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**Special Crash Investigations:
On-Site Ambulance Crash
Investigation;
Vehicle: 2019 Ford E-350 Type III
Ambulance;
Location: Georgia;
Date: November 2022**

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16. Abstract This report documents the on-site investigation of the fatal frontal off-set crash of a 2019 Ford E-350 Type III ambulance, a 1996 Ford Mustang, and a 2002 Dodge Ram 1500 pickup truck in Georgia in November 2022. The ambulance was driven by a belted 57-year-old female EMT with an unbelted 31-year-old female paramedic riding in the front passenger seat. The Mustang was driven by a belted 48-year-old male. The Dodge was driven by a belted 58-year-old male. The crash occurred when the Mustang was trailing a tanker truck and tried to pass it but struck the ambulance with its lights and sirens activated. The ambulance ramped up the Mustang and rolled onto its right side. The force of the crash redirected the Mustang into the Dodge. The ambulance driver was critically injured while the paramedic sustained police-reported non-incapacitating (B-level) injuries. Both were transported by ambulance to a Level II trauma center, but the ambulance driver later died in the emergency room. The Mustang driver sustained incapacitating (A-level) injuries and the Dodge driver sustained B-level injuries.			
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Special Crash Investigations
On-Site Ambulance Crash Investigation
Case Number: CR22017
Vehicle: 2019 Ford E-350 Type III Ambulance
Location: Georgia
Crash Date: November 2022

Background

This report documents the on-site investigation of the fatal frontal off-set crash of a 2019 Ford E-350 configured as a Type-III ambulance (Figure 1), a 1996 Ford Mustang, and a 2002 Dodge Ram 1500 pickup truck. The crash was identified by the National Highway Traffic Safety Administration's Office of Emergency Medical Services in November 2022 via news media sources. The notification was forwarded to the Special Crash Investigations (SCI) group and assigned for on-site investigation by the SCI team at Crash Research & Analysis Inc. the same month. The SCI team contacted the police department to obtain a police crash report and determine cooperation for an investigation. However, due to pending litigation resulting from the crash and the open police investigation, the authorization to inspect the vehicles did not occur until June 2023.

The belted 57-year-old female EMT driver of the ambulance was critically injured and transported by ambulance to a Level II trauma center. She later died in the emergency room prior to hospital admission. The unbelted 31-year-old female paramedic riding in the front passenger seat was police-reported to have non-incapacitating (B-level) injuries. She was transported by ambulance to a Level II trauma center where she was treated and released. The belted 48-year-old male Mustang driver sustained incapacitating (A-level) injuries. He was transported by ambulance to a Level II trauma center but the degree of his injuries and treatment is unknown. The belted 58-year-old male Ram driver sustained police-reported B-level injuries. He was transported by ambulance to a Level II trauma center. His injuries and treatment are unknown.

The ambulance was traveling east in the center two-way left turn lane of a four-lane roadway with its emergency lights and sirens activated en route to an emergency scene; it did not have a patient onboard. A tanker truck traveling west slowed due to another vehicle in front of it that was yielding to the oncoming ambulance. According to the police crash report (PCR), the Mustang was closely following the tanker truck. In an avoidance maneuver, the Mustang steered left around the tanker truck and into the center lane. The Mustang struck the ambulance in an off-set frontal crash configuration. The ambulance ramped up the Mustang and rolled one-quarter turn onto its right side in the center lane of the roadway 44 m (144 ft) from the initial impact with the Mustang and facing east. The force of the crash redirected the Mustang into a 2002 Dodge Ram 1500 pickup truck.



Figure 1. Front left oblique view of the ambulance

The ambulance service was cooperative and shared its procedure guide and employee records. The on-site investigation included the exterior and interior inspections of the ambulance to measure exterior deformation, interior damage, and intrusion, document any evidence of interior occupant contact, and examine the manual and supplemental restraint systems. The specialty equipment and features of the patient compartment were also inspected and documented. The ambulance had an event data recorder (EDR) supported by the Bosch Crash Data Retrieval tool and was imaged by the SCI investigator. The crash site was inspected, photographed, and measured by the total station. The Mustang was also photographed, and crush deformation measurements were made with the total station. Due to its age, the Mustang did not have an EDR. The Ram pickup had been released and was not available for inspection. The SCI investigator contacted the ambulance passenger but was refused an interview. The SCI investigator was unable to contact the Mustang and Ram drivers.

Summary

Crash Site

The crash occurred at 6:51 a.m. on a four-lane east-west undivided roadway. At the time of the crash the National Weather Service reported conditions as fair with a temperature of 1.1°C (34°F), 73 percent humidity, and northwesterly winds of 12.8 km/h (8 mph). The roadway was straight, constructed of bituminous asphalt (Figures 2 and 3) and had one eastbound lane, two westbound lanes, and a common center two-way left turn lane. The right-most westbound lane was for traffic turning into a business located on the north side of the road.

All travel lanes were 3.4 m (11.0 ft) wide. There was a positive 3 percent grade in the eastbound direction. The posted speed limit was 89 km/h (55 mph). The crash was recorded by security cameras located on the north side of a business. The footage and photos of the crash have been uploaded to the Crash Data Acquisition Network. A crash diagram is attached to this report.



Figure 2. Looking east at the crash area



Figure 3. Looking west at the crash area

Ambulance Agency, Crew, and Transport Description

According to the ambulance literature, the ambulance was owned and operated by a private ambulance agency that was not associated with any medical treatment center and provided emergency transport with basic and advanced life support medical services. Ambulance crews typically have a designated driver EMT and an advanced EMT or paramedic passenger working a 24-hour shift. The ambulance crew were in their last hour of their shift at the time of the crash. The driver was a basic EMT, and the passenger was a paramedic.

Pre-Crash

The ambulance was traveling east in the center two-way left turn lane with its emergency lights and sirens activated and was en route to an emergency scene at an EDR-reported speed of 107 km/h (66.5 mph) 5 seconds prior to algorithm enabled (AE). The Mustang was traveling west following a tanker truck and was being followed by the Dodge Ram. The tanker truck slowed and steered to the right giving way to the ambulance traveling up the hill. The Mustang steered left around the tanker truck and crossed into the center two-way left turn lane (Figures 4 and 5).



Figure 4. Looking south from camera 2 viewing the pre-crash positions of the vehicle. Blue arrow shows the Mustang, red arrow shows the box truck, and the yellow arrow shows the ambulance entering the frame.



Figure 5. Looking east from camera 1 viewing the Mustang (blue arrow) and box truck (red arrow)

Crash

The front of the Mustang struck the left and center aspects of the ambulance front plane (Event 1, Figure 6). The ambulance's left front wheel assembly was crushed rearward into the toe pan as the ambulance ramped up the Mustang (Figure 7). The Mustang's momentum was redirected, and it began to rapidly rotate counterclockwise. The ambulance overturned one-quarter turn onto its right side (Event 2), sliding approximately 44 m (144 ft) from the initial impact area to rest in the center two-way left turn lane facing east.



