INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER

ON-SITE AMBULANCE CRASH INVESTIGATION

CASE NUMBER - IN14004
LOCATION - MINNESOTA
VEHICLE - 2012 FORD E-450 TYPE III AMBULANCE
CRASH DATE - January 2014

Contract Number: DTNH22-12-C-00270

Prepared for:

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

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16. *Abstract*

This on-site investigation focused on the off-set frontal crash of a 2012 Ford E-450 Type III Ambulance, the patient cot, and the sources of the injuries sustained by the driver, paramedic, and patient. This crash occurred on a two-lane, undivided highway during snowy conditions. The Ford was a rear wheel drive cutaway van equipped with a Type III ambulance body manufactured by Road Rescue EV (Model: Ultramedic III). A restrained 43-year-old male driver occupied the cab of the vehicle. An unrestrained 30-year-old paramedic and 35-year-old female patient occupied the patient compartment. The patient was secured on a Stryker model 6506 Power Pro XT cot by a shoulder harness and chest, thigh, and lower leg restraints. The ambulance was conducting a non-emergency transport of the patient and was operating without the emergency lights and siren. The patient was being transported for abdominal pain from a previous surgery. The original dispatch was as a 9-1-1 emergency, but the paramedic assessed that the patient's condition as stable and not requiring an emergency return to the hospital. The ambulance was traveling west and a 2013 Lincoln MKX was traveling east. The Lincoln entered the westbound lane and the vehicles collided head-on in an offset configuration in the center of the roadway. The patient cot separated from the rail clamp and antler bracket during the crash and overturned. The patient was displaced on the cot within the restraints, but remained secured on the cot. The driver and patient sustained police-reported "B" (non-incapacitating) injuries and were transported by ambulance to a hospital. The paramedic sustained "A" (incapacitating) injuries and was transported by ambulance to a hospital then transferred to a trauma center. The driver of the Lincoln sustained fatal injuries. Both vehicles were towed from the crash scene due to damage.

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BACKGROUND

This on-site investigation focused on the off-set frontal crash of a 2012 Ford E-450 Type III Ambulance (**Figure 1**), the patient cot, and the sources of the injuries sustained by the driver, paramedic, and patient. This crash investigation was initiated by the National Highway Traffic Safety Administration (NHTSA) on January 30, 2014, after the crash was identified by Special Crash Investigation (SCI) team 4 through an on-line news article. This investigation was assigned on February 3, 2014. This crash involved the ambulance and a 2013 Lincoln MKX. The crash occurred in January, 2014, at 0125 hours, in Minnesota and was investigated by a local police agency. The crash scene and both vehicles were inspected on April 28 - 29, 2014. The delay in conducting the inspections was due to a combination of police impound of the vehicles until their investigation was complete, obtaining approval for the inspections from the representatives for each vehicle, and coordinating the inspections of the vehicles with legal counsel for the ambulance service. Interviews with the paramedic who was tending to the patient and the ambulance driver were conducted on September 23 - 24, 2014.

Figure 1: The damaged 2012 Ford E-450 Type III ambulance

This crash occurred on a two-lane, undivided highway during snowy conditions. The Ford was a rear wheel drive cutaway van equipped with a Type III ambulance body manufactured by Road Rescue EV (Model: Ultramedic III). A restrained 43-year-old male driver occupied the cab of the vehicle. An unrestrained 30-year-old paramedic and 35-year-old female patient occupied the patient compartment. The patient was secured on a Stryker model 6506 Power Pro XT cot by a shoulder harness and chest, thigh, and lower leg restraints. The ambulance was conducting a non-emergency transport of the patient and was operating without the emergency lights and siren. The patient was being transported for abdominal pain from a previous surgery. The original dispatch was as a 9-1-1 emergency, but the paramedic assessed that the patient's condition as stable and not requiring an emergency return to the hospital. The ambulance was traveling west and the Lincoln was traveling east. The Lincoln entered the westbound lane and the vehicles collided head-on in an offset configuration in the center of the roadway. The patient cot separated from the rail clamp and antler bracket during the crash and overturned. The patient was displaced on the cot within the restraints, but remained secured on the cot. The driver and patient sustained police-reported "B" (non-incapacitating) injuries and were transported by ambulance to a hospital. The paramedic

sustained "A" (incapacitating) injuries and was transported by ambulance to a hospital then transferred to a trauma center. The driver of the Lincoln sustained fatal injuries. Both vehicles were towed from the crash scene due to damage.

Emergency Medical Service, Personnel, Driver Training: The private Emergency Medical Service (EMS) provided 9-1-1 response, non-emergency transfer, priority medical dispatch, 9-1-1 pre-arrival instructions, wheelchair transport, and "Flight Care (in-flight medical kits) Program" to more than 100 Minnesota communities with a population of approximately 1 million and an area of approximately 3,108 square kilometers (1,200 square miles). The EMS employed approximately 570 paramedics, Emergency Medical Technicians (EMTs), dispatchers, special transportation drivers, and maintenance, administration, and support personnel. The ambulance driver in this crash reported that the EMS provided him with an ambulance operators course that consisted of 80 hours of classroom instruction and 40 hours of behind-the-wheel experience with a field training officer. Drivers were required to re-certify every three years and driver records were screened. The driver had approximately 16 years of previous experience driving fire emergency vehicles and had been employed with the EMS for approximately 14 months, and had been an ambulance driver for approximately one year. The driver also had approximately 16 years of experience as an EMT. The work shift for the driver and paramedic on the day of the crash was from 2000 hours to 0600 hours.

CRASH SUMMARY

Crash Site: This crash occurred on a two-lane, undivided, rural highway during nighttime hours with no artificial lighting. The weather conditions were snow with a temperature of -11.5 C (11.3° F), dew point of -13.5° C (7.7° F), and east-southeast winds at 16.7 km/h (10.4 mph), according to local weather reports. The roadway surface was level, snow-covered bituminous and was bordered by bituminous shoulders. The snow accumulation on the roadway at the time of the crash was approximately 4 cm (1.5 in) according to the police crash report. Snow continued to fall following the crash. The westbound and eastbound lanes were 3.3 m (10.8 ft) and 3.7 m (12.1 ft) wide, respectively. The north and south shoulders were 3 m (9.8 ft) and 3.5 m (11.5 ft) wide, respectively. The speed limit was 89 km/h (55 mph). The Crash Diagram is included on page 15 of this report.

Pre-Crash: The ambulance was traveling west (**Figure 2**) while conducting a non-emergency transport of a patient and was operating without the emergency lights and siren. The Lincoln was traveling east. The ambulance driver stated to police that visibility was approximately 92 m (300 ft) and that he saw a vehicle approaching in his lane. He also stated that he applied the brakes and his vehicle slid due to the snow. The driver stated during the SCI interview that he did not steer, but only applied the brakes in an attempt to avoid the crash, and believed that he remained the westbound lane. Each vehicle was equipped with an Event Data Recorder (EDR) and the tables on the following page present each vehicle's pre-crash data. Stability control and traction control for the

Figure 2: Westbound approach of the ambulance

ambulance was reported as "non-engaged" for the full 5 seconds of pre-crash recording, and steering wheel angle data was reported as "Invalid." Traction control for the Lincoln was reported as "non-engaged" for the full 5 seconds of pre-crash recording. The negative steering wheel angle in the pre-crash data table for the Lincoln signifies a clockwise steering direction and suggested the driver of the Lincoln was attempting to steer back into the eastbound lane when the crash occurred.

