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Special Crash Investigations Ambulance Crash Investigation Vehicle: 2009 Ford E-350 Type II Ambulance Location: New Mexico Crash Date: July 2016

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This report documents the investigation of a rollover crash involving a 2009 Ford E-350 Type II ambulance with another vehicle and the injuries sustained by the occupants.

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

16. Abstract

Seven occupants including the driver and patient were traveling in the Ford. A 6-week-old female unbelted patient was being transported in a Drager Isolette 8000 incubator from one hospital to another for emergency surgery with emergency lights and siren activated when the Ford was struck in the left plane by a 2009 Dodge Ram in a front-to-side angled configuration in an intersection. Following the initial impact, the Ford overturned and came to rest on its right side. Prior to the crash, the 6-week-old female patient was in critical condition related to pre-term birth and had been placed in the incubator mounted to a sled and secured on a patient cot. The incubator was not equipped with a manual restraint system. During the crash, the patient was displaced from the incubator and came to rest in the patient compartment. She was located by a nurse who resumed attending to the patient during transport in another ambulance to the hospital. The patient was later transported by air to a third hospital. She died while undergoing treatment in the hospital 28 days after the crash. The investigation determined the cause of death was not related to injuries sustained in the crash but from pre-existing and subsequent conditions relating to the pre-term birth.

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On-Site Ambulance Crash Investigation Case Number DS16014
Vehicle: 2009 Ford E-350 Type II Ambulance
Ambulance Body: Medtec Ambulance Corporation
Location: New Mexico
Crash Date: July 2016

BACKGROUND

This report documents the investigation of a rollover crash involving a 2009 Ford E-350 Type II ambulance (**Figure 1**) with another vehicle and the injuries sustained by the occupants. Seven occupants including the driver and patient were traveling in the ambulance. A 6-week-old female unbelted patient was being transported in a Drager Isolette 8000 incubator from one hospital to another for emergency surgery with emergency lights and siren activated when the Ford was struck in the left plane by a 2009 Dodge Ram in a front-to-side angled configuration in an intersection. Following the initial impact, the Ford overturned and came to rest on its right side. Prior to the crash, the 6-week-old female patient was in critical condition related to pre-term birth and had been placed in the incubator mounted to a sled and secured on a patient cot. The incubator was not equipped with a manual restraint system. During the crash, the patient was displaced from the incubator and came to rest in the patient compartment. She was located by a nurse who resumed attending to the patient during transport in another ambulance to the hospital. The patient was later transported by air to a third hospital. She died while undergoing treatment in the hospital 28 days after the crash. The investigation determined the cause of death was not related to injuries sustained in the crash but from pre-existing and subsequent conditions relating to the pre-term birth.

Figure 1. 2009 Ford E-350 Type II Ambulance

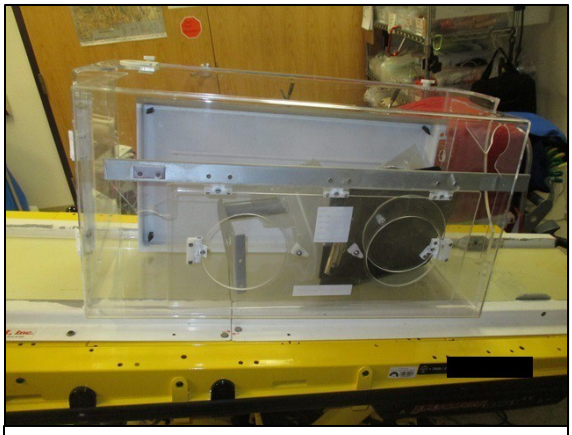


Figure 2. Drager Isolette 8000 Incubator (insurance company photo)

The Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration initiated the investigation in July 2016. The SCI team obtained a preliminary police report and the Ford was inspected in July 2016. Both vehicles involved in the crash were supported by the Bosch Crash Data Retrieval (CDR) system. Police removed the Ford's event data recorder

(EDR) during their investigation and imaged the EDRs from both vehicles. The SCI team obtained PDF copies of the EDR reports for both vehicles, which are included as **Appendix A** and **B** of this report.

The crash occurred during morning hours in July 2016 in a four-leg intersection in New Mexico. The Ford was being driven southbound on an interstate frontage road by a belted 24-year-old female. Six additional occupants were traveling in the patient compartment of the ambulance, including a belted 21-year-old female who was the patient's mother, an unbelted 21-year-old male EMT-intermediate listed in the EMS report as the primary patient caregiver, the unbelted 6-week-old female patient, an unbelted 32-year-old male EMS student who was listed in the EMS report as a third-party ride-along, an unbelted 60-year-old male nurse, and an unbelted 63-year-old female nurse. The 6-week-old female patient was placed inside the incubator without any restraints. The Drager Isolette 8000 is a self-contained incubator unit that provides a controlled heat, humidity, and oxygen micro-environment for the isolation and care of premature and low-birth weight infants. The apparatus is made of a clear plastic material and has a hinged door on top and portholes on the sides for access to the infant with a minimum of heat and oxygen loss. A servocontrol mechanism constantly monitors the infant's temperature and controls the heat in the unit. The Isolette was anchored to a sled that was mounted to a Stryker 6516 Power-Pro IT patient cot that was secured in the patient compartment. The cot and incubator are discussed in greater detail in the Patient Cot and Drager Isolette 8000 Incubator section of this report.

The other vehicle in the crash was a 2009 Dodge Ram 2500 traveling westbound. The Dodge was being driven by a belted 35-year-old female. The Dodge entered the intersection and the front plane of the Dodge struck the left plane of the Ford. Following the impact, the Ford initiated a one quarter-turn rollover and came to rest on its right side in the southbound lanes of the roadway. The Dodge came to a stop in the westbound lanes of the intersection near the point of impact. The 24-year-old female driver of the Ford, the 21-year-old male occupant, the 32- year-old male occupant and the 60-year-old male occupant sustained police-reported "C" (complaint of injury - but not visible) injuries and were transported to a local hospital for evaluation. The 63-year-old female occupant sustained "B" (visible) injuries and was transported. The 21-year-old female occupant sustained "O" (no apparent) injuries and was transported for evaluation and to stay in contact with the patient. The 6-week-old female patient sustained police-reported "A" (incapacitating) injuries and was transported. The driver of the Dodge was not injured or transported. Both vehicles were towed due to damage and placed on a police hold.

SUMMARY

Crash Site

The crash occurred in a four-leg intersection in an urban environment in New Mexico. The intersection included a southbound interstate highway frontage road and a two-way, east/west roadway. The east/west roadway was partially covered by an interstate overpass. This intersection was controlled by three-phase traffic signs in all directions. The signals were located at the corners of the intersection as well as over the traffic lanes. The north, south, and west aspects of the intersection were configured with white pained crosswalks and pedestrian crossing signal. The area was configured with overhead illumination. Both roadways were paved with asphalt in good condition.

The southbound roadway consisted of three lanes each measuring 3.7 mm (12.0 ft) in width and a paved shoulder on the right edge measuring 2.1 m (7.0 ft) in width (**Figure 3**). The first lane from the right was configured for through or right-turning traffic, the center lane was for through traffic only and the third lane from the right was configured for through or left turning traffic. The left edge of the roadway was bordered by a concrete barrier and wall configured in an elevated interstate highway structure. The lanes were separated by solid white painted stripes. This roadway was straight and had variable slopes in the area of the crash. The profile was a negative 4.0 percent slope approaching the intersection, level in the intersection, and a positive 4.0 slope beyond the intersection. The posted speed limit for this roadway was 56 km/h (35 mph).

Figure 3. Approach to intersection, looking south

The east/west roadway was undivided and configured with two lanes for each direction, separated by a double yellow painted stripe and delineated by both solid and dashed white painted stripes (**Figure 4**). On the eastbound aspect, the first lane from the right was configured for through traffic and the second lane was configured for through or left turning traffic. The roadway was level and curved slightly left in the westbound direction with a radius of 76.2 m (250.0 ft) measured from the north curb line. This roadway was covered by an overpassing interstate highway that measured 53.3 m (175.0 ft) in width and ended at the east aspect

Figure 4. Approach to intersection, looking west

of the intersection. The roadside under the overpass was configured with paved sidewalks, concrete pillars and overhead illumination. The posted speed limit was 40 km/h (25 mph).

Conditions at the time of the crash as reported by the nearest weather station were temperature 28.3 degrees C (82.9 degrees F), winds west/southwest 9.3 km/h (5.8 mph), and clear skies. It was daylight without street lamp illumination and dry. No unusual conditions were reported at the time of the crash. A crash diagram is included at the end of this report.

Pre-Crash

The Ford was an in-service ambulance used by a private company that provides service 24 hours a day, 7 days a week, to both emergency and non-emergency calls as contracted to private agencies. The vehicle was transporting the 6-week-old female patient from one hospital to another for emergency surgery in an incubator unit anchored to a Stryker Power-Pro IT patient cot that was secured in place along the left interior wall using a Stryker antler design floor-mount cot fastener system. Approaching the intersection, the Ford was traveling southbound at an unknown speed in the second lane from the right with emergency lights and siren activated. A witness traveling directly behind the ambulance stated to police the ambulance was traveling 32 to 40 km/h (20 to 25 mph). The driver of the ambulance stated to police that prior to entering the intersection she braked and slowed, looked right and left and sounded the vehicle's air horn. She stated she observed a stopped vehicle on the right (eastbound) and the moving Dodge on the left (westbound). The driver stated she observed the Dodge was slowing and so she proceeded into the intersection. According to witnesses and the police report the Ford entered the intersection against a red signal. The driver stated when she observed the signal it was in the yellow phase.