Figure 6. Looking south from camera 2 and viewing the ambulance vs Mustang crash (Event 1). Yellow arrow shows ambulance and Mustang. Red arrow shows the box truck.



Figure 7. Looking south from camera 2 and viewing the ambulance ramping over the Mustang and initiating the rollover Event 2 (yellow arrow). The Dodge comes into frame (blue arrow) and the box truck (red arrow).

The redirected Mustang rotated approximately 180° counterclockwise. The Dodge Ram then struck the right side of the Mustang. The Mustang came to final rest against the Ram in the west right-turn lane (Event 3, Figures 8 and 9).



Figure 8. Looking south from camera 2 and viewing the ambulance in the rollover event (yellow arrow) and the Dodge striking the right side of the Mustang (blue arrow) and the box truck (red arrow).



Figure 9. Looking east from camera 1 and viewing Event 3 (blue arrow)

Post-Crash

The ambulance driver sustained critical injuries. She was extricated from the ambulance through the roof by EMS personnel and transported by ambulance to a Level II trauma center. She died due to injuries sustained in the crash at the emergency room prior to hospital admittance.

The front passenger EMT sustained non-incapacitating injuries. Due to the ambulance's orientation at final rest, she was removed from the vehicle by EMS personnel through the cut away roof and was transported by ambulance to a Level II trauma center. She was treated and released. The SCI contacted her for an interview but she refused.

The Mustang driver was removed from his vehicle by EMS personnel due to perceived serious injuries. He received police-reported incapacitating injuries and was transported by ambulance to a Level II trauma center. Details concerning his injuries and treatment are unknown.

The Dodge Ram driver exited his vehicle on his own. He had police-reported non-incapacitating injuries and was transported by ambulance to a Level II trauma center. Details regarding his injuries and treatment are unknown.

All three vehicles were towed to a secure location. The Dodge Ram was released to its owner and was not available for this investigation. The ambulance and Mustang were held in a secure location for the duration of the police investigation and was subsequently inspected at that location by the SCI investigator.

2019 Ford E-350 Type III Ambulance

Description

The 2019 Ford E-350 type III ambulance (Figure 10) was identified by the Vehicle Identification Number (VIN) 1FDWE3FS0KDxxxxxx. The 2-door van-based vehicle was manufactured as an incomplete unit in 2019 and was then fitted to a previously used ambulance compartment in May 2019 as evidenced by the secondary manufacturers label. Due to the impact with the Mustang, the left front corner/door was crushed, and the primary manufacturer's label could not be documented. Constructed on a 370 cm (145.6 in) wheelbase, the ambulance had a 6.8-liter, V10 gasoline engine linked to an automatic transmission. The ambulance did not have any crash avoidance equipment. At the time of the SCI inspection, the ambulance had Maxxis Bravo Commercial LT225/75R16 tires on the front axle left rear and right rear inside tire positions and a Firestone TransForce HT2 LT225/75R16 tire on the right rear outer tire position. All tires were mounted on original equipment manufacturer aluminum alloy wheels with stainless steel hubs. All tire tread depths measured 5 mm (6/32 in) or greater. The ambulance gross vehicle weight rating (GVWR) label could not be documented due to damage to the driver's door. The search of the VIN revealed the GVWR of the ambulance chassis (excluding the ambulance box) ranged from 4,536 to 6,350 kg (10,001–14,000 lb).



Figure 10. Viewing the front of the ambulance

The ambulance was completed as a Type III ambulance during secondary manufacturing by Wheeled Coach Industries, Inc.¹ The ambulance compartment had been previously mounted on a different vehicle in July 2011. During the May 2019 refitting, emergency services operations equipment such as warning lights, sirens, and radio communications were installed in the ambulance's cab and on the exterior of the vehicle.

NHTSA Recalls and Investigations

A search of the NHTSA recall website using the ambulance's VIN at the time of the assignment in November 2022 and again in April 2025 revealed no open or unrepaired recalls.

¹ Wheeled Coach Industries, Inc., Winter Park, FL.

Exterior Damage

The ambulance sustained severe damage to the front plane as a result of the initial impact with the Mustang (Event 1). The ambulance's front stainless steel wraparound bumper separated at impact and was missing at the time of the SCI investigation. Damage measurements were taken across the lower radiator support bar. Direct damage started at the center line of the radiator and extended 66 cm (26.0 in) to the left corner with a maximum crush of 81 cm (31.9 in). The left front axle was crushed rearward 130 cm (51.2 in) causing severe intrusions to the driver's toe pan area (Figures 11 and 12). The driver's door and sill were driven upwards as the ambulance ramped over the Mustang causing the upper portion of the door to be separated away from the roof rail. The residual crush was measured at the lower radiator support bar with a total station and the resultant profile was: C1= 81 cm (31.9 in), C2= 65 cm (25.6 in), C3= 42 cm (16.5 in), C4= 17 cm (6.7 in), C5= 30 cm (11.8 in), C6= 19 cm (7.5 in). The GVWR of the ambulance exceeded the 4,535 kg (10,000 lb) limit and analysis was outside of scope of the WinSMASH program. For comparative purposes, the damage profile was run through the barrier algorithm. The barrier equivalent speed of this crush profile was calculated as 52 km/h (32.3 mph). The Truck Deformation Classification (TDC) assigned to this damage pattern was 12FYEW5.



Figure 11. Damage to the front end from the initial impact with the Mustang



Figure 12. Viewing the left side of the ambulance

The ambulance sustained minor damage during the rollover (Event 2, Figure 13) that consisted of minor abrasions along the right side. As the ambulance came down onto the ground, the already compromised cab separated from the patient compartment causing a 23 cm (9.1 in) gap between the left B-pillar and the front of the patient compartment (Figure 14). The TDC assigned to this event is 33RDAO1.



Figure 13. Viewing the right side of the ambulance



Figure 14. Viewing the damaged left side of the cab

Event Data Recorder

The ambulance had a restraints control module that monitored and controlled the diagnostic sensing and deployable commands for the vehicle's supplemental safety systems. The module had EDR capabilities. The EDR component was imaged with version 23.1.1 of the Bosch Crash Data Retrieval software via a direct-to-module connection by the SCI investigator. The imaged data reported with 23.3.1 of the software is attached at the end of this report as Appendix A.

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 [minimum of 8 km/h (5 mph)]. Data from non-deployments can be overwritten by subsequent events. Deployment events are locked and cannot be overwritten. This module also categorizes non-air bag deployment events 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. A 5-second pre-crash buffer attached to each event. Several pre-crash data points are recorded on a recurring basis of 0.5 seconds that should include: vehicle speed, accelerator pedal (% full), service brake status, engine rpm, ABS activity, and steering data. The EDR recorded two events with one locked frontal event and one unlocked event. The crash ignition cycle for both events was 8,942 and the downloaded ignition cycle was 8,945.

Pre-Crash

The EDR reported that 5.0 seconds prior to the frontal impact, the ambulance was traveling 107 km/h (66.5 mph) as it climbed the road grade and decelerated to 106 km/h (65.9 mph). Reconstruction of the crash data determined that the ambulance did not attempt any avoidance maneuvers. The ignition cycle at the time of the pre-crash recording was 8,942 and 8,945 at the time of the imaging. At the time of the crash, the air bag warning light was off and the driver's seat belt status was buckled.