Ambulance's EDR pre-crash table

Time (sec)	Speed km/h (mph)	Accel pedal % full	Brake	Engine RPM	ABS activity
-5.0	77 (47.8)	18	Off	1,800	Non-engaged
-4.5	77 (47.8)	18	Off	1,800	Non-engaged
-4.0	77 (47.8)	19	Off	1,800	Non-engaged
-3.5	76 (47.2)	17	Off	1,800	Non-engaged
-3.0	76 (47.2)	17	Off	1,800	Non-engaged
-2.5	76 (47.2)	0	Off	1,800	Non-engaged
-2.0	74 (46)	0	On	1,800	Non-engaged
-1.5	72 (44.7)	0	On	1,600	Non-engaged
-1.0	68 (42.3)	0	On	1,400	Engaged
-0.5	63 (39.1)	0	On	1,300	Engaged
0.0	54 (33.6)	0	On	1,000	Engaged

Lincoln's EDR pre-crash table

Time (sec)	Speed km/h (mph)	Accel Pedal, % Full	Service Brake	Engine RPM	Steering Wheel Angle (degrees)	Stability Control Yaw Rate (deg/sec)
-5.0	96 (60)	25.8	Off	1,774	-1.6	-0.25
-4.5	96 (60)	20.6	Off	1,770	-1.6	-0.37
-4.0	96 (60)	18.1	Off	1,762	-0.1	0.0
-3.5	96 (60)	21.7	Off	1,754	-0.1	0.0
-3.0	95 (59)	22.1	Off	1,762	-0.1	0.0
-2.5	95 (59)	23.0	Off	1,754	-1.6	0.0
-2.0	95 (59)	23.6	Off	1,748	-1.6	0.12

Time (sec)	Speed km/h (mph)	Accel Pedal, % Full	Service Brake	Engine RPM	Steering Wheel Angle (degrees)	Stability Control Yaw Rate (deg/sec)
-1.5	95 (59)	24.0	Off	1,754	-1.6	0.0
-1.0	95 (59)	25.3	Off	1,748	-27.1	-5.37
-0.5	95 (59)	26.8	Off	1,758	-28.6	-8.75
0.0	95 (59)	16.7	Off	1,744	-58.6	-7.12

Crash: The front plane of the ambulance (**Figure 3**) was impacted by the front plane of the Lincoln (**Figure 4**). The impact occurred approximately in the center of the roadway (**Figure 5**). The force direction on the ambulance was within the 12 o'clock sector, and the impact resulted in deployment of the driver's frontal air bag and actuation of his safety belt pretensioner. The patient cot separated from the rail clamp and antler bracket and the cot overturned. The patient was displaced on the cot and partially out of the restraints, but remained on the cot. The force direction on the Lincoln was also within the 12 o'clock sector and the impact resulted in actuation of the driver's safety belt pretensioner and a stage two deployment of the driver's frontal air bag. The driver's seat-mounted side impact air bag and both inflatable curtain (IC) air bags also deployed.

Figure 3: Damage to the front plane of the ambulance from the impact with the front plane of the Lincoln

Figure 4: Damage to the front plane of the Lincoln

The WinSMASH program could not be used to calculate Delta V since the ambulance was a medium/heavy vehicle type and impacts involving such vehicles are out of scope for the program. The maximum longitudinal velocity change reported on the ambulance's EDR crash pulse graph was -40.08 km/h (-24.91 mph) and the corresponding lateral velocity change was -10.47 km/h (-6.51 mph). The maximum longitudinal velocity change reported on the Lincoln's EDR crash pulse graph was -91.74 km/h (-57.00 mph) and the corresponding lateral velocity change was 7.50 km/h (4.66 mph).

The impact caused the ambulance to rotate counterclockwise approximately 80 degrees as it traveled approximately 5 m (16 ft) to final rest in the middle of the roadway, heading south. The

Lincoln rotated counterclockwise approximately 75 degrees as it traveled 9.5 m (31.2 ft) in a southwest direction and departed the south side of the roadway coming to final rest on the front slope of a ditch and near the shoulder, heading northeast.

Figure 5: View west at impact gouge marks on the center line and in the eastbound lane

Post-Crash: The driver of the ambulance exited the vehicle with much effort, but without assistance, through the right front door. The paramedic in the patient compartment was incapacitated from a severe head injury. The patient removed herself from the cot restraints and took the paramedic's cellular telephone out of his pocket and called 9-1-1 and reported the crash. The patient stated during a police interview that the paramedic began to "freak out" (a reaction related to his severe head injury) and attempted to sit on her. She stated that she opened the right side door to the patient compartment and the paramedic exited the vehicle. Police from a nearby town arrived on scene followed by a police officer from the investigating police agency, who arrived at 0138 hours. Emergency medical responders tended to the paramedic and sedated him due to his level of combativeness. The driver of the Lincoln was entrapped in her vehicle and emergency responders cut the vehicle's A- and B-pillars with a power rescue tool and forced open the driver's door and extricated her from the vehicle. The ambulance driver and patient sustained police-reported "B" (non-incapacitating) injuries and were transported by ambulance to a hospital. The paramedic sustained "A" (incapacitating) injuries and was transported by ambulance to a hospital, then transferred to a trauma center. The driver of the Lincoln was transported by ambulance to a hospital and passed away 11 days following the crash. Both vehicles were towed from the crash scene due to damage.

2012 FORD E-450 TYPE III AMBULANCE

DESCRIPTION

The Ford was a rear wheel drive, super duty cutaway van (VIN: 1FDXE4FS1CDxxxxxx) manufactured in December 2011. The vehicle was equipped with a Type III ambulance body (Model: Ultramedic III), manufactured by Road Rescue EV. The Ford was equipped with a 6.8-liter V-10 engine, five-speed automatic transmission with overdrive, and four-wheel anti-lock brakes. The vehicle was also equipped with redesigned frontal air bags, an EDR, and a tilt steering column, which was adjusted to the center position. The patient compartment was configured with a right side entry door, double rear doors for patient loading, and multiple storage cabinets on both sides and front. A three person, inward-facing bench seat equipped with lap safety belts was located on the right side, and a single inward-facing seat with lap safety belt was located on the left side. A forward-facing box-mount seat equipped with lap safety belt and swivel feature was located at the front of the patient compartment. A class M oxygen cylinder and medical air cylinder were located in an exterior compartment at the left front side of the patient compartment.

The vehicle manufacturer's recommended tire size was LT225/75R16. The vehicle was equipped with Bridgestone Duravis R500 HD tires of the recommended size. The vehicle manufacturer's recommended cold tire pressure for the front and rear tires was 517 kPa (75 psi) and 550 kPa (80 psi), respectively. The tread and sidewalls of all the tires were in good condition. The left front tire was deflated and restricted from damage. The remaining tires were undamaged.

The front row of the ambulance was equipped with driver and front right passenger box-mounted bucket seats with integral head restraints. The driver's seat track was adjusted to the rear-most position and the seat back was upright.

EXTERIOR DAMAGE

The ambulance sustained damage to the front plane during the impact with the front plane of the Lincoln. The front bumper, grille, hood, both headlamp/turn signal assemblies, left fender, and front portion of the right fender were directly damaged. The direct damage began at the left corner of the front bumper and extended 176 cm (69.3 in) across the front plane. The Field L was 147 cm (57.9 in). Crush measurements were taken at the bumper level and the maximum residual crush was 154 cm (60.6 in) occurring at C_1 (**Figure 6**). The crush values were: C_1 = 157 cm (61.8 in), C_2 = 135 cm (53.1 in), C_3 = 127 cm (50 in), C_4 = 83 cm (32.7) C_5 = 60 cm (23.6 in), C_6 = 40 cm (15.7 in).

Figure 6: Crush to the front plane of the ambulance

The Collision Deformation Classification (CDC) was 12FDEW6 (10 degrees). The WinSMASH program could not be used to calculate Delta V since the ambulance was a medium/heavy vehicle type and impacts involving such vehicles are out of scope for the program. The severity of the damage was severe.

EVENT DATA RECORDER

The ambulance's EDR was imaged with version 12.2.1 of the Bosch Crash Data Retrieval software and reported with version 14.2.1 The EDR was imaged via direct connection to the ACM since it had been removed from the vehicle by law enforcement. The data were imaged by an investigator for the attorney representing the ambulance company. The EDR reported one "locked frontal event" and the event recording was complete. The driver's safety belt status was reported as "Driver buckled." The time to deployment for the driver's frontal air bag and safety belt pretensioner was 17.5 msec. The maximum longitudinal velocity change reported on the longitudinal crash pulse graph was -40.08 km/h (-24.91 mph) occurring at 186.5 msec. The lateral velocity change at 186.5 msec was -10.47 km/h (-6.51 mph). The longitudinal and lateral "Time Zero Offset" was reported as 6.5 msec, so these velocity changes occurred at 180 msec (186.5 - 6.5=180) following AE. The pre-crash data were discussed and presented in the pre-crash section

on this report on page 2. The EDR report is attached at the end of this report as Attachment A.

INTERIOR DAMAGE

Cab of ambulance: The cab sustained severe damage from intrusion. The most severely intruded components into the driver's space were the left instrument panel, steering wheel, and left A-pillar, which intruded longitudinally 50 cm (19.6 in), 48 cm (18.9 in), and 47 cm (18.5 in), respectively. The upper half of the steering wheel rim was deformed forward approximately 3 cm (1 in) from the driver loading through the deployed frontal air bag and contacting the steering wheel, which intruded longitudinally 48 cm (18.9 in). The lower left instrument panel was deformed by a combination of contact by the driver's knees and intrusion of the instrument panel. A small area of blood spatter was located on the right side of the deflated passenger air bag, which probably occurred as the driver was exiting the vehicle through the right front door. The left front glazing was disintegrated from impact forces and the windshield glazing was cracked from impact forces and separated from the left A-pillar. The left front door was jammed closed, while the right front door remained closed and opertional. The right front door would not close at the SCI inspection. The driver's seat was displaced during removal of the ACM, which was located under the seat. The damage to the base of the seat suggested power tools were used to pry the seat upward. The police on-scene photographs showed that the seat was not displaced during the crash.