The Dodge was traveling westbound at a driver-indicated speed of 24 to 32 km/h (15 to 20 mph) in the first lane from the right and entered the intersection with a green signal. The driver stated to police she heard the ambulance siren just prior to seeing the ambulance. When she entered the intersection she observed the ambulance and attempted to brake but did not have sufficient time to avoid contacting the other vehicle.

Crash

The crash included two events. Event 1 was a front-to-side impact and Event 2 was a rollover. For Event 1, the front plane of the Dodge struck the left plane of the Ford. The area of impact was near the northwest corner of the intersection. The area of contact to the Ford was aft of its rear axle, causing it to initiate a counterclockwise rotation. The vehicle rotated approximately 90 degrees until its right side was leading. The right rear tire de-beaded and deflated, allowing the right rear rim and wheel to contact the roadway surface with sufficient opposing lateral forces applied to cause a right side leading trip rollover. For Event 2, the Ford rolled one quarter-turn and came to rest on its right side facing northbound in the southbound lanes. The roll distance was unknown. Evidence gathered from on-scene images and the scene inspection was used to estimate the distance traveled from Event 1 to final rest to be 18.0 m (60.0 ft). Following the first

impact, the Dodge came to rest in the intersection facing eastbound near the point of impact. Trajectory distance for this vehicle is unknown.

For the Ford in Event 1, the damage with CDC-only algorithm of the WinSMASH program calculated a total delta-V of 14 km/h (8 mph) with longitudinal and lateral components of -7 km/h (-4 mph) and 12 km/h (7 mph), respectively, and a barrier equivalent speed (BES) of 9 km/h (5 mph). The WinSMASH results fit the model and were considered reasonable.

For the Dodge in Event 1, WinSMASH calculated a total delta-V of 19 km/h (12 mph) with Longitudinal and Lateral components of -17 km/h (-10 mph) and -10 km/h (-6 mph), respectively, and a barrier equivalent speed (BES) of 23 km/h (14 mph). The WinSMASH results were considered reasonable.

Post-Crash

During the crash, the top-mounted access door of the incubator came open and the 6-week-old female patient was displaced from the incubator through the opening. The incubator was displaced from the cot and overturned. The patient came to rest in an area between the overturned incubator and Occupant 7, who was attending the patient. Following the crash, the nurse found the child in the patient compartment and resumed efforts to perform emergency breathing procedures on the patient until responders arrived. Police were dispatched 5 minutes after the crash and arrived on-scene 6 minutes after. The Ford was at rest on its right side (**Figure 5**). Another ambulance was dispatched 6 minutes after the crash and arrived on-scene 9 minutes after. A witness traveling behind the ambulance stopped and reportedly kicked out the windshield and assisted the front row occupants from the vehicle through the opening. The occupants in the patient compartment were assisted through the back doors by responders. All occupants of the Ford were transported by ambulance to local hospitals.

Figure 5. Crash site looking north, final rest positions Dodge on left, Ford on right (news photo)

The incubator was removed from the original ambulance but was not transferred to the second ambulance. According to an insurance representative who was interviewed it was damaged and removed from service. The patient cot, which was configured to transport the incubator, remained secured in the patient compartment. The incubator is discussed further in the Patient Cot and Isolette section of this report. Both vehicles were towed due to damage and placed on a police hold.

2009 FORD E-350 TYPE II AMBULANCE

Description

The ambulance was a 2009 Ford E-350 extended length cargo van type chassis manufactured in August 2009 and identified by the Vehicle Identification Number (VIN): 1FDSS34P39Dxxxxxx. The vehicle mileage is unknown. Secondary manufacturing was completed in October 2009 by Medtec Ambulance as a Type II ambulance. The chassis was a rear-wheel-drive platform powered by a Ford 6.0-liter, 8-cylinder, diesel engine linked to an automatic transmission. The Ford was equipped with standard electronic stability control (ESC) and, antilock braking system (ABS).

Secondary manufacturing of the vehicle consisted of installation of the patient compartment module and installation of emergency services operational equipment (warning lights, sirens, and radio communications). Completed as a Type II certified ambulance, the vehicle was configured with a forward cab and rear patient compartment equipped for the treatment of medical emergencies in a mobile environment.

The Ford's cab was configured for the seating of two occupants, with forward-facing, box-mounted seats that featured manual seat track and seat back recline adjustments. The seats were configured with three-point lap and shoulder seat belts and integral head restraints. The driver's seat track was adjusted to full-back and the front passenger seat was adjusted between middle and full-forward. The cab's seats were divided by a center console that integrated communications equipment and an array of switches related to the ambulance's emergency response and operational activities. Seating in the patient compartment module accommodated up to four crew members and one patient cot. This configuration included a rear-facing, high-back attendant seat at the forward wall, an inward facing, three-passenger bench seat on the right side wall, and a centrally located single occupant cot secured to the left side wall and floor. The attendant seat was configured with an integrated lap and shoulder belt, and an integral head restraint. The squad bench seat was configured with three lap belts.

The patient compartment had interior dimensions of 345 cm (138.8 in) long, 144 cm (56.7 in) wide, and 167 cm (65.7 in) high from floor to ceiling. Double rear doors served for the loading and unloading of the cot, as well as entry for the crew. A steel, step-configured bumper was located below the double doors on the back plane. Another set of double doors on the right side forward of the bench seat provided additional occupant access.

The ambulance crew included two employees of the ambulance company and one third-party ride-along. The 24-year-old female held an EMT-Basic certification and held the title of driver. The 21-year-old male held an EMT-Intermediate certification and held the title of primary patient caregiver. The 32-year-old male was an EMS student listed as a third-party ride-along who was observing the patient transport and had no further responsibilities in the effort.

Vehicle Weight, Payload, and Tire Data

The Ford chassis was placarded with a curb weight of 3,601 kg (7,940 lb), and a gross vehicle weight rating (GVWR) of 4,309 kg (9,500 lb). This was distributed as a GAWR front 2,087 kg (4,600 lb) and GAWR rear 2,760 kg (6,084 lb). The vehicle had a maximum payload (total remaining weight capacity of occupants and cargo a user may add) of 771 kg (1,700 lb). Total weight of option equipment was 63 kg (140 lb).

The vehicle manufacturer's recommended tire size was LT245/75R16 with recommended cold tire pressures of 415 kPa (60 psi) front and 550 kPa (80 psi) rear. At the time of the SCI inspection, the vehicle was equipped with Maxxis Bravo Commercial LT tires of the recommended size manufactured in 2014. Specific tire data was as follows:

Position	Measured Tread Depth	Restricted	Damage
LF	5 mm (6/32 in)	No	None
LR	4 mm (5/32 in)	No	De-beaded
RR	5 mm (6/32 in)	No	De-beaded
RF	6 mm (8/32 in)	No	None

Exterior Damage

The Ford sustained minor severity damage to the left plane caused during the impact with the Dodge in Event 1. The direct damage was distributed across the rear and middle aspects of the left plane beginning 12 cm (4.7 in) forward of the left rear bumper corner and extending 180 cm (70.9 in) forward ending 45 cm (17.7 in) forward of the rear axle. The Field L was distributed across the rear and middle aspects of the left plane beginning 5 cm forward of the left rear bumper corner and extending 216 cm (85.0 in) forward ending 85 cm (33.5 in) forward of the rear axle. Twenty-three measurements were taken at mid-door level (**Figure 6**) by the Nikon Total Station and the Faro Blitz program computed crush measurement in six increments as follows: $C_1 = 6$ cm (2.4 in), $C_2 = 10$ cm (3.9 in), $C_3 = 9$ cm (3.5 in), $C_4 = 7$ cm (2.8 in), $C_5 = 3$ cm (1.2 in), $C_6 = 0$ cm. Maximum crush was located 80 cm (31.5 in) aft of the left rear axle and the CDC for the Ford in Event 1 was 10LZEW2. The Ford sustained moderate severity damage to the right plane and roof caused during the rollover event. Direct damage extended from the right rear bumper corner to the right front bumper corner and measured 570 cm (224.4 in). Vertically, direct damage extended from the sill to the roof and measured 218 cm (85.8 in). Maximum lateral crush was located at the top of the right A-pillar and measured 10 cm

Figure 6. Left plane crush, 2009 Ford E-350 Type II Ambulance

(3.9 in). Maximum vertical crush to the greenhouse was located at the right roof side rail above the rear bumper corner and measured 4 cm (2.0 in). The CDC for the Ford in Event 2 was 00RDAO2.

Event Data Recorder

The Ford's EDR data was imaged by police using a direct-to-module method and CDR version 16.6. SCI obtained a PDF copy of the Ford's EDR report included at the end of this report as Attachment A. The EDR report recovered no events and no pre-crash data for this crash. No further EDR data was available.

Interior Damage

The Ford's front row and patient compartment interior revealed damage from impact forces and post-crash activities (**Figure 7**). The windshield was fractured and displaced from the frame, the front row right side glass, patient compartment rear side door glass and left backlight glass were disintegrated. Cabinets and trim in the patient compartment revealed fractures from impact forces and shifting of the greenhouse. Police had removed the EDR and a GPS-based data collector from the front row. Lateral intrusion reduced the front row of the occupant compartment in the following areas: right side door, rear upper quadrant (11 cm [5.1 in]), right roof side rail (8 cm [3.1 in]) and right B-pillar (5 cm [2.0 in]).

Figure 7. Front row interior, 2009 Ford E-350 Type II Ambulance

Manual Restraint Systems

The cab of the Ford was equipped with manual restraint systems for both front seat positions. Both belts consisted of a 3-point continuous loop system with sliding latch plates and adjustable D-rings set to the full-down position. The belts were configured with buckle pretensioners that did not actuate in the crash. According to the police report and interviewee, both front row occupants were belted at the time of the crash. Both belts revealed evidence of historical usage but neither exhibited evidence of occupant loading.