First Record

The frontal impact with the Mustang initiated AE that deployed the driver's and passenger's frontal air bags and actuated the driver's and front passenger's retractor pretensioners 14.5 milliseconds after AE. A maximum longitudinal delta V of -33.67 km/h (-20.92 mph) was recorded at 64 milliseconds after AE and had a lateral component of 32.90 km/h (20.44 mph) at 66 milliseconds after AE. There were no fault codes at the time of this event.

Second Record

The second record had B0090-93 and B1193-00 fault codes that are consistent with the deployment of devices from the previous event. The recorded longitudinal delta V was 1.89 km/h (1.17 mph) at 300 milliseconds after AE with a lateral component of 1.44 km/h (0.90 mph) at 171 milliseconds. The time between the first and second records was 100 milliseconds, and its source is related to Event 1.

Interior Damage

The interior damage to the ambulance cab was severe (Figure 15). The driver's floor/toe pan was intruded 25 cm (9.8 in) vertically and 20 cm (7.9 in) longitudinally into the occupant space from contact with the deformed left front wheel assembly (Figure 16). Based on these intrusions it is likely the driver's lower extremities were pinned between the toe pan and the knee bolster. The instrument panel was intruded 5 cm (2.0 in) longitudinally into the driver's space. The driver's door was fractured in several points and was laterally intruded into the driver's space by 19 cm (7.5 in). The center console was pushed 15 cm (5.9 in) right of the cab's center line and into the front passenger's seat base. The roof was damaged post-crash during the mechanical extrication of the occupants.



Figure 15. Looking across the front row from the right side



Figure 16. Viewing the intrusion and driver's seat

Patient Compartment Interior Damage

The patient compartment interior sustained no structural damage from Events 1 and 2. There were no occupants in the rear of the ambulance and no significant damage was observed.

Manual Restraint System

The ambulance had three-point continuous loop lap and shoulder seat belts for each cab position using sliding latch plates, fixed D-rings, and fixed anchors attached to the seat base. Both front seat belts had buckle pretensioners.

Based on the observations of the SCI investigator, the driver was belted at the time of the crash, evidenced by friction abrasions on the webbing and is confirmed by the EDR report. The buckle pretensioners for both positions actuated as a result of the crash forces. The driver's seat belt was cut, and several sections of the belt were missing as well as the latch plate. The front passenger was not belted at the time of the crash. The front passenger's seat belt was found in a stowed position against the right B-pillar. There was no evidence of frictional loading (abrasions) to the latch plate or webbing that could be attributed to occupant loading. Such evidence would be expected in a crash of this severity had the occupants been using the restraints.

The patient compartment had a lap and shoulder seat belt for the captain's chair and lap belts for the bench seat located on the right rear side of the compartment. The three seats were fitted with retractor systems at the base of the seatbacks. These seats were not occupied during the crash.

Supplemental Restraint System

The ambulance had dual stage driver's and passenger's frontal air bags. Both air bags deployed as a result of the crash and were undamaged. The ambulance did not have side impact air bags or inflatable curtains.

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2019 Ford E-350 Type III Ambulance Occupants

Driver Demographics

Age/sex: 57 years/female
 Height: Unknown
 Weight: 60 kg (132 lb)
 Eyewear: Unknown
 Seat type: Forward-facing bucket seat with integral head restraint.
 Seat track position: Between middle and rear-most
 Manual restraint usage: Lap and shoulder belt available; lap and shoulder used
 Usage source: Vehicle inspection and EDR
 Air bags: Driver's frontal available; deployed
 Alcohol/drug involvement: No test given
 Egress from vehicle: Mechanically restrained, removed due to perceived serious injuries
 Transport from scene: Transported by ambulance to Level II trauma center
 Type of medical treatment: Fatal

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Left common iliac artery injury; Zone 3 retroperitoneal hematoma	520899.3	Tandem IPC Primary: Interior – Lap portion of belt restraint Secondary: Left Door Panel – Left rear upper quadrant	Probable Probable
2	Left-sided Grade 3 diaphragm injury	440606.3	Tandem IPC Primary: Interior – Lap portion of belt restraint Secondary: Left Door Panel – Left rear upper quadrant	Probable Probable
3	Left hemopneumothorax	442205.3	Tandem IPC Primary: Interior – Lap portion of belt restraint Secondary: Left Door Panel – Left rear upper quadrant	Probable Probable
4	Pneumomediastinum	442209.2	Isolated IPC Caused by other injury: 442205.3	Probable
5	Comminuted right 1st rib fracture	450201.1	Isolated	Possible

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
			Front – Steering wheel (combination of rim and hub/spoke)	
6	Small subarachnoid hemorrhage in left high frontal lobe	140693.2	Isolated IPC Primary: Roof – Roof left side rail Alternate: Left Side – Left A (A1/A2) – pillar	Probable Possible
7	Trace subarachnoid hemorrhage within interpeduncular cistern	140693.2	Isolated IPC Primary: Roof – Roof left side rail Alternate: Left Side – Left A (A1/A2) – pillar	Probable Possible
8	Right ankle fracture, NFS	852002.2	Isolated Floor – Floor (including toe pan)	Certain
9	Left ankle fracture, NFS	852002.2	Isolated Floor – Floor (including toe pan)	Certain
10	Left ankle laceration, 6 cm	810602.1	Isolated Floor – Floor (including toe pan)	Certain
11	Abrasion to nose	210202.1	Isolated Left Air Bag – Steering wheel hub	Probable
12	Contusion to left clavicle area	710402.1	Isolated Interior – Shoulder portion of belt restraint	Certain

Source: Emergency room record.

Driver Kinematics

At the time of the crash, the driver was restrained by the lap and shoulder seat belt. The seat track was found between the middle and rear-most position, but the at-crash adjustment position is unknown. The initial impact with the Mustang actuated the buckle pretensioner and the driver was nominally displaced forward in her seat belt. Due to the crash configuration, associated forces and intruded interior components, the driver contacted the steering wheel, frontal air bag, and left door panel causing several chest injuries. As the driver rode down the frontal crash forces, her feet and lower extremities contacted the pedals and intruding toe pan. The driver's space was greatly decreased due to the intrusions and the driver contacted the left roof rail.

Due to the post-crash orientation of the ambulance and intrusions sustained in the crash, the driver was mechanically restrained in her seating position. She was removed from the vehicle through the cab's roof due to perceived serious injuries. She was transported by ambulance to a Level II trauma center. The driver died due to injuries sustained in the crash in the emergency

room prior to admittance into the hospital. A copy of her emergency room records was requested and received. There was no autopsy report.

