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Special Crash Investigations:

On-Site Ambulance Rollover Crash Investigation;

Vehicle: 2019 Ford E350 Type III Ambulance;

Location: North Carolina;

Date: January 2022

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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 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.

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16. Abstract

This on-site investigation documents the fatal multi-event crash and rollover of a 2019 Ford E-350 Type III ambulance conducting an inter-facility transport due to the patient's heart condition. It was operating without its emergency lights or sirens on a four-lane highway when it encountered icy pavement. The ambulance lost traction and rotated counterclockwise. The driver oversteered into the right lanes where it departed the right side of the roadway and struck a guardrail (Event 1). The ambulance penetrated through the guardrail, went down an embankment and rolled over (Event 2) until it struck several trees with its undercarriage (Event 3), which interrupted the rollover. The ambulance came to rest at the bottom of the embankment on its wheels after completing four quarter-turns. At the time of the crash, the ambulance was occupied by a belted 20-year-old male driver, an unbelted 32-year-old male emergency medical technician seated in the rear-facing captain's chair, and an 84-year-old female patient. The patient was partially restrained on the cot by a lateral foot and thigh straps. The driver and EMT suffered police reported C-level possible injuries. They were both transported by ambulance to a level 1 trauma center where they were treated and released. The police reported K-level (fatal) injuries for the patient who suffered a cardiac arrest during transport and was pronounced deceased prior to admission to the trauma center.

17. Key Words	18. Distribution Statement
Rollover, guardrail, ambulance, fatality	Document is available to the public from the DOT, National Highway Traffic Safety Administration, National Center for Statistics and Analysis, https://crashstats.nhtsa.dot.gov.

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Special Crash Investigations
On-Site Ambulance Rollover Crash Investigation
Case No.: CR22003
Vehicle: 2019 Ford E-350 Type III Ambulance
Location: North Carolina
Crash Date: January 2022

Background

This on-site investigation documents the multi-event rollover crash of a 2019 Ford E-350 Type III ambulance (Figure 1) conducting an inter-facility transport due to the patient's heart condition. Operating without the use of its emergency lights or sirens, the ambulance was traveling westbound and negotiating the left curve of a four-lane highway when it encountered icy pavement. The ambulance lost traction and rotated counterclockwise. The driver oversteered to the right to regain control, causing the ambulance to yaw clockwise into the right lanes. It departed the right side of the roadway and struck a guardrail (Event 1). Its mass and impact angle caused the ambulance to penetrate the guardrail and go down an embankment, entering a left-side-leading rollover (Event 2), striking several trees with its undercarriage (Event 3), which interrupted the rollover. It came to rest at the bottom of the embankment on its wheels after completing four quarter-turns. The ambulance was driven by a belted 20-year-old male, with an unbelted 32-year-old male emergency medical technician (EMT) in the rear-facing captain's chair, and an 84-year-old female patient partially restrained on the cot by lateral foot and thigh straps. The driver and EMT suffered police-reported C-level possible injuries. They were transported by ambulance to a level 1 trauma center where they were treated and released. The police reported K-level (fatal) injuries for the patient. According to the driver and EMT's interviews and her medical report, the patient was transported from the crash by ambulance to a level 1 trauma center but suffered cardiac arrest during transport. She was pronounced deceased prior to admission to the trauma center. The ambulance was pulled up to the embankment and towed from the scene to a secured location for the duration of the police investigation. It was later released to the ambulance agency and towed to a secondary secured lot where it remained for this investigation.

Figure 1. Left front oblique view of the ambulance

The crash was identified by NHTSA's Office of Emergency Medical Services. A notification was forwarded to the Special Crash Investigations (SCI) group and assigned for on-site investigation by the SCI team at Crash Research & Analysis in January 2022. The SCI team-initiated contact with the ambulance service for an inspection of the ambulance, which occurred in February 2022. The on-site investigation included exterior and interior inspections of the ambulance to measure exterior deformation, interior damage, and intrusion, as well as to document any evidence of interior occupant contact, and to examine the manual and supplemental restraint systems. The specialty equipment and features of the patient compartment were also inspected and documented. The crash site was documented using photographs and a total station mapping system. The SCI investigators conducted interviews with the driver and the EMT, in addition to gathering information from the ambulance service regarding operating procedures and policies.

Crash Summary

Crash Site

The crash occurred at night on a divided four-lane east/west highway. At the time of the crash the National Weather Service reported conditions as cloudy with a temperature of -1.1 °C (30 °F), 85 percent humidity, and north-by-northeast winds of 12.8 km/h (8 mph). The hour prior to the crash, conditions reported were light snow with a temperature of -1.1 °C (30 °F) and a dew point of -3.3 °C (25 °F). There was no artificial overhead lighting in the vicinity of the crash site.

Figure 2. Approach of the ambulance looking west

Figure 3. Viewing east and the look back at the ambulance approach

Figure 4. Facing southwest and viewing the shoulder/ embankment drop-off as seen from Event 2

Figure 5.Facing southwest and viewing the shoulder/ embankment drop-off as seen from Event 2

The highway consisted of a large radius left curve with 2° superelevation running right to left. In the immediate area of the crash was a concrete overpass with a posted speed limit of 113 km/h (70 mph) (Figures 2 and 3). The right-most lane was an entrance lane from the overpassed roadway below. All lanes were 3.6 m (11.8 ft) wide and separated by dashed white lane lines. There was a W-beam guardrail bordering the right side of the roadway that was 65 cm (25.6 in) tall and supported by I-beams spaced every 1.9 m (6.2 ft). The roadside beyond the guardrail dropped down 11.8 m (38.4 ft) with a 40 to 45 percent graded slope. The ground was soft earth covered by a thick layer of pine needles. Small brush and softwood trees were growing sporadically along the embankment (Figure 4). The embankment bottomed out into a level wooded area of softwood pine trees (Figure 5). A crash diagram is included at the end of this report.

Ambulance Agency, Crew, and Transport Description

The ambulance was owned and operated by a private ambulance agency that was not associated with any medical treatment center and provided general transport to and from medical facilities. The ambulance crews provided basic and advanced life support medical services.

The belted ambulance driver was a basic EMT who had received in-house training through the emergency vehicle operator course. The driver had worked with the agency for 6 months before this crash. He had previously worked for another ambulance service for an unknown duration. His normal work schedule was 12-hour shifts from 6 p.m. to 6 a.m. He worked the night prior to the crash on the same shift.

The unbelted EMT in the captain's chair in the back of the ambulance was trained as an advanced EMT with 10 years' experience. He had been working with the agency for a year prior to the crash and typically worked 12-hour shifts from 6 p.m. to 6 a.m. The EMT and driver were both wearing tactical pants, agency polo shirts, and polyester zip-up jackets.

The ambulance was conducting an inter-facility transport due to the female patient's heart condition, which required surgery at a more advanced facility.

Pre-Crash

The ambulance was traveling west in the third lane from the right with its cruise control set to a driver-reported speed of 125.5 km/h (78 mph). The driver said they had just completed a run on the same route and that during the prior transport there had been visible, intermittent snowfall. He did not remember icing on the overpass. The ambulance was approximately 70 minutes into its 2-hour trip, and the driver had been on duty for approximately 9 hours.

As the ambulance traveled over the overpass it hit an icy area and lost traction. The ambulance rotated counterclockwise approximately 15°. The driver reacted by steering to the right, overcorrecting the ambulance into a clockwise yaw, and into the right lanes.

Crash

The ambulance yawed clockwise, departed the right side of the roadway, and struck a guardrail (Event 1) with its front plane. The guardrail deformed and the momentum of the ambulance carried the vehicle through it. The negative slope of the embankment and the clockwise yaw led

to-a left–side-leading rollover (Event 2). The patient compartment's left-side roof rail struck the ground approximately 30 meters (98 ft) from the roadway departure point. The ambulance rolled an additional 14.3 meters (46.9 ft) striking the soft ground with its right rear top corner of the patient compartment. It continued rolling approximately 8 meters (26 ft) down the embankment and struck several softwood trees with its undercarriage (Event 3). The trees interrupted the rollover and brought the vehicle to final rest, located 13.6 meters (44.6 ft) away from the tree contact at the bottom of the embankment. At final rest the ambulance was on its wheels facing northwest. It had traveled approximately 66 meters (216 ft) with a 11.8 m (38.4 ft) elevation drop from its road departure and its heading changed approximately 124 degrees.

Post-Crash

During the ambulance crew interviews, the driver said he exited the ambulance through the front passenger's door. He opened the right-side patient compartment door and saw that the EMT was injured, and that the patient was on the floor next to the door, lying on her back with her feet angled up on the cot. The driver called for help and activated his emergency lights. The police and EMS personnel responded accordingly. The driver had non-incapacitating injuries and was transported by ambulance to a level 1 trauma center. The EMT was removed from the ambulance with suspected incapacitating injury and transported by ambulance to a level 1 trauma center. The patient was removed from the ambulance with suspected incapacitating injury and transported to a level 1 trauma center. During that transport, the patient suffered cardiac arrest and cardiopulmonary resuscitation occurred. She was pronounced deceased in the emergency room 71 minutes after the reported crash time prior to admittance.