In the rear patient compartment, the rearward-facing captain's seat was equipped with an integrated lap and shoulder belt and the squad bench seat was configured with three lap belts. All four seats were occupied but none of the occupants in the rear compartment were belted. Police reported their restraint usage as "Unknown" and the interviewees stated they were not belted. The patient compartment belts exhibited wear caused by historical usage but no occupant loading evidence was documented.

Supplemental Restraint Systems
The Ford's supplemental restraint systems (SRS) included an airbag control module (ACM), dual-stage frontal air bags for the front row seat positions and seat belt buckle pretensioners. No air bags deployed in the crash and the air bag pretensioners did not actuate. The Ford was a fleet vehicle and the air bag status is unknown.

Patient Compartment
The Type II van-based patient compartment was an Endeavor model manufactured by Medtec Ambulance Corporation in October 2009. The standard layout of the interior featured a rear- facing attendant's seat, an inward-facing squadbench along the right wall, a backboard, and multiple storage shelving and cabinetry consisting of Formica surfaces, sliding plexiglass access doors and fixed aluminum shelving (**Figure 8**). At the time of the SCI inspection, the patient cot was secured in place along the left wall using a Stryker 6371 antler design floor-mount cot fastener system. The serial number placard for the fastener system was missing.

Figure 8. Patient compartment, 2009 Ford E-350 Type II Ambulance

An M-size oxygen cylinder was stored in an upright orientation in a recessed cabinet located at the right rear aspect of the patient compartment. The cylinder was secured using two 5 cm (2.0 in) band straps and appeared to have remained in place during the crash. Two fire extinguishers were mounted to the cabinet wall.

Patient Cot and Drager Isolette 8000 Incubator
The patient cot was a Stryker 6516 Power-Pro IT manufactured in October 2014 **(Figure 9**). The Stryker was configured specifically as a powered incubator transport unit. It was configured with a hydraulic lift system for raising and lowering the incubator during transport and transfers. The height mechanism used infinite settings from 36 cm (14.0 in) to 105 cm (41.5 in). The manufacturer tech sheet indicated the incubator should be transported in the lowest, most stable setting. At the time of the SCI inspection, the cot height was 41 cm (16.1 in).

Figure 9. Stryker 6516 Power-Pro IT patient cot

The cot was constructed of a tubular aluminum frame with circumferential weld joints and steel hardware fasteners. It measured 206 cm (81.0 in) in length and 58 cm (23.0 in) in width. It weighed 61 kg (134.0 lb) and required two operators

when occupied. Labeling declared that the maximum load capacity was 318 kg (700.0 lb). It was configured with four tie-down brackets used to attach the incubator to the mounting surface. The cot was secured in place in the passenger compartment using a Stryker model 6371 antler design floor-mount cot fastener system. The system consisted of a forward antler bracket and rearward side mounted locking-clamp mechanism. The antler bracket cradled the forward portion (location of the patient's head area) of the cot's frame, while the vertically-oriented locking mechanism clamped around a pin protruding from the cot's lower frame rail. At the time of the SCI inspection, the ambulance cot was secured in place by the fastening system (**Figure 10**). The investigator released the mechanism for inspection and it was determined to be functional and undamaged. An ambulance company representative stated the cot remained secured to the vehicle during the crash. There was no visible damage to the cot's metal frame or fastening system.

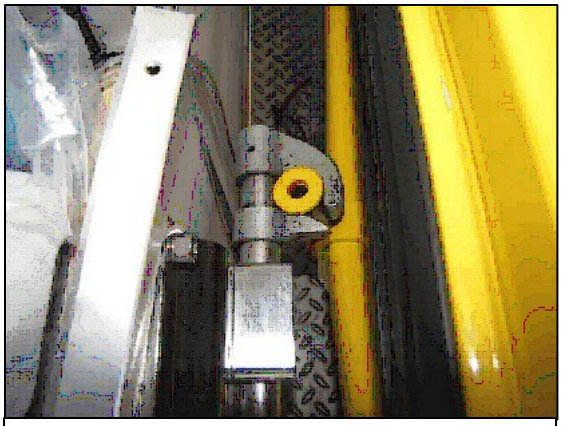


Figure 10. Stryker patient cot locking clamp, 2009 Ford E-350 Type II Ambulance

The 6-week-old female patient was being transported to an emergency surgery in a Drager Isolette 8000 incubator (**Figure 11**) that was secured to the Stryker Power-Pro patient cot. The Isolette is a self-contained incubator unit that provides a controlled heat, humidity, and oxygen micro-environment for the isolation and care of premature and low-birth weight infants. The apparatus is made of a clear plastic material and has a large door and portholes for access to the infant with a minimum of heat and oxygen loss. A servocontrol mechanism constantly monitors the infant's temperature and controls the heat in the unit. The Isolette measured 153 cm (60.1 in) high, 104 cm (41.0 in) wide and 75 cm (29.5 in) long. Weight without options and accessories was 93 kg (205 lb). The unit was equipped with a standard hood configured with front and rear access panels and six access ports. The access panel opening height measured 28 cm (11.0 in). The unit was configured with a hinged door that opened to 90 degrees. The Isolette was owned by the hospital. It was removed from the Ford at the crash scene and, according to an insurance company representative who was interviewed, it was not returned to service due to damage.

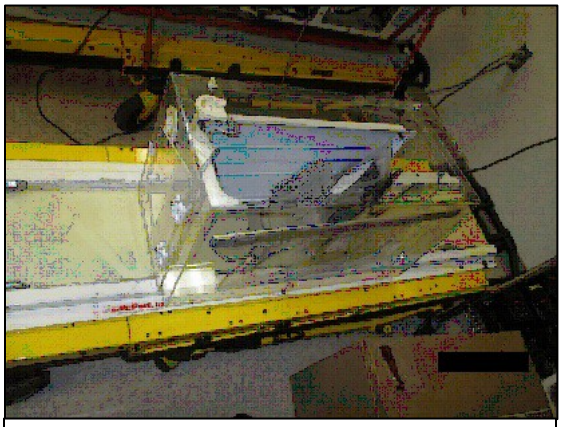


Figure 11. Drager Isolette 8000 incubator, fractured and displaced top was exit medium for patient (insurance company photo)

GPS Activity Detail Report
The ambulance company provided SCI with a GPS activity detail report. The report was generated from a satellite-based GPS system and provided data including date, time, ignition status, address, city, State, ZIP Code, county and odometer. This report included data collected in a 1-hour time period prior to the time of the crash. The report indicated the Ford had traveled 6.9 km (4.3 mi) in 18 minutes on a combination of surface streets and interstate highways in the same city. The report indicated the Ford made no stops during the trip prior to the crash with the other vehicle.

Rollover Mitigation
The Ford was equipped with standard ESC, ABS, and rear-wheel drive. It was traveling at an unknown speed through a level intersection at impact with the other vehicle. The area of impact was aft of the Ford's center of gravity, compromising its stability and causing it to initiate a counterclockwise rotation. The rear left and right side tires de-beaded and deflated while the vehicle was in rotation. The Ford rotated approximately 90 degrees and its right side tires and right rear rim contacted the roadway with sufficient opposing lateral force as to cause a right side leading trip rollover. The right rear wheel revealed fracturing and significant damage to the rim caused by furrowing into the asphalt pavement. The vehicle rolled one quarter turn and came to rest on its right side facing north in the southbound lanes.

After the impact with the Dodge, it is probable the driver lost control, precluding the stability features of ESC and ABS. The Ford was equipped with tires of the recommended size manufactured in 2014, each tire having a minimum tread of 4 mm (5/32 in). The front tire pressures were slightly higher than recommended and the rear tires were flattened during the crash. It is unlikely that tire condition or air pressure was a contributory cause of this rollover. The roll distance is unknown.

2009 FORD E-350 TYPE II AMBULANCE OCCUPANTS

Driver Demographics

Age/Sex:	24 years/female
Height:	165 cm (65 in)
Weight:	61 kg (135 lb)
Eyewear:	Unknown
Seat type:	Box-mounted seat with integral head restraint
Seat track position:	Full back
Manual restraint usage:	Lap and shoulder seat belt used
Usage source:	Vehicle inspection, interview, police report
Air bags:	Frontal air bag, not deployed

Alcohol/drug data:	None
Egress from vehicle:	Exited with assistance through opening in windshield
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Driver Injuries

The police report indicated the driver of the Ford sustained "C" (complaint of injury-but not visible) injuries.

Driver Kinematics

The belted 24-year-old female driver of the Ford was seated in an upright posture and was actively steering the vehicle. According to the police report, she was using the lap and shoulder seat belt. As she approached the intersection she manually sounded the air horn to alert other drivers of her presence. She braked to slow the vehicle speed, looked right and left to observe other vehicles present and in the intersection then proceeded through. At impact with the Dodge, the driver was displaced to the left in response to the 10 o'clock direction of force. She likely contacted the left door panel with her left shoulder and she remained held in the seat by the lap and shoulder seat belt. The Ford initiated a counterclockwise rotation and then initiated a right-side-leading one quarter-turn rollover and the driver was displaced to the right. She remained held in place in her seat by the vehicle's seat belt. After the vehicle came to rest, the driver exited the vehicle with assistance through an opening created in the windshield by a witness responder. She remained on-scene to speak with responders and police before being transported by ambulance to a local hospital for observation and discharged later that day.

Front Row Right Occupant 2 Demographics

Age/Sex:	21 years/female
Height:	168 cm (66 in)
Weight:	64 kg (140 lb)
Eyewear:	Unknown
Seat type:	Box-mounted seat with integral head restraint
Seat track position:	Between forward most and middle
Manual restraint usage:	Lap and shoulder seat belt used
Usage source:	Vehicle inspection, interview, police report
Air bags:	Frontal air bag not deployed
Egress from vehicle:	Exited with assistance through opening in windshield
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Front Row Right Occupant 2 Injuries
According to the police report, the 21-year-old female occupant of the Ford sustained "O" (no apparent) injuries.