Front Passenger Demographics

Age/sex: 31 years/female
 Height: 170 cm (67 in)
 Weight: 79 kg (175 lb)
 Eyewear: Unknown
 Seat type: Forward-facing bucket seat with integral head restraint
 Seat track position: Between the middle and rear-most
 Manual restraint use: Lap and shoulder seat belt available; none used
 Usage source: Vehicle inspection
 Air bags: Passenger's frontal available; deployed
 Egress from vehicle: Could not exit due to jammed doors and vehicle orientation,
 Transport from scene: Transported by ambulance to Level II trauma center
 Type of medical treatment: Treated and released

Front Passenger Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Head injury NFS, involving only headache	110009.1	Isolated Front – Center instrument panel	Probable
2	Slightly distally angulated fracture along distal left 4th metacarpal without definitive intraarticular extension	752553.2	Isolated Interior – Other interior object(s) (specify): Ambulance control panel	Possible
3	Comminuted displaced fracture along base of left 3rd proximal phalanx without definitive intraarticular extension	752653.1	Isolated Interior – Other interior object(s) (specify): Ambulance control panel	Possible
4	2.5 cm laceration on upper midline forehead	210602.1	Isolated Front – Center instrument panel	Probable
5	Left flank abrasion	510202.1	Isolated Interior – Other interior object(s) (specify): Ambulance control panel	Probable
6	Abrasion over left iliac crest	810202.1	Isolated Interior – Other interior object(s) (specify):	Probable

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
			Ambulance control panel	

Source: Emergency room record.

Front Passenger Kinematics

At the time of the crash, the front passenger was unbelted and positioned in the front passenger seat. The seat track was found between the middle and rear-most position. The initial impact with the Mustang displaced the passenger into the center console tunnel, computer/computer mount, and her frontal air bag. During the rollover event she likely struck her door and right A-pillar. She was removed through the cab's roof and was transported to a Level II trauma center where she was treated and released.

1996 Ford Mustang

Description

The 1996 Ford Mustang GT was a 2-door coupe (Figure 17) manufactured in August 1995 and identified by the VIN 1FALP42X9TFxxxxxx. The vehicle had a 257 cm (101.2 in) wheelbase powered by a 4.6-liter, V8-cylinder gasoline engine linked to a 5-speed manual transmission with rear-wheel drive. The service brakes were power-assisted four-wheel disc systems. Steering was a hydraulic rack-and-pinion system. The Mustang did not have any crash avoidance features.



Figure 17. Left front oblique view of the Mustang

The vehicle did not have a manufacturer's tire placard. At the time of the SCI inspection, the Mustang had Sailun Atrezzo Svat 245/45ZR17 99WL tires for the front and Continental Extreme Contact Sport 285/40ZR17 in the rear. The tires were mounted on aftermarket Cobra aluminum alloy wheels. All tire tread depths measured 3 mm (4/32 in) or greater.

The Mustang had two rows of seats for seating five occupants, two in the front and three in the rear. At the time of the SCI inspection, the driver's seat was reclined approximately 20° aft of vertical. All seating surfaces were cloth. All seating positions had three-point-lap and shoulder seat belts with the exception of the second row-center seat that had a standard lap belt. The three-point-lap and shoulder seat belts had emergency locking capabilities.

Supplemental restraint was provided by the driver's and passenger's frontal air bags. All supplemental restraint systems deployed due to the crash forces. The Mustang did not have an EDR.

Vehicle Damage

The Mustang sustained moderate damage to its front plane at impact and to its left side as it disengaged from the ambulance (Figure 18). The front bumper bar reinforcement separated during the impact and was missing. The direct damage measured 109 cm (42.9 in) along the radiator support plane with a maximum crush of 66 cm (26.0 in) at the left front corner. As the ambulance ramped over the front of the Mustang and began to disengage, the left door panel was ripped away leaving the mid-door support bar intact (Figure 19). The frontal impact caused

severe interior damage. The steering wheel with the deployed hub-mounted air bag was found in the driver's seat and was attributed to post crash extrication. The residual crush for Event 1 was measured with a total station and the resultant profile was: C1= 66 cm (26.0 in), C2= 49 cm (19.3 in), C3= 46 cm (18.1 in), C4= 48 cm (18.8 in), C5= 45 cm (17.7 in), C6= 32 cm (12.6 in). A barrier equivalent speed for this crush profile was estimated by the WinSMASH program as 62 km/h (38.5 mph). The collision deformation classification (CDC) assigned to the damage pattern for Event 1 is 12FDEW3.



Figure 18. Damage to the front end of the Mustang from Event 1



Figure 19. The left rear oblique view of the Mustang and damage along the left side

The Mustang then rotated approximately 180° counterclockwise facing east when the following Dodge Ram struck the right side of the Mustang (Event 3). The direct damage began at the right rear corner and extended forward 256 cm (100.8 in, Figure 20). The impact of the Dodge caused a severe 30 cm (11.8 in) intrusion of the right B-pillar into the occupant space. The maximum crush of 41 cm (16.1 in) was measured at the rear of the right B-pillar, 96 cm (37.8 in) rear of the right vehicle center line. A barrier equivalent speed for this crush profile was estimated by the missing vehicle algorithm of the WinSMASH program as 23 km/h (14.2 mph). The CDC assigned to the damage pattern was 03RZAW3.



Figure 20. Damage to the right side of the Mustang from Event 3

Occupant Data

The Mustang was driven by a 48-year-old male who was belted at the time of the crash and sustained police-reported incapacitating (A-level) injuries. He was transported by ambulance to a Level II trauma center. The extent of his injuries and treatment is unknown.