Figure 7: Displaced railing at front of the right inward-facing bench seat from contact by the paramedic

Figure 8: Occupant contact marks from the paramedic located on the storage shelf forward of the right inward-facing bench seat

Patient Compartment: There was no intrusion of the patient compartment. The stainless steel railing at the front of the right inward-facing bench seat (**Figure 7**) was bent forward 22 cm (8.7 in) from contact by the paramedic's torso. Blood transfer and scuff marks from contact by the paramedic's head were located on the front edge of the top shelf of the storage cabinet (**Figure 8**) located forward of the right inward-facing bench seat. The edge of the middle shelf was also dented and scuffed from contact by the paramedic's torso. No other components in the patient compartment were damaged or exhibited discernable evidence of occupant contact.

The front row was equipped with driver and front right passenger lap and shoulder safety belts that were equipped with adjustable upper anchors, sliding latch plates, and buckle-mounted pretensioners, both of which actuated during the crash. The driver was restrained by the lap and shoulder safety belt as evidenced by the load marks from the belt webbing on the latch plate belt guide. The forward-facing box-mount seat, inward-facing bench seat on the right side of the patient compartment, and the inward facing seat on the left side of the patient compartment were all equipped with lap safety belts. The paramedic was seated in the middle position of the bench seat and was unrestrained as evidenced by the bent railing at the front of the bench seat and the occupant contact evidence on the shelves of the storage cabinet located forward of the bench seat.

PATIENT COT

The patient was restrained on a Stryker 6506 Power-Pro XT patient cot (Serial Number: 13084xxxx, date of manufacture: August 2013, **Figure 9**). The cot was an X-frame design and the manufacturer's specifications stated the standard length, width, weight, and weight rating were 206 cm (81 in), 58 cm (23 in), 57 kg (125 lbs), 318kg (700 lbs), respectively. The cot was equipped with shoulder harness straps and restraints for the chest, thighs, and lower legs. Each restraint was labeled "Rugged," and the model numbers on the buckles of the lower leg, thigh, and chest restraints were ASCP 2B130401, ASCP 2B130301, and 2B070702, respectively. The number 1C1301 was present on the latch plate of the lower leg restraint, chest restraint, and shoulder harnesses. The patient was restrained by the shoulder harness, chest, thigh, and lower leg restraints, and the back rest was reclined 31 degrees aft of vertical.

Figure 9: The Stryker 6506 Power-Pro XT patient cot

PATIENT COT FASTENING SYSTEM

The cot was secured to the floor of the ambulance by the rail clamp and the front wheels were secured by an antler bracket. The rail clamp (**Figure 10**) was manufactured by Stryker and the serial number was 12034xxxx. The rail clamp was not damaged in the crash. The rail clamp floor anchor was slightly loose, but was not deformed. The loose status of the anchor did not appear to be crash related. The rail clamp striker on the right frame rail of the cot was not damaged and the right frame rail was not deformed. The antler bracket was also not damaged. Heavy scuff marks were present on the front wheel brackets of the cot from contacting the antler bracket during the crash.

Figure 10: The Stryker rail clamp

The patient cot separated from the rail clamp during the crash and the cot was displaced out of position and overturned. The driver stated during the interview that he clearly heard the sound of the rail clamp snapping closed when he and the paramedic loaded the patient in the ambulance. The lack of damage to the rail clamp, rail clamp striker, and right frame rail of the cot suggested that the rail clamp released from the striker during the crash. The severity of the crash and possibly the upward pitch of the back of the ambulance during the impact were most likely the primary factors contributing to the release of the rail clamp from the striker. The heavy scuff marks on the front wheel brackets of the cot indicated that the front wheels contacted the antler bracket and probably resulted in the foot end of the cot pitching upward contributing to the overturn of the cot during the crash.

SUPPLEMENTAL RESTRAINT SYSTEMS

The Ford was equipped with redesigned frontal air bags. The driver's and front right passenger's air bags deployed during the crash. Inspection of the driver's air bag was not possible since it was not accessible. The driver's seat was displaced upward and forward against the steering wheel during removal of the ACM.

2012 FORD E-450 TYPE III AMBULANCE OCCUPANTS

DRIVER DEMOGRAPHICS

Age/Sex:	43 years/Male
Height:	183 cm (72 in)
Weight:	98 kg (215 lbs)
Eyewear:	No
Seat Type:	Box-mounted bucket seat
Seat Track Position:	Rear-most
Restraint Usage:	Lap and shoulder belt
Usage Source:	Vehicle inspection, EDR
Air Bags	Frontal, deployed
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Exited vehicle without assistance through right front door
Transport from Scene:	Ambulance
Medical Treatment:	Treated in hospital emergency room and released

Injury Number	Injury	AIS 2005/08	Injury Source	Confi-dence Level
1	Fracture left tibia, not further specified	854000.2,2	Left lower instrument panel (includes knee bolster)	Certain
2	Laceration (blow out) left medial collateral ligament left knee, not further specified	840407.2,2	Left lower instrument panel (includes knee bolster)	Certain
3	Fracture right calcaneus (heel), not further specified	857300.2,1	Floor, including toe pan	Probable
4	Fracture left great toe, not further specified	858211.1,2	Floor, including toe pan	Probable
5	Contusion face, not further specified	210402.1,9	Air bag, driver's frontal	Possible

*Sources: Interviewee Data–Same Person and Other: News Article. Injury Numbers 1 through 4 came only from **Interviewee Data**. Injury Number 5 came only from a **News Article**.*

DRIVER KINEMATICS

The driver was restrained by the lap and shoulder safety belt. The seat was adjusted to the rear-most position and the seat back was upright. The frontal impact to the ambulance resulted in deployment of the driver's frontal air bag and actuation of the his safety belt pretensioner. The driver was displaced forward and loaded the safety belt. His face and chest loaded the deployed frontal air bag causing a contusion to his face. The driver's knees and lower legs contacted the intruded lower instrument panel causing a fracture of the left tibia and a lacerated medial colateral ligament in the left knee. His feet contacted the intruded toe pan causing a fracture of the right calcaneus and left great toe. He exited the vehicle through the right front door after crawling over the damaged center console components and front right passenger seat. He was transported to a hospital by ambulance and was treated in the emergency room for 14 hours and then released.

PARAMEDIC DEMOGRAPHICS

Age/Sex:	30 years/Male
Height:	178 cm (70 in)
Weight:	83 kg (178 lbs)
Eyewear:	None
Seat Type:	Inward-facing bench seat, right side
Seat Track Position:	Fixed track
Restraint Usage:	None
Usage Source:	Vehicle inspection
Air Bags	None
Alcohol/Drug Involvement:	Not reported
Egress from Vehicle:	Patient opened right side entry door to patient compartment and paramedic exited vehicle
Transport from Scene:	Ambulance
Medical Treatment:	Hospitalized

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
1	Injury, head, serious; combative at scene and talking irrationally; sedated	100099.9,0	Edge of top shelf of storage cabinet located at front right of patient compartment	Certain
2	Fracture, open[1], right front skull with torn dura mater over right frontal lobe, not further specified	150406.4,1	Edge of top shelf of storage cabinet located at front right of patient compartment	Certain
3	Hematoma, subdural over right frontal lobe, not further specified	140650.3,1	Edge of top shelf of storage cabinet located at front right of patient compartment	Certain
4	Fracture left occipital condyle, not further specified	150200.3,8	Edge of top shelf of storage cabinet located at front right of patient compartment	Certain
5	Fracture, blowout, right orbit[2], not further specified	251223.2,1	Edge of top shelf of storage cabinet located at front right of patient compartment	Certain
6	Fracture right maxilla[2], not further specified	250800.2,1	Edge of top shelf of storage cabinet located at front right of patient compartment	Certain
7	Fracture right zygomatic bone[2], not further specified	251800.1,1	Edge of top shelf of storage cabinet located at front right of patient compartment	Certain
8	Fracture nose[2], not further specified	251000.1,4	Edge of top shelf of storage cabinet located at front right of patient compartment	Certain
9	Laceration, 6.4 cm (2.5 in) in length, right forehead, not further specified	210602.1,7	Edge of top shelf of storage cabinet located at front right of patient compartment	Certain

*Sources: Interviewee Data–Same Person and Police Supplemental Narrative Reports. Injury Number 1 came only from **Police Supplemental Narrative Reports**. Injury Numbers 2 through 8 came only from **Interviewee Data**. Injury Number 9 came from a combination of **Interviewee Data** and **Police Narratives**.*

PARAMEDIC KINEMATICS

The paramedic was unrestrained and seated in the middle seating position of the right inward-facing bench seat tending to the patient. The impact displaced the paramedic forward and he contacted and bent the stainless steel railing on the front end of the seat. He continued forward and his head contacted the front of the top shelf of the storage compartment located at the front right of the patient compartment. He sustained a serious head injury, open fracture of the right front skull,

[1] It is probable but not certain that lesion #9 is one and the same as the "open" referenced in this lesion; however, without medical records to ascertain the exact location of the laceration(s), both lesions are included.