Front Row Right Occupant 2 Kinematics
Prior to the crash, the belted 21-year-old female occupant was seated in an upright posture in the front right passenger seat of the ambulance. According to the police report, she was using the lap and shoulder seat belt. At impact with the Dodge, the occupant was displaced left in response to the direction of force. The Ford initiated a counterclockwise rotation and overturned to the right. During the rollover, the occupant was displaced to the right, likely contacted the right door and remained in her seated position. After the vehicle came to rest, the occupant exited the vehicle with assistance through an opening in the windshield. She was transported by ambulance to accompany her child to the hospital and to be examined in the ER. She was released later that day.

Patient Compartment Occupant 3 Demographics

Age/Sex:	32 years/male
Height:	178 cm (70 in)
Weight:	86 kg (190 lb)
Eyewear:	Unknown
Seat type:	Box mounted rear facing captain's chair
Seat track position:	N/A
Manual restraint usage:	Lap and shoulder belt not used
Usage source:	Vehicle inspection, interview, police report
Air bags:	None available
Egress from vehicle:	Exited through back doors
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Patient Compartment Occupant 3 Injuries
According to the police report, the 32-year-old male occupant of the Ford sustained "C" (complaint of injury - but not visible) injuries and was transported, treated, and released.

Patient Compartment Occupant 3 Kinematics
Prior to the crash, the unbelted 32-year-old male occupant was seated on the box-mounted rear-facing captain's chair at the forward wall of the patient compartment. This occupant was an EMS student and was in transport for the purpose of observation only; he did not have specific duties or responsibilities related to the patient. At impact with the Dodge, the occupant was displaced to his right in response to the direction of force. During the rollover he was displaced completely from his seated position and to his left. He came to rest near the step and right side door of the patient compartment. The occupant was later assisted from the vehicle through the back doors. He was transported by ambulance to a local hospital for observation and was later released.

Patient Cot Occupant 4 Demographics

Age/Sex:	6 weeks/female
Height:	36 cm (14 in)
Weight:	1.0 kg (2.2 lb)
Eyewear:	None
Seat type:	Positioned supine in an incubator unit mounted longitudinally on patient cot
Seat track position:	N/A
Manual restraint usage:	None available
Usage source:	Vehicle inspection, police report, medical records, interview
Air bags:	None available
Egress from vehicle:	Ejected from Isolette, remained in patient compartment until carried through back doors
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Transported and admitted; was transferred by air to another hospital; died 28 days after crash from pre-existing conditions not directly caused by the crash

Patient Cot Occupant 4 Injuries

Inj. No.	Injury	AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Bilateral Grade 3 Intraventricular hemorrhage	140678.2	Incubator	Possible
2	Right basilar pneumothorax	442202.2	Incubator	Possible
3	Abrasion, right forehead	210202.1	Incubator	Possible
4	Abrasion, abdomen	510202.1	Incubator	Possible

Source: Medical records, EMS records

Patient Cot Occupant 4 Kinematics

The 6-week-old female patient was being transported from one hospital to another for the purpose of having an emergency surgery. The patient's health was in a critical care state prior to the transport. She had been diagnosed with multiple preexisting conditions relating to pre-term birth including extreme prematurity, low birth weight, and possible intestinal perforation. Prior to the crash, the occupant required external breathing apparatus. She was placed in the incubator unit without restraints of any kind placed directly upon her. She was lying supine in the unit on a padded cushion. At impact with the other vehicle, the patient was displaced left in response to the direction of force and probably contacted the wall of the unit. During the rollover, the Isolette and adjoining sled were displaced from the patient cot to the right. The top door of the incubator

came open or was displaced from the unit. The patient was then displaced from the incubator through the opening on top and to the right. She came to rest somewhere near the lower extremities of Occupant 7 but was not visible to anyone until the Isolette and sled were removed from Occupant 7. Occupant 7 then picked up the patient and continued to attend to her medical needs that included the administering of emergency ventilation techniques that continued on-scene and during transport from the crash to the destination hospital.

The patient's medical records from the destination hospital indicated she had sustained a right basilar pneumothorax and a bilateral Grade 3 intraventricular hemorrhage. The specific physical components are unknown. The EMS report obtained from the ambulance that transported the patient from the crash indicated the only visible signs of injury were redness near the umbilical region and a red mark on the right side of her forehead.

She was transferred by air to a children's hospital in another State where she was admitted for additional surgery and care. While being treated at that hospital, her condition included treatment for septic shock, acute renal failure, thrombosis of the atrium, hypocalcemia, and anemia. The patient died in the hospital 28 days after the crash. The cause of death was unknown and no autopsy was performed in the State in which she died. Based the patient's medical history prior to the crash and minor to moderate severity injuries following the crash, the SCI investigation determined her death was likely caused by pre-existing conditions relating to pre-term birth and not injuries sustained during the crash.

Patient Compartment Occupant 5 Demographics

Age/Sex:	21 years/male
Height:	183 cm (72 in)
Weight:	82 kg (180 lb)
Eyewear:	Unknown
Seat type:	Inboard-facing bench seat
Seat track position:	N/A
Manual restraint usage:	Lap belt not used
Usage source:	Vehicle inspection, interview, police report
Air bags:	None available
Egress from vehicle:	Exited through back doors
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Patient Compartment Occupant 5 Injuries

According to the police report, the 21-year-old male occupant of the Ford sustained "C" (complaint of injury-but not visible) injuries and was transported for observation, treated and released.

Patient Compartment Occupant 5 Kinematics

Prior to the crash, the unbelted 21-year-old male occupant was seated in an upright position in the forward-most position on the inward-facing bench seat on the right side of the patient compartment. The occupant was an EMT-Intermediate who was the primary patient caregiver and whose function during this transport was providing communication support between the medical team in the patient compartment and the driver of the ambulance. At impact with the Dodge, the occupant was displaced forward relative to his inward-facing orientation. The Ford initiated a counterclockwise rotation followed by a rollover and the patient was displaced rearward. He came to rest near his seated position against the right wall of the patient compartment and exited the vehicle with assistance through the back doors. He stated in the EMS report that he sustained right shoulder pain with no other injuries. This occupant was transported by ambulance to a local hospital for observation and was later released.

Patient Compartment Occupant 6 Demographics

Age/Sex:	60 years/male
Height:	183 cm (72 in)
Weight:	84 kg (185 lb)
Eyewear:	Unknown
Seat type:	Inboard-facing bench seat
Seat track position:	N/A
Manual restraint usage:	Lap belt not used
Usage source:	Vehicle inspection, interview, police report
Air bags:	None available
Egress from vehicle:	Exited with assistance through back doors
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Patient Compartment Occupant 6 Injuries

Inj. No.	Injury	AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Multiple rib fractures NFS	450210.2	Interior wall	Possible
2	Overall contusions	910200.1	Interior wall	Possible
3	Injuries to the upper extremity (right hand) NFS	700099.9	Unknown	Unknown

Source: Interview

Patient Compartment Occupant 6 Kinematics

Prior to the crash, the unbelted 60-year-old male occupant was seated at the center position on the inboard-facing bench seat. The occupant was a nurse who was assisting to the medical needs of the patient during transport. He was actively attending to the patient and leaning forward while holding a clock timing device and communicating the Occupant 7 to his right. At impact with the Dodge, the occupant was displaced forward relative to his inward-facing seat in response to the direction of force and was probably displaced from his seat. The Ford initiated a counterclockwise rotation before rolling over onto its right side and he was displaced rearward against the seat back and interior right wall. His right hand sustained an injury of unknown nature and severity and his chest sustained unspecified fractures to the ribs. He sustained contusions to multiple regions.

The occupant came to rest positioned against the right wall. After a few moments he realized Occupant 7 needed help and he lifted the incubator and sled off her. He remained in the patient compartment attending to the patient with Occupant 7 until he exited through the back doors with the help of responders. The occupant continued to attend to the patient on-scene and was transported to the destination hospital so he could continue the medical intervention. This occupant refused treatment on-scene and during transport so that he could attend to the needs of the patient. After arriving at the hospital, the occupant was treated in the ER and then released. He later developed complications of an unknown nature related to the right hand injury that kept him out of work for approximately 4 months.

Patient Compartment Occupant 7 Demographics

Age/Sex:	63 years/female
Height:	163 cm (64 in)
Weight:	73 kg (160 lb)
Eyewear:	Unknown
Seat type:	Inboard-facing bench seat
Seat track position:	N/A
Manual restraint usage:	Lap belt not used
Usage source:	Vehicle inspection, interview, police report
Air bags:	None available
Egress from vehicle:	Exited with assistance through back doors
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Patient Compartment Occupant 7 Injuries

Inj. No.	Injury	AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Fractures, right ribs R7-R8	450202.2	Incubator	Probable
2	Laceration, minor, posterior scalp	110602.1	Loose object, IV pump	Probable
3	Laceration, minor, left forehead	210602.1	Loose object, IV pump	Probable
4	Contusions, back	410402.1	Seat back	Probable
5	Contusions, right forearm	710402.1	Incubator	Probable
6	Contusions, left forearm	710402.1	Incubator	Probable
7	Lacerations, minor, right forearm	710602.1	Incubator	Probable
8	Lacerations, minor, left forearm	710602.1	Incubator	Probable
9	Contusions, right lower leg	810402.1	Incubator	Probable
10	Contusions, left lower leg	810402.1	Incubator	Probable
11	Laceration, minor, left lower leg	810602.1	Incubator	Probable

Source: Interview

Patient Compartment Occupant 7 Kinematics

Prior to the crash, the unbelted 63-year-old female occupant was seated at the rear-most position on the inboard-facing bench seat. The occupant was a nurse who was assisting to the medical needs of the patient during transport. She was actively attending to the patient and leaning forward toward the incubator with both hands and forearms inserted into portals on the incubator. At impact with the Dodge, the occupant was displaced forward in response to the direction of force and was probably displaced from her seat. The Ford initiated a counterclockwise rotation and the occupant's arms were displaced from the incubator causing minor lacerations and contusions to both forearms. During the rollover she was displaced rearward against the seat back and interior wall. An intravenous (IV) pump was displaced from an unknown location contacting the occupant's head causing a minor laceration to the left forehead. The back of her head contacted the right interior wall causing a minor laceration and the occupant claimed to have lost consciousness for a minute or two. The occupant's right flank contacted the seat back causing the incubator unit and sled were displaced from the patient cot contacting the occupant's torso and legs causing fractures to ribs R7-R8 and causing a minor lacerations and contusions to both lower legs. Her back and buttocks contacted the seat back and cushion causing contusions.