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2002 Dodge Ram

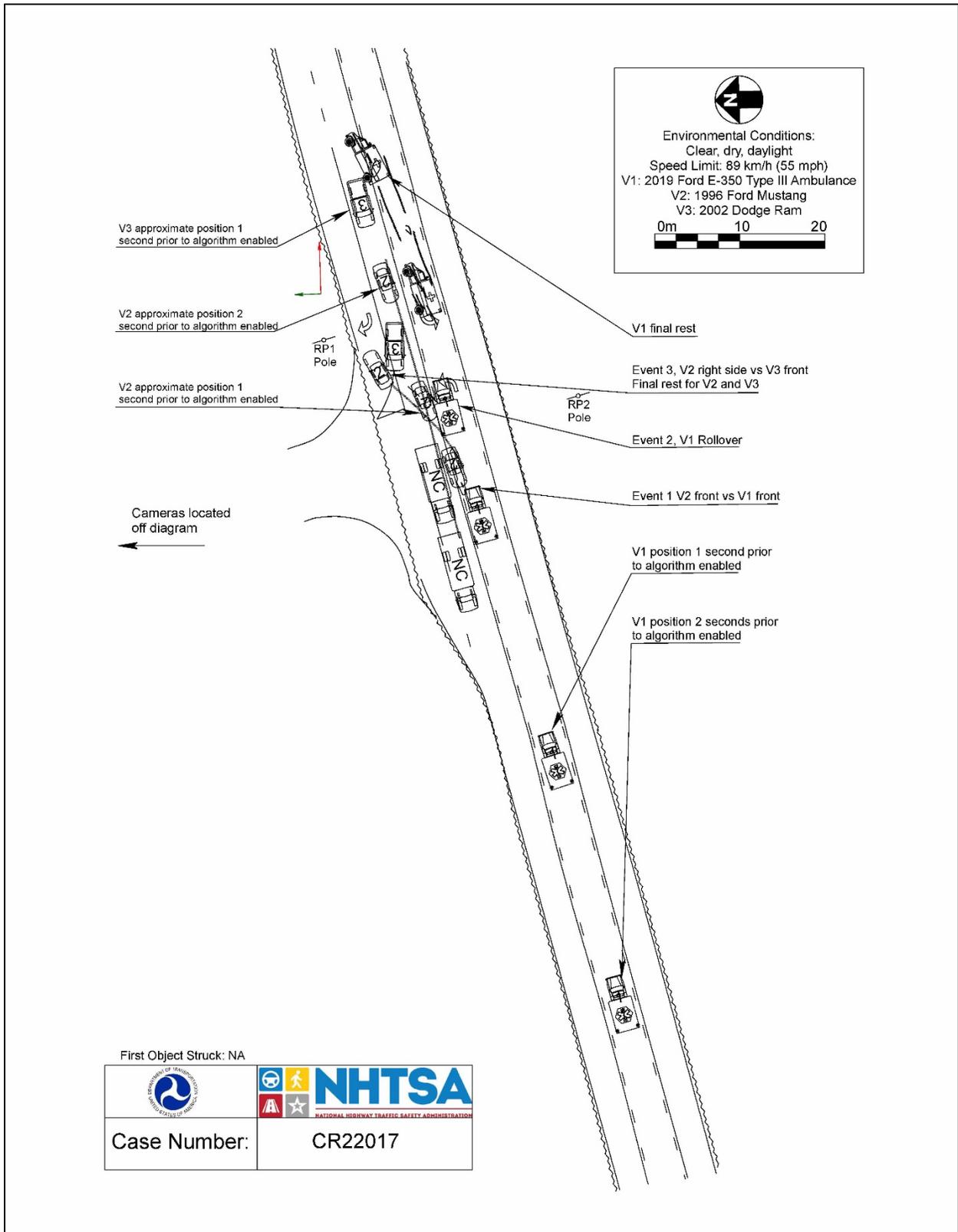
Description

The 2002 Dodge Ram 1500 was identified by the VIN: 1D7HA16NX2Jxxxxxx and was not available for inspection. The 2-door, long-bed pickup was constructed on a 357 cm (140.6 in) wheelbase and was powered by a 4.7-liter, V8 gasoline engine linked to an automatic transmission with rear-wheel drive. The service brakes were power-assisted four-wheel disc systems. Steering was a hydraulic rack and pinion system. The Dodge did not have any crash avoidance features. According to the PCR, it had disabling damage with an impact at 12 o'clock.

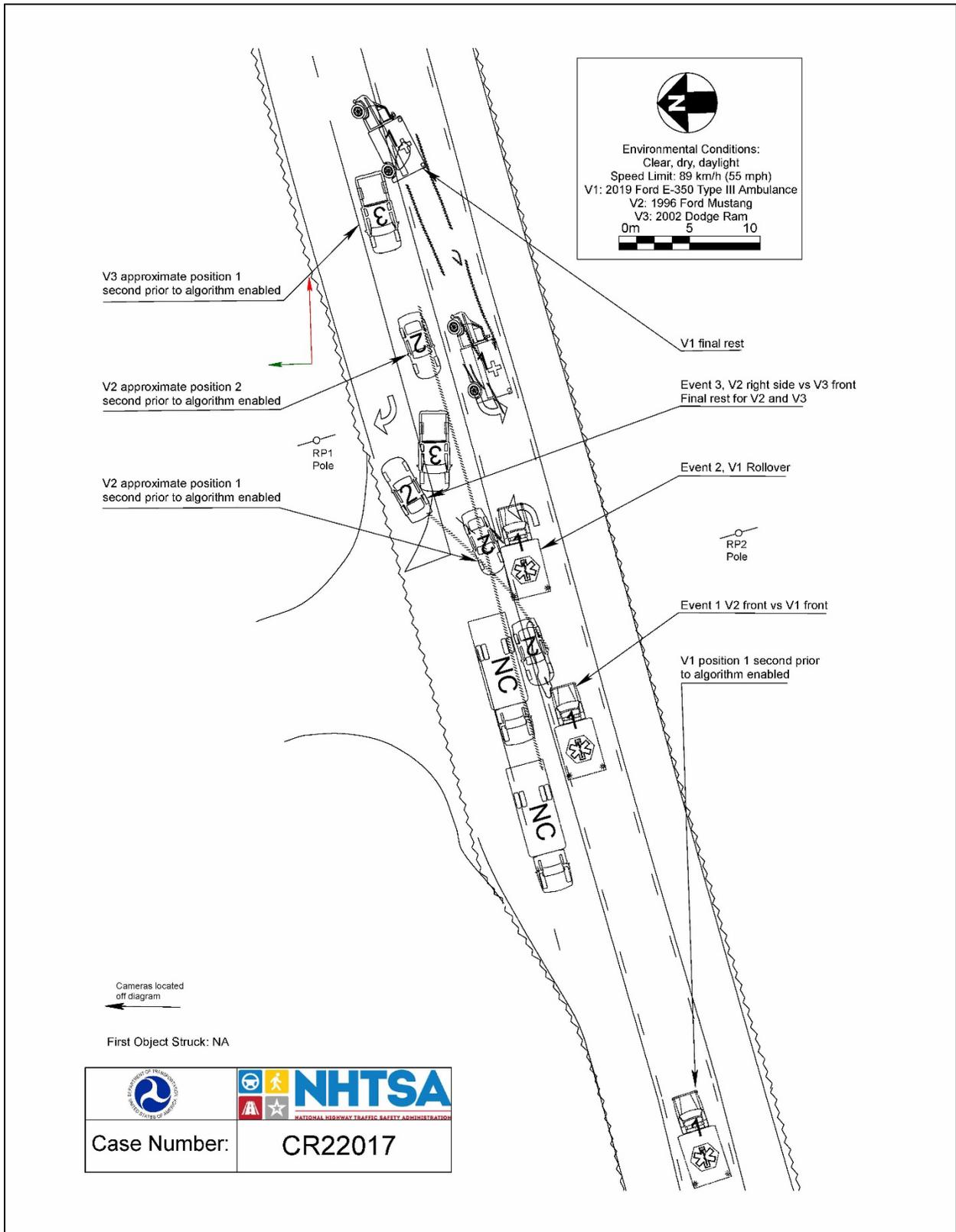
Occupant Data

The Dodge was driven by a 58-year-old male who was belted at the time of the crash and sustained police-reported non-incapacitating (B-level) injuries. He was transported by ambulance to a Level II trauma center. The extent of his injuries and treatment is unknown.

