INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER

ON-SITE ROLLOVER INVESTIGATION

CASE NUMBER - IN11007
LOCATION - TEXAS
VEHICLE - 2009 CHEVROLET EQUINOX LS
CRASH DATE - December, 2010

Submitted:

September 1, 2011

Contract Number: DTNH22-07-C-00044

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Washington, D.C. 20590-0003

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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.

Technical Report Documentation Page

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16. *Abstract*

The focus of this on-site investigation was the rollover of a 2009 Chevrolet Equinox LS. The vehicle was occupied by a restrained 25-year-old male driver. He was traveling southeast in the first lane from the right on a 10-lane, divided, interstate highway approaching an exit ramp. A 2000 Ford Explorer XLT was traveling in the second lane from the right and was slightly ahead of the Chevrolet. The Ford's driver initiated a right steering maneuver to enter the exit ramp and the right front corner of the Ford impacted the left rear door of the Chevrolet (event 1). The Chevrolet rotated counterclockwise and the right front corner of the Ford impacted the left front door of the Chevrolet (event 2). The force direction on the Chevrolet for both impacts was within the 9 o'clock sector and the impacts did not trigger a deployment of any of the Chevrolet's air bags. Both vehicles departed the south side of the exit ramp and both rolled over (events 3 and 4). The Chevrolet rolled over (event 4), right side leading, eight quarter turns and came to final rest on its wheels at the bottom of the embankment heading northeast. The vehicle's rollover/side impact Inflatable Curtain (IC) air bags deployed during the rollover. The driver of the Chevrolet was transported by ground ambulance to a hospital where he was treated in the emergency room for minor injuries and released.

17. *Key Words* Rollover Side Air Bag Deployment Motor Vehicle Traffic Crash Injury Severity		18. *Distribution Statement* General Public	
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CRASH DATE - December 2010

BACKGROUND

The focus of this on-site investigation was the rollover of a 2009 Chevrolet Equinox LS (**Figure 1**). This investigation was initiated by the National Highway Traffic Safety Administration (NHTSA) on February 25, 2011 through the sampling activities of the National Automotive Sampling System (NASS)-General Estimates System (GES). This investigation was assigned on March 4, 2011. The crash occurred in December, 2010, at 0904 hours, in Texas and was investigated by the city police department. The Chevrolet was inspected on March 17, 2011. The crash scene inspection and an interview with the driver of the Chevrolet were conducted on March 18, 2011. The Ford was not inspected since it could not be located.

Figure 1: The damaged 2009 Chevrolet Equinox LS

The Chevrolet was a 4-door, sport utility vehicle equipped with dual stage frontal air bags and rollover/side impact Inflatable Curtain (IC) air bags. The vehicle was occupied by a restrained 25-year-old male driver. He sustained minor injuries and was transported by ambulance to a hospital where he was treated in the emergency room and released. The Ford was a 4-door sport utility vehicle equipped with frontal air bags. It was occupied by a restrained 28-year-old male driver.

CRASH SUMMARY

Crash Site: This crash occurred within the interchange area of a 10-lane, divided, interstate highway during daylight hours and clear weather conditions. The trafficway traversed in a southeasterly and northwesterly direction. Each roadway had five lanes and was bordered by bituminous shoulders and W-beam steel guardrails on the outside of the roadways and a median barrier on the inside. The lane adjacent to the median barrier was a High Occupancy Vehicle (HOV) lane. Each lane was approximately 3.7 m (12.1 ft) in width. The roadway pavement markings consisted of solid white edge lines, broken white lane lines, and solid double white lane lines for the HOV lane. The roadway surface was dry concrete and the grade was negative 5%. The speed limit was 97 km/h (60 mph). The Scene Diagram is on page 10 of this report.

Pre-Crash: The Chevrolet and Ford were traveling southeast approaching an exit ramp (**Figure 2**). The Chevrolet was in the first lane from the right and the driver was intending to continue southeast. The Ford was in the second lane from the right and was slightly ahead of the Chevrolet. The driver of the Ford intended to enter the exit ramp. The driver of the Chevrolet stated during the SCI interview that he took no actions to avoid the crash. His statement was supported by the Chevrolet's Event Data Recorder (EDR), which reported no pre-crash braking during the 2.5 seconds of pre-crash recording. The EDR also reported the Chevrolet's speed as 106 km/h (66 mph) at 2.5 sec prior to Algorithm Enable (AE) increasing to 108 km/h (67 mph) at 0.5 sec prior to AE. According to the police crash report, the driver of the Ford was under the influence of alcohol.

Figure 2: Approach of the Chevrolet southeast toward the exit ramp; the Ford was in the second lane from the right

Figure 3: Damage on the left rear door of the Chevrolet from the initial impact by the Ford

Figure 4: Damage on the left front door of the Chevrolet from the secondary impact by the Ford

Crash: The driver of the Ford initiated a right steering maneuver to enter the exit ramp. The right front corner of the Ford impacted the left rear door of the Chevrolet (**Figure 3**, event 1). The force direction on the Chevrolet was within the 9 o'clock sector and the impact did not trigger deployment of any air bags. The Missing Vehicle algorithm of the WinSMASH program calculated the Chevrolet's Delta V for this impact as 10 km/h (6.2 mph). The impact caused the Chevrolet to rotate counterclockwise and the right front corner of the Ford impacted the Chevrolet's left front door (**Figure 4**, event 2). The force direction on the Chevrolet for this impact was also within the 9 o'clock sector. The Missing Vehicle algorithm calculated the Chevrolet's Delta V for this impact as 3 km/h (1.9 mph) and the impact did not trigger deployment of any air bags. The Chevrolet continued to rotate counterclockwise and it departed the south side of the exit ramp. The Ford also departed the south side of the exit ramp and rolled over (event 3). The Chevrolet rolled over (event 4), right side leading, eight quarter turns and came to final rest on its wheels at the bottom of the embankment heading northeast. Based on the Chevrolet's EDR report, the IC air bags deployed during the rollover.

Post-Crash: The police were notified of the crash at 0904 hours and arrived at the crash scene at 0914 hours. Emergency medical and rescue services also responded. The driver of the Chevrolet exited his vehicle through the left front door without assistance. He was transported by ground ambulance to a hospital where he was treated in the emergency room for minor injuries and released. The driver of the Ford was also transported by ambulance to a hospital. Both vehicles were towed from the crash scene due to damage.

2009 CHEVROLET EQUINOX LS

DESCRIPTION

The Chevrolet was a front-wheel drive, 5-passenger, 4-door, sport utility vehicle (VIN: 2CNDL13FX96------) manufactured in July 2008. The vehicle was equipped with a 3.4-liter, V-6 engine, a 5-speed automatic transmission, 4-wheel, anti-lock brakes with electronic brake force distribution, traction control, Electronic Stability Control (ESC), a Rollover Sensor (ROS), and an EDR. The driver and front right passenger frontal air bags were certified by the manufacturer to be compliant to the Advanced Air Bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The windshield glazing was AS-1 laminated while the remainder of the glazing was AS-2 tempered with after-market tint. Prior to the crash, all of the glazing was either closed or fixed. The odometer reading at the SCI inspection was 57,536 kilometers (35,751 miles). The specified wheelbase was 286 cm (112.6 in).

The vehicle manufacturer's recommended tire size was P235/65R16. The vehicle was equipped with tires of the recommended size. The recommended cold tire pressure for the front and rear tires was 207 kPa (30 psi). The tire data for the Chevrolet are presented in the table below.

Position	*Measured Pressure*	*Measured Tread Depth*	*Restricted*	*Damage*
LF	97 kPa (14 psi)	3 mm (4/32 in)	No	None
LR	103 kPa (15 psi)	6 mm (8/32 in)	No	None
RR	Flat (Flat)	6 mm (8/32 in)	No	None
RF	221 kPa (32 psi)	3 mm (4/32 in)	No	None

The front row was equipped a tilt steering wheel that was adjusted to the full down position and cloth-covered bucket seats with adjustable head restraints. The second row was equipped with a cloth-covered bench seat with folding backs and adjustable head restraints. The driver's seat track was adjusted to the rear position and the seat back was slightly reclined. The top of the driver's head restraint was adjusted 30 cm (11.8 in) above the top of the seat back. The second row had fixed seat tracks.

Exterior Damage Event 1: The Chevrolet sustained direct damage to the left rear door during the initial impact with the Ford. The direct damage began 192 cm (34.6 in) rear of the left front axle and extended 77 cm (30.3 in) along the door. Crush measurements were taken at the mid-door level and the maximum residual crush was 16 cm (6.3 in) occurring at C_3. The height of the maximum door crush was 80 cm (31.5 in) and the door sill differential was 8 cm (3.1 in). The height of the sill was 30 cm (11.8 in).

Damage Classification Event 1: The Collision Deformation Classification (CDC) was 09LPEW2 (280 degrees). The Missing Vehicle algorithm of the WinSMASH program calculated the total Delta V as 10 km/h (6.2 mph). The longitudinal and lateral velocity changes were -2 km/h (1.2 mph) and 10 km/h (6.2 mph), respectively. Based on the damage, the results appeared reasonable.