She came to rest against the bench seat, seat back and right wall surface with the incubator and sled resting on her legs and torso. Occupant 6 seated initially seated to her left helped to lift the displaced incubator and sled off her and once that was accomplished the patient was found underneath the objects and on the legs of Occupant 7. The occupant regained her consciousness and began attending to the medical needs of the patient until responders assisted in moving the occupant and patient through the back doors of the ambulance. She continued to attend to the patient on-scene and was transported to the destination hospital so she could continue the medical intervention. This occupant refused treatment on-scene and during transport so that she could attend to the needs of the patient. After arriving at the hospital, the occupant was treated in the ER for 12 hours then released. She missed approximately 10 days from work due to her injuries.

2009 DODGE RAM 2500

Description

The 2009 Dodge Ram 2500 (**Figure 12**) was identified by the VIN 3D7KS28L79Gxxxxxx. The date of manufacture and the odometer reading were unknown. The vehicle was equipped with a 6.7-liter, 6-cylinder, diesel engine linked to an automatic transmission, 4-wheel drive, and antilock brakes.

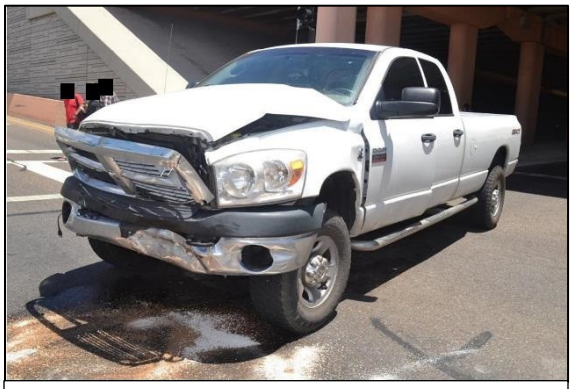


Figure 12. 2009 Dodge Ram 2500 (attorney photo)

Exterior Damage

Images provided to SCI by an attorney indicate the Dodge sustained damage distributed across the front plane and minor to moderate severity crush (**Figure 13**). The estimated CDC for the Dodge in Event 1 was 01FDEW1.

Figure 13. 2009 Dodge Ram 2500, front end damage (attorney photo)

Occupant Data

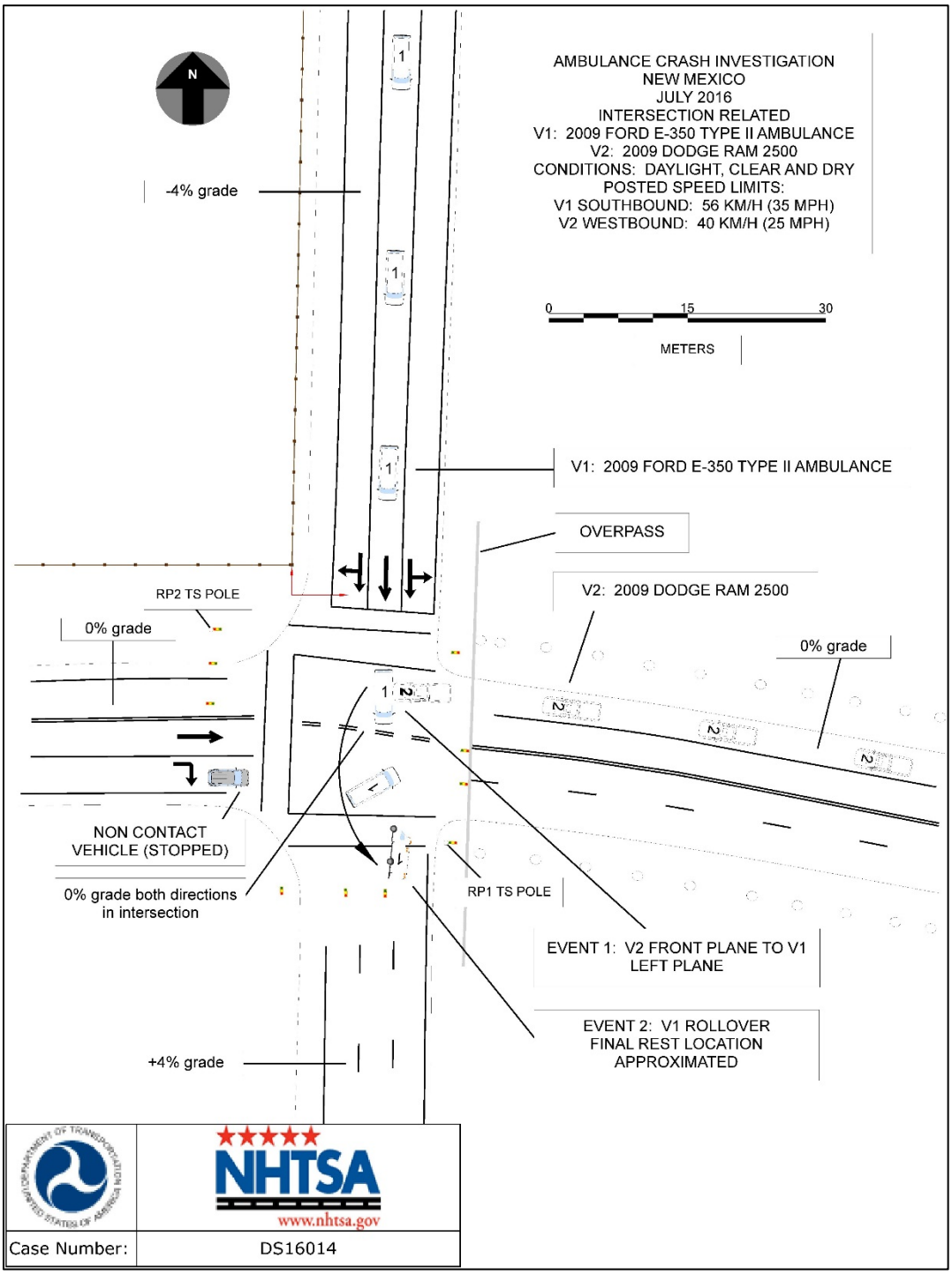
According to the police report, the 35-year-old belted female driver of the Dodge reportedly sustained “O” (no apparent) injuries and was not transported.

Event Data Recorder

The Dodge’s EDR was imaged by police via the Data Link Connector (DLC) using CDR version 16.6. SCI obtained a PDF copy of the EDR report that is included at the end of this report as Attachment B. The EDR data is summarized below.

The EDR reported data for one event and included three pre-crash data tables. Data at all time stamps for engine RPM and speed, vehicle Indicated was entered as SNA (Signal Not Available). According to the EDR data limitations, if a recorded event has an engine RPM equal to SNA and speed, vehicle indicated equal to SNA for each time stamp, then the data is default data and the event stored in the ACM is not valid. The reason for the invalid record was unknown.

CRASH DIAGRAM



APPENDIX A: EVENT DATA RECORDER REPORT 2009 FORD E-350 TYPE II AMBULANCE[1]

[1] The Bosch CDR Report contained in this technical report was imaged by the investigating police department using the current version of the Bosch CDR software at the time of imaging the EDR. Only a PDF copy of the Bosch CDR report was provided by police and the EDR hexadecimal data has been deleted from the report due to potential personal identifiable information contained (vehicle identification number, etc.) in the report.

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CDR CRASH DATA RETRIEVAL

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	1FDSS34P39D
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	
Saved on	
Collected with CDR version	Crash Data Retrieval Tool 16.6
Reported with CDR version	Crash Data Retrieval Tool 16.6
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	Yes
Event(s) recovered	None

Comments

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.

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CDR CRASH DATA RETRIEVAL

System Status at Time of Retrieval

VIN as programmed into RCM at factory	1FDSS34P79D
Current VIN from PCM	1FDSS34P79D
Ignition cycle, download (first record)	N/A
Ignition cycle, download (second record)	N/A
Restraints Control Module Part Number	9C24-14B321-BJ
Restraints Control Module Serial Number	3103219400000000
Restraints Control Module Software Part Number (Version)	9L34-14C028-AN
Left/Center Frontal Restraints Sensor Serial Number	0C48B658
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

APPENDIX B: EVENT DATA RECORDER REPORT 2009 DODGE RAM[2]

[2] The Bosch CDR Report contained in this technical report was imaged by the investigating police department using the current version of the Bosch CDR software at the time of imaging the EDR. Only a PDF copy of the Bosch CDR report was provided by police and the EDR hexadecimal data has been deleted from the report due to potential personal identifiable information contained (vehicle identification number, etc.) in the report.