Crash Diagram



Crash Diagram: A Detailed View



Appendix A: 2019 Ford E-350 Type III Ambulance Event Data Recorder Report²

² 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	1FDWE3FS0KD*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CR22017 V1ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 23.1.1
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 23.3.1
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	Yes
Event(s) recovered	locked frontal event unlocked event

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	1FDWE3FS0KD*****
Current VIN from PCM	1FDWE3FS0KD*****
Ignition cycle, download (first record)	8,945
Ignition cycle, download (second record)	8,945
Restraints Control Module Part Number	KC24-14B321-BA
Restraints Control Module Serial Number	9207218100000000
Restraints Control Module Software Part Number (Version)	BL84-14C028-AB
Left/Center Frontal Restraints Sensor Serial Number	1E228215
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	Locked 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)	30,899,570
Key-on Timer at event time zero (seconds)	175
Vehicle voltage at time zero (Volts)	13.932
Energy Reserve Mode entered during event (Y/N)	Yes
Time Driver Front Satellite Sensor Lost Relative to Time Zero (msec)	2.0

Faults Present at Start of Event (First Record)

No Faults Recorded

Deployment Data (First Record)

Frontal airbag deployment, time to first stage deployment, driver (msec)	14.5
Pretensioner (buckle) deployment, time to fire, driver (msec)	14.5
Frontal airbag deployment, time to first stage deployment, front passenger (msec)	14.5
Pretensioner (buckle) deployment, time to fire, right front passenger (msec)	14.5
Maximum delta-V, longitudinal (MPH [km/h])	-20.92 [-33.67]
Time, maximum delta-V longitudinal (msec)	64
Maximum delta-V, lateral (MPH [km/h])	20.44 [32.90]
Time, maximum delta-V lateral (msec)	66
Left or center front, satellite Sensor discriminating deployment	Yes
Right, front satellite sensor discriminating deployment	Yes
RCM, front sensor discriminating deployment	Yes
RCM, front sensor safing	Yes
Longitudinal Delta-V Time Zero Offset	7.0 ms
Lateral Delta-V Time Zero Offset	7.0 ms

Pre-Crash Data -1 sec (First Record)

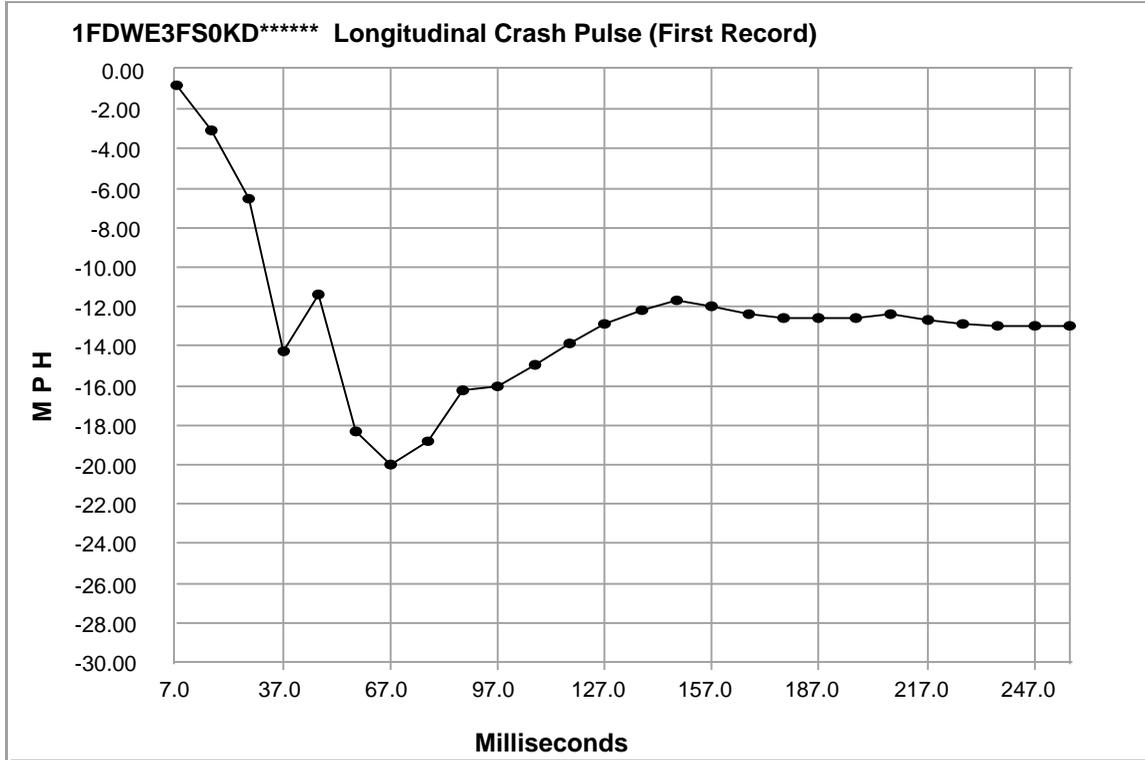
Ignition cycle, crash	8,942
Frontal air bag warning lamp, on/off	Off
Frontal air bag suppression switch status, front passenger	Not Active
Safety belt status, driver	Driver Buckled
Brake Telltale	Off
ABS Telltale	Off
Stability Control Telltale	Off
Speed Control Telltale	Off
Powertrain Wrench Telltale	Off
Powertrain Malfunction Indicator Lamp (MIL)Telltale	Off

Pre-Crash Data -5 to 0 sec [2 samples/sec] (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	66.5 [107.0]	24	Off	2,100	non-engaged	non-engaged	non-engaged	non-engaged
- 4.5	67.1 [108.0]	24	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 4.0	67.1 [108.0]	24	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 3.5	67.7 [109.0]	24	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 3.0	67.1 [108.0]	24	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 2.5	67.1 [108.0]	23	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 2.0	67.1 [108.0]	22	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 1.5	67.1 [108.0]	22	Off	2,100	non-engaged	non-engaged	non-engaged	non-engaged
- 1.0	66.5 [107.0]	22	Off	2,100	non-engaged	non-engaged	non-engaged	non-engaged
- 0.5	66.5 [107.0]	21	Off	2,100	non-engaged	non-engaged	non-engaged	non-engaged
0.0	65.9 [106.0]	21	Off	2,100	non-engaged	non-engaged	non-engaged	non-engaged