The ambulance was pulled up from the embankment and towed from the scene to a secure location for the police investigation until it was released to the ambulance agency. The ambulance agency then relocated the ambulance to a secured facility where it remained for this SCI investigation.

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2019 Ford E-350 Type III Ambulance

Description

The 2019 Ford E-350 (Figure 6) was identified by the VIN 1FDWE3FS8KDxxxxxx. The two-door van-based vehicle was manufactured as an incomplete unit in 2019. Due to damage, the left front door was jammed shut and the certification label was unavailable. The Ford was completed as a Type III ambulance during secondary manufacturing in September 2019 by Medix Specialty Vehicles (Elkhart, Indiana). Emergency services equipment such as warning lights, reflective signage, sirens, and radio communications were also installed in the cab and on the exterior of the vehicle. An external stainless steel bull bar was installed over the secondary manufacturer's bumper. The ambulance had a 6.8-liter, V10 gasoline engine linked to an automatic transmission with rear-wheel drive. The ambulance did not have any crash avoidance equipment. It had two forward-facing cloth bucket seats with 3-point lap and shoulder seat belts with adjustable D-rings. The overall length of the ambulance was 670 cm (263.7 in) with a width of 213 cm (83.8 in). The wheelbase was 375 cm (147.6 in) with the exterior of the patent compartment measured 370 cm (145.6 in) long by 229 cm (90.1 in) wide and 210 cm (82.6 in) tall. The interior of the compartment measured 172 cm (67.7 in) long by 115 cm (45.2 in) wide and 172 cm (67.7 in) tall.

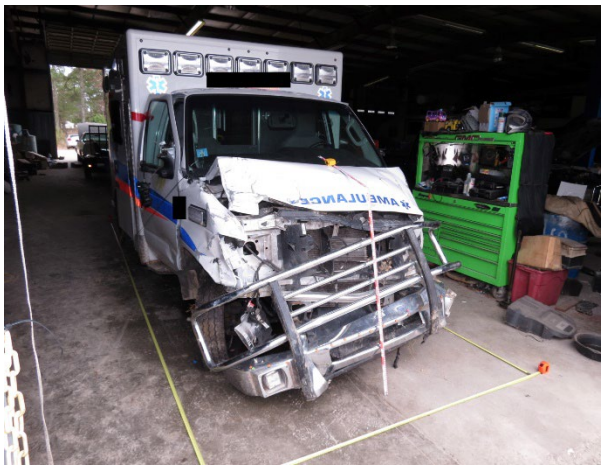

Figure 6. Right front oblique view of the Ford

At the time of the SCI inspection, the ambulance had Maxxix Bravo Commercial tires on the front axle and Ironman All Country CH/T tires on the rear axle. All tires were LT225/75R16 size and mounted on aluminum alloy rims. The tire treads varied from 4 to 7 mm (5/32 to 9/32 in) in depth. The ambulance had a gross vehicle weight rating of 5,216 kg (11,500 lb). This was distributed as gross axle weight ratings of 1,515 kg (3,340 lb) in the front and 4,114 kg (9,070 lb) in the rear. The curb weight was 4,114 kg (9,070 lb). According to the Medix literature on the ambulance, the maximum payload capacity was 1,102 kg (2,430 lb). The SCI investigator estimated the weight of the equipment and supplies to be approximately no more than 249 kg (550 lb). The combined weight of the vehicle’s occupants was estimated to be less than 279 kg (615 lb) for a payload of the occupants plus equipment of no more than 528 kg (1,165 lb). Based on the gross vehicle weight rating and other available weight information, it was the SCI

investigator's assessment that at the time of the crash, the ambulance was operating within its usable payload capacity and weight rating.

NHTSA Recalls and Investigations

A search of the NHTSA database website www.nhtsa.gov/recall using the ambulance's VIN at the time of assignment in January 2022 and at the time of this report in January 2025 revealed no open or unrepaired recalls.

Exterior Damage

The ambulance sustained moderate damage to the front plane due to impact with the guardrail (Event 1, Figure 7). The direct damage measured 166 cm (65.4 in) and extended across the entire front bumper and the lower vertical support beams of the bull bar. During the roll sequence the right end of the bumper bar separated from the frame. The left side was still attached. To measure the crush profile, the bumper was repositioned to replicate its attachment. The residual crush profile was C1= 51 cm (20.1 in), C2= 37 cm (14.6 in), C3= 35 cm (13.8 in), C4= 34 cm (13.4 in), C5= 33 cm (13.0 in), C6= 38 cm (15.0 in). The maximum crush of 51 cm (20.1 in) was located on the left bumper corner. For comparative purposes, the severity of the impact was calculated by the barrier algorithm of the WinSMASH program. The total change in velocity (delta V) was 30 km/h (19 mph). The longitudinal and lateral components were -28 km/h (-18 mph) and -10 km/h (-6 mph). The calculated results fit the collision model and were considered high due to the aftermarket bull guard installed on the front end of the ambulance and overlapping damage from the non-horizontal forces associated with the rollover event. The truck deformation classification[1] (TDC) assigned to this damage pattern was 01FDEW2.

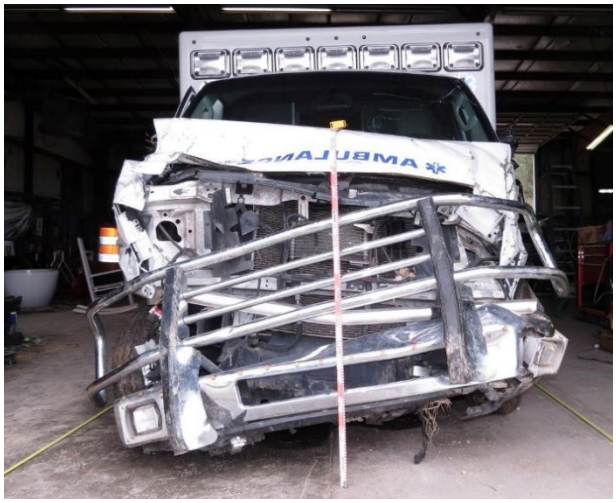

Figure 7. View of the front of the ambulance and damage from Event 1

[1] SAE J1301_202206 – SAE Recommended Practice describing truck (medium, heavy, and articulated combination) collision damage in an alphanumeric format.

The ambulance sustained minor damage because of the rollover (Event 2). The roof rail welds along the driver and passenger sides were fractured on the cab (Figure 8 and 9). The ambulance landed on the left-roof-side-rail of the patient compartment during the rollover, but there was no corresponding structural damage. The right-rear-top corner of the patient compartment struck the ground during the rollover but there was no structural or crush damage. There were surface abrasions across the ambulance as it traveled through the brush growing along the embankment. The TDC assigned to this event is 33TPDO1.

Figure 8. Left side roof weld fracture

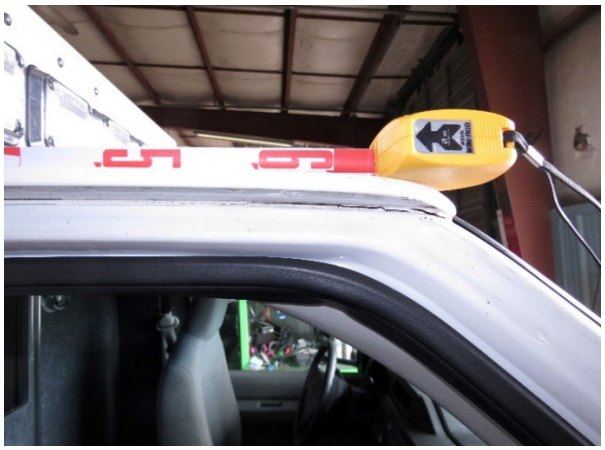

Figure 9. Right side roof weld fracture

The rollover event was interrupted when the ambulance undercarriage struck three softwood trees that averaged 26 cm (10.2 in) in diameter (Event 3). The trees uprooted and fractured, stopping the rollover event, and brought the ambulance down to settle onto its wheels at the bottom of the embankment. The TDC assigned to this event is 33UPDW1.

Event Data Recorder

The ambulance had a restraint control module (RCM) that monitored and controlled the diagnostic sensing and deployable commands for the vehicle's supplemental safety systems. The module had EDR capabilities, and the SCI investigator imaged it with version 21.4 of the Bosch Crash Data Retrieval software via a direct-to-module connection. The imaged data reported with 21.5.1 of the software is attached at the end of this report.

The EDR could store up to two crash events, termed either non-deployment or deployment events. Non-deployment events occur when the recording trigger threshold is met or exceeded a minimum of 8 km/h (5 mph). Data from non-deployments can be overwritten by subsequent events. Deployment events cannot be overwritten from the RCM. This RCM also categorizes non-air bag deployment events when there is an event in which non-air bag devices such as pretensioners have actuated. This type of event can be overwritten given a subsequent air bag deployment event.