Exterior Damage Event 2: The Chevrolet sustained direct damage on the left front door during the secondary impact with the Ford. The direct damage consisted of a dent in the door, scuffs, and paint transfer from the Ford. The direct damage began 88 cm (34.6 in) rear of the left front axle and extended 35 cm (13.8 in) along door. Crush measurements were taken at the mid-door level and the maximum residual crush was 1 cm (0.4 in) occurring at C_3. The height of the maximum door crush was 73 cm (28.7 in) and the door sill differential was 0 cm.

Damage Classification Event 2: The CDC was 09LPMN1 (260 degrees). The Missing Vehicle algorithm of the WinSMASH program calculated the total Delta V as 3 km/h (1.9 mph). The longitudinal and lateral velocity changes were 1 km/h (0.6 mph) and 3 km/h (1.9 mph), respectively. Based on the damage, the results appeared reasonable.

Exterior Damage Event 4: In the fourth event of the crash (third impact to this vehicle), the Chevrolet sustained damage to both side planes and the top plane when it rolled over. The direct damage on the left side plane began on the left fender 45 cm (17.7 in) forward of the left front axle and extended 240 cm (94.5 in) rearward along the left side. The fender, pillars, left roof side rail, upper portion of the left side doors, and quarter panel were directly damaged. The direct damage on the right side plane began on the A-pillar 35 cm (13.8 in) rear of the left front axle and extended 310 cm (122 in) rearward to the end of the vehicle. The right roof side rail, doors, pillars, and quarter panel were directly damaged. The direct damage on the top plane began on the front left corner of the hood and extended onto the roof and involved both luggage racks. The maximum vertical crush was 5 cm (2 in) occurring at the left corner of the windshield header. The maximum lateral crush was 5 cm (2 in) occurring at the top of the left A-pillar.

Damage Classification Event 4: The CDC was 00TDDO2. Based on the extent of the roof crush, the severity of the damage was minor.

The Chevrolet's EDR was imaged using version 3.6 of the Bosch Crash Data Retrieval software and was reported with version 4.1. The EDR reported two deployment events and a non-deployment event in the Air Bag Control Module (ACM) report and two event records were reported in the ROS report. In the report from the ACM, the non-deployment event was reported as following the deployment events but no non-deployment data was present in the report. The SIR warning lamp and low tire pressure warning lamps were reported as "Off." The driver's safety belt switch circuit status was reported as "Buckled" and the driver and front right passenger pretensioners were commanded to actuate. The system status at deployment record reported that the side air bags were first commanded to deploy due to a rollover event. The time from AE to the IC air bag command criteria being met was 124 ms. The time from rollover event enable to deployment was 40 ms. The rollover occupant containment enable status was reported as "Enable." The maximum reported longitudinal velocity change was 3.44 km/h (2.14 mph) occurring 20 ms prior to the deployment criteria being met. The maximum reported lateral velocity change was 19.5 km/h (12.12 mph) occurring 140 ms after the deployment criteria was met. For the second deployment record, the maximum reported longitudinal velocity change was -3.44 km/h (-2.14 mph) occurring 160 ms after the deployment criteria was met. The maximum reported lateral velocity change was 6.88 km/h (4.28 mph) occurring at 0 ms.

The ROS report contained an "Event Record A" and an "Event Record B." For "Event Record A," the vehicle's speed at event enable was reported as 108 km/h (67 mph). The time from event enable to deployment command criteria being met was 43 msec and event enable was confirmed by the Sensing and Diagnostic Module (SDM). The deployment mode was reported as "IKEC," which is understood to indicate "Initial Kinetic Energy Criterion." The maximum lateral acceleration was reported as 7.04 g occurring 10 msec after the deployment criteria was met. The maximum vertical acceleration was reported as -4.04 g occurring 50 msec after the deployment criteria was met. The maximum roll rate was reported as 60 deg/sec occurring 20 msec before the deployment criteria was met. For "Event Record B," the vehicle speed at event enable was reported as 72 km/h (45 mph). The time from event enable to deployment command criteria being met was 15 ms and event enable was not confirmed by the SDM. The deployment mode was reported as "IKEC." The maximum lateral acceleration was reported as 6.78 g occurring 30 msec prior to the deployment criteria being met. The maximum vertical acceleration was reported as -3.65 g occurring 10 ms prior to the deployment criteria being met. The maximum roll rate was reported as -48 deg/sec occurring at 0 ms. The EDR report[1] is attached at the end of this report. The pre-crash data was discussed in the Pre-Crash section of this report on page 2.

1. Pages 14-15 of the SDM report and 19-21 of the ROS report were deleted for confidentiality purposes.

The inspection of the interior of the vehicle revealed a light scuff mark on the left roof side rail adjacent to driver's seating position, which was probably caused by contact from the driver's head. No other occupant contacts were observed. There was no deformation of the steering wheel rim or compression of the energy absorbing steering column. There was no deformation of the driver's seat.

The left rear door was jammed shut. All the other doors and the tailgate remained closed and operational. The windshield was cracked from impact forces and had separated from the bonding at the top of the windshield frame. The left rear and second right rear glazing was disintegrated from impact forces. The remaining glazing was undamaged.

The passenger compartment sustained a total of 10 intrusions. In the driver's space, the left A-pillar intruded laterally 6 cm (2.4 in), while the left roof side rail and windshield header intruded vertically 5 cm (2 in) and 6 cm (2.4 in), respectively.

MANUAL RESTRAINT SYSTEMS

The front row was equipped with driver and front right passenger lap-and-shoulder safety belts. The driver's safety belt was equipped with continuous loop belt webbing, a sliding latch plate, an Emergency Locking Retractor (ELR), and an adjustable upper anchor that was in the full-down position. The front right passenger's safety belt was equipped the same as the driver, but had a switchable ELR/Automatic Locking Retractor (ALR). The adjustable upper anchor was in the full-up position. The front seat positions were equipped with retractor-mounted pretensioners, which actuated during the crash. The second row was equipped with lap-and shoulder safety belts and Lower Anchors and Tethers for Children (LATCH). The second row safety belts were equipped with continuous loop belt webbing, sliding latch plates, switchable ELR/ALRs, and non-adjustable upper anchors.

Inspection of the driver's safety belt assembly revealed heavy historical usage scratches on the latch plate and a load abrasion on the latch plate belt guide. This evidence indicated that the driver was restrained at the time of the crash. The vehicle's EDR also reported the driver's safety belt switch status as "Buckled." The remaining seating positions were unoccupied.

The Chevrolet was equipped with a Certified Advanced 208-Compliant (CAC) driver and front right passenger frontal air bag system. These air bags did not deploy in this crash.

The vehicle was also equipped with roof side rail-mounted rollover/side impact IC air bags. Based on the 2009 edition of the Holmatro Rescuer's Guide to Vehicle Safety Systems, the side impact sensors were located within the lower B-pillars. The inflators were located within the roof side rails. Both IC air bags deployed in this crash. This vehicle was not equipped with seat-mounted side impact air bags.

Figure 6: Chevrolet's deployed left IC air bag

The deployed left IC air bag extended from the A-pillar to the C-pillar (**Figure 6**). There were no external vent ports. The IC was 181 cm (55.1 in) in width and 41 cm (16.1 in) in height. It was attached to the A-pillar by a 14 cm (5.5 in) nylon tether. A 45 cm (17.7 in) nylon tether attached the back of the IC to the D-pillar. The IC extended 10 cm (3.9 in) below the beltline. The gap between the front of the air bag's sail panel and the A-pillar was approximately 20 cm (7.9 in). Inspection of the IC revealed no discernable evidence of occupant contact. The IC was not damaged in the crash. The right IC air bag was of the same dimensions and features as the left IC.

ROLLOVER MITIGATION

The NHTSA has given this vehicle model a four star rollover rating on a five star scale[2]. The Chevrolet's rollover mitigation features consisted of ESC and a rollover sensor. The ESC uses sensors to detect a loss of steering control and selectively applies the brakes to minimize the control loss and keep the vehicle on the driver's intended path. The control loss in this crash was the result of impact forces, which induced a rapid counterclockwise rotation of the vehicle causing it to depart the south edge of the exit ramp. The vehicle traveled down the negative 8% grade of a grass covered embankment for approximately 22 m (72.2 ft) when the right side tires furrowed into the ground. The vehicle tripped and rolled over, right side leading, eight quarter turns across a distance of approximately 37 m (121.4 ft). It came to final rest on its wheels at the bottom of the embankment heading northeast.