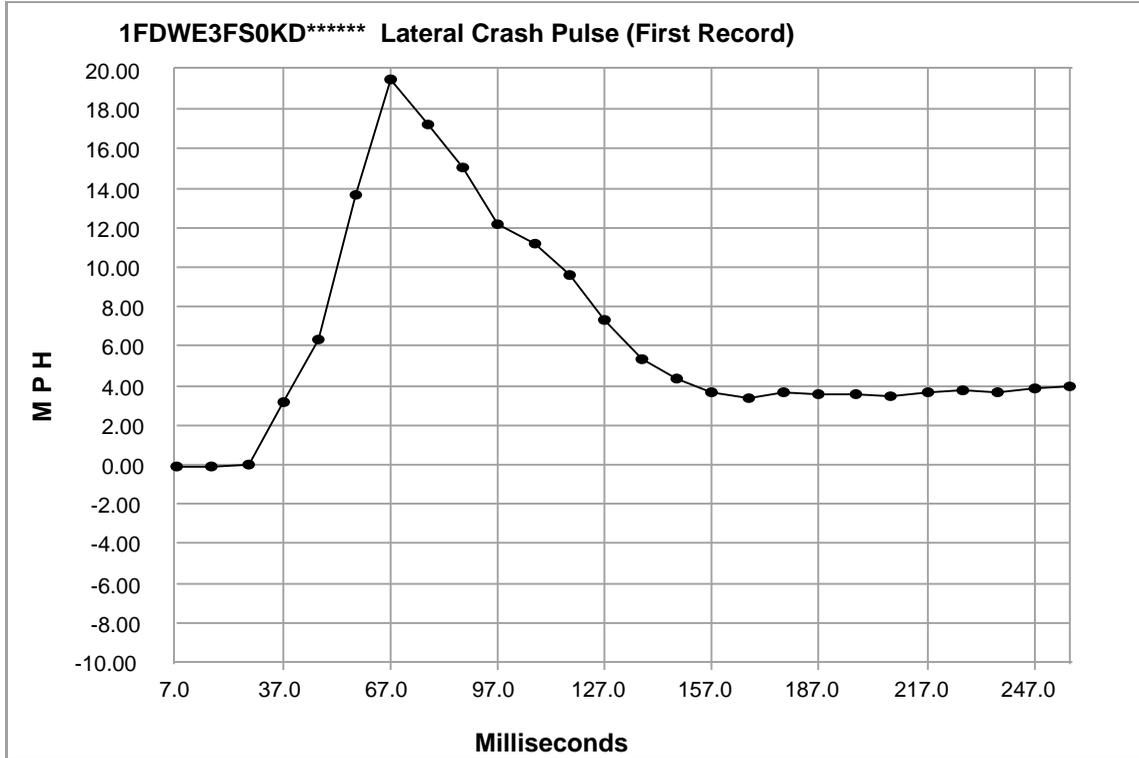
Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record)

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)
7.0	-0.79	-1.28
17.0	-3.06	-4.93
27.0	-6.58	-10.59
37.0	-14.28	-22.98
47.0	-11.35	-18.27
57.0	-18.31	-29.47
67.0	-20.04	-32.25
77.0	-18.79	-30.24
87.0	-16.25	-26.16
97.0	-16.02	-25.78
107.0	-14.92	-24.02
117.0	-13.84	-22.27
127.0	-12.86	-20.69
137.0	-12.23	-19.68
147.0	-11.69	-18.81
157.0	-11.94	-19.22
167.0	-12.33	-19.85
177.0	-12.56	-20.21
187.0	-12.61	-20.30
197.0	-12.55	-20.19
207.0	-12.42	-19.99
217.0	-12.70	-20.43
227.0	-12.91	-20.78
237.0	-12.97	-20.88
247.0	-12.92	-20.80
257.0	-12.98	-20.90



Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
7.0	-0.07	-0.11
17.0	-0.08	-0.13
27.0	-0.01	-0.02
37.0	3.20	5.16
47.0	6.29	10.13
57.0	13.65	21.96
67.0	19.55	31.46
77.0	17.27	27.79
87.0	15.01	24.15
97.0	12.14	19.54
107.0	11.24	18.09
117.0	9.56	15.39
127.0	7.30	11.75
137.0	5.31	8.54
147.0	4.33	6.97
157.0	3.67	5.90
167.0	3.38	5.43
177.0	3.67	5.91
187.0	3.53	5.68
197.0	3.55	5.72
207.0	3.48	5.59
217.0	3.62	5.82
227.0	3.80	6.12
237.0	3.69	5.94
247.0	3.81	6.14
257.0	3.97	6.40

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)	100
Lifetime Operating Timer at event time zero (seconds)	30,899,570
Key-on Timer at event time zero (seconds)	175
Vehicle voltage at time zero (Volts)	4.293
Energy Reserve Mode entered during event (Y/N)	Yes
Time Driver Front Satellite Sensor Lost Relative to Time Zero (msec)	Data lost prior to event

Faults Present at Start of Event (Second Record)

B0090-93
B1193-00

Deployment Data (Second Record)

Maximum delta-V, longitudinal (MPH [km/h])	1.17 [1.89]
Time, maximum delta-V longitudinal (msec)	300
Maximum delta-V, lateral (MPH [km/h])	0.90 [1.44]
Time, maximum delta-V lateral (msec)	171
Longitudinal Delta-V Time Zero Offset	4.5 ms
Lateral Delta-V Time Zero Offset	4.5 ms

Pre-Crash Data -1 sec (Second Record)

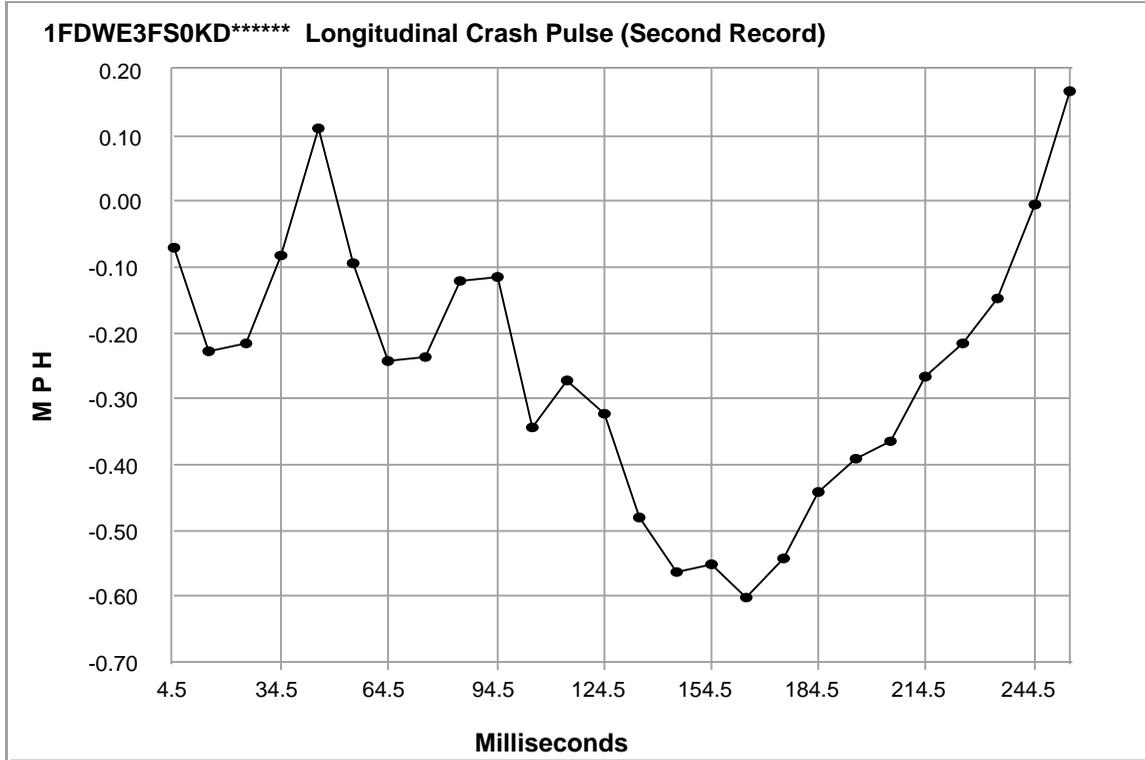
Ignition cycle, crash	8,942
Frontal air bag warning lamp, on/off	On
Frontal air bag suppression switch status, front passenger	Not Active
Safety belt status, driver	Driver Buckled
Brake Telltale	Off
ABS Telltale	Off
Stability Control Telltale	Off
Speed Control Telltale	Off
Powertrain Wrench Telltale	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	66.5 [107.0]	24	Off	2,100	non-engaged	non-engaged	non-engaged	non-engaged
- 4.5	67.1 [108.0]	24	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 4.0	67.1 [108.0]	24	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 3.5	67.7 [109.0]	24	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 3.0	67.1 [108.0]	24	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 2.5	67.1 [108.0]	23	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 2.0	67.1 [108.0]	22	Off	2,200	non-engaged	non-engaged	non-engaged	non-engaged
- 1.5	67.1 [108.0]	22	Off	2,100	non-engaged	non-engaged	non-engaged	non-engaged
- 1.0	66.5 [107.0]	22	Off	2,100	non-engaged	non-engaged	non-engaged	non-engaged
- 0.5	66.5 [107.0]	21	Off	2,100	non-engaged	non-engaged	non-engaged	non-engaged
0.0	65.9 [106.0]	21	Off	2,100	non-engaged	non-engaged	non-engaged	non-engaged