Each reported event had a 5.0-second pre-crash buffer. Data points were recorded on a recurring basis of 0.5 seconds, including vehicle speed, accelerator pedal (% full), service brake status, engine rpm, and ABS activity. Pre-crash steering data was recorded as invalid. The EDR

recorded two unlocked (non-deployment) events. It was determined that the data was consistent with the SCI investigation.

First Record

The ignition cycle count at the time of the crash was 4,437 and 4,441 at the time of the download. There were no diagnostics trouble codes, and the air bag warning lamp was off. The driver's seat belt was buckled.

A portion of the 5.0-second pre-crash buffer is included in the following table:

Time (sec)	Indicated Speed km/h (mph)	Accelerator Pedal % Full	Engine rpm	Service Brake	ABS Activity	Steering Wheel Angle (deg.)
-5.0	130 (80.8)	0	2,600	Off	Not engaged	Invalid
-4.5	130 (80.8)	0	2,600	Off	Not engaged	Invalid
-4.0	131 (81.4)	0	2,600	Off	Not engaged	Invalid
-3.5	131 (81.4)	0	2,600	Off	Not engaged	Invalid
-3.0	131 (81.4)	0	2,600	Off	Not engaged	Invalid
-2.5	130 (80.8)	0	2,600	Off	Not engaged	Invalid
-2.0	130 (80.8)	0	2,600	Off	Not engaged	Invalid
-1.5	130 (80.8)	0	2,600	Off	Not engaged	Invalid
-1.0	128 (79.5)	0	2,600	Off	Engaged	Invalid
-0.5	111 (69.0)	0	2,200	On	Engaged	Invalid
0	84 (52.2)	0	1,700	On	Engaged	Invalid

The EDR reported the ambulance was operating on cruise control as it entered the 5.0-second pre-crash recording window. At the -5.0-second interval the speed of the ambulance was 130 km/h (80.8 mph). The cruise control disengaged at the -0.5-second interval by the driver's application of the brakes and with the ABS being engaged at -1.0-second interval. The brake remained engaged for the final two samples of the precrash at -0.5 and 0. The steering output reading was invalid. The maximum longitudinal delta V of this record was -7.16 km/h (-4.45 mph) at 299 milliseconds with a lateral maximum delta V of -2.07 km/h (-1.29 mph) at 300 milliseconds. This record was attributed to Event 1.

Second Record

A second longitudinal and lateral crash pulse was recorded 700 milliseconds after the first record. This recording is attributed to the rollover (Event 2). The maximum longitudinal delta V was -13.89 km/h (-8.63 mph) at 300 milliseconds with a lateral maximum delta V component of 19.69 km/h (12.23 mph) at 232 milliseconds. This second recording is annotated in the table below.

Time (sec)	Indicated Speed km/h (mph)	Accelerator Pedal % Full	Engine RPM	Service Brake	ABS Activity	Steering Wheel Angle (deg.)
-5.0	131 (81.4)	0	2,600	Off	Not engaged	Invalid
-4.5	131 (81.4)	0	2,600	Off	Not engaged	Invalid
-4.0	131 (81.4)	0	2,600	Off	Not engaged	Invalid
-3.5	131 (81.4)	0	2,600	Off	Not engaged	Invalid
-3.0	131 (81.4)	0	2,600	Off	Not engaged	Invalid
-2.5	130 (80.8)	0	2,600	Off	Not engaged	Invalid
-2.0	128 (79.5)	0	2,600	Off	Engaged	Invalid
-1.5	111 (69.0)	0	2,200	On	Engaged	Invalid
-1.0	84 (52.2)	0	1,700	On	Engaged	Invalid
-0.5	64 (39.8)	0	1,300	On	Engaged	Invalid
0	40 (24.9)	0	800	On	Engaged	Invalid

Interior Damage

The interior damage to the ambulance cab was minimal (Figure 10). There were no measurable intrusions. The knee bolster panel was displaced from the driver's right knee contact during Event 2 (Figure 11). There was also a single crack in the windshield that occurred due to the external crash forces (non-occupant contact) of the rollover.

Figure 10. View of the interior of the cab

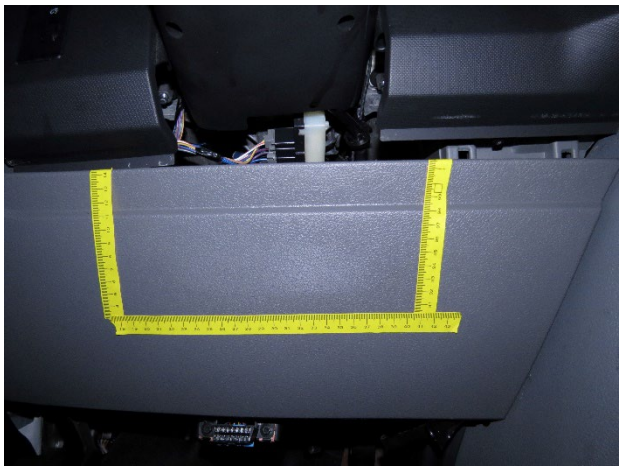

Figure 11. Driver's right knee contact to knee bolster

Patient Compartment Interior Damage

The patient compartment interior was intact with no structural damage despite the rollover event (Figure 12). There were many contact points from the EMT and patient. The EMT was unbelted and seated in the rear-facing captain's chair. There was a contact embedded into the seat back of the captain's chair from the EMT loading it during Event 3 (Figure 13). The counter on the left side of the patient compartment housed several medical devices. One of the devices, a suction container with an oxygen flow meter was broken off its fixture (Figure 14). The flow meter was missing, and the container was shattered. These components were broken due to equipment coming loose during the crash events and are not linked to occupant contacts. There was a 90 cm (35 in) long grab handle that ran along the roof of the compartment and hung down 3.5 cm (1.3 in). The forward section of the handle was bent upward 2 cm (0.8 in).

The remainder of the left side of the patient's compartment had plastic slide door cabinetry designed to hold the various tools used by the staff. The cabinets were blocked with aluminum trim. There were several small soft tissue contacts along the bottom of the aluminum trim (Figure 12). There were also a few patches of blood splatters along the roof in line with the counter. The splatters were directed in the 11 o'clock direction in relation to the ambulance (Figure 15). There were no occupant contacts to the right side of the patient compartment except for several rubber/plastic transfers that traversed laterally across the roof of the compartment that were attributed to flying debris during Event 2.

Figure 12. View of the left rear of the patient's compartment (tape at the left bottom indicated the soft tissue contacts to the aluminum trim)

Figure 13. EMT contact to the captain's chair seatback

Figure 14. EMT contacts to the left side counter

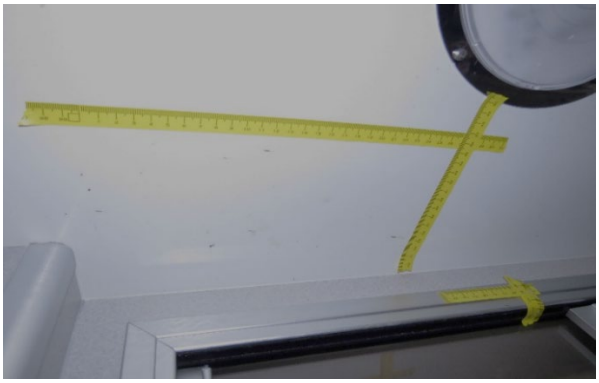

Figure 15. Blood spatters on the top left ceiling

Manual Restraint System

The ambulance had 3-point continuous-loop lap and shoulder seat belts for the two cab seating positions. They used sliding latch plates and adjustable D-rings. Both seat belts had retractor pretensioners. The driver's retractor had emergency locking capabilities. The driver was the only occupant in the cab and was belted during the crash. His seat belt was found spooled out and hanging loose against the B-pillar. There was a slight waffle in the webbing at the latch plate catch. The D-ring was positioned full-down and friction burns were found on the sliding latch plate from occupant loading. The retractor pretensioner did not actuate during the crash events.

The patient compartment had 5-point harnesses for the captain's chair and the bench seats on the right rear side of the compartment (Figure 16). The three seats were fitted with retractor systems

at the base of the seat backs (Figure 17). The EMT was unbelted in the captain's chair at the time of the crash.