[2] www.safercar.gov, 3/23/11

DRIVER DEMOGRAPHICS

Age/Sex:	25 years/male
Height:	180 cm (71 in)
Weight:	109 kg (240 lbs)
Eyewear:	None
Seat Type:	Bucket
Seat Track Position:	Rear position
Restraint Usage:	Lap-and-shoulder
Usage Source:	Vehicle inspection, interview, and EDR data
Air Bags	Frontal, not deployed; IC, deployed
Alcohol/Drug Involvement:	Police reported none, not tested
Egress from Vehicle:	Through left front door without assistance
Transport from Scene:	Ambulance
Medical Treatment:	Treated in emergency room and released

DRIVER INJURIES

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
1	Strain, acute cervical, not further specified	640278.1,6	Roof, left front side rail	Probable
2	Contusion left head, not further specified	110402.1,2	Roof, left front side rail	Probable
3	Laceration, 2.5 cm (1 in) left side of forehead, not further specified	210602.1,7	Roof, left front side rail	Probable
4	Laceration, 2.5 cm (1 in) on left ear, not further specified	210602.1,2	Noncontact injury: flying glass	Probable
5	Lacerations face, not further specified	210600.1,9	Noncontact injury: flying glass	Certain
6	Lacerations arms, not further specified	710600.1,3	Noncontact injury: flying glass	Certain
7	Abrasion, minor, left elbow, not further specified	710202.1,2	Noncontact injury: flying glass	Certain

*Sources: Emergency Room Records, EMS treatment Record, and Interviewee Data–Driver. Injury Numbers 1 and 2 came from **ER records**, Injury Numbers 3 through 6 came from Interviewee Data, and Injury Number 7 from a combination of **Interviewee Data** and **EMS records**.*

DRIVER KINEMATICS

The left side impacts with the Ford displaced the driver to the left within his safety belt. As the vehicle rotated counterclockwise, the driver was redirected to the right as the vehicle decelerated. When the vehicle rolled over, right side leading, the driver was redirected toward

the roof within his safety belt. During the rollover, he contacted the left side of his head on the left roof side rail causing a laceration, contusion, and cervical strain. He also sustained multiple small lacerations on his face, arms, and left ear flying glass fragments. Flying glass also caused a small abrasion on his left elbow. The driver exited the vehicle through the left front door without assistance. He was transported by ground ambulance to a hospital where he was treated in the emergency room and released.

2000 FORD EXPLORER XLT

DESCRIPTION

The 2000 Ford Explorer XLT was a 4-wheel drive, 5-passenger, 4-door sport utility vehicle (VIN 1FMZU73E5YZ------) equipped with a 4.0 liter, V-6 engine, a 5-speed automatic transmission, and 4-wheel, anti-lock brakes. The front row was equipped with bucket seats, redesigned frontal air bags, and lap-and-shoulder safety belts. The specified wheelbase was 283 cm (111.4 in).

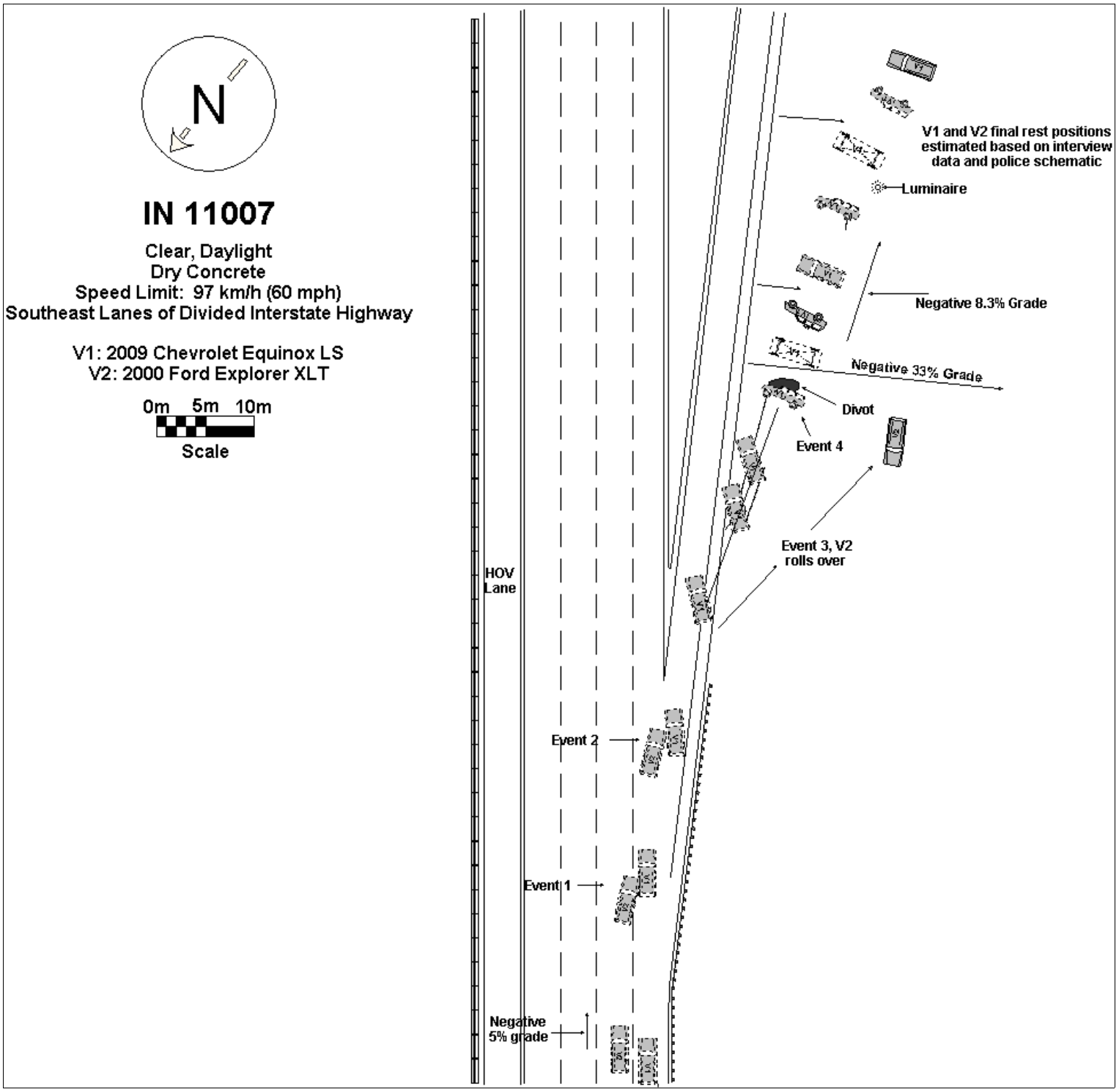
EXTERIOR DAMAGE

Damage Classification Event 1: The Ford was not inspected since in could not be located. The Missing Vehicle algorithm of the WinSMASH program calculated the total Delta V for the initial impact with the Chevrolet as 9 km/h (5.6 mph). The longitudinal and lateral velocity changes were 0 km/h and –9 km/h (-5.6 mph), respectively. The results should be considered borderline since they are based only on the crush to the Chevrolet.

Damage Classification Event 2: The Missing Vehicle algorithm calculated the total Delta V for the second impact with the Chevrolet as 3 km/h (1.9 mph). The longitudinal and lateral velocity changes were -1 km/h (-0.6 mph) and -3 km/h (-1.9 mph), respectively. The results were borderline.

OCCUPANT DATA

The driver of the Ford (28-year-old male) sustained police reported A (incapacitating) injuries and was transported by ambulance to a hospital.


N
IN 11007
Clear, Daylight
Dry Concrete
Speed Limit: 97 km/h (60 mph)
Southeast Lanes of Divided Interstate Highway
V1: 2009 Chevrolet Equinox LS
V2: 2000 Ford Explorer XLT
0m 5m 10m
Scale
V1 and V2 final rest positions estimated based on interview data and police schematic
Luminaire
Negative 8.3% Grade
Negative 33% Grade
Divot
Event 4
Event 3, V2 rolls over
HOV Lane
Event 2
Event 1
Negative 5% grade

Attachment A
2009 Chevrolet Equinox LS
Event Data Recorder Report
Air Bag Control Module

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	2CNDL13FX96******
User	
Case Number	
EDR Data Imaging Date	03/17/2011
Crash Date	
Filename	IN11007_ACM.CDRX
Saved on	Thursday, March 17 2011 at 11:55:19
Collected with CDR version	Crash Data Retrieval Tool 3.6
Reported with CDR version	Crash Data Retrieval Tool 4.1
EDR Device Type	Airbag Control Module
Event(s) recovered	Deployment Deployment #2

Comments

No comments entered.

Data Limitations

Recorded Crash Events:

There are two types of recorded crash events. The first is the Non-Deployment Event. A Non-Deployment Event records data but does not deploy the air bag(s). The minimum SDM Recorded Vehicle Velocity Change, that is needed to record a Non-Deployment Event, is five MPH. A Non-Deployment Event may contain Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event will be cleared by the SDM, after approximately 250 ignition cycles. This event can be overwritten by a second Deployment Event, referred to as Deployment Event #2, if the Non-Deployment Event is not locked. A locked Non Deployment Event cannot be overwritten by the SDM.

The second type of SDM recorded crash event is the Deployment Event. It also may contain Pre-Crash and Crash data. The SDM can store up to two different Deployment Events. If a second Deployment Event occurs any time after the Deployment Event, the Deployment Event #2 will overwrite any non-locked Non-Deployment Event. Deployment Events cannot be overwritten or cleared by the SDM. Once the SDM has deployed an air bag, the SDM must be replaced.

Data:

-SDM Recorded Vehicle Velocity Change reflects the change in velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. For Deployment Events, the SDM can record 220 milliseconds of data after Deployment criteria is met and up to 70 milliseconds before Deployment criteria is met. For Non-Deployment Events, the SDM can record up to the first 300 milliseconds of data after algorithm enable. Velocity Change data is displayed in SAE sign convention.

-The CDR tool displays time from Algorithm Enable (AE) to time of Deployment command in a Deployment event and AE to time of maximum SDM recorded vehicle velocity change in a Non-Deployment event. Time from AE begins when the first air bag system enable threshold is met and ends when Deployment command criteria is met or at maximum SDM recorded vehicle velocity change. Air bag systems such as frontal, side, or rollover, may be a source of an enable. The time represented in a CDR report can be that of the enable of one air bag system to the Deployment time of another air bag system.