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CDR CRASH DATA RETRIEVAL

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	3D7KS28L79G
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	
Saved on	Monday, July 11 2016 at 13:06:38
Collected with CDR version	Crash Data Retrieval Tool 16.6
Reported with CDR version	Crash Data Retrieval Tool 16.6
EDR Device Type	Airbag Control Module
Event(s) recovered	Most Recent Event

Comments

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

GENERAL INFORMATION:

CAUTION: During direct-to-module imaging where the Airbag Control Module (ACM) is disconnected and removed from a vehicle, make sure the ACM is not moved, tilted or turned over while connected to and powered by the CDR Interface Module (with appropriate adaptors in place, where required). Also, after a CDR imaging process, wait 2 minutes after power is removed from the ACM before attempting to move the module. Not following these general ACM guidelines direct-to-module imaging could cause new events to be recorded in the ACM.

- For additional definitions, please refer to the CDR Help File Glossary.
- As the VIN may be used to determine the configuration of the restraint system, it is imperative that the correct VIN be entered into the CDR Tool during the imaging process.
- For Fiat vehicles, the "Read VIN from Vehicle" feature in the CDR Tool will not work. The VIN will have to be manually entered.
- Delta-V is first available starting with some 2010 MY vehicles. On vehicles not equipped with side impact sensing, Lateral Delta-V will not be available. Lateral Delta-V is also not available for the 2010 MY Dodge Journey and Fiat Freemont even when equipped with side impact sensing. Longitudinal and Lateral Delta-V are not available for the 2010-2012 MY Chrysler Town and Country/ Dodge Grand Caravan/Lancia Voyager.
- The following table provides an explanation of the sign notation for data elements that may be included in this CDR report. All directional references to sign notation are from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Data Element Name	Positive Sign Notation Indicates
Longitudinal Acceleration	Forward
Delta-V, Longitudinal	Forward
Maximum Delta-V, Longitudinal	Forward
Lateral Acceleration	Left to Right
Delta-V, Lateral	Left to Right
Maximum Delta-V, Lateral	Left to Right
Steering Input*	Steering wheel turned counter clockwise
Angular Rate	Left to Right RotationClockwise rotation around the longitudinal axis
Yaw Rate**	Counter clockwise rotation

* The Steering Input for the following vehicles has a positive sign notation for the steering wheel turned clockwise:

- 2006 - 2007 Grand Cherokee
- 2006 - 2007 Commander
- 2005 - 2010 300, Magnum, and Charger
- 2008 - 2010 Challenger

**The Yaw Rate for the 2011-2012 MY RAM has a positive sign notation for clockwise rotation.

CDR FILE INFORMATION:

- For ACMs that store non-deployment events, an event will be stored when the delta V is approximately 5 mph (8 km/h) or greater within a 150 ms interval.

BOSCH

CDR CRASH DATA RETRIEVAL

- For non-NAFTA ACMs that control pedestrian protection devices, a non-deployment event will be stored when the pedestrian protection devices are activated.

Event(s) Recovered definitions:
- None - There are no stored events in the ACM
- Not Retrievable - Event Data may be stored in the ACM but is not retrievable by the CDR tool.
- For Continental ACMs:
  - Event Record 1 - Data from an event is stored in the ACM (not necessarily in chronological order)
  - Event Record 2 - Data from another event is stored in the ACM (not necessarily in chronological order)
  - Event Record 3 - Data from another event is stored in the ACM (not necessarily in chronological order) (for modules with 3 stored events)
- For all other ACMs:
  - Most Recent Event - Data of the most recent event is displayed in the report
  - 1st Prior Event - Two events are stored in the ACM, Data displayed is of the first prior event.
  - 2nd Prior Event - Three events are stored in the ACM, Data displayed is of the second prior event.
  - Etc., (for modules with 3 to 5 stored events)
- For TRW modules:
  - If there is a side impact, two EDR events may be stored for the one side impact event. The second event may be recorded due to the Lateral Delta V exceeding 5 mph (8 km/h) within a 150 ms interval after the side deployment occurred.
- For some Fiat vehicles:
  - Two EDR events may be stored for one impact event. The second event may be recorded due to the deployment of the frontal airbag, 3rd stage passenger.
- During an event, if power to the ACM is lost, all or part of the event data record may not be recorded. An indication may be observed in the recorded data under this condition:
  - "None" may be displayed in the "Event(s) Recovered" section of the report indicating no pre-crash vehicle data.
  - An event may be displayed in the "Event(s) Recovered" section of the report and "Interrupted" will be displayed for Vehicle Event /Pre-Crash Recorder Status.
- For 2010-2012 MY Dodge Journey and 2010-2012 MY Chrysler Town and Country/Dodge Grand Caravan/Lancia Voyager, a non-deployment event will also display "Interrupted" for the Vehicle Event/Pre-Crash Recorder Status. This non-deployment event can be distinguished from a power loss by:
  - In the System Status at Event and Deployment Command Data section, Event/Deployment Recorder Status will display "Interrupted".
  - In the Deployment Command Data section, a value of "No" will be displayed for each deployment data element.

SYSTEM STATUS AT RETRIEVAL:

- Original VIN - The VIN is captured by the ACM and then recorded as the Original VIN after 10 consecutive ignition cycles of capturing the same number. Once it has been recorded, this number cannot be changed.

SYSTEM CONFIGURATION AT RETRIEVAL:

- The System Configuration data tables indicate the components that the ACM for a particular vehicle monitors and/or controls.
- Active Head Restraint (AHR) - This refers to the active head restraint systems that are electronically controlled by the ACM. AHRs may activate but not store an EDR Record if the delta V does not exceed the minimum delta V threshold. Activation of only the AHRs, if stored, will be a non-deployment event.

SYSTEM STATUS AT EVENT (if applicable):

- Event Number -
  - Indicates the event number per vehicle ignition cycle for 2010-2012 Sebring, Avenger, Caliber, Nitro, Compass, Liberty, Patriot, Wrangler, and Ram
  - Indicates the overall order of the events for all other applicable vehicles.
- Event Signal Transmission, Complete - "Yes" indicates that the ACM has sent the automatic collision notification (ACN) message.
- Odometer at Event - Vehicle odometer at the time of the event
- Operation via Energy Reserve Only - "Yes" indicates that the ACM had lost power at or before T0 and was only operating on energy reserve at T0.
- Side Fuel Cutoff, Activated - Applicable to the Fiat 500, "Yes" indicates that the ACM has sent the automatic collision notification (ACN) message.
- System Voltage at Event, ECU - Voltage at the ACM as measured by the ACM.
- System Voltage at Event, Bussed - Voltage of the vehicle system, communicated on the communication bus to other electronic modules in the vehicle.
- Temperature, Outside - Ambient Air Temperature.
- Time, Airbag Warning Lamp On - This is a cumulative time. It indicates the total amount of time that the ACM has requested the Airbag Warning Lamp be turned on.
- This time does not include the warning lamp bulb check time, which occurs at every ignition cycle
- Time from event 1 to 2 -
  - If only one event is stored, either a value of 0 or >5 may be displayed for this data element.
  - If multiple events exist in the EDR, the time from event 1 to event 2 is defined as:
    - For Bosch and TRW modules, the time from the prior recorded event (even if it has been overwritten) to the current recorded event.
    - For Continental modules, the time from the prior existing recorded event (as long as it is still displayed in the CDR report) to the current recorded event. If the prior event in a multi-event condition is overwritten by a subsequent event, the multi-event status will no longer be displayed.

BOSCH

CDR CRASH DATA RETRIEVAL

- Time, Operation System Time - This is a cumulative lifetime timer for the ACM. It indicates the total amount of time the ACM has been powered up.
- Total Number of Events -
  - Stops incrementing when each event record is recorded by the ACM for 2010 - 2012 Sebring, Avenger, Caliber, Nitro, Compass, Liberty, Patriot, Wrangler, and Ram
  - Indicates the total number of events that the ACM has recorded, including those non-deployment events that have been overwritten by a subsequent event, for all other applicable vehicles.
- VIN at Event, Last 8 Digits- Last 8 digits of the VIN of the vehicle at the time the ACM records the event.

STATUS OF THE DATA IN THE MOST RECENT EVENT (if applicable):

Definitions for Data Blocks 1 - 7 and Overall Data Record Complete:

1. Crash Record (system status and DTCs)
2. NHTSA Table #1 Vehicle System data
3. NHTSA Table #1 Longitudinal delta-V
4. NHTSA Table #2 Vehicle System Data
5. NHTSA Table #2 Lateral delta-V - will be a NO if vehicle is not equipped with side sensing
6. ACM angular rate data - will be a NO if vehicle is not equipped with roll-over sensing
7. Other Vehicle System Data - Chrysler Specific Data

Overall Data Record Complete - Yes, No is defined based on the specific vehicle configuration. For example, a NO may be present for a non-applicable data block but a YES may be present for overall data record complete as all of the applicable data is complete.

DEPLOYMENT COMMAND DATA (if applicable):

- A "Yes" for a particular item in the Deployment Command Data section of the report indicates that the ACM commanded the deployment /activation of the associated device.

DTCs PRESENT AT START OF EVENT (if applicable):

- If any DTCs (diagnostic trouble codes) are present in the ACM at the start of the event, these will be listed in this section. A dealership service manual can be used to decode the DTCs.

