	-12.5
110	-9.0
120	-6.5
130	-5.0
140	-2.5
150	-2.0
160	-2.0
170	0.0
180	0.0
190	3.0
200	2.0
210	-1.0
220	-0.5
230	-1.0
240	-3.0
250	-2.5



Lateral Acceleration (Event Record 1)

Time (msec)	g
0	0.0
10	-1.5
20	3.0
30	2.5
40	-4.5
50	-3.5
60	0.0
70	1.0
80	0.0
90	1.0
100	5.0
110	1.5
120	2.0
130	-0.5
140	0.0
150	-0.5
160	-0.5
170	0.0
180	-0.5
190	-0.5
200	-1.5
210	-1.5
220	-1.0
230	0.5
240	0.5
250	0.5



Normal Acceleration (Event Record 1)

Time (msec)	g
0	0.0
10	2.5
20	0.0
30	-5.0
40	-1.0
50	3.0
60	2.0
70	-1.0
80	0.0
90	-1.0
100	-0.5
110	-0.5
120	-1.0
130	-2.0
140	0.0
150	2.0
160	0.5
170	0.0
180	0.0
190	0.0
200	0.0
210	0.0
220	0.0
230	0.0
240	0.0
250	0.0

Hexadecimal Data

```
DID #          Data

$8000          21 6E 11 11 01 33 00 55 00 55 00 00 11 33 80 00
               20 0F 00 E9 02 05 00 00 00 00 00 00 00 00 00 00
               11 11 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 6C

$8020          01 03 00 00 00 00 00 00 00 00 00 00 00 00 00 FC

$8021          AA 00 01 00 00 00 00 00 00 00 00 55 09 0C AA 00

$8022          AA 00 CC 78 66 00 00 00 12 00 00 00 1A 00 00 00
               00 28 00 46 00 00 00 00 00 00 00 00 00 00 5F 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               11 00 00 00 00 00 00 00 00 00 00 00 00 00 00 A2

$8023          AA 00 CC 78 66 00 00 00 00 00 00 00 00 00 00 00
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               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               11 00 00 00 00 00 00 00 00 00 00 00 00 00 00 9B

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               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 B1

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$802C       AA 01 F7 FD FB 00 00 FA F5 F7 EF E5 E7 EE F3 F6
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$802E       AA 01 00 FD 06 05 F7 F9 00 02 00 02 0A 03 04 FF
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$8007       AA 00 00 00 00 00 00 00 0E 00 00 00 00 00 00 00
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                FF D9 00 01 C1 FE 62 00 FE 05 01 B0 00 00 00 52
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October 2021

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

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