[2] Lesions #5, #6, #7, and #8 could be part of an LeFort fracture, but without medical records to describe the lesions in greater detail, all are reported separately.

subdural hematoma, fracture of left occipital condyle, blow-out fracture of the right orbit, fractured right maxilla, zygomatic, and nose. He also sustained a 6.4 cm (2.5 in) laceration to the right forehead. The paramedic probably came to rest on the floor in front of the storage compartment as indicated by blood transfers on the floor in this area. The paramedic become disoriented and combative as a result of the head injury. The patient told police that he attempted to sit on her. She opened the right side entry door and the paramedic exited the patient compartment. Emergency medical personnel sedated him and he was transported to a hospital where he was treated in the emergency room and then transferred to a trauma center and hospitalized for 30 days.

PATIENT DEMOGRAPHICS

Age/Sex:	35 years/Female
Height:	168 cm (66 in)
Weight:	73 kg (160 lbs)
Eyewear:	Unknown
Seat Type:	Stryker 6506 Power-Pro XT patient cot
Seat Track Position:	Not applicable
Restraint Usage:	Shoulder harness, chest, thigh, and lower leg restraints
Usage Source:	Interviews with driver and paramedic
Air Bags	None
Alcohol/Drug Involvement:	Not reported
Egress from Vehicle:	Emergency responders removed patient through patient loading doors
Transport from Scene:	Ambulance
Medical Treatment:	Unknown

PATIENT INJURIES

Injury Number	Injury	AIS 2005/08	Injury Source	Confi-dence Level
1	Laceration head, not further specified	110600.1,9	Bench seat on right side of patient compartment	Possible

Source: Police Supplemental Narrative Reports.

PATIENT KINEMATICS

The patient was restrained on a Stryker 6506 Power-Pro XT patient cot by the shoulder harness, chest, thigh, and lower leg restraints, and the cot backrest was reclined 31 degrees aft of vertical. The frontal impact to the ambulance displaced the patient forward on the cot into the backrest. The rail clamp released from the striker and the cot overturned. The patient sustained a laceration to her head, possibly from contact to the bench seat when the cot overturned. Emergency responders removed her from the ambulance through the patient loading doors and transported her by ambulance to a hospital. Her treatment status is not known.

DESCRIPTION

The Lincoln was an all wheel drive, five- passenger, four-door sport utility vehicle (VIN: 2LMDJ8JK5DBxxxxxx) equipped with a 3.7-liter V-6 engine, six-speed automatic transmission with sport shift feature, four-wheel anti-lock brakes with electronic brake force distribution, brake assist, traction control, Electronic Stability Control (ESC), a Tire Pressure Monitoring System (TPMS), and an EDR. The vehicle was also equipped with multi-stage frontal air bags, front seat-mounted side impact air bags, and rollover/side impact Inflatable Curtain (IC) air bags. The driver's frontal air bag, seat-mounted side impact air bag, and both IC air bags deployed during the crash.

EXTERIOR DAMAGE

The Lincoln sustained damage to the front and left planes during the impact with the front plane of the ambulance. The front bumper, grille, hood, both headlamp/turn signal assemblies, left fender, and left front door were directly damaged. The direct damage began at the left corner of the front bumper and extended 149 cm (58.7 in) across the front plane. The Field L was 79 cm (31.1 in). The crush measurements were taken on the bumper bar and the maximum residual crush was 80 cm (31.5 in) occurring at C_3 (**Figure 11**). The crush values were: C_1 = 63 cm (24.8 in), C_2 = 70 cm (27.6 in), C_3 = 80 cm (31.5 in), C_4 = 74 cm (29.1) C_5 = 50 cm (19.7 in), C_6 = 2 cm (0.8 in).

Figure 11: Crush to the front plane of the Lincoln

The CDC was 12FDEW4 (0 degrees). The WinSMASH could not be used to calculate Delta V since the ambulance was out of scope for the program for the program. However, WinSMASH was used to calculate a Barrier Equivalent Velocity (BES) of 64 km/h (39.8 mph). The severity of the damage was severe.

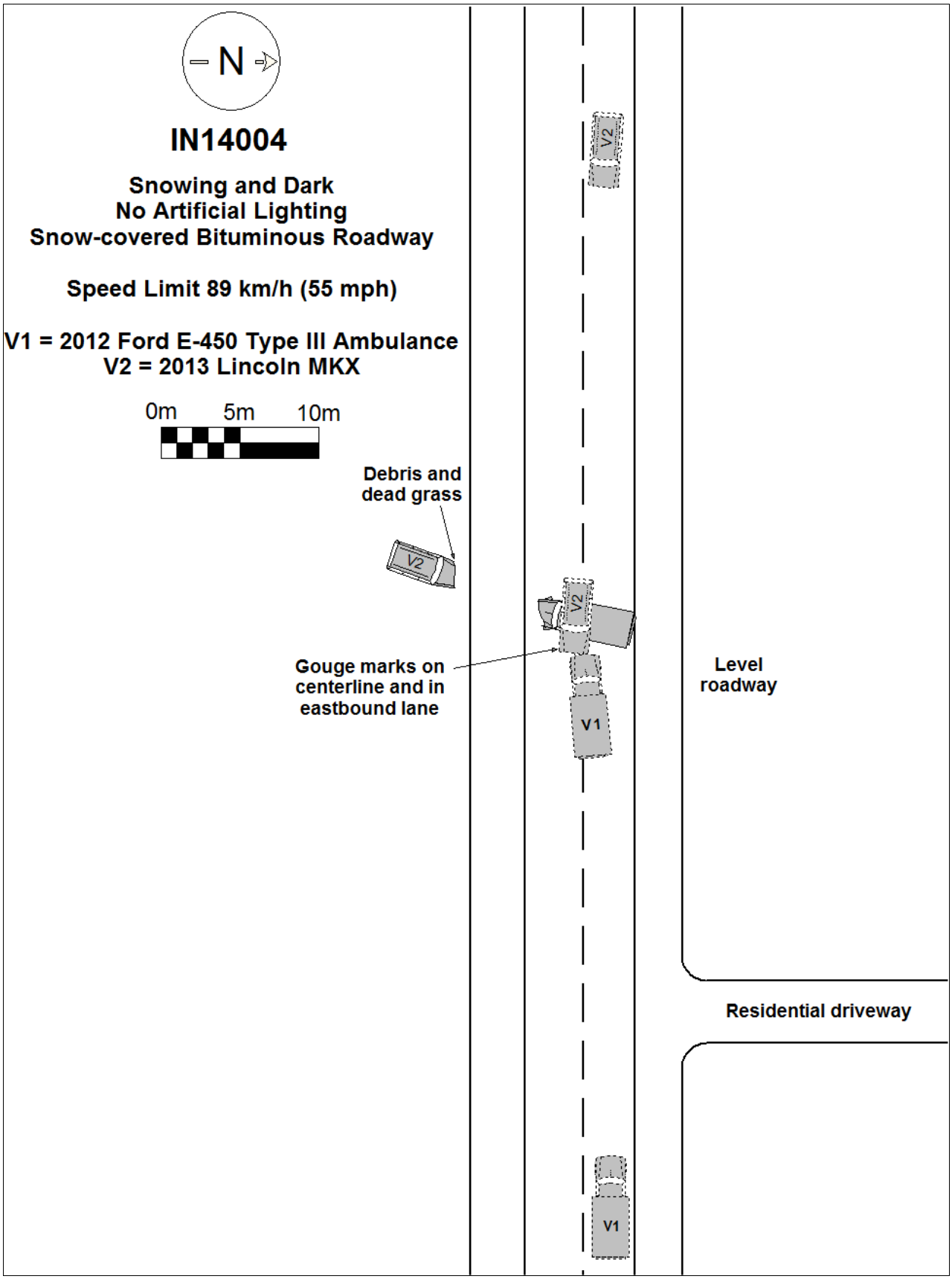
EVENT DATA RECORDER

The Lincoln's EDR was imaged with version 12.3 of the Bosch Crash Data Retrieval software an reported with version 14.2.1. The EDR was imaged via direct connection to the ACM since it had been removed from the vehicle by law enforcement. The data were imaged by an investigator for the attorney representing the ambulance company. The EDR reported that one event was recorded and that the recording was complete, which consisted of locked frontal, side, and rollover data. The frontal air bag warning lamp was reported as "Off." The driver's safety belt status was reported as "Driver Buckled," and the driver's seat track position was reported as "Not Forward." The time to first and second stage deployments of the driver's frontal air bag was 18.5 msec and 28.5 msec, respectively. The time to actuation of the driver's safety belt pretensioner was 2.0 msec. The time to deployment of the left IC air bag and driver's seat-mounted side impact air bag was 20.5 msec and 45.0 msec, respectively. The maximum longitudinal velocity change reported on the longitudinal crash pulse graph was -91.74 km/h (-57.00 mph) occurring at 196.5 msec. The lateral