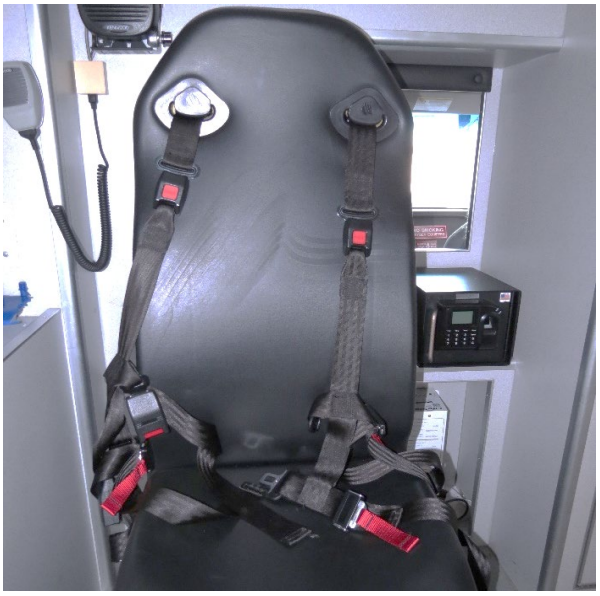

Figure 16. Viewing the belt systems of the captain's chair

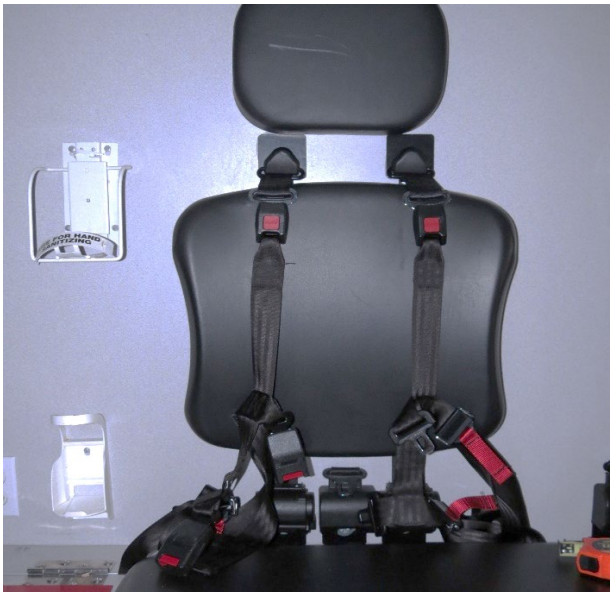

Figure 17. The right bench seat belt systems with retractors at the base

Supplemental Restraint System

The ambulance had dual stage driver's and passenger's frontal air bags. The air bags did not deploy because of the crash forces. There was no remarkable damage or suspected failures in the supplemental restraint systems.

Stryker Cot

The wheeled ambulance cot was a Power-Pro XT Model 6506, manufactured by Stryker. Its serial number was S/N: 1908xxxxxxxxx and it was manufactured in September 2019. The Stryker cot (Figure 18) was constructed of a tubular aluminum frame with circumferential weld joints and steel hardware fasteners. The X-frame supporting the mattress platform featured power lift capabilities with infinite height positions between a minimum of 36 cm (14.1 in) and a maximum of 105 cm (41.3 in). The mattress platform featured 0- to 73° of positive backrest angular adjustment via a manually controlled gas-pressure cylinder. In a similar fashion, the leg portion featured 15° of positive angular adjustment. Overall dimensions of the cot were 58 cm (22.8 in) wide and 206 cm (81.1 in) long. A placard declared the loaded capacity limit of the cot to be 317 kg (700 lb). Electrical power was supplied by a removable 24-v nickel-cadmium direct current battery. There was no damage to the cot frame or cross members.

Figure 18. The Stryker cot viewing right side

The Stryker cot was secured to the ambulance by the Performance-Load[2] system. The mount was identified by the S/N: 2019xxxxxxxxx. The cot was attached to the mounting system at the time of the investigation with no apparent damage from the crash (Figure 19). The cot remained secured to the latching system throughout the crash sequence. The Stryker cot had a multi-point harness system for manual restraint of its occupant that had lateral foot, thigh, and lap straps, and an upper torso harness. The three lateral straps had adjustable latch plates and sewn-on buckles. The torso harness had two shoulder straps with latches that buckled at the lateral lap strap position (Figure 20). The EMT reported that the patient was restrained by only the foot and lap straps. However, due to evidence observed during the SCI inspection it was determined that the patient was only restrained by the foot and thigh straps.

Figure 19. View of the cot latching system

Figure 20. Safety belt system of the cot (looking left to right, foot, thigh, lap, and shoulder straps)

[2] https://www.stryker.com/us/en/emergency-care/products/performance-load.html

It was noted that the latch plates remained in the buckles of the foot and thigh straps. The hourglass-shaped stitching which should have secured the buckles to the fixed-length webbing had torn (Figures 21 to 24). Remains of the stitching were embedded in both sides of the webbing and did not show signs of being cut. The stitching failure was due to excessive loading from the patient's lower extremities during Events 2 and 3. There was no other damage to the cot or fastener systems.

Figure 21. View of the foot strap restraint face

Figure 22. View of the foot strap restraint back

Figure 23. View of the thigh strap restraint face

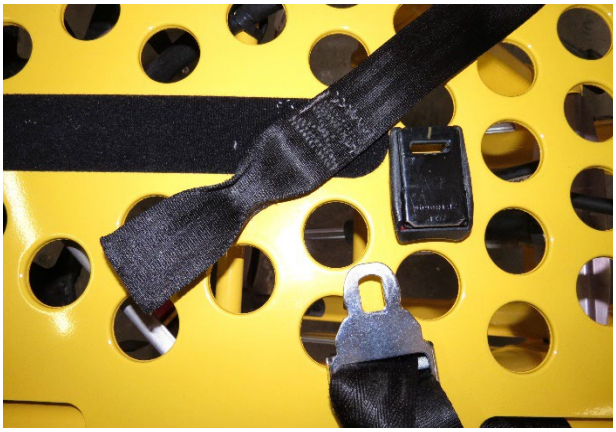

Figure 24. View of the thigh strap restraint back

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2019 Ford E-350 Ambulance Occupants

Driver Demographics

Age/sex:	20 years/male
Height:	185 cm (73 in)
Weight:	88 kg (195 lb)
Eyewear:	None
Seat type:	Forward-facing bucket seat with integrated head restraint
Seat track position:	Seat at rear-most track position
Manual restraint usage:	Lap and shoulder belt
Usage source:	Vehicle inspection corroborated by PCR, and EDR
Air bags:	Driver's frontal available; not deployed
Alcohol/drug involvement:	No test performed
Egress from vehicle:	Exited under own power
Transport from scene:	Transport to level 1 trauma center
Type of medical treatment:	Treated and released

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Contusion to right forehead	210402.1	Isolated Front - Steering wheel rim	Possible

Source: Driver interview

Note: The driver reported that he had a hyperextended right thumb, pain in his right elbow, pain in his ribs, and a bruise on the right side of his forehead.

Driver Kinematics

At the time of the crash the driver was restrained by the lap and shoulder seat belt with the driver seat track set in the rear-most position. Due to the rotation of the ambulance prior to the impact with the guardrail, the driver was nominally displaced to the left in his seat belt. The initial impact with the guard rail nominally displaced him forward so his right forehead struck the steering wheel. As the ambulance penetrated the guardrail and began its rollover, the driver was inverted and loaded his emergency-locked seat belt. When the ambulance struck the ground with its right rear top corner, the driver vertically loaded his locked seat belt lap portion and seat back, causing his knees to contact the knee bolster. Once the ambulance settled in its final rest, the driver removed his seat belt and exited through the front passenger's door. In his interview he said that while exiting he hyperextended his thumb on the front passenger's door. He was transported by ambulance to a level 1 trauma center where he was treated and released.

EMT Demographics

Age/sex:	32 years/male
Height:	183 cm (72 in)
Weight:	113 kg (250 lb)
Eyewear:	None
Seat type:	Rear-facing captain's chair in patient compartment
Seat track position:	Not adjustable
Manual restraint usage:	5-point harness available, not used
Usage source:	Vehicle inspection
Air bags:	None available
Alcohol/drug involvement:	No test performed
Egress from vehicle:	Removed from vehicle due to perceived serious injuries
Transport from scene:	Transport to level 1 trauma center and released
Type of medical treatment:	Unknown

EMT Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Left L4 transverse process fracture	650620.1	Isolated Interior – This occupant's seat back	Probable
2	Small left paraspinal hematoma	410402.1	Isolated Interior – This occupant's seat back	Probable
3	Right flank bruising	510402.1	Isolated Interior – Other interior object(s) (specify): Left side cabinetry of patient compartment	Probable
4	Left flank bruising	510402.1	Isolated Interior – This occupant's seat back	Possible

Source: Hospital records

EMT Kinematics

At the time of the crash, the EMT was unbelted and seated in a rear-facing captain's chair. Due to the rotation of the ambulance prior to the impact with the guardrail, the passenger was nominally displaced to his right. The EMT braced himself with his legs under the front handlebar of the cot and his right arm on the counter to his right. The initial impact with the guard rail nominally displaced him into his seat back. As the ambulance penetrated the guard rail and began its rollover, the EMT was inverted. When the ambulance landed on its left roof rail, the EMT was thrown to his right where his right flank contacted the left side cabinetry. When the ambulance's undercarriage struck the trees in Event 3, the EMT loaded his seat back causing the L4 TP fracture, left paraspinal hematoma, and the left flank bruising. The EMT remained in his pre-crash seated position when the driver opened the right access door but was unable to exit the compartment due to extreme back pain. He was removed from the ambulance by EMS personnel through the right access door. He was transported by ambulance to a level 1 trauma center where he was treated and released.