-Maximum Recorded Vehicle Velocity Change is the maximum square root value of the sum of the squares for the vehicle's combined "X" and "Y" axis change in velocity.

-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has been interrupted and not fully written.

-SDM Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:

- -Significant changes in the tire's rolling radius
- -Final drive axle ratio changes
- -Wheel lockup and wheel slip

-Brake Switch Circuit Status indicates the status of the brake switch circuit.

-Pre-Crash data is recorded asynchronously.

-Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if:

- -The SDM receives a message with an "invalid" flag from the module sending the pre-crash data
- -No data is received from the module sending the pre-crash data
- -No module present to send the pre-crash data

-Driver's and Passenger's Belt Switch Circuit Status indicates the status of the seat belt switch circuit.
-The Time Between Non-Deployment to Deployment Events is displayed in seconds. If the time between the two events is greater than five seconds, "N/A" is displayed in place of the time. If the value is negative, then the Deployment Event occurred first. If the value is positive, then the Non-Deployment Event occurred first.
-If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.
-The ignition cycle counter relies upon the transitions through OFF->RUN->CRANK power-moding messages, on the GMLAN communication bus, to increment the counter. Applying and removing of battery power to the module will not increment the ignition cycle counter.
-All data should be examined in conjunction with other available physical evidence from the vehicle and scene.

Data Source:
All SDM recorded data is measured, calculated, and stored internally, except for the following:
-Vehicle Status Data (Pre-Crash) is transmitted to the SDM, by various vehicle control modules, via the vehicle's communication network.
-The Belt Switch Circuit is wired directly to the SDM.

01004_SDMC-autoliv_r002

Multiple Event Data

Associated Events Not Recorded	1
Event(s) was an Extended Concatenated Event	No
An Event(s) was in Between the Recorded Event(s)	No
An Event(s) Followed the Recorded Event(s)	Yes
The Event(s) Not Recorded was a Deployment Event(s)	No
The Event(s) Not Recorded was a Non-Deployment Event(s)	Yes

System Status At AE

Low Tire Pressure Warning Lamp (If Equipped)	OFF
Vehicle Power Mode Status	Run
Remote Start Status (If Equipped)	Inactive
Run/Crank Ignition Switch Logic Level	Active

Pre-crash data

Parameter	-1.0 sec	-0.5 sec
Reduced Engine Power Mode	OFF	OFF
Cruise Control Active (If Equipped)	No	No
Cruise Control Resume Switch Active (If Equipped)	No	No
Cruise Control Set Switch Active (If Equipped)	No	No
Engine Torque (foot pounds)	Invalid	Invalid

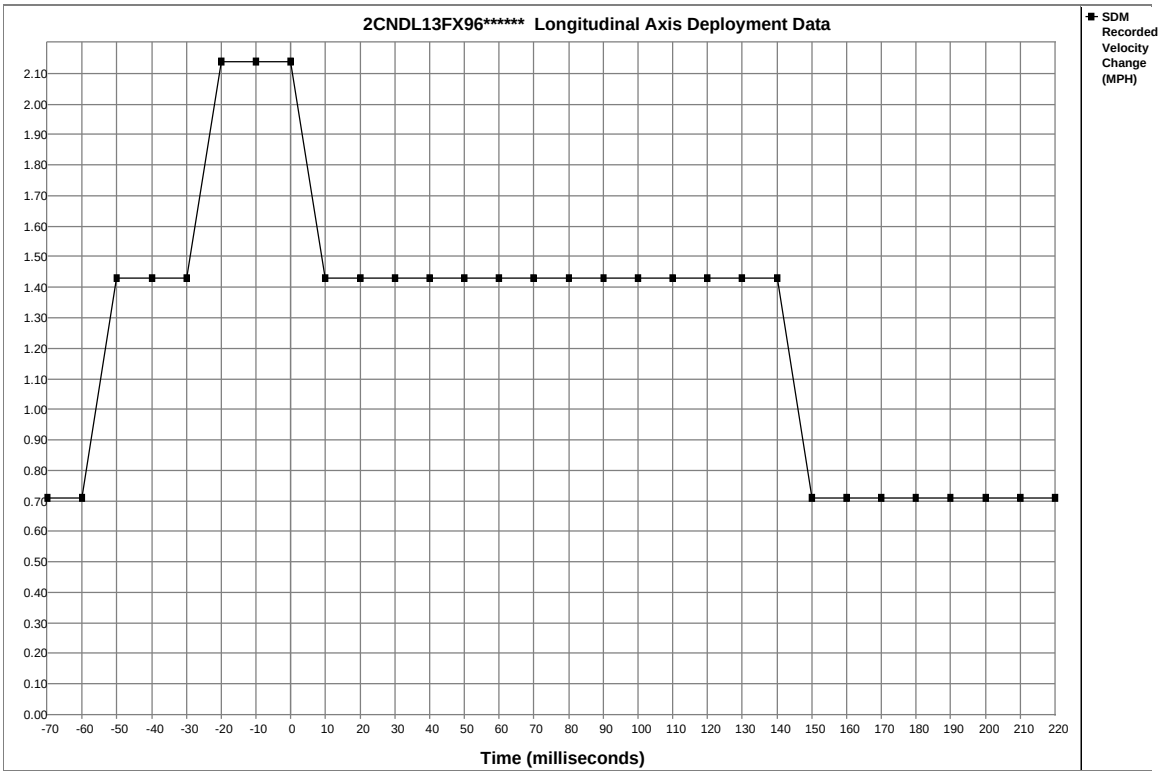
Pre-Crash Data

Parameter	-2.5 sec	-2.0 sec	-1.5 sec	-1.0 sec	-0.5 sec
Accelerator Pedal Position (percent)	9	10	10	11	11
Vehicle Speed (MPH)	66	66	66	66	67
Engine Speed (RPM)	1984	1984	1984	2048	2048
Percent Throttle	25	25	25	27	27
Brake Switch Circuit State	OFF	OFF	OFF	OFF	OFF