velocity change at 196.5 msec was 7.50 km/h (4.66 mph). The longitudinal and lateral "Time Zero Offset" was reported as 6.5 msec, so these velocity changes occurred at 190 msec (196.5 - 6.5=190) following AE. The vehicle's roll sensing algorithm activated during the crash but the vehicle did not rollover. The Lincoln's EDR report is attached at the end of this report (Attachment B).

OCCUPANT DATA

The driver of the Lincoln (51-year-old female) was restrained by the lap and shoulder safety belt based on the EDR data and police crash report. She was transported by ambulance to a hospital and passed away 11 days following the crash.


N
IN14004
Snowing and Dark
No Artificial Lighting
Snow-covered Bituminous Roadway
Speed Limit 89 km/h (55 mph)
V1 = 2012 Ford E-450 Type III Ambulance
V2 = 2013 Lincoln MKX
0m 5m 10m
Debris and dead grass
Gouge marks on centerline and in eastbound lane
Level roadway
Residential driveway
V1
V2

Attachment A
2012 Ford E-450 Type III Ambulance
Event Data Recorder (EDR) 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	1FDXE4FS1CD******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	IN14004_V1_ACM.CDRX
Saved on	Tuesday, April 29 2014 at 10:08:52
Collected with CDR version	Crash Data Retrieval Tool 12.2.1
Reported with CDR version	Crash Data Retrieval Tool 14.2.1
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	Yes
Event(s) recovered	locked frontal 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 Tuesday, April 29 2014 at 10:08:52.

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	1FDXE4FS1CD******
Current VIN from PCM	1FDXE4FS1CD******
Ignition cycle, download (first record)	5,479
Ignition cycle, download (second record)	N/A
Restraints Control Module Part Number	BC24-14B321-BD
Restraints Control Module Serial Number	3113128200000000
Restraints Control Module Software Part Number (Version)	BL84-14C028-AB
Left/Center Frontal Restraints Sensor Serial Number	1559AD86
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)	12,460,675
Key-on Timer at event time zero (seconds)	725
Vehicle voltage at time zero (Volts)	13.77
Energy Reserve Mode entered during event (Y/N)	Yes
Time Driver Front Satellite Sensor Lost Relative to Time Zero (msec)	0.5

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)	17.5
Pretensioner (buckle) deployment, time to fire, driver (msec)	17.5
Frontal airbag deployment, time to first stage deployment, front passenger (msec)	17.5
Pretensioner (buckle) deployment, time to fire, right front passenger (msec)	17.5
Maximum delta-V, longitudinal (MPH [km/h])	-26.16 [-42.10]
Time, maximum delta-V longitudinal (msec)	44
Maximum delta-V, lateral (MPH [km/h])	9.82 [15.80]
Time, maximum delta-V lateral (msec)	46
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	6.5 ms
Lateral Delta-V Time Zero Offset	6.5 ms

Pre-Crash Data -1 sec (First Record)

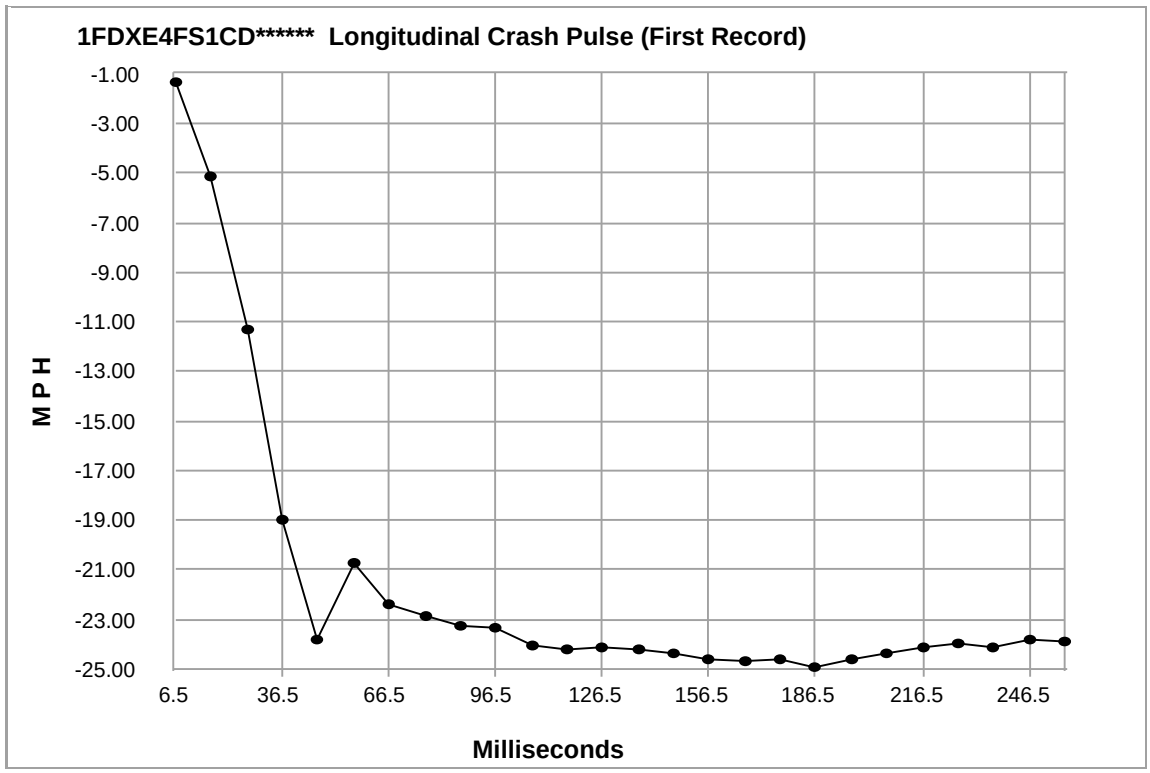
Ignition cycle, crash	5,476
Frontal air bag warning lamp, on/off	Off
Frontal air bag suppression switch status, front passenger	Not Active
Safety belt status, driver	Driver Buckled
Brake Telltale	Off
ABS Telltale	Off
Stability Control Telltale	Off
Speed Control Telltale	Off
Powertrain Wrench Telltale	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	47.8 [77.0]	18	Off	1,800	non-engaged	non-engaged	non-engaged	non-engaged
- 4.5	47.8 [77.0]	18	Off	1,800	non-engaged	non-engaged	non-engaged	non-engaged
- 4.0	47.8 [77.0]	19	Off	1,800	non-engaged	non-engaged	non-engaged	non-engaged
- 3.5	47.2 [76.0]	17	Off	1,800	non-engaged	non-engaged	non-engaged	non-engaged
- 3.0	47.2 [76.0]	17	Off	1,800	non-engaged	non-engaged	non-engaged	non-engaged
- 2.5	47.2 [76.0]	0	Off	1,800	non-engaged	non-engaged	non-engaged	non-engaged
- 2.0	46.0 [74.0]	0	On	1,800	non-engaged	non-engaged	non-engaged	non-engaged
- 1.5	44.7 [72.0]	0	On	1,600	non-engaged	non-engaged	non-engaged	non-engaged
- 1.0	42.3 [68.0]	0	On	1,400	engaged	non-engaged	non-engaged	non-engaged
- 0.5	39.1 [63.0]	0	On	1,300	engaged	non-engaged	non-engaged	non-engaged
0.0	33.6 [54.0]	0	On	1,000	engaged	non-engaged	non-engaged	non-engaged