Patient Demographics

Age/sex:	84 years/female
Height:	165 cm (65 in)
Weight:	57 kg (126 lb)
Eyewear:	Unknown
Seat type:	Patient cot in a semi-fowler's position
Seat track position:	Not adjustable
Manual restraint usage:	Foot, thigh, lap, shoulder harness available; Foot and thigh straps used
Usage source:	Cot inspection and driver/EMT interview
Air bags:	None available
Alcohol/drug involvement:	No test performed
Egress from vehicle:	Removed by EMS
Transport from scene:	Transported to level 1 trauma center
Medical treatment:	Deceased prior to admission

Patient Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Rib fractures: right posterolateral 3-6	450203.3	Isolated IPC Primary: Interior – Other interior object(s) (specify): Patient cot Alternate: Floor – Floor (includes toe pan)	 Probable Possible

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
2	Pelvis fractures with retroperitoneal tissue hemorrhage: right pubis, left pubis, left sacroiliac joint (displaced)	856161.3	Isolated IPC Primary: Interior – Other interior object(s) (specify): Patient cot Alternate: Floor – Floor (includes toe pan)	Probable Possible
3	T2 fracture, NFS	650416.2	Isolated IPC Primary: Interior – Other interior object(s) (specify): Patient cot Alternate: Floor – Floor (includes toe pan)	Probable Possible
4	T3 fracture, NFS	650416.2	Isolated IPC Primary: Interior – Other interior object(s) (specify): Patient cot Alternate: Floor – Floor (includes toe pan)	Probable Possible
5	Right lower quadrant of abdominal fat layer has 5 x 3-inch hemorrhagic avulsion pocket	510100.2	Isolated IPC Interior – Other interior object(s) (specify): Left side cabinetry of patient compartment	Probable
6	Large abraded contusion of right lower quadrant of abdomen	510402.1	Isolated Interior – Other interior object(s) (specify): Left side cabinetry of patient compartment	Probable
7	Large abraded contusion of right lower quadrant of abdomen	510202.1	Isolated Interior – Other interior object(s) (specify): Left side cabinetry of patient compartment	Probable

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
8	Left lower quadrant of abdomen has ½ x ¼ inch irregular superficial orange abrasion	510202.1	Isolated Interior – Other interior object(s) (specify): Edge of bench seat	Possible
9	Left orbit has multiple irregular red ecchymoses ranging from punctate to ¼ inch in greatest dimension	210402.1	Isolated Roof – Roof or convertible top	Probable
10	Left eye has scattered, coarse red-purple petechial hemorrhage	210202.1	Isolated Roof – Roof or convertible top	Probable
11	Right posterior forearm has two irregular skin tears, proximal one 1 ¾ inch and inferior-most 1 x ½ inch	710602.1	Isolated Interior – Other interior object(s) (specify): Left side cabinetry of patient compartment	Certain
12	Left posterior forearm has 7/8 x ½ inch irregular skin tear	710602.1	Isolated Interior – Other interior object(s) (specify): Grab rail	Probable
13	Right upper arm has approximately 15 x 5 inch red and purple contusion that extends to elbow and anterior forearm; posterior right forearm has 10 x 3-inch area of irregular and discontinuous and confluent red and purple ecchymoses; right hand has 10 x 3 inch area of irregular and discontinuous and confluent red and purple ecchymoses; right superior shoulder musculature is hemorrhagic	710402.1	Isolated Interior – Other interior object(s) (specify): Left side cabinetry of patient compartment	Certain

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
14	Entire left arm has multiple irregular, discontinuous and confluent red and purple ecchymoses (upper arm)	710402.1	Isolated Interior – Other interior object(s) (specify): Grab rail	Probable
15	Right medial knee has 5/8-inch diameter round pink contusion	810402.1	Isolated Interior – Other interior object(s) (specify): Left side cabinetry of patient compartment	Probable
16	Anterior left shin has a 1 ½ x ¾ inch irregular pink contusion	810402.1	Isolated Interior – Other interior object(s) (specify): Patient cot rail	Possible
17	Lateral proximal left thigh has 3 linear superficial abrasions ranging from 1–1¼ inch in length	810202.1	Isolated Interior – Other interior object(s) (specify): Patient cot strap	Probable

Source: Hospital records

Note: Cause of death was cited as "Multiple blunt force injuries; listed as contributing factors are hypertensive and atherosclerotic cardiovascular disease; COVID-19; and osteoporosis."

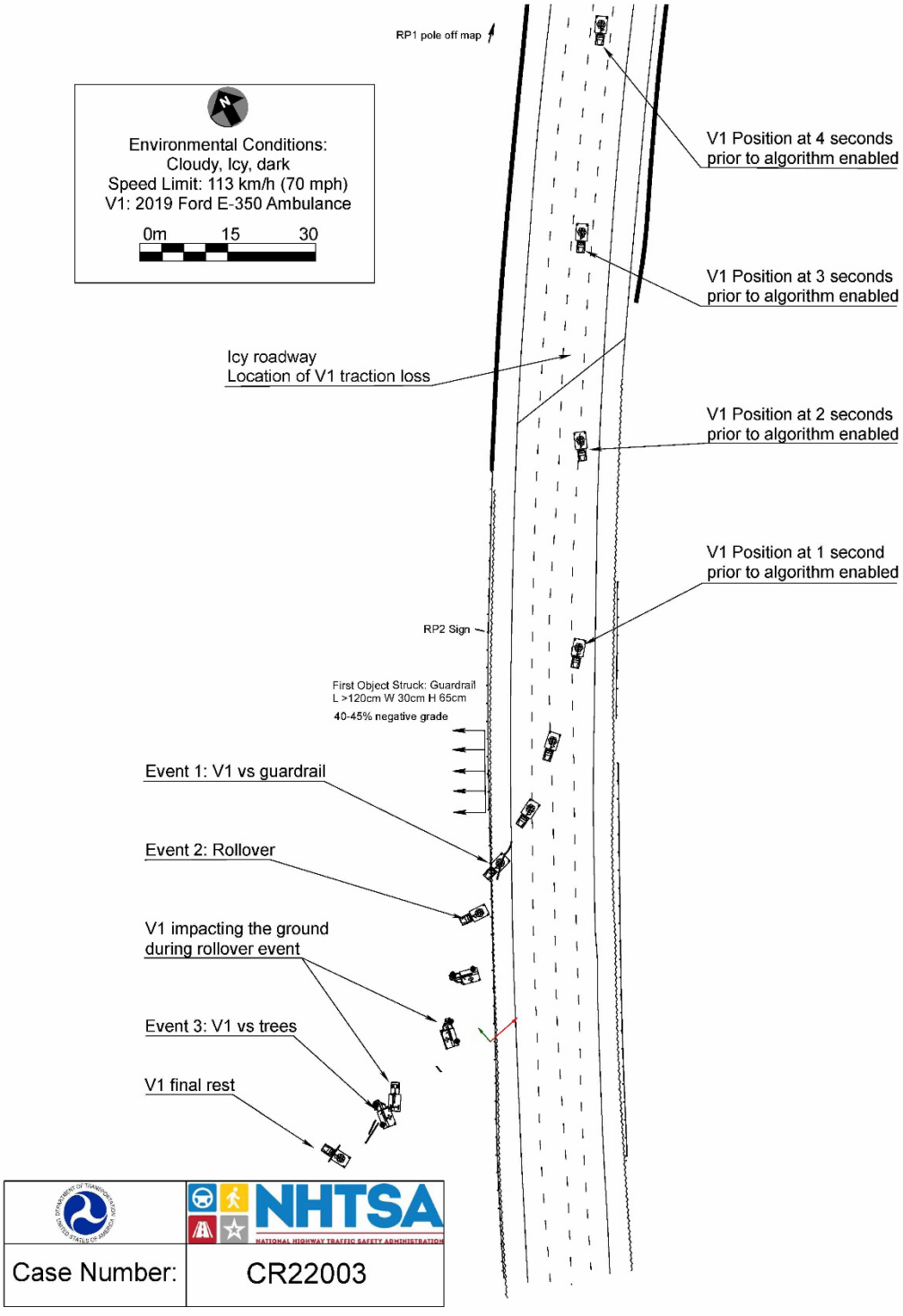
Patient Kinematics

At the time of the crash the patient was partially secured to the rear-facing Stryker cot by the lower foot and thigh straps. The patient's back was elevated at 45° in the semi-fowler's position. According to the EMT's interview, the patient was stable and connected to an intravenous saline drip hanging from the cot's IV pole and an electrocardiogram that was on the counter to her right. During Event 1 the patient was displaced into the angled back rest, applying longitudinal tension to the two lower straps. As the ambulance rolled and inverted, the patient was displaced vertically and to her right, applying a vertical tension load to the two lower straps. Due to the longitudinal and vertical loading of the straps the hourglass shape stitching tore apart and no longer restrained the patient. The patient traveled along the left cabinetry with her right side. Her face and chest struck the upper aspect of the compartment, and her upper left arm struck the grab bar located above the cot and center of the ceiling.

As the ambulance rolled between the third and fourth quarter-turn, its undercarriage struck the trees, causing a sudden interruption to the roll sequence (Event 3). The patient responded to the non-horizontal force of this impact with a diagonal trajectory from the left ceiling to the right floor area. The patient struck the cot with her hip and her back glanced off the forward corner of the bench seat, striking the floor.