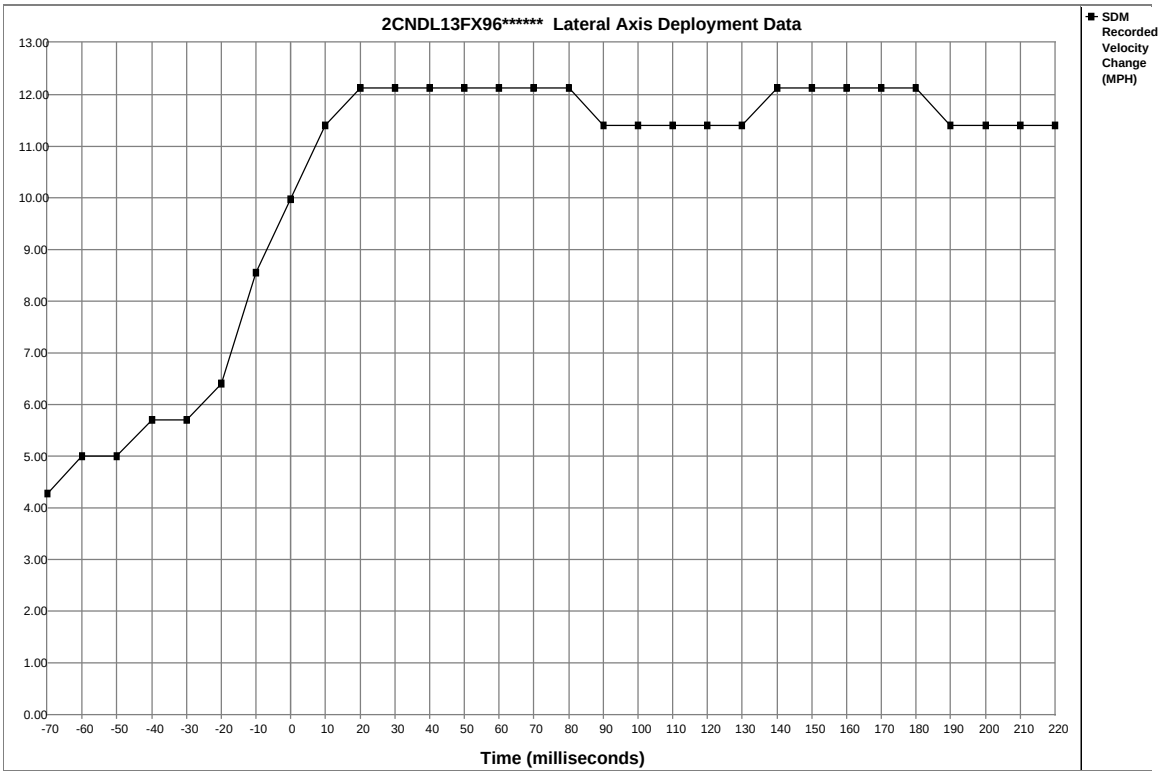
System Status At Deployment

Ignition Cycles At Investigation	2546
SIR Warning Lamp Status	OFF
SIR Warning Lamp ON Time Continuously (seconds)	0
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	2510
Ignition Cycles At Event	2546
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
Passenger's Belt Switch Circuit Status	UNBUCKLED
Passenger Classification Status at Event Enable	Passenger Seat Empty
Current Passenger Position Status at Event Enable	Position Not Applicable
Previous Passenger Position Status at Event Enable	Unknown
Passenger Air Bag Indicator Status at Event Enable	OFF
Diagnostic Trouble Codes at Event, fault number: 1	N/A
Diagnostic Trouble Codes at Event, fault number: 2	N/A
Diagnostic Trouble Codes at Event, fault number: 3	N/A
Diagnostic Trouble Codes at Event, fault number: 4	N/A
Diagnostic Trouble Codes at Event, fault number: 5	N/A
Diagnostic Trouble Codes at Event, fault number: 6	N/A
Diagnostic Trouble Codes at Event, fault number: 7	N/A
Diagnostic Trouble Codes at Event, fault number: 8	N/A
Diagnostic Trouble Codes at Event, fault number: 9	N/A
Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Driver 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Passenger 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Driver Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec)	124
Passenger Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec)	124
Time Between Events (sec)	0
Rollover Occupant Containment Enable Status	Enabled
Side Air Bag Deployment Status	Side Air Bag(s) Were First Commanded to Deploy Due to Rollover Event
Rollover Sensor Status	Rollover Event
Time From Rollover Event Enable to Deployment (ms)	40
Crash Record Locked	Yes
Multiple Event Data/Vehicle Event Data (Pre-Crash) Associated With This Event	Yes
SDM Synchronization Counter	2545
Event Recording Complete	Yes
Driver First Stage Deployment Loop Commanded	No
Passenger First Stage Deployment Loop Commanded	No
Driver Second Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded for Disposal	No
Passenger Second Stage Deployment Loop Commanded	No
Passenger 2nd Stage Deployment Loop Commanded for Disposal	No
Driver Pretensioner Deployment Loop Commanded	Yes
Passenger Pretensioner Deployment Loop Commanded	Yes
Driver Side Deployment Loop Commanded	No
Passenger Side Deployment Loop Commanded	No
Second Row Left Side Deployment Loop Commanded	No
Second Row Right Side Deployment Loop Commanded	No
Driver (Initiator 1) Roof Rail/Head Curtain Loop Commanded	Yes
Passenger (Initiator 1) Roof Rail/Head Curtain Loop Commanded	Yes
Driver (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 3) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 3) Roof Rail/Head Curtain Loop Commanded	No
Driver Knee Deployment Loop Commanded	No
Passenger Knee Deployment Loop Commanded	No
Second Row Left Pretensioner Deployment Loop Commanded	No

Second Row Right Pretensioner Deployment Loop Commanded	No
Second Row Center Pretensioner Deployment Loop Commanded	No



Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.71	0.71	1.43	1.43	1.43	2.14	2.14	2.14	1.43	1.43	1.43	1.43	1.43	1.43	1.43
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Longitudinal Axis Recorded Velocity Change (MPH)	1.43	1.43	1.43	1.43	1.43	1.43	1.43	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71

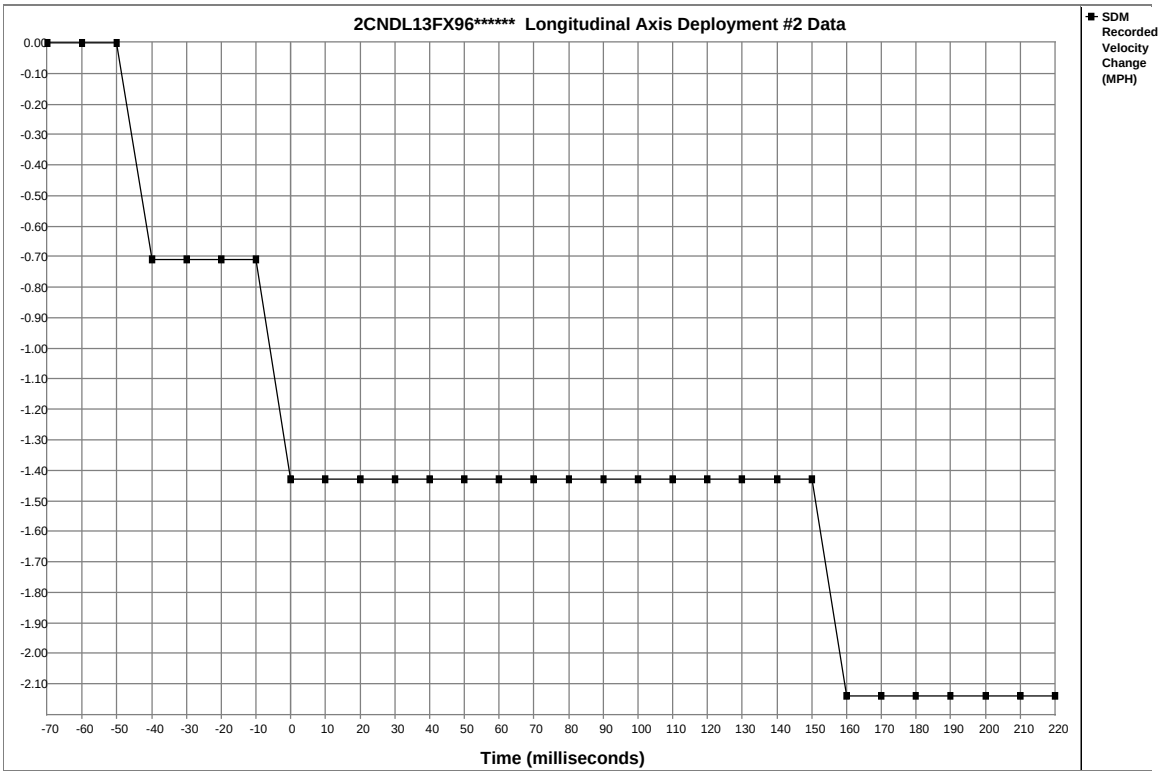


Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Lateral Axis Recorded Velocity Change (MPH)	4.28	4.99	4.99	5.70	5.70	6.41	8.55	9.98	11.40	12.12	12.12	12.12	12.12	12.12	12.12
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Lateral Axis Recorded Velocity Change (MPH)	12.12	11.40	11.40	11.40	11.40	11.40	12.12	12.12	12.12	12.12	12.12	11.40	11.40	11.40	11.40