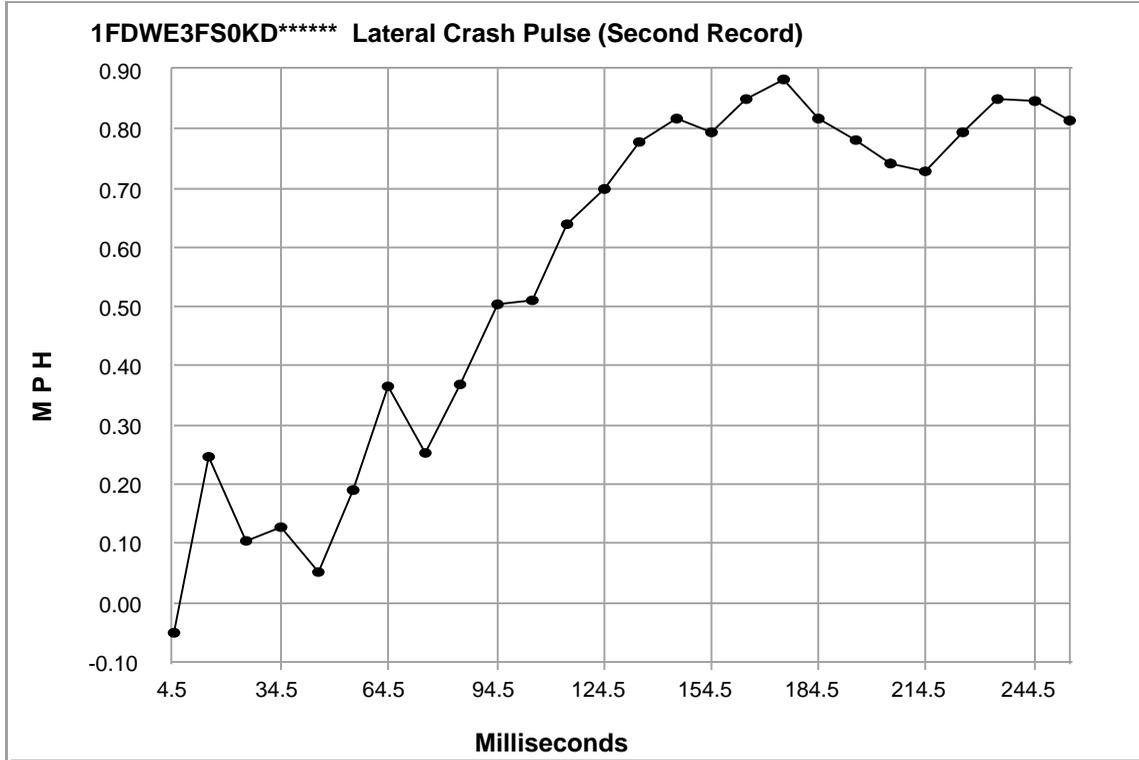
Pre-Crash Data -5 to 0 sec [10 samples/sec] (Second Record)

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
- 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 (Second Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
4.5	-0.07	-0.11
14.5	-0.23	-0.37
24.5	-0.21	-0.35
34.5	-0.08	-0.13
44.5	0.11	0.18
54.5	-0.10	-0.15
64.5	-0.24	-0.39
74.5	-0.24	-0.38
84.5	-0.12	-0.19
94.5	-0.11	-0.18
104.5	-0.34	-0.55
114.5	-0.27	-0.44
124.5	-0.32	-0.52
134.5	-0.48	-0.77
144.5	-0.56	-0.91
154.5	-0.55	-0.89
164.5	-0.60	-0.97
174.5	-0.54	-0.87
184.5	-0.44	-0.71
194.5	-0.39	-0.63
204.5	-0.37	-0.59
214.5	-0.27	-0.43
224.5	-0.21	-0.35
234.5	-0.15	-0.24
244.5	-0.01	-0.01
254.5	0.17	0.27



Lateral Crash Pulse (Second Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
4.5	-0.05	-0.08
14.5	0.25	0.40
24.5	0.10	0.17
34.5	0.13	0.20
44.5	0.05	0.08
54.5	0.19	0.31
64.5	0.37	0.59
74.5	0.25	0.41
84.5	0.37	0.59
94.5	0.51	0.81
104.5	0.51	0.82
114.5	0.64	1.03
124.5	0.70	1.12
134.5	0.78	1.25
144.5	0.82	1.32
154.5	0.79	1.28
164.5	0.85	1.37
174.5	0.88	1.42
184.5	0.82	1.31
194.5	0.78	1.26
204.5	0.74	1.19
214.5	0.73	1.17
224.5	0.80	1.28
234.5	0.85	1.37
244.5	0.85	1.36
254.5	0.81	1.31

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.

02 00 00 00

4B 43 32 34 2D 31 34 42 33 32 31 2D 42 41 00 00 00 00 00 00 00 00 00 00

39 32 30 37 32 31 38 31 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

1E 22 82 15 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

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00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

31 46 44 57 45 33 46 53 30 4B 44 2A 2A 2A 2A 2A 2A

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Disclaimer of Liability

The users of the CDR product and reviewers of the CDR reports and exported data shall ensure that data and information supplied is applicable to the vehicle, vehicle's system(s) and the vehicle ECU. Robert Bosch LLC and all its directors, officers, employees and members shall not be liable for damages arising out of or related to incorrect, incomplete or misinterpreted software and/or data. Robert Bosch LLC expressly excludes all liability for incidental, consequential, special or punitive damages arising from or related to the CDR data, CDR software or use thereof.

DOT HS 813 734
February 2026



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**



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