The patient was found conscious with her lower legs positioned upwards on the cot with her back on the floor between the cot and the forward bench seat. The patient was alert and tried to prop herself up on her elbows. She reportedly asked what had happened and asked for help. The patient was removed from the right-side access door by the responding EMS personnel and pulled up the steep embankment. During her transport by ambulance to a nearby trauma center the patient suffered cardiac arrest. EMS personnel perform cardiopulmonary resuscitation, to no avail. She was pronounced deceased 71 minutes after the crash notification and prior to admission into the medical facility.

Crash Diagram



Appendix A. 2019 Ford E-350 Type III Event Data Recorder Report

The EDR contained in this technical report was imaged using the current version of the Bosch CDR software 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	1FDWE3FS8KD******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CR22003_ACM21.5.1.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 21.4
Imaged with Software Licensed to (Company Name)	Company Name information was removed when this file was saved without VIN sequence number
Reported with CDR version	Crash Data Retrieval Tool 21.5.1
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	Yes
Event(s) recovered	unlocked events

Comments

No comments entered.

The retrieval of this data has been authorized by the vehicle's owner, or other legal authority such as a court order or search warrant, as indicated by the CDR tool user on .

Data Limitations

Restraints Control Module Recorded Crash Events:

Deployment Events cannot be overwritten or cleared from the Restraints Control Module (RCM). Once the RCM has deployed any airbag device, the RCM must be replaced. The data from events which did not qualify as deployable events can be overwritten by subsequent events. The RCM can store up to two deployment events.

Airbag Module Data Limitations:

- Restraints Control Module Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced from the point of algorithm wake up. It is not the speed the vehicle was traveling before the event. Note that the vehicle speed is recorded separately five seconds prior to algorithm wake up. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle forward velocity change.
- Event Recording Complete will indicate if data from the recorded event has been fully written to the RCM memory or if it has been interrupted and not fully written.
- If power to the Airbag Module is lost during a crash event, all or part of the crash record may not be recorded.
- For 2011 Ford Mustangs, the Steering Wheel Angle parameter indicates the change in steering wheel angle from the previously recorded sample value and does not represent the actual steering wheel position.

Airbag Module Data Sources:

- Event recorded data are collected either INTERNALLY or EXTERNALLY to the RCM.

  - INTERNAL DATA is measured, calculated, and stored internally, sensors external to the RCM include the following:
    > The Driver and Passenger Belt Switch Circuits are wired directly to the RCM.
    > The Driver's Seat Track Position Switch Circuit is wired directly to the RCM.
    > The Side Impact Sensors (if equipped) are located on the side of vehicle and are wired directly to the RCM.
    > The Occupant Classification Sensor is located in the front passenger seat and transmits data directly to the RCM on high-speed CAN bus.
    > Front Impact Sensors (right and left) are located at the front of vehicle and are wire directly to the RCM.

  - EXTERNAL DATA recorded by the RCM are data collected from the vehicle communication network from various sources such as Powertrain Control Module, Brake Module, etc.

02007_RCM-RC6_r002

System Status at Time of Retrieval

VIN as programmed into RCM at factory	1FDWE3FS8KD******
Current VIN from PCM	1FDWE3FS8KD******
Ignition cycle, download (first record)	4,441
Ignition cycle, download (second record)	4,441
Restraints Control Module Part Number	KC24-14B321-BA
Restraints Control Module Serial Number	9206895300000000
Restraints Control Module Software Part Number (Version)	BL84-14C028-AB
Left/Center Frontal Restraints Sensor Serial Number	1E25906A
Left Side Restraint Sensor 1 Serial Number	00000000
Left Side Restraint Sensor 2 Serial Number	00000000
Right Frontal Restraints Sensor Serial Number	00000000
Right Side Restraint Sensor 1 Serial Number	00000000
Right Side Restraints Sensor 2 Serial Number	00000000

System Status at Event (First Record)

Recording Status	Unlocked Record
Complete file recorded (yes,no)	Yes
Multi-event, number of events (1,2)	1
Time from event 1 to 2 (msec)	N/A
Lifetime Operating Timer at event time zero (seconds)	22,302,985
Key-on Timer at event time zero (seconds)	11,450
Vehicle voltage at time zero (Volts)	13.851
Energy Reserve Mode entered during event (Y/N)	No

Faults Present at Start of Event (First Record)

No Faults Recorded

Deployment Data (First Record)

Maximum delta-V, longitudinal (MPH [km/h])	-4.45 [-7.16]
Time, maximum delta-V longitudinal (msec)	299
Maximum delta-V, lateral (MPH [km/h])	-1.29 [-2.07]
Time, maximum delta-V lateral (msec)	300
Longitudinal Delta-V Time Zero Offset	8.5 ms
Lateral Delta-V Time Zero Offset	8.5 ms

Pre-Crash Data -1 sec (First Record)

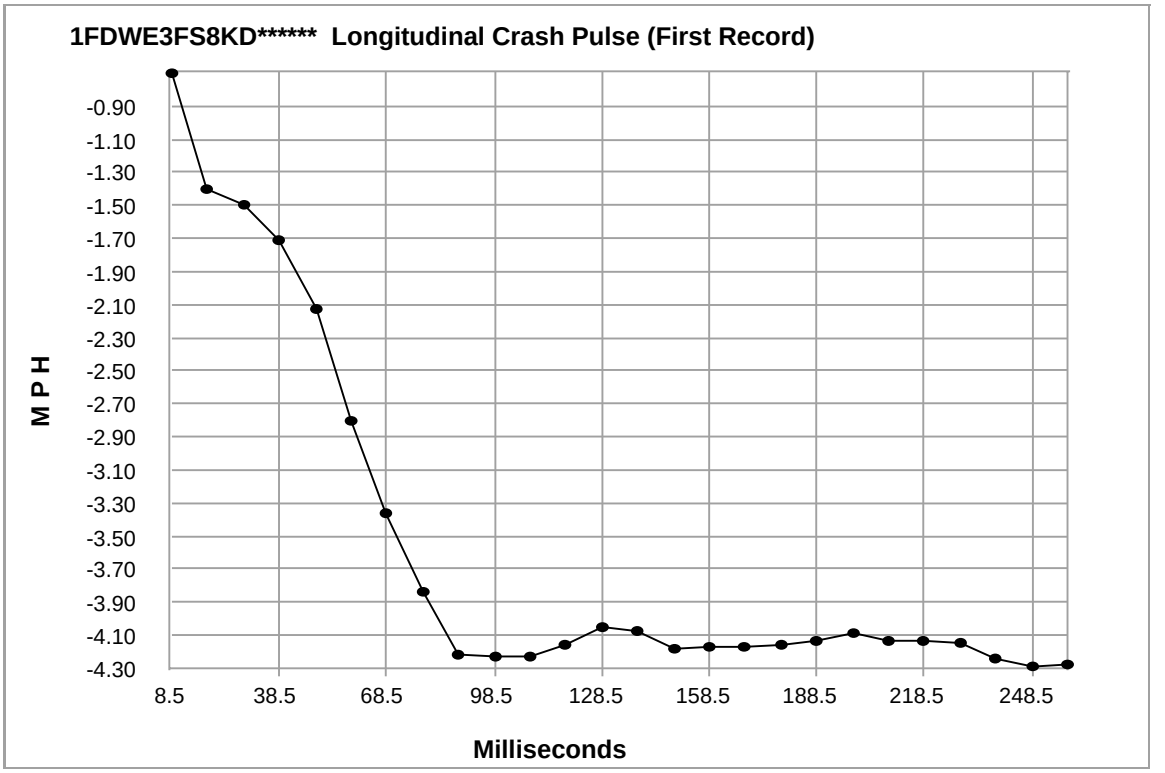
Ignition cycle, crash	4,437
Frontal air bag warning lamp, on/off	Off
Frontal air bag suppression switch status, front passenger	Not Active
Safety belt status, driver	Driver Buckled
Brake Telltale	Off
ABS Telltale	Off
Stability Control Telltale	Off
Speed Control Telltale	On
Powertrain Wrench Telltale	Off
Powertrain Malfunction Indicator Lamp (MIL)Telltale	Off

Pre-Crash Data -5 to 0 sec [2 samples/sec] (First Record)

Times (sec)	Speed vehicle indicated MPH [km/h]	Accelerator pedal, % full	Service brake, on/off	Engine RPM	ABS activity (engaged, non-engaged)	Stability control (engaged, non-engaged)	Traction Control via Brakes (engaged, non-engaged)	Traction Control via Engine (engaged, non-engaged)
- 5.0	80.8 [130.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 4.5	80.8 [130.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 4.0	81.4 [131.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 3.5	81.4 [131.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 3.0	81.4 [131.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 2.5	80.8 [130.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 2.0	80.8 [130.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 1.5	80.8 [130.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 1.0	79.5 [128.0]	0	Off	2,600	engaged	non-engaged	non-engaged	non-engaged
- 0.5	69.0 [111.0]	0	On	2,200	engaged	non-engaged	non-engaged	non-engaged
0.0	52.2 [84.0]	0	On	1,700	engaged	non-engaged	non-engaged	non-engaged