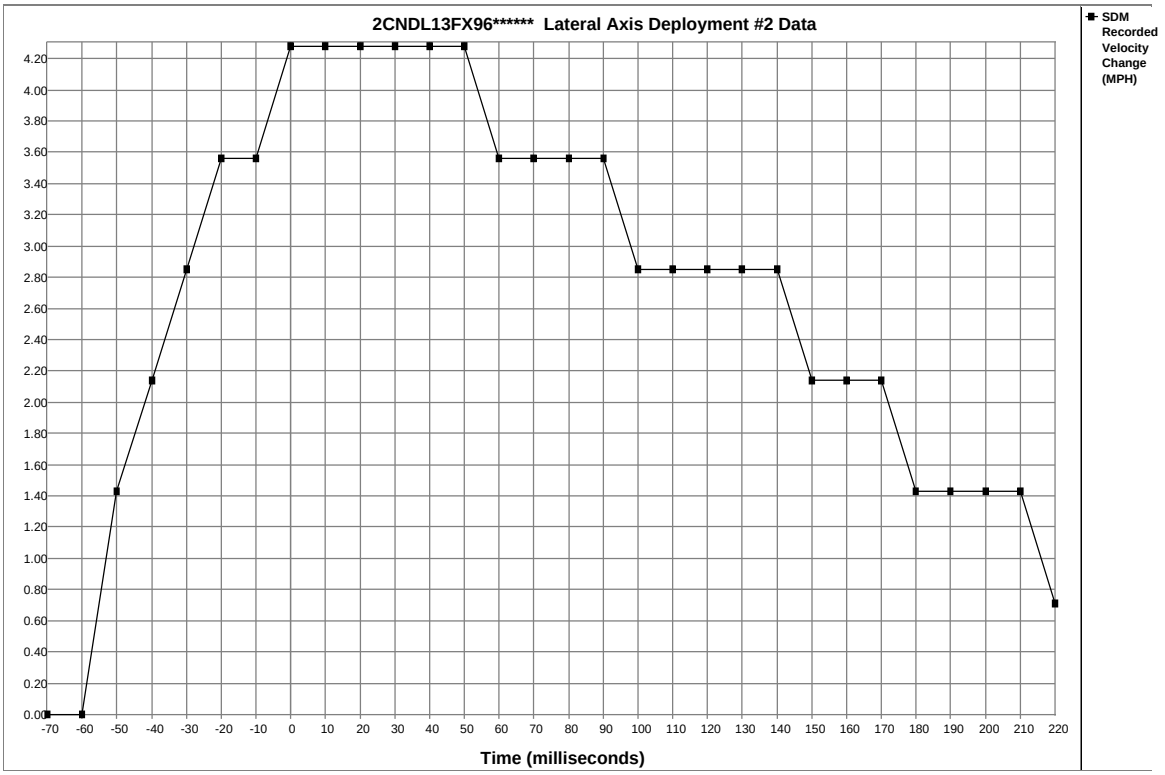
System Status At Deployment #2

Ignition Cycles At Investigation	2546
SIR Warning Lamp Status	OFF
SIR Warning Lamp ON Time Continuously (seconds)	0
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	2510
Ignition Cycles At Event	2546
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
Passenger's Belt Switch Circuit Status	UNBUCKLED
Passenger Classification Status at Event Enable	Passenger Seat Empty
Current Passenger Position Status at Event Enable	Position Not Applicable
Previous Passenger Position Status at Event Enable	Unknown
Passenger Air Bag Indicator Status at Event Enable	OFF
Diagnostic Trouble Codes at Event, fault number: 1	B0052
Diagnostic Trouble Codes at Event, fault number: 2	N/A
Diagnostic Trouble Codes at Event, fault number: 3	N/A
Diagnostic Trouble Codes at Event, fault number: 4	N/A
Diagnostic Trouble Codes at Event, fault number: 5	N/A
Diagnostic Trouble Codes at Event, fault number: 6	N/A
Diagnostic Trouble Codes at Event, fault number: 7	N/A
Diagnostic Trouble Codes at Event, fault number: 8	N/A
Diagnostic Trouble Codes at Event, fault number: 9	N/A
Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Driver 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Passenger 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Driver Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Passenger Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Time Between Events (sec)	1.7336
Rollover Occupant Containment Enable Status	Enabled
Side Air Bag Deployment Status	Side Air Bag(s) Were First Commanded to Deploy Due to Rollover Event
Rollover Sensor Status	Rollover Event
Time From Rollover Event Enable to Deployment (ms)	20
Crash Record Locked	Yes
Deployment Event Recorded in the Non-Deployment Record	Yes
Multiple Event Data/Vehicle Event Data (Pre-Crash) Associated With This Event	No
SDM Synchronization Counter	2545
Event Recording Complete	Yes
Driver First Stage Deployment Loop Commanded	No
Passenger First Stage Deployment Loop Commanded	No
Driver Second Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded for Disposal	No
Passenger Second Stage Deployment Loop Commanded	No
Passenger 2nd Stage Deployment Loop Commanded for Disposal	No
Driver Pretensioner Deployment Loop Commanded	No
Passenger Pretensioner Deployment Loop Commanded	No
Driver Side Deployment Loop Commanded	No
Passenger Side Deployment Loop Commanded	No
Second Row Left Side Deployment Loop Commanded	No
Second Row Right Side Deployment Loop Commanded	No
Driver (Initiator 1) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 1) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 3) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 3) Roof Rail/Head Curtain Loop Commanded	No
Driver Knee Deployment Loop Commanded	No
Passenger Knee Deployment Loop Commanded	No

Second Row Left Pretensioner Deployment Loop Commanded	No
Second Row Right Pretensioner Deployment Loop Commanded	No
Second Row Center Pretensioner Deployment Loop Commanded	No



Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	-0.71	-0.71	-0.71	-0.71	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Longitudinal Axis Recorded Velocity Change (MPH)	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-2.14	-2.14	-2.14	-2.14	-2.14	-2.14	-2.14



Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Lateral Axis Recorded Velocity Change (MPH)	0.00	0.00	1.43	2.14	2.85	3.56	3.56	4.28	4.28	4.28	4.28	4.28	4.28	3.56	3.56
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Lateral Axis Recorded Velocity Change (MPH)	3.56	3.56	2.85	2.85	2.85	2.85	2.85	2.14	2.14	2.14	1.43	1.43	1.43	1.43	0.71

Attachment B
2009 Chevrolet Equinox LS
Event Data Recorder Report
Rollover Sensor

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	2CNDL13FX96******
User	
Case Number	
EDR Data Imaging Date	03/17/2011
Crash Date	
Filename	IN11007_ROS.CDRX
Saved on	Thursday, March 17 2011 at 11:57:46
Collected with CDR version	Crash Data Retrieval Tool 3.6
Reported with CDR version	Crash Data Retrieval Tool 4.1
EDR Device Type	Roll-over Sensor
Event(s) recovered	Event Record "A" Event Record "B"

Comments

No comments entered.

Data Limitations

Recorded Crash Events:

There are two types of recorded crash events. The first is the Non-Rollover Event. A Non-Deployment Event records data but does not deploy the air bag(s). The ROS can store one Non-Rollover Event. This event will be overwritten by the next Non-Rollover Event or by a second Rollover Event. A locked Non-Rollover Event cannot be overwritten or cleared by the ROS.
The second type of ROS recorded crash event is the Rollover Event. The ROS can store up to two different Rollover Events. Rollover Events cannot be overwritten or cleared from the ROS. Once the ROS records two Rollover Events, the ROS must be replaced.

Data:

-The ROS Records Lateral Acceleration, Vertical Acceleration, and Roll Rate data. This data reflects what the sensing system experienced during the recorded portion of the event. For Rollover Events, the ROS will record 490 milliseconds of data before the Deployment criteria is met and 250 milliseconds after Deployment criteria is met. For Non-Rollover Events, the ROS will record 490 milliseconds of data before event conclusion and 250 milliseconds after event conclusion. Acceleration and Roll Rate data are displayed in SAE sign convention.
-Event Recording Complete will indicate if data from the recorded event has been fully written to the ROS memory or if it has been interrupted and not fully written.
-ROS Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:
    -Significant changes in the tire's rolling radius
    -Final drive axle ratio changes
    -Wheel lockup and wheel slip
-Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if:
    -The ROS receives a message with an "invalid" flag from the module sending the pre-crash data
    -No data is received from the module sending the pre-crash data
    -No module present to send the pre-crash data
-If power to the ROS is lost during a crash event, all or part of the crash record may not be recorded.
-Ignition Cycles Since DTCs Were Last Cleared can record a maximum value of 255 cycles and can only be reset by a scan tool.
-Event Recorded Last in the Ignition Cycle is used to determine event order if more than one event is recorded in the same ignition
-Rollover Occupant Containment Enable Status
    Enabled: Indicates that the ROS system enabled after the ROS internal system check
    Disabled: Indicates that the ROS system disabled after the ROS internal system check
-Rollover Occupant Containment Enable Override Status
    Normal: Indicates that the ROS system enabled after receipt of expected messages from the SDM
    Override: Indicates that the ROS system enabled without receipt of expected messages from the SDM (This does not inhibit ROS performance)
-Event Enable SDM Confirmation will confirm the SDM's recite of the ROS event enable message
-Post-Event/Event Concluded Confirmation Messages From the SDM will Confirm the SDM's recite of the ROS event conclusion message
-Order of Event Record Information Counter is used if two events are recorded on the same ignition cycle. The event with the smaller recorded counter value came before the event with the grater recorded counter value
-Data Recording Complete indicates that the data record for that portion of the event was completely written
-When reviewing ROS crash data, associated SDM crash data should also be reviewed.

-All data should be examined in conjunction with other available physical evidence from the vehicle and scene.

Data Source:
All ROS recorded data is measured, calculated, and stored internally, except for the following:
-Vehicle Status Data (Pre-Crash) is transmitted to the ROS, by various vehicle control modules, via the vehicle's communication network.

01037_ROSC_r003

Event Record "A" Data

Crash Record Locked	Yes
Event Record Type	Rollover
SDM Event Synchronization Counter at Event Enable	2545
Ignition Cycles Since DTCs Were Last Cleared	255
Non-Rollover Data Overwritten	No
Vehicle Speed at Event Enable (MPH)	67
Vehicle Power Mode Status at Event Enable	Run
Remote Start Status at Event Enable (If Equipped)	Inactive
Time from Event Enable to Deployment Command Criteria Met (msec)	43
Rollover Occupant Containment Enable Status	Enabled
Rollover Occupant Containment Enable Override Status	Normal
Energy Source Rollover System Used	Battery
Number of Non-Rollover Events During this Ignition Cycle	0
Deployment Mode	IKEC
Event Enable SDM Confirmation	Yes
Safing Met	Yes
Order of Event Record Information Counter	1
Time from Rollover Deployment Command Criteria Met to Safing Being Met (msec)	N/A
Rollover Deployment Command Criteria Met Without Safing being Met	No
Data Recording Complete - Event Enable Data (Block 1)	Event Record Complete
Data Recording Complete -Non-Rollover/Rollover Data Less Sensor Data (Block 2)	Event Record Complete
Data Recording Complete - Event Concluded Data Less Completion of Event Record Type Data (Block 3)	Event Record Complete
Data Recording Complete - Post-Event Concluded	Event Record Complete

Event Concluded Confirmation Messages From the SDM

SDM in Sequence with ROS	Yes
Event Deployment, Data Received	Yes
Deployment Event, SDM in Sequence	Yes
Event Concluded, Data Received	No

Post-Event Concluded Confirmation Messages from the SDM

SDM in Sequence with ROS	Yes
Event Deployment, Data Received	Yes
Deployment Event, SDM in Sequence	Yes
Event Concluded, Data Received	No