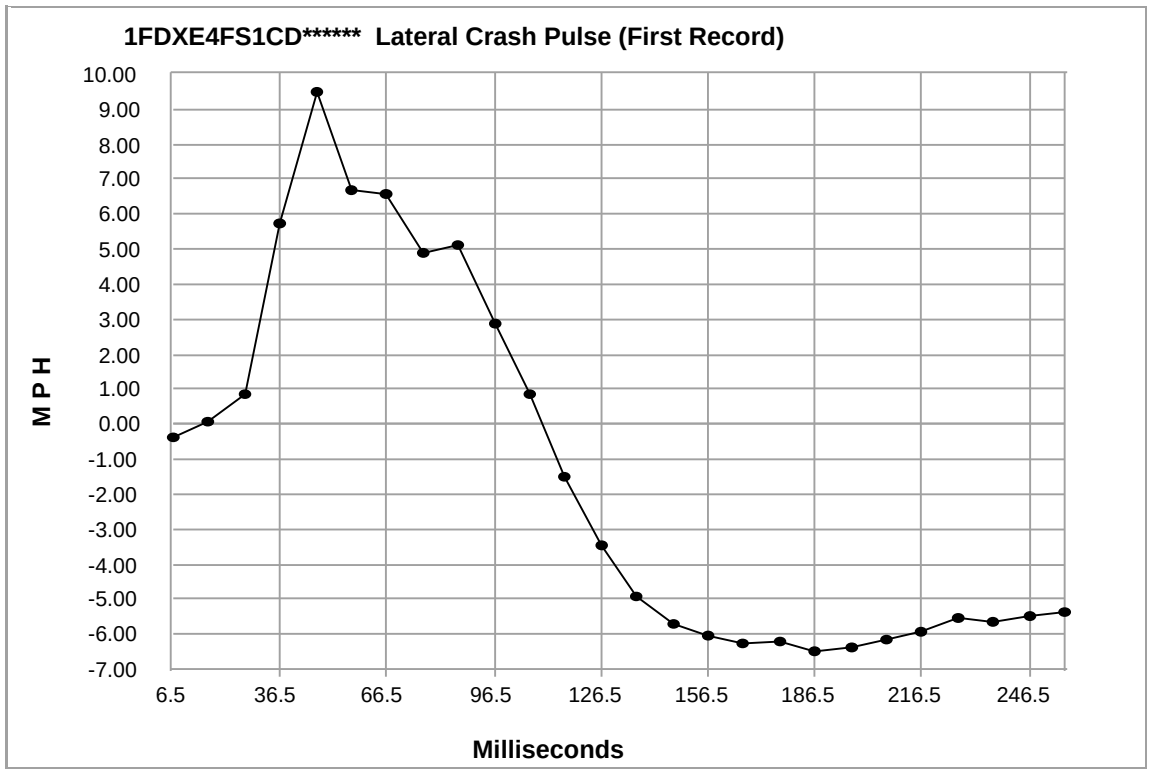
Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record)

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)
6.5	-1.30	-2.10
16.5	-5.15	-8.29
26.5	-11.31	-18.21
36.5	-18.98	-30.55
46.5	-23.77	-38.26
56.5	-20.74	-33.38
66.5	-22.37	-36.00
76.5	-22.88	-36.83
86.5	-23.24	-37.41
96.5	-23.37	-37.62
106.5	-24.07	-38.74
116.5	-24.18	-38.91
126.5	-24.12	-38.82
136.5	-24.19	-38.92
146.5	-24.40	-39.27
156.5	-24.61	-39.60
166.5	-24.68	-39.72
176.5	-24.58	-39.56
186.5	-24.91	-40.08
196.5	-24.61	-39.60
206.5	-24.39	-39.26
216.5	-24.13	-38.84
226.5	-23.96	-38.56
236.5	-24.10	-38.78
246.5	-23.84	-38.37
256.5	-23.92	-38.49



Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
6.5	-0.39	-0.62
16.5	0.09	0.15
26.5	0.83	1.34
36.5	5.72	9.21
46.5	9.47	15.24
56.5	6.67	10.73
66.5	6.57	10.57
76.5	4.87	7.84
86.5	5.12	8.25
96.5	2.89	4.65
106.5	0.84	1.35
116.5	-1.52	-2.45
126.5	-3.45	-5.55
136.5	-4.95	-7.97
146.5	-5.72	-9.20
156.5	-6.06	-9.76
166.5	-6.29	-10.12
176.5	-6.22	-10.01
186.5	-6.51	-10.47
196.5	-6.37	-10.26
206.5	-6.14	-9.88
216.5	-5.91	-9.52
226.5	-5.56	-8.95
236.5	-5.63	-9.06
246.5	-5.49	-8.84
256.5	-5.36	-8.63

Hexadecimal Data

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

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Event Record 2


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Disclaimer of Liability

Attachment B
2013 Lincoln MKX
Event Data Recorder (EDR) 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	2LMDJ8JK5DB******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	IN14004_V2_ACM.CDRX
Saved on	Tuesday, April 29 2014 at 10:46:50
Collected with CDR version	Crash Data Retrieval Tool 12.3
Reported with CDR version	Crash Data Retrieval Tool 14.2.1
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	Yes
Event(s) recovered	locked frontal event locked side event locked rollover 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 Tuesday, April 29 2014 at 10:46:50.

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	2LMDJ8JK5DB******
Current VIN from PCM	2LMDJ8JK5DB******
Ignition cycle, download (first record)	4,384
Ignition cycle, download (second record)	N/A
Restraints Control Module Part Number	CT43-14B321-AC
Restraints Control Module Serial Number	3009920100000000
Restraints Control Module Software Part Number (Version)	BB5T-14C028-AD
Left/Center Frontal Restraints Sensor Serial Number	15B38369
Left Side Restraint Sensor 1 Serial Number	89522B62
Left Side Restraint Sensor 2 Serial Number	15BA95AA
Right Frontal Restraints Sensor Serial Number	15B36B26
Right Side Restraint Sensor 1 Serial Number	A4622B62
Right Side Restraints Sensor 2 Serial Number	15C5330C

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)	4,496,920
Key-on Timer at event time zero (seconds)	420
Vehicle voltage at time zero (Volts)	14.337
Energy Reserve Mode entered during event (Y/N)	Yes
Time Driver Front Satellite Sensor Lost Relative to Time Zero (msec)	24.0
Time Passenger Front Satellite Sensor Lost Relative to Time Zero (msec)	15.5
Time Driver First Row Satellite Sensor Lost Relative to Time Zero (msec)	192.0
Time Passenger Second Row Satellite Sensor Lost Relative to Time Zero (msec)	192.0

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)	18.5
Frontal airbag deployment, time to 2nd stage, driver (msec)	28.5
Side curtain airbag deployment, time to deploy, driver side (msec)	20.5
Side (thorax) air bag deployment, time to deploy, driver (msec)	45.0
Pretensioner (retractor) deployment, time to fire, driver (msec)	2.0
Side curtain airbag deployment, time to deploy, right side (msec)	45.0
Maximum delta-V, longitudinal (MPH [km/h])	-57.09 [-91.88]
Time, maximum delta-V longitudinal (msec)	192
Maximum delta-V, lateral (MPH [km/h])	17.74 [28.55]
Time, maximum delta-V lateral (msec)	60
Left, forward, side satellite sensor discriminating deployment	Yes
Left, forward, side satellite sensor safing	Yes
Left, rear, side satellite sensor safing	Yes
Right, rear, side satellite sensor safing	Yes
RCM, side left sensor safing	Yes
RCM, side right sensor safing	Yes
Left or center front, satellite Sensor discriminating deployment	Yes
Left or center, front satellite Sensor safing	Yes
Right, front satellite sensor discriminating deployment	Yes
Right, front satellite sensor safing	Yes
RCM, front sensor discriminating deployment	Yes
RCM, front sensor safing	Yes
RCM, rollover sensor discriminating deployment	Yes
RCM, vertical sensor safing	Yes
Longitudinal Delta-V Time Zero Offset	6.5 ms
Lateral Delta-V Time Zero Offset	6.5 ms
Roll Angle Time Zero Offset	86.5 ms

Pre-Crash Data -1 sec (First Record)