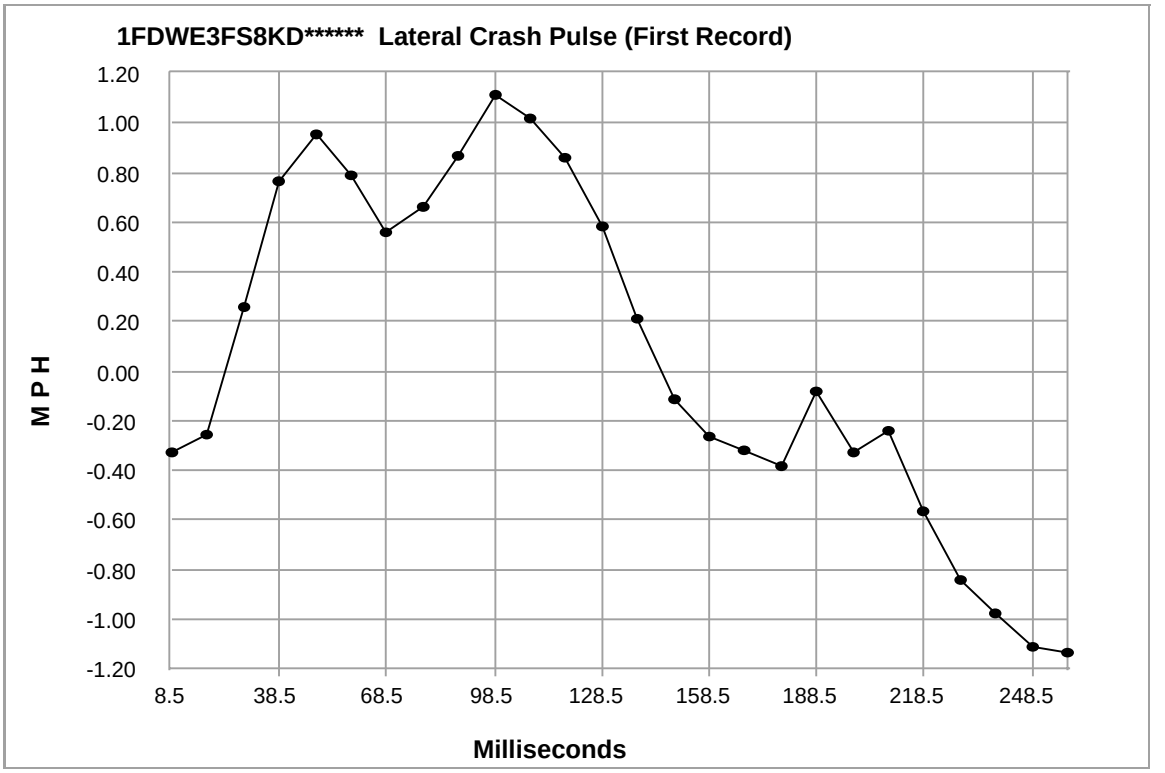
Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record)

Times (sec)	Steering Wheel Angle (degrees)
- 5.0	Invalid
- 4.9	Invalid
- 4.8	Invalid
- 4.7	Invalid
- 4.6	Invalid
- 4.5	Invalid
- 4.4	Invalid
- 4.3	Invalid
- 4.2	Invalid
- 4.1	Invalid
- 4.0	Invalid
- 3.9	Invalid
- 3.8	Invalid
- 3.7	Invalid
- 3.6	Invalid
- 3.5	Invalid
- 3.4	Invalid
- 3.3	Invalid
- 3.2	Invalid
- 3.1	Invalid
- 3.0	Invalid
- 2.9	Invalid
- 2.8	Invalid
- 2.7	Invalid
- 2.6	Invalid
- 2.5	Invalid
- 2.4	Invalid
- 2.3	Invalid
- 2.2	Invalid
- 2.1	Invalid
- 2.0	Invalid
- 1.9	Invalid
- 1.8	Invalid
- 1.7	Invalid
- 1.6	Invalid
- 1.5	Invalid
- 1.4	Invalid
- 1.3	Invalid
- 1.2	Invalid
- 1.1	Invalid
- 1.0	Invalid
- 0.9	Invalid
- 0.8	Invalid
- 0.7	Invalid
- 0.6	Invalid
- 0.5	Invalid
- 0.4	Invalid
- 0.3	Invalid
- 0.2	Invalid
- 0.1	Invalid
0.0	Invalid



Longitudinal Crash Pulse (First Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
8.5	-0.70	-1.13
18.5	-1.40	-2.26
28.5	-1.50	-2.41
38.5	-1.71	-2.76
48.5	-2.13	-3.42
58.5	-2.80	-4.51
68.5	-3.37	-5.42
78.5	-3.83	-6.17
88.5	-4.22	-6.79
98.5	-4.23	-6.81
108.5	-4.23	-6.80
118.5	-4.15	-6.68
128.5	-4.05	-6.53
138.5	-4.08	-6.56
148.5	-4.18	-6.73
158.5	-4.17	-6.72
168.5	-4.17	-6.72
178.5	-4.16	-6.69
188.5	-4.13	-6.65
198.5	-4.09	-6.58
208.5	-4.14	-6.66
218.5	-4.13	-6.65
228.5	-4.15	-6.68
238.5	-4.24	-6.83
248.5	-4.29	-6.90
258.5	-4.27	-6.88



Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
8.5	-0.33	-0.53
18.5	-0.26	-0.42
28.5	0.26	0.41
38.5	0.76	1.22
48.5	0.95	1.53
58.5	0.79	1.26
68.5	0.56	0.90
78.5	0.66	1.07
88.5	0.87	1.40
98.5	1.12	1.80
108.5	1.01	1.63
118.5	0.86	1.38
128.5	0.58	0.94
138.5	0.21	0.34
148.5	-0.11	-0.18
158.5	-0.26	-0.42
168.5	-0.32	-0.51
178.5	-0.38	-0.61
188.5	-0.09	-0.14
198.5	-0.33	-0.53
208.5	-0.24	-0.39
218.5	-0.56	-0.91
228.5	-0.84	-1.35
238.5	-0.98	-1.57
248.5	-1.12	-1.79
258.5	-1.14	-1.83

System Status at Event (Second Record)

Recording Status	Unlocked Record
Complete file recorded (yes,no)	Yes
Multi-event, number of events (1,2)	2
Time from event 1 to 2 (msec)	700
Lifetime Operating Timer at event time zero (seconds)	22,302,985
Key-on Timer at event time zero (seconds)	11,450
Vehicle voltage at time zero (Volts)	13.932
Energy Reserve Mode entered during event (Y/N)	No

Faults Present at Start of Event (Second Record)

No Faults Recorded

Deployment Data (Second Record)

Maximum delta-V, longitudinal (MPH [km/h])	-8.63 [-13.89]
Time, maximum delta-V longitudinal (msec)	300
Maximum delta-V, lateral (MPH [km/h])	12.23 [19.69]
Time, maximum delta-V lateral (msec)	232
Longitudinal Delta-V Time Zero Offset	7.5 ms
Lateral Delta-V Time Zero Offset	7.5 ms

Pre-Crash Data -1 sec (Second Record)

Ignition cycle, crash	4,437
Frontal air bag warning lamp, on/off	Off
Frontal air bag suppression switch status, front passenger	Not Active
Safety belt status, driver	Driver Buckled
Brake Telltale	Off
ABS Telltale	Off
Stability Control Telltale	Off
Speed Control Telltale	Off
Powertrain Wrench Telltale	Off
Powertrain Malfunction Indicator Lamp (MIL)Telltale	Off

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Second Record)

Times (sec)	Speed vehicle indicated MPH [km/h]	Accelerator pedal, % full	Service brake, on/off	Engine RPM	ABS activity (engaged, non-engaged)	Stability control (engaged, non-engaged)	Traction Control via Brakes (engaged, non-engaged)	Traction Control via Engine (engaged, non-engaged)
- 5.0	81.4 [131.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 4.5	81.4 [131.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 4.0	81.4 [131.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 3.5	80.8 [130.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 3.0	80.8 [130.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 2.5	80.8 [130.0]	0	Off	2,600	non-engaged	non-engaged	non-engaged	non-engaged
- 2.0	79.5 [128.0]	0	Off	2,600	engaged	non-engaged	non-engaged	non-engaged
- 1.5	69.0 [111.0]	0	On	2,200	engaged	non-engaged	non-engaged	non-engaged
- 1.0	52.2 [84.0]	0	On	1,700	engaged	non-engaged	non-engaged	non-engaged
- 0.5	39.8 [64.0]	0	On	1,300	engaged	non-engaged	non-engaged	non-engaged
0.0	24.9 [40.0]	0	On	800	engaged	non-engaged	non-engaged	non-engaged

Pre-Crash Data -5 to 0 sec [10 samples/sec] (Second Record)