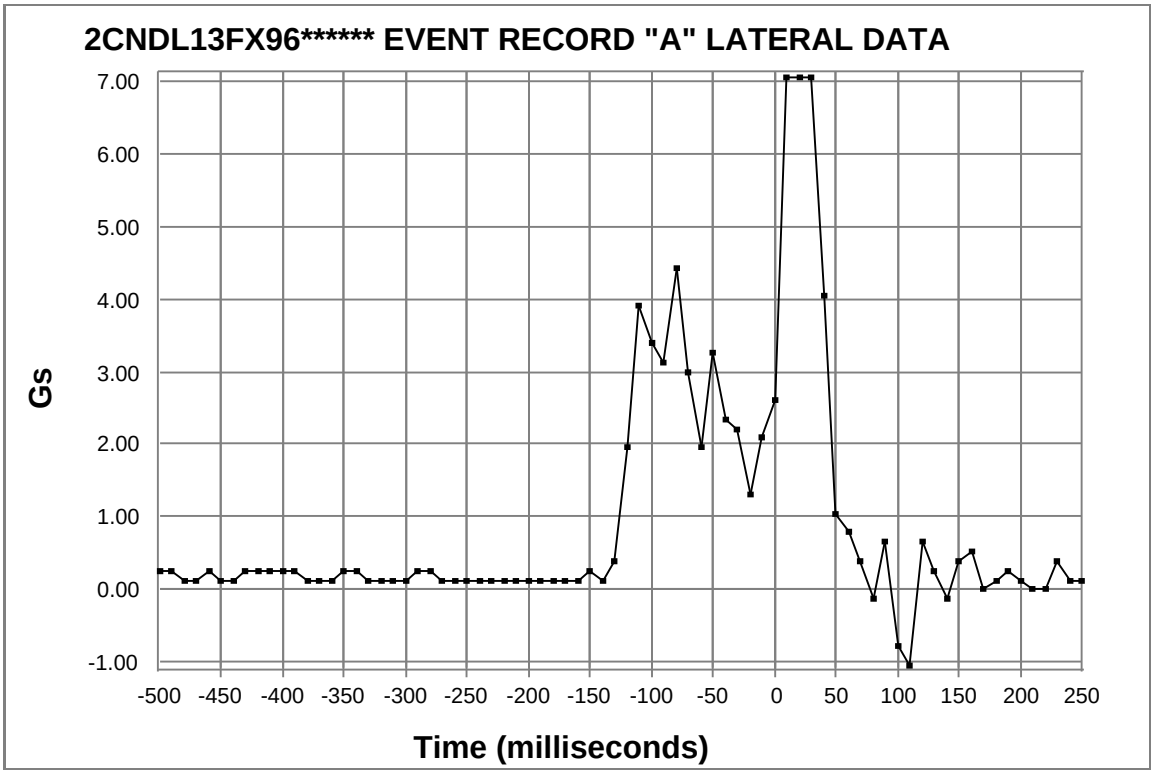
Diagnostic Trouble Codes at Event Enable

- None

Event Record "A" ROS Recorded Vehicle Lateral Acceleration

Time (ms)	Acceleration (G)
-500	0.26
-490	0.26
-480	0.13
-470	0.13
-460	0.26
-450	0.13
-440	0.13
-430	0.26
-420	0.26
-410	0.26
-400	0.26
-390	0.26
-380	0.13
-370	0.13
-360	0.13
-350	0.26
-340	0.26
-330	0.13
-320	0.13
-310	0.13
-300	0.13
-290	0.26
-280	0.26
-270	0.13
-260	0.13
-250	0.13
-240	0.13
-230	0.13
-220	0.13
-210	0.13
-200	0.13
-190	0.13
-180	0.13
-170	0.13
-160	0.13
-150	0.26
-140	0.13
-130	0.39

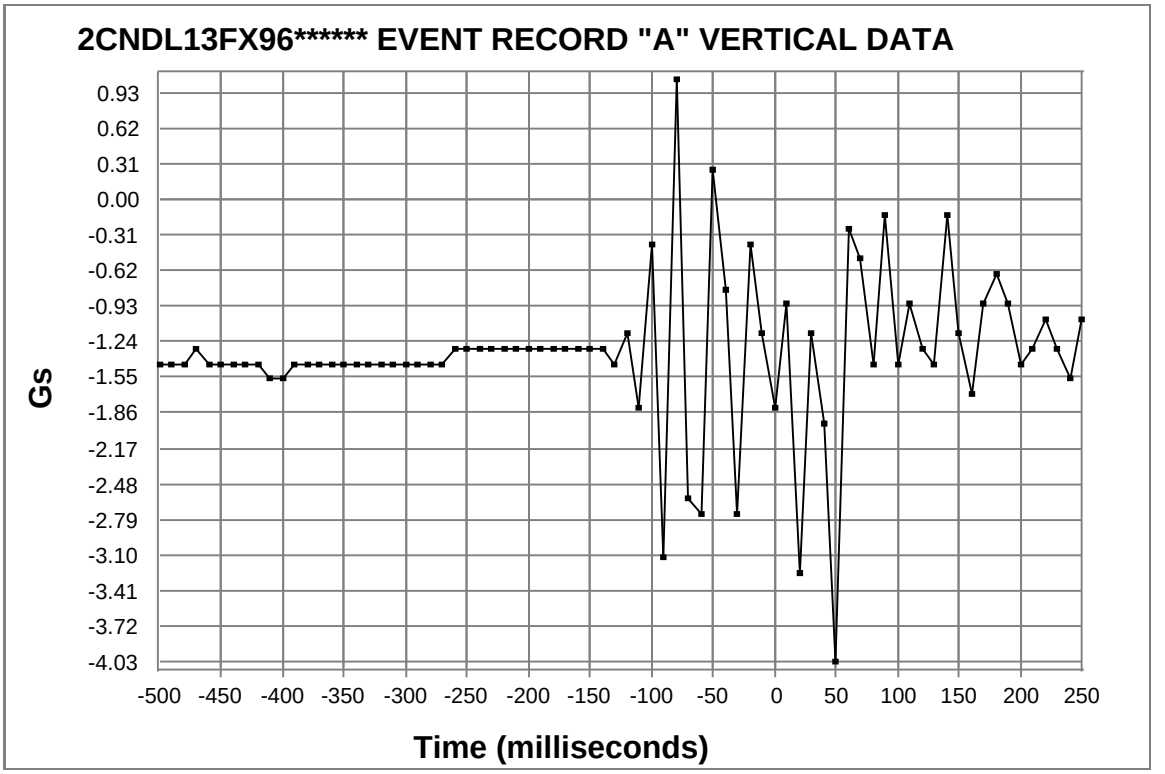
Time (ms)	Acceleration (G)
-120	1.95
-110	3.91
-100	3.39
-90	3.13
-80	4.43
-70	3.00
-60	1.95
-50	3.26
-40	2.35
-30	2.21
-20	1.30
-10	2.08
0	2.61
10	7.04
20	7.04
30	7.04
40	4.04
50	1.04
60	0.78
70	0.39
80	-0.13
90	0.65
100	-0.78
110	-1.04
120	0.65
130	0.26
140	-0.13
150	0.39
160	0.52
170	0.00
180	0.13
190	0.26
200	0.13
210	0.00
220	0.00
230	0.39
240	0.13
250	0.13


2CNDL13FX96****** EVENT RECORD "A" LATERAL DATA
Gs
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0 50 100 150 200 250
Time (milliseconds)

Event Record "A" ROS Recorded Vehicle Vertical Acceleration

Time (ms)	Acceleration (G)
-500	-1.43
-490	-1.43
-480	-1.43
-470	-1.30
-460	-1.43
-450	-1.43
-440	-1.43
-430	-1.43
-420	-1.43
-410	-1.56
-400	-1.56
-390	-1.43
-380	-1.43
-370	-1.43
-360	-1.43
-350	-1.43
-340	-1.43
-330	-1.43
-320	-1.43
-310	-1.43
-300	-1.43
-290	-1.43
-280	-1.43
-270	-1.43
-260	-1.30
-250	-1.30
-240	-1.30
-230	-1.30
-220	-1.30
-210	-1.30
-200	-1.30
-190	-1.30
-180	-1.30
-170	-1.30
-160	-1.30
-150	-1.30
-140	-1.30
-130	-1.43

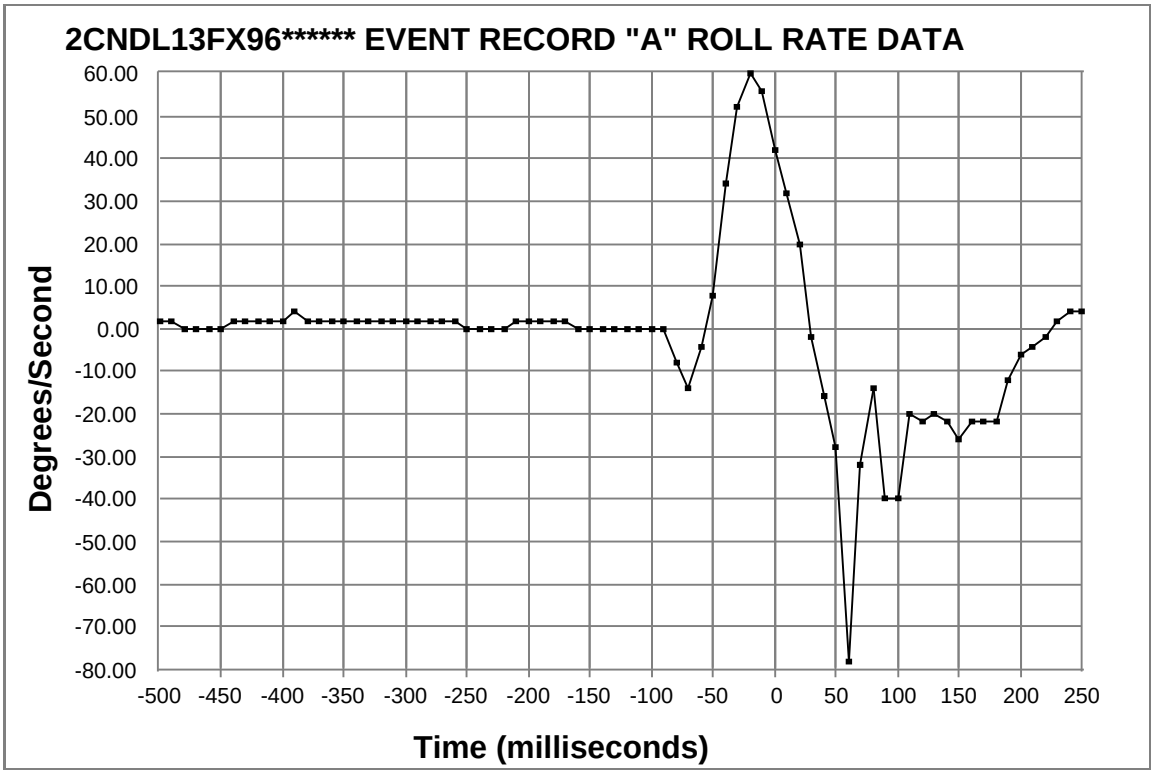
Time (ms)	Acceleration (G)
-120	-1.17
-110	-1.82
-100	-0.39
-90	-3.13
-80	1.04
-70	-2.61
-60	-2.74
-50	0.26
-40	-0.78
-30	-2.74
-20	-0.39
-10	-1.17
0	-1.82
10	-0.91
20	-3.26
30	-1.17
40	-1.95
50	-4.04
60	-0.26
70	-0.52
80	-1.43
90	-0.13
100	-1.43
110	-0.91
120	-1.30
130	-1.43
140	-0.13
150	-1.17
160	-1.69
170	-0.91
180	-0.65
190	-0.91
200	-1.43
210	-1.30
220	-1.04
230	-1.30
240	-1.56
250	-1.04