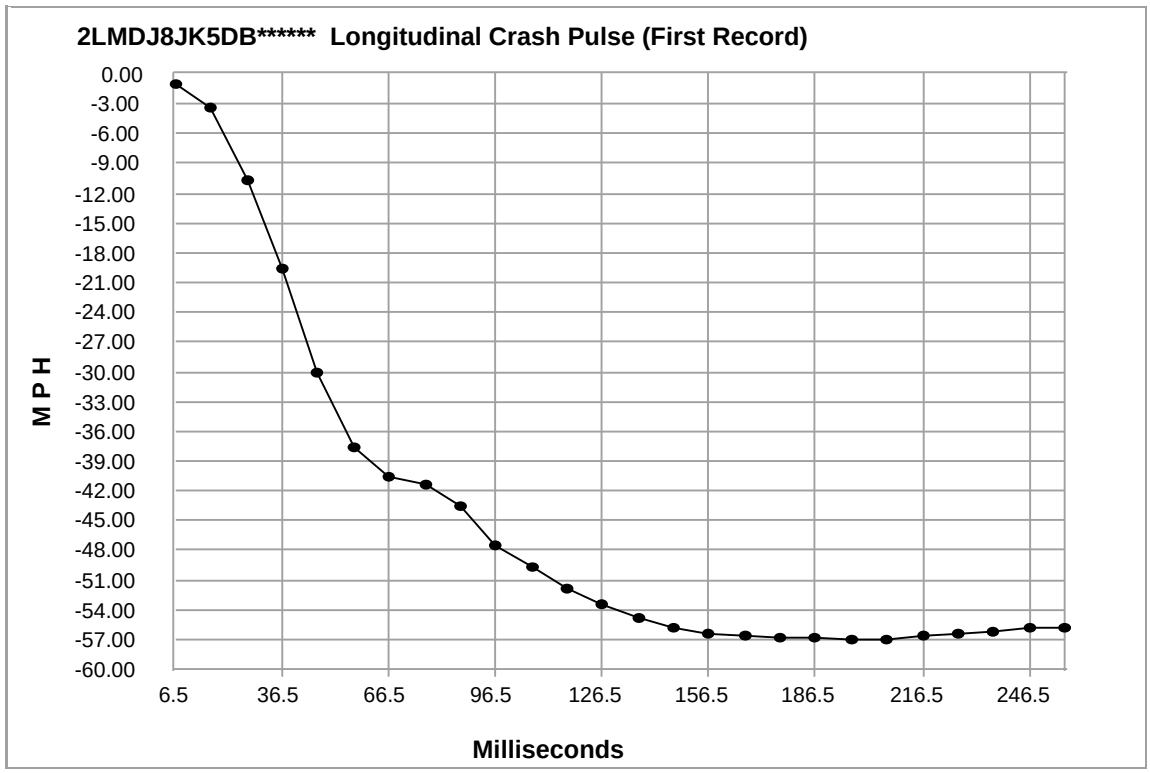
Ignition cycle, crash	4,381
Frontal air bag warning lamp, on/off	Off
Occupant size classification, front passenger (Child size Yes/No [Hex value])	No [$01]
Safety belt status, driver	Driver Buckled
Seat track position switch, foremost, status, driver	Not Forward
Safety belt status, front passenger	Passenger Not Buckled
Brake Telltale	Off
ABS Telltale	Off
ESC/TC Telltale	Off
ESC/TC Off Telltale	Default
Powertrain Wrench Telltale	Off
Speed Control Telltale	Off
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)	Brake Powertrain Torque Request	Driver Gear Selection	Traction Control via Brakes	Wheel Torque
- 5.0	60 [96]	25.8	Off	1,774	non-engaged	No	Drive	non-engaged	444
- 4.5	60 [96]	20.6	Off	1,770	non-engaged	No	Drive	non-engaged	372
- 4.0	60 [96]	18.1	Off	1,762	non-engaged	No	Drive	non-engaged	260
- 3.5	60 [96]	21.7	Off	1,754	non-engaged	No	Drive	non-engaged	312
- 3.0	59 [95]	22.1	Off	1,762	non-engaged	No	Drive	non-engaged	344
- 2.5	59 [95]	23.0	Off	1,754	non-engaged	No	Drive	non-engaged	352
- 2.0	59 [95]	23.6	Off	1,748	non-engaged	No	Drive	non-engaged	376
- 1.5	59 [95]	24.0	Off	1,754	non-engaged	No	Drive	non-engaged	380
- 1.0	59 [95]	25.3	Off	1,748	non-engaged	No	Drive	non-engaged	400
- 0.5	59 [95]	26.8	Off	1,758	non-engaged	No	Drive	non-engaged	448
0.0	59 [95]	16.7	Off	1,744	non-engaged	No	Drive	non-engaged	428

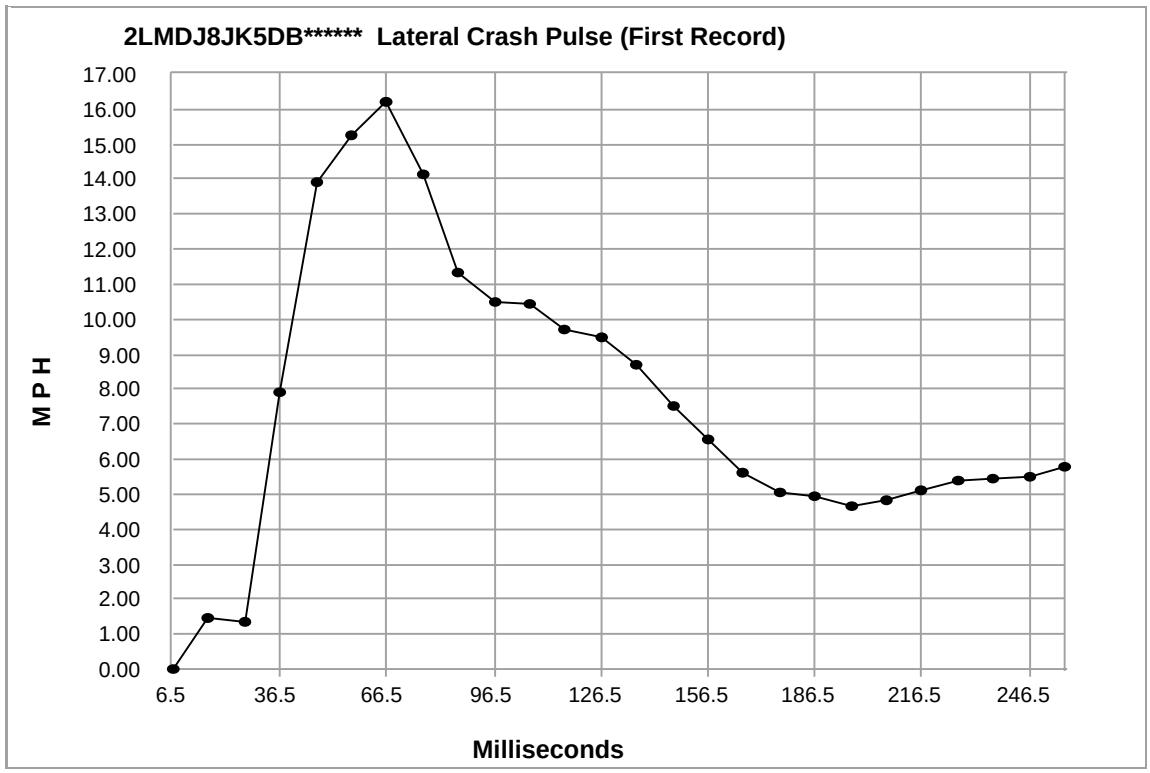
Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record)