Times (sec)	Steering Wheel Angle (degrees)
- 5.0	Invalid
- 4.9	Invalid
- 4.8	Invalid
- 4.7	Invalid
- 4.6	Invalid
- 4.5	Invalid
- 4.4	Invalid
- 4.3	Invalid
- 4.2	Invalid
- 4.1	Invalid
- 4.0	Invalid
- 3.9	Invalid
- 3.8	Invalid
- 3.7	Invalid
- 3.6	Invalid
- 3.5	Invalid
- 3.4	Invalid
- 3.3	Invalid
- 3.2	Invalid
- 3.1	Invalid
- 3.0	Invalid
- 2.9	Invalid
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- 1.7	Invalid
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- 1.5	Invalid
- 1.4	Invalid
- 1.3	Invalid
- 1.2	Invalid
- 1.1	Invalid
- 1.0	Invalid
- 0.9	Invalid
- 0.8	Invalid
- 0.7	Invalid
- 0.6	Invalid
- 0.5	Invalid
- 0.4	Invalid
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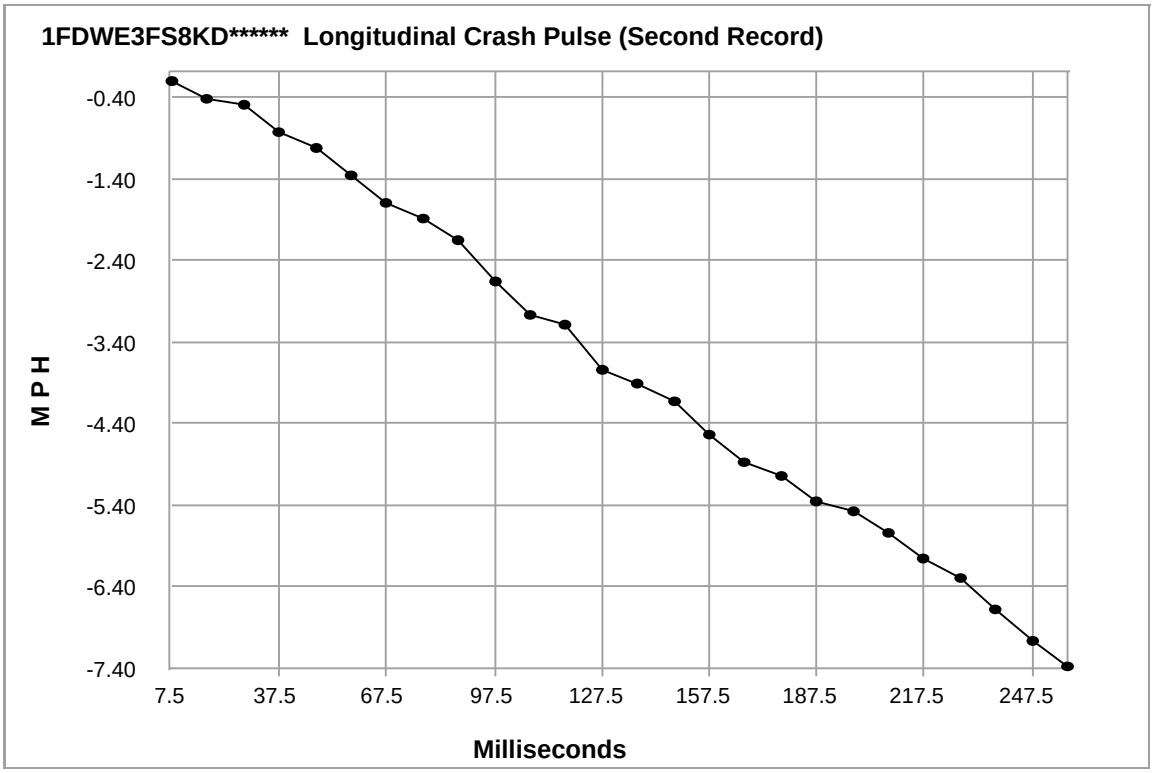
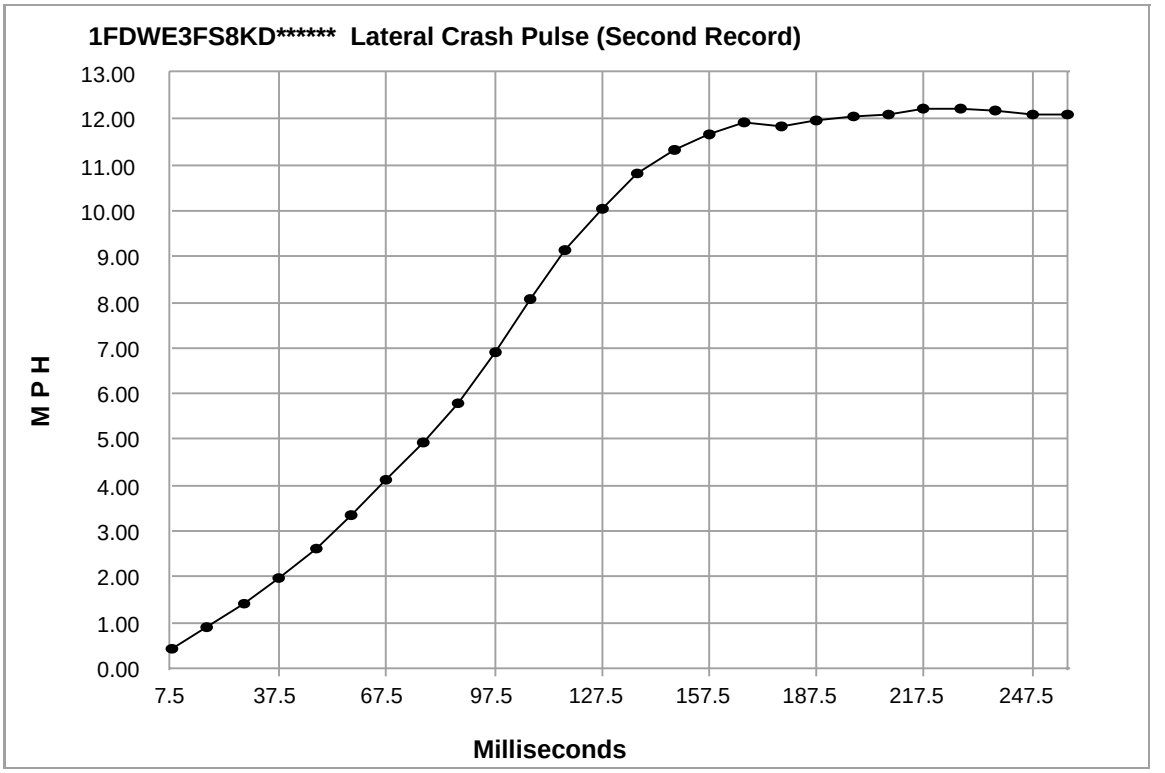


Longitudinal Crash Pulse (Second Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
7.5	-0.19	-0.30
17.5	-0.42	-0.67
27.5	-0.49	-0.78
37.5	-0.81	-1.31
47.5	-1.01	-1.63
57.5	-1.35	-2.17
67.5	-1.68	-2.71
77.5	-1.88	-3.03
87.5	-2.15	-3.45
97.5	-2.66	-4.28
107.5	-3.07	-4.93
117.5	-3.18	-5.11
127.5	-3.73	-6.01
137.5	-3.90	-6.28
147.5	-4.12	-6.62
157.5	-4.53	-7.29
167.5	-4.87	-7.84
177.5	-5.03	-8.09
187.5	-5.34	-8.60
197.5	-5.48	-8.82
207.5	-5.73	-9.23
217.5	-6.05	-9.73
227.5	-6.30	-10.14
237.5	-6.67	-10.73
247.5	-7.05	-11.35
257.5	-7.38	-11.88



Lateral Crash Pulse (Second Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
7.5	0.43	0.70
17.5	0.91	1.46
27.5	1.43	2.30
37.5	1.96	3.16
47.5	2.61	4.20
57.5	3.35	5.40
67.5	4.10	6.60
77.5	4.93	7.93
87.5	5.80	9.33
97.5	6.91	11.12
107.5	8.08	13.00
117.5	9.14	14.71
127.5	10.03	16.15
137.5	10.80	17.38
147.5	11.32	18.22
157.5	11.65	18.76
167.5	11.91	19.17
177.5	11.86	19.08
187.5	11.97	19.27
197.5	12.06	19.42
207.5	12.10	19.48
217.5	12.21	19.66
227.5	12.23	19.68
237.5	12.17	19.58
247.5	12.08	19.45
257.5	12.10	19.47

Hexadecimal Data

Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR system.

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39 32 30 36 38 39 35 33 30 30 30 30 30 30 30 30

42 4C 38 34 2D 31 34 43 30 32 38 2D 41 42 00 00 00 00 00 00 00 00 00 00

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Event Record 1

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E7 BC AE 00 FA BC AE 00 58 BD AE 00 50 BD AE 00 52 BD AE 00 41 BD AE 00 2D BD AE 00
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9D EF 51 FF 55 F0 51 FF 30 F1 51 FF D5 F0 51 FF 4A F0 51 FF 56 EF 51 FF 09 EE 51 FF
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Event Record 2
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**National Highway
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