PRE-CRASH DATA:

- The recorded Event may contain Pre-Crash data. Pre-Crash data from the various electronic control modules in the vehicle is transmitted to the Airbag Control Module via the vehicle's communication bus.
- If a recorded event has Engine RPM equal to SNA and Speed, Vehicle Indicated equals SNA for each time stamp, then the data is default data and the event stored in the ACM is not valid.
- (if equip.) - If a parameter name is followed by the words (if equip.), then the parameter is only valid for vehicles equipped with the associated parameter/vehicle system.
- The MIL (Malfunction Indicator Lamp) Status for the various recorded systems indicates the requested state of the applicable malfunction indicator lamp at the time that the data was captured. Note: Some fault codes could be stored due to component/system damage from the accident. The appropriate diagnostic tool should be used to read any stored Diagnostic Trouble Codes (DTC's) in the various electronic modules (ACM, PCM, ABS, TCM, etc., where applicable) for use in interpretation of some vehicle specific recorded data.
- ABS Activity - "Yes" indicates an active ABS event in which the ABS is actively controlling the brakes.
- ABS MIL- This indicates the ABS fault indicator lamp status. It will only be "On" when there is a fault in the ABS system. The Electronic brake module DTC's should be read and recorded for final system interpretation.
- Accelerator Pedal, % Full - This indicates the actual position of the accelerator pedal.
- Brakes:
  - Brake Lamps On - "On" indicates that the brake lamps/CHMSL are illuminated.
  - Brake Switch #2 Status - "On" indicates that the brake pedal is depressed.
  - Braking System, Intervention by ESP - "Yes" indicates that the stability control system has engaged the brakes.
  - Braking System, Intervention Enabled "Yes" indicates that the ESC system is functional.
  - Braking System, Emergency Braking - "Yes" indicates that panic brake assist is active.
  - Braking System, Maximum Braking -- "Yes" indicates that ABS is active on all 4 wheels.
  - Panic Brake Assist Active - "Yes" indicates that all four of the brake circuits are undergoing ABS control.
  - Service Brake - "On" indicates that the brake pedal is depressed.
- Cruise Control:
  - Cruise Control System/Status -"On" indicates that the Cruise Control system is turned on.
  - Cruise Control Engaged/Active - "Engaged"/"Yes" indicates the Cruise Control system is actively controlling vehicle speed. "Not Engaged"/"No" indicates the system is NOT controlling vehicle speed.
- Electronic Brake/Stability Control Information:
  - ESC/ESP MIL - This indicates the ESC/ESP fault indication lamp status. It will only be "On" when there is a fault or thermal mode shutdown in the ESC/ESP system. The ESC/ESP module DTC's should be read and recorded for final system interpretation.
  - ESP Lamp - This is the status of the ESP symbol - "car with squiggly lines" indicator lamp. "On" indicates ESP has been turned off by the driver or has reduced performance and is not an indication of a fault in the system.
  - ESP Lamp Flashing Requested - If "Yes", then an ESP, Traction Control or Trailer Sway Control (if equipped) event was active at the

time of data capture.
- ESP Disabled - "Yes" indicates that ABS & ESP have been disabled by the driver or due to system performance.
- ESP/ESC Functional/Active - "YES" indicates that the ESP system is functional and has no faults.
- ESC System Status - "OK" indicates no faults in the ABS or ESC system that affect the system functionality; "ABS Fault" indicates a fault in the ABS system and "ESC Fault" indicates a fault in the ESC system.
- Engine Torque Applied - "No" indicates no engine torque output was applied (as in Park/Neutral for Automatic transmissions or clutch depressed on manual or during an ESP/Traction Control event). If "Yes", then engine torque output was applied.
- Stability Control - This is the status of the ESC symbol - "car with squiggly lines" indicator lamp. "On" indicates that the ESC system is functional. "Off" indicates that the ESC system was turned off either by the driver or due to a fault or thermal mode shutdown. "Engaged" indicates an active ESC/TCS event.
- Traction Control Intervention Active - "Yes" indicates that the traction control system is actively controlling the vehicle's wheels.

- Engine RPM - On 2006-2009 Ram 2500/3500, the Engine RPM recorded is limited to a maximum of 4080 RPM. On the 2008 - 2010 Dodge Grand Caravan, 2008-2010 Chrysler Town and Country and 2009-2010 Dodge Journey, the engine RPM resolution is 256 rpm. On all other vehicles, the resolution is 32 rpm.
- Engine Throttle, % Full - This indicates the actual position of the Engine Throttle blade.
- ETC -
  - On vehicles equipped with ETC, "Accelerator Pedal, % Full" and "Engine Throttle, % Full" are relative values - relative pedal position and relative engine throttle. These parameters may record values of less than 100% when the pedal/throttle is actually at its maximum. (Max. ~ 77%)
  - ETC Lamp - Lamp "ON" indicates there is an active Electronic Throttle DTC.
  - ETC Lamp Flashing - "Yes" indicates that the ETC is in the limp-in mode.
- PCM MIL - This indicates the PCM fault indicator lamp status. It will only be "On" when there is a fault in the PCM. The Powertrain Control Module DTC's should be read and recorded for final system interpretation.
- Raw Manifold Pressure - This indicates engine load in kPa.
- Speed, Vehicle Indicated - This indicates the average of the drive wheels. The accuracy of the recorded Speed, Vehicle Indicated will be affected if the vehicle had the tire size or the final drive axle ratio changed from the factory build specifications. On the 2008 - 2009 Dodge Grand Caravan, 2008-2009 Chrysler Town and Country and 2009 Dodge Journey, the speed resolution is 2 kph. On all other vehicles, the resolution is 1 kph.
- Tire Information:
  - XX where LF = Left Front Tire, RF = Right Front Tire, LR = Left Rear Tire, and RR = Right Rear Tire.
  - Tire X Location - This indicates the location of the tire pressure sensor data being displayed for that time stamp. Default is used to indicate that the location of the tire pressure sensor is unknown or there is no tire pressure sensor in that wheel. Vehicles with Base Tire Pressure Monitoring systems will display SNA for both Tire Locations as these vehicles do not send actual pressure values across the communication bus.
  - Tire X Pressure/Tire Pressure Status, XX -This indicates the actual pressure status of the Tire Location defined in the previous column (Tire X Location) or by the values for XX. Possible values are LOW, NORMAL, HIGH, or SNA for this parameter. Vehicles with Base Tire Pressure Monitoring systems may display NORMAL even though these vehicles do not send actual pressure values across the communication bus.
  - Tire X Pressure/Tire Pressure, XX (psi) - This indicates the actual tire pressure value of the Tire Location defined in the previous column (Tire X Location) or by the values for XX. Vehicles with Base Tire Pressure Monitoring systems will display N/A for this parameter as these vehicles do not send actual pressure values across the communication bus.
  - Wheel Speed, XX - This indicates the speed value (in revolutions per minute) of a particular tire as denoted by XX.
  - For the following vehicles, the tire location, if displayed, may not be accurate if the tires have been rotated:
    - 2011-2012 MY Jeep Wrangler
    - 2010-2012 MY Jeep Patriot
    - 2010-2012 MY Chrysler 200
    - 2010-2012 MY Jeep Compass
  - Tire pressure is not stored in the EDR for the following vehicles. If a value is displayed, it may not be accurate:
    - 2011-2012 MY Jeep Grand Cherokee
    - 2011-2012 MY Dodge Durango
    - 2010-2012 MY Dodge Challenger
    - 2011-2012 MY Chrysler Town and Country
    - 2011-2012 MY Dodge Grand Caravan
    - 2010-2012 MY Ram
- Tire Pressure Monitor Indicator Lamp - "On" indicates a fault in the tire pressure monitoring system. The TPM module DTC's should be read and recorded for final system interpretation.
- "T0" ("Time zero" where '0' is seen as subscript) is defined as "beginning of the crash event". T0 is the time at which the ACM algorithm is activated, a specific Delta-V is exceeded, or a non-reversible restraint device is deployed. T0 may be defined differently for front, side, rear and roll-over events.
  - If multiple algorithm decisions (i.e.: frontal, side, rear and/or rollover) are made before the first recorded event ends, all of those events are part of the same event record and "T0" is defined as the "T0" from the first recorded event.
  - In the Pre-Crash data tables, the relative time marker "-0.1s" represents the last set of data captured in the buffer prior to "T0."
- Transmission/Shifter Position -
  - Gear Status - This indicates the current transmission gear.
  - PRND/PRNDL Status - This indicates the status of the Shifter Position.
  - Reverse Gear - For manual transmission vehicles only, "Yes" indicates the transmission is in the reverse gear.
  - Shift Gear Position - This indicates the current transmission gear/Shifter Position.
- Vehicle Data Recorder Complete - Due to the interruption of data recording in one section, this data element may display "Interrupted" for all sections when some data sections are actually complete.