Times (sec)	Steering Wheel Angle (degrees)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)	Stability Control Roll Rate (deg/sec)
- 5.0	-1.6	-0.011	-0.014	-0.25	0.37
- 4.9	-1.6	0.001	-0.014	-0.12	0.25
- 4.8	-1.6	0.008	-0.009	-0.25	-0.12
- 4.7	-1.6	0.037	-0.014	-0.5	-0.62
- 4.6	-1.6	0.021	-0.014	-0.5	-0.87
- 4.5	-1.6	0.0	-0.045	-0.37	-0.87
- 4.4	-1.6	-0.023	-0.036	-0.5	-0.75
- 4.3	-1.6	-0.019	-0.039	-0.25	-0.87
- 4.2	-1.6	-0.015	-0.034	-0.25	0.25
- 4.1	-1.6	-0.009	-0.031	0.0	-0.12
- 4.0	-0.1	-0.019	-0.053	0.0	0.12
- 3.9	-0.1	-0.02	-0.034	-0.25	1.5
- 3.8	-0.1	-0.025	-0.014	0.0	1.12
- 3.7	-0.1	0.015	-0.006	0.12	0.75
- 3.6	-0.1	0.03	0.0	0.12	-0.12
- 3.5	-0.1	0.027	-0.014	0.0	0.12
- 3.4	-0.1	-0.01	-0.034	0.37	0.25
- 3.3	-0.1	0.005	-0.031	0.0	-0.87
- 3.2	-0.1	-0.003	-0.006	-0.37	-2.37
- 3.1	-0.1	-0.005	-0.024	-0.12	-1.75
- 3.0	-0.1	-0.033	-0.034	0.0	-0.75
- 2.9	-1.6	-0.009	-0.014	-0.37	0.25
- 2.8	-1.6	0.024	-0.014	0.0	-0.37
- 2.7	-1.6	-0.009	-0.014	-0.25	1.0
- 2.6	-1.6	-0.027	-0.034	-0.5	1.5
- 2.5	-1.6	-0.025	-0.029	0.0	-0.12
- 2.4	-1.6	-0.019	-0.014	-0.12	-0.25
- 2.3	-1.6	-0.018	-0.014	-0.37	-0.87
- 2.2	-1.6	-0.016	0.003	-0.5	-0.75
- 2.1	-1.6	-0.023	-0.019	0.0	-0.12
- 2.0	-1.6	-0.029	-0.014	0.12	0.5
- 1.9	-1.6	-0.02	-0.014	-0.25	-0.25
- 1.8	-1.6	-0.013	-0.014	0.0	0.12
- 1.7	-1.6	0.003	-0.031	0.0	-0.87
- 1.6	-1.6	0.002	0.003	0.0	-1.37
- 1.5	-1.6	-0.016	-0.019	0.0	-0.75
- 1.4	-1.6	-0.029	-0.019	0.25	0.0
- 1.3	-4.6	-0.052	-0.034	-0.62	-1.0
- 1.2	-10.6	-0.101	-0.029	-1.25	-2.12
- 1.1	-16.6	-0.164	-0.014	-3.0	-1.87
- 1.0	-27.1	-0.238	-0.016	-5.37	-2.87
- 0.9	-31.6	-0.316	-0.014	-7.87	-1.75
- 0.8	-31.6	-0.354	-0.019	-8.12	-0.87
- 0.7	-30.1	-0.392	-0.014	-9.37	-0.12
- 0.6	-30.1	-0.379	-0.034	-9.75	-2.12
- 0.5	-28.6	-0.395	0.003	-8.75	-1.12
- 0.4	-19.6	-0.322	-0.024	-7.12	1.37
- 0.3	-6.1	-0.285	-0.021	-5.12	4.87
- 0.2	-21.1	-0.296	-0.026	-3.37	2.75
- 0.1	-46.6	-0.411	-0.07	-5.37	1.25
0.0	-58.6	-0.351	-0.073	-7.12	3.0



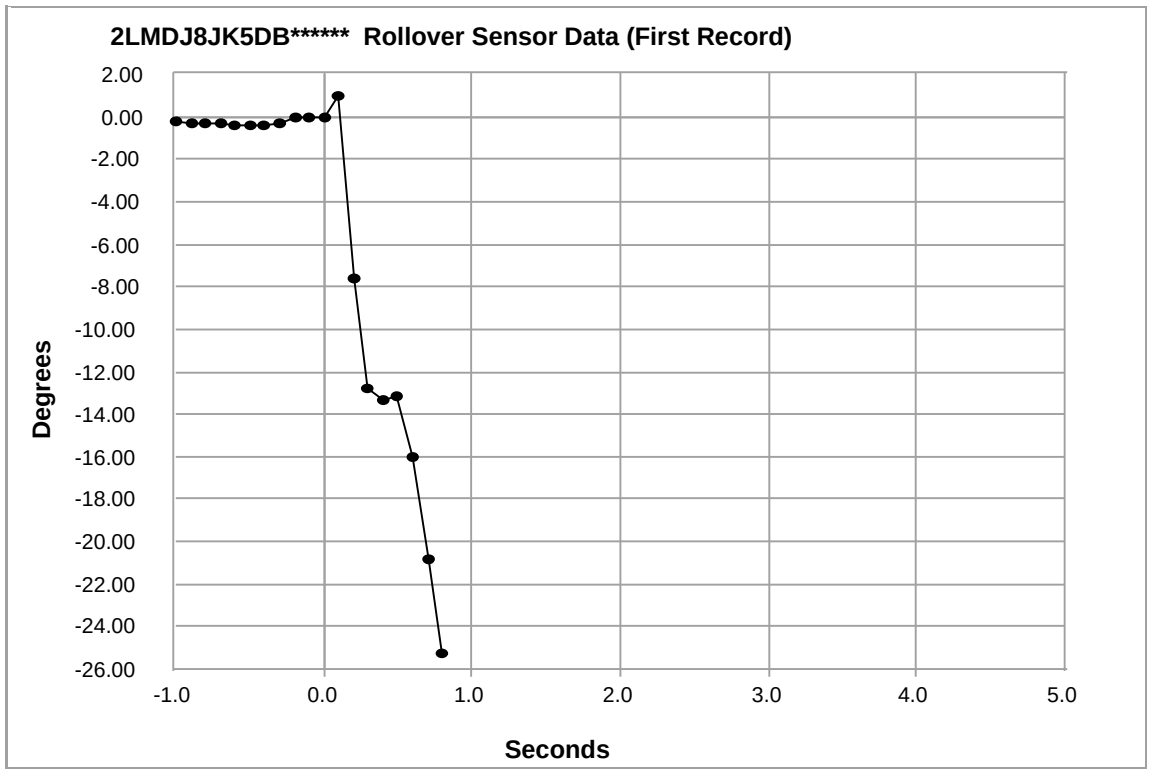
Longitudinal Crash Pulse (First Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
6.5	-0.94	-1.51
16.5	-3.28	-5.29
26.5	-10.76	-17.31
36.5	-19.68	-31.68
46.5	-30.08	-48.41
56.5	-37.67	-60.63
66.5	-40.51	-65.19
76.5	-41.33	-66.51
86.5	-43.61	-70.18
96.5	-47.62	-76.64
106.5	-49.73	-80.03
116.5	-51.80	-83.36
126.5	-53.39	-85.92
136.5	-54.86	-88.29
146.5	-55.85	-89.88
156.5	-56.38	-90.73
166.5	-56.63	-91.14
176.5	-56.81	-91.43
186.5	-56.91	-91.59
196.5	-57.00	-91.74
206.5	-56.97	-91.68
216.5	-56.73	-91.30
226.5	-56.39	-90.75
236.5	-56.17	-90.39
246.5	-55.88	-89.93
256.5	-55.76	-89.74



Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
6.5	0.03	0.04
16.5	1.44	2.31
26.5	1.33	2.14
36.5	7.92	12.75
46.5	13.90	22.37
56.5	15.28	24.60
66.5	16.22	26.10
76.5	14.15	22.76
86.5	11.34	18.25
96.5	10.50	16.90
106.5	10.46	16.84
116.5	9.73	15.66
126.5	9.51	15.30
136.5	8.67	13.96
146.5	7.53	12.11
156.5	6.58	10.59
166.5	5.62	9.05
176.5	5.05	8.12
186.5	4.94	7.95
196.5	4.66	7.50
206.5	4.85	7.80
216.5	5.09	8.19
226.5	5.36	8.63
236.5	5.42	8.72
246.5	5.50	8.85
256.5	5.79	9.33



Rollover Sensor Data (First Record)

Time (sec)	Vehicle roll angle (degrees)
-1.0	-0.23
-0.9	-0.34
-0.8	-0.34
-0.7	-0.34
-0.6	-0.39
-0.5	-0.42
-0.4	-0.42
-0.3	-0.28
-0.2	-0.08
-0.1	-0.07
0.0	-0.02
0.1	1.01
0.2	-7.57
0.3	-12.78
0.4	-13.31
0.5	-13.2
0.6	-15.98
0.7	-20.84
0.8	-25.22
0.9	N/A
1.0	N/A

Time (sec)	Vehicle roll angle (degrees)
1.1	N/A
1.2	N/A
1.3	N/A
1.4	N/A
1.5	N/A
1.6	N/A
1.7	N/A
1.8	N/A
1.9	N/A
2.0	N/A
2.1	N/A
2.2	N/A
2.3	N/A
2.4	N/A
2.5	N/A
2.6	N/A
2.7	N/A
2.8	N/A
2.9	N/A
3.0	N/A
3.1	N/A

Time (sec)	Vehicle roll angle (degrees)
3.2	N/A
3.3	N/A
3.4	N/A
3.5	N/A
3.6	N/A
3.7	N/A
3.8	N/A
3.9	N/A
4.0	N/A
4.1	N/A
4.2	N/A
4.3	N/A
4.4	N/A
4.5	N/A
4.6	N/A
4.7	N/A
4.8	N/A
4.9	N/A
5.0	N/A

Hexadecimal Data

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

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15 B3 6B 26 00 00 00 00 00 00 00 00 00 00 00 00

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15 C5 33 0C 00 00 00 00 00 00 00 00 00 00 00 00

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Event Record 1

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