APPLICATION INFORMATION:

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CDR CRASH DATA RETRIEVAL

- 2005 - 2009 Durango's equipped with side airbags have EDR data that can be imaged by the CDR tool. Durango's not equipped with side airbags have EDR Data that might be imaged by the CDR tool and may be imaged by the supplier.
- For 2005 & 2006 MY, some Chrysler 300, Dodge Magnum, Dodge Charger, Jeep Grand Cherokee, and Jeep Commander models may contain EDR data that cannot be imaged by the CDR tool, but may be imaged by the supplier.
- For 2006 & 2007 MY, some PT Cruiser models may contain EDR data that cannot be imaged by the CDR tool, but may be imaged by the supplier
- EDR Data is only recorded for frontal deployments in the following vehicles:
  - 2005-2007 Durango
  - 2006-2007 Ram 1500
  - 2006-2009 Ram 2500/3500 Heavy Duty
  - 2007 Aspen, Caliber, Compass, Patriot, Nitro, Sebring, Wrangler

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CDR CRASH DATA RETRIEVAL

System Status at Retrieval

Original VIN	3D7KS28L79G
Airbag Control Module Part Number	56043708AH
Airbag Control Module Serial Number	TIXME0769X0264a
Airbag Control Module Supplier	TRW

System Configuration at Retrieval

Configured for Driver Seatbelt Switch	No
Configured for Front Center Seatbelt Switch	No
Configured for Front Passenger Seatbelt Switch	No
Configured for 2nd Row Left Seatbelt Switch	No
Configured for 2nd Row Center Seatbelt Switch	No
Configured for 2nd Row Right Seatbelt Switch	No
Configured for 3rd Row Left Seatbelt Switch	No
Configured for 3rd Row Center Seatbelt Switch	No
Configured for 3rd Row Right Seatbelt Switch	No
Configured for Driver Knee Airbag	No
Configured for Left Curtain #1	No
Configured for Right Curtain #1	No
Configured for Left Curtain #2	No
Configured for Right Curtain #2	No
Configured for Front Driver Seatbelt Pretensioner	No
Configured for Front Center Seatbelt Pretensioner	No
Configured for Front Passenger Seatbelt Pretensioner	No
Configured for 2nd Row Left Seatbelt Pretensioner	No
Configured for 2nd Row Center Seatbelt Pretensioner	No
Configured for 2nd Row Right Seatbelt Pretensioner	No
Configured for 3rd Row Left Seatbelt Pretensioner	No
Configured for 3rd Row Center Seatbelt Pretensioner	No
Configured for 3rd Row Right Seatbelt Pretensioner	No
Configured for Left Side Sensor #1	No
Configured for Left Side Sensor #2	No
Configured for Left Side Sensor #3	No
Configured for Right Side Sensor #1	No
Configured for Right Side Sensor #2	No
Configured for Right Side Sensor #3	No
Configured for Left Up Front Sensor	No
Configured for Right Up Front Sensor	No
Configured for Front Driver Digressive Load Limiter	No
Configured for Front Passenger Digressive Load Limiter	No
Configured for Driver Seat Track Position Sensor	No
Configured for Front Passenger Seat Track Position Sensor	No
Configured for Passenger Airbag Disable Switch	No
Configured for Front Passenger Occupant Classification System	No

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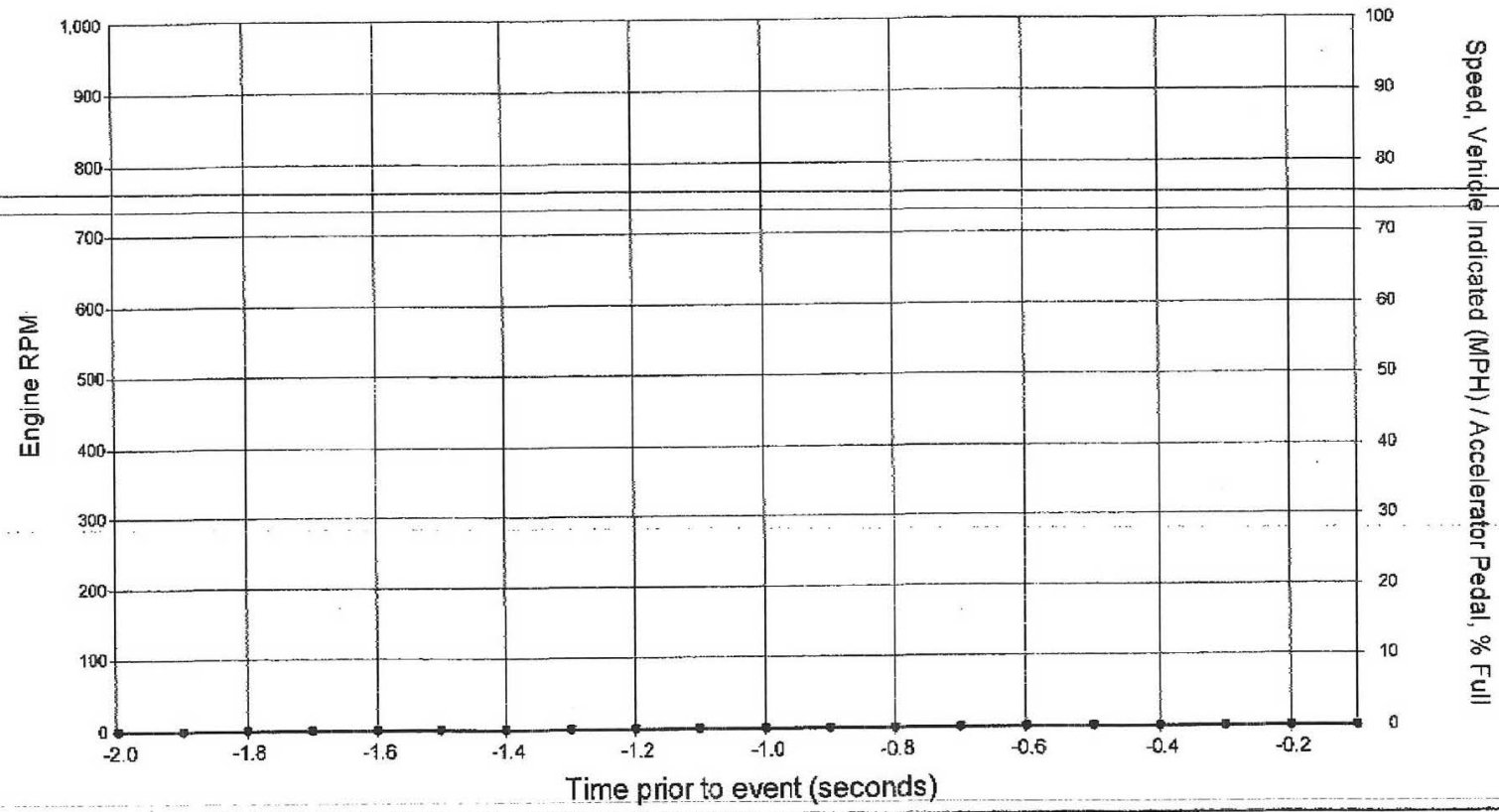
CDR CRASH DATA RETRIEVAL

Pre-Crash Data (Most Recent Event)



- Engine RPM
- Service Brake (0=Off/10=On)
- Speed, Vehicle Indicated (MPH)
- Accelerator Pedal, % Full

SNA values will not be plotted on the graph

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CDR CRASH DATA RETRIEVAL

Pre-Crash Data (Most Recent Event - table 1 of 3)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Vehicle Event Recorder Status	Engine RPM	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal, % Full	Raw Manifold Pressure (kPa)	Service Brake	Brake Switch #2 Status
-2.0	Complete	SNA	SNA	0.0	0	Off	Open
-1.9	Complete	SNA	SNA	0.0	0	Off	Open
-1.8	Complete	SNA	SNA	0.0	0	Off	Open
-1.7	Complete	SNA	SNA	0.0	0	Off	Open
-1.6	Complete	SNA	SNA	0.0	0	Off	Open
-1.5	Complete	SNA	SNA	0.0	0	Off	Open
-1.4	Complete	SNA	SNA	0.0	0	Off	Open
-1.3	Complete	SNA	SNA	0.0	0	Off	Open
-1.2	Complete	SNA	SNA	0.0	0	Off	Open
-1.1	Complete	SNA	SNA	0.0	0	Off	Open
-1.0	Complete	SNA	SNA	0.0	0	Off	Open
-0.9	Complete	SNA	SNA	0.0	0	Off	Open
-0.8	Complete	SNA	SNA	0.0	0	Off	Open
-0.7	Complete	SNA	SNA	0.0	0	Off	Open
-0.6	Complete	SNA	SNA	0.0	0	Off	Open
-0.5	Complete	SNA	SNA	0.0	0	Off	Open
-0.4	Complete	SNA	SNA	0.0	0	Off	Open
-0.3	Complete	SNA	SNA	0.0	0	Off	Open
-0.2	Complete	SNA	SNA	0.0	0	Off	Open
-0.1	Complete	SNA	SNA	0.0	0	Off	Open

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CDR CRASH DATA RETRIEVAL

Pre-Crash Data (Most Recent Event - table 2 of 3)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	ABS MIL (if equip.)	ESP MIL (if equip.)	ESP Lamp (if equip.)	ESP Lamp Flashing Requested (if equip.)
-2.0	Off	Off	Off	No
-1.9	Off	Off	Off	No
-1.8	Off	Off	Off	No
-1.7	Off	Off	Off	No
-1.6	Off	Off	Off	No
-1.5	Off	Off	Off	No
-1.4	Off	Off	Off	No
-1.3	Off	Off	Off	No
-1.2	Off	Off	Off	No
-1.1	Off	Off	Off	No
-1.0	Off	Off	Off	No
-0.9	Off	Off	Off	No
-0.8	Off	Off	Off	No
-0.7	Off	Off	Off	No
-0.6	Off	Off	Off	No
-0.5	Off	Off	Off	No
-0.4	Off	Off	Off	No
-0.3	Off	Off	Off	No
-0.2	Off	Off	Off	No
-0.1	Off	Off	Off	No

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CDR CRASH DATA RETRIEVAL

Pre-Crash Data (Most Recent Event - table 3 of 3)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	ETC Lamp (If equip.)	ETC Lamp Flashing (if equip.)	Cruise Control System	Cruise Control Active
-2.0	Off	No	Off	No
-1.9	Off	No	Off	No
-1.8	Off	No	Off	No
-1.7	Off	No	Off	No
-1.6	Off	No	Off	No
-1.5	Off	No	Off	No
-1.4	Off	No	Off	No
-1.3	Off	No	Off	No
-1.2	Off	No	Off	No
-1.1	Off	No	Off	No
-1.0	Off	No	Off	No
-0.9	Off	No	Off	No
-0.8	Off	No	Off	No
-0.7	Off	No	Off	No
-0.6	Off	No	Off	No
-0.5	Off	No	Off	No
-0.4	Off	No	Off	No
-0.3	Off	No	Off	No
-0.2	Off	No	Off	No
-0.1	Off	No	Off	No

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U.S. Department
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**National Highway
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