2CNDL13FX96****** EVENT RECORD "A" VERTICAL DATA
Gs
0.93
0.62
0.31
0.00
-0.31
-0.62
-0.93
-1.24
-1.55
-1.86
-2.17
-2.48
-2.79
-3.10
-3.41
-3.72
-4.03
-500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0 50 100 150 200 250
Time (milliseconds)

Event Record "A" ROS Recorded Vehicle Roll Rate Data

Time (ms)	Roll Rate (degrees/second)
-500	2.00
-490	2.00
-480	0.00
-470	0.00
-460	0.00
-450	0.00
-440	2.00
-430	2.00
-420	2.00
-410	2.00
-400	2.00
-390	4.00
-380	2.00
-370	2.00
-360	2.00
-350	2.00
-340	2.00
-330	2.00
-320	2.00
-310	2.00
-300	2.00
-290	2.00
-280	2.00
-270	2.00
-260	2.00
-250	0.00
-240	0.00
-230	0.00
-220	0.00
-210	2.00
-200	2.00
-190	2.00
-180	2.00
-170	2.00
-160	0.00
-150	0.00
-140	0.00
-130	0.00

Time (ms)	Roll Rate (degrees/second)
-120	0.00
-110	0.00
-100	0.00
-90	0.00
-80	-8.00
-70	-14.00
-60	-4.00
-50	8.00
-40	34.00
-30	52.00
-20	60.00
-10	56.00
0	42.00
10	32.00
20	20.00
30	-2.00
40	-16.00
50	-28.00
60	-78.00
70	-32.00
80	-14.00
90	-40.00
100	-40.00
110	-20.00
120	-22.00
130	-20.00
140	-22.00
150	-26.00
160	-22.00
170	-22.00
180	-22.00
190	-12.00
200	-6.00
210	-4.00
220	-2.00
230	2.00
240	4.00
250	4.00


2CNDL13FX96****** EVENT RECORD "A" ROLL RATE DATA
Degrees/Second
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
-70.00
-80.00
-500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0 50 100 150 200 250
Time (milliseconds)

Event Record "B" Data

Crash Record Locked	Yes
Event Record Type	Rollover
SDM Event Synchronization Counter at Event Enable	2545
Ignition Cycles Since DTCs Were Last Cleared	255
Non-Rollover Data Overwritten	No
Vehicle Speed at Event Enable (MPH)	45
Vehicle Power Mode Status at Event Enable	Run
Remote Start Status at Event Enable (If Equipped)	Inactive
Time from Event Enable to Deployment Command Criteria Met (msec)	15
Rollover Occupant Containment Enable Status	Enabled
Rollover Occupant Containment Enable Override Status	Normal
Energy Source Rollover System Used	Battery
Number of Non-Rollover Events During this Ignition Cycle	0
Deployment Mode	IKEC
Event Enable SDM Confirmation	No
Safing Met	Yes
Order of Event Record Information Counter	2
Time from Rollover Deployment Command Criteria Met to Safing Being Met (msec)	N/A
Rollover Deployment Command Criteria Met Without Safing being Met	No
Data Recording Complete - Event Enable Data (Block 1)	Event Record Complete
Data Recording Complete -Non-Rollover/Rollover Data Less Sensor Data (Block 2)	Event Record Complete
Data Recording Complete - Event Concluded Data Less Completion of Event Record Type Data (Block 3)	Event Record Complete
Data Recording Complete - Post-Event Concluded	Event Record Complete

Event Concluded Confirmation Messages From the SDM

SDM in Sequence with ROS	Yes
Event Deployment, Data Received	Yes
Deployment Event, SDM in Sequence	Yes
Event Concluded, Data Received	No

Post-Event Concluded Confirmation Messages from the SDM

SDM in Sequence with ROS	Yes
Event Deployment, Data Received	Yes
Deployment Event, SDM in Sequence	Yes
Event Concluded, Data Received	No

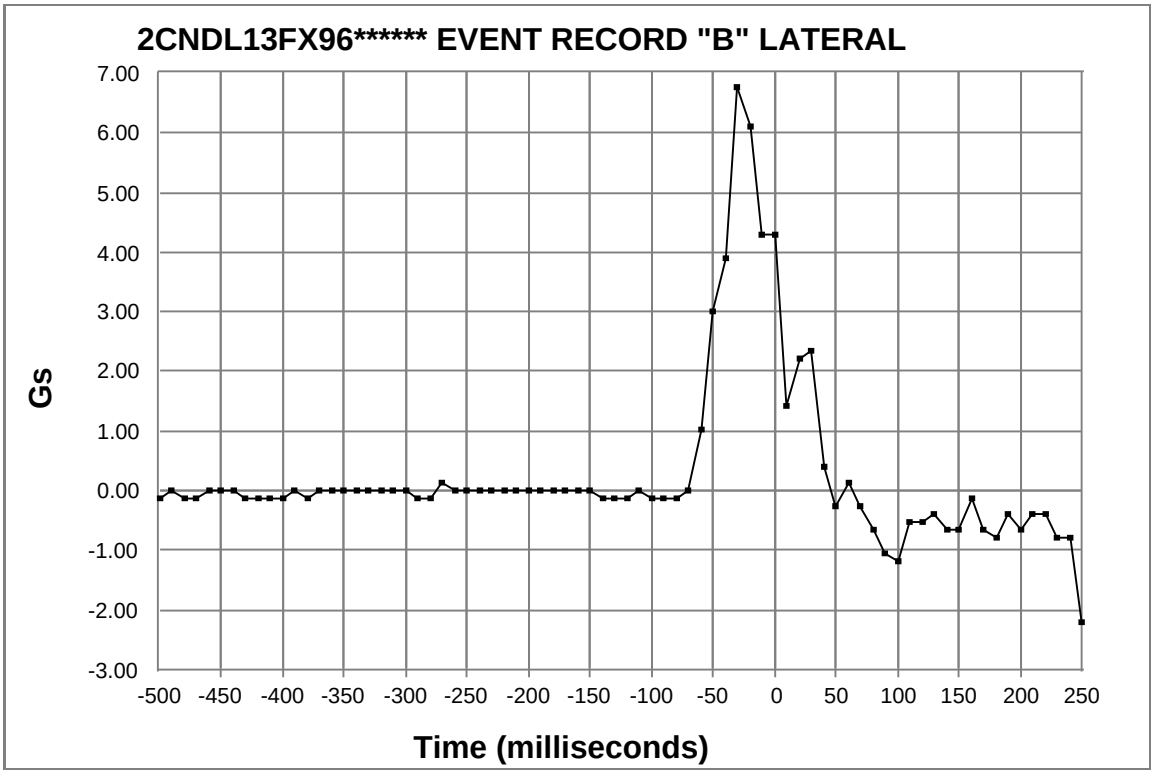
Diagnostic Trouble Codes at Event Enable

- None

Event Record "B" ROS Recorded Vehicle Lateral Acceleration

Time (ms)	Acceleration (G)
-500	-0.13
-490	0.00
-480	-0.13
-470	-0.13
-460	0.00
-450	0.00
-440	0.00
-430	-0.13
-420	-0.13
-410	-0.13
-400	-0.13
-390	0.00
-380	-0.13
-370	0.00
-360	0.00
-350	0.00
-340	0.00
-330	0.00
-320	0.00
-310	0.00
-300	0.00
-290	-0.13
-280	-0.13
-270	0.13
-260	0.00
-250	0.00
-240	0.00
-230	0.00
-220	0.00
-210	0.00
-200	0.00
-190	0.00
-180	0.00
-170	0.00
-160	0.00
-150	0.00
-140	-0.13
-130	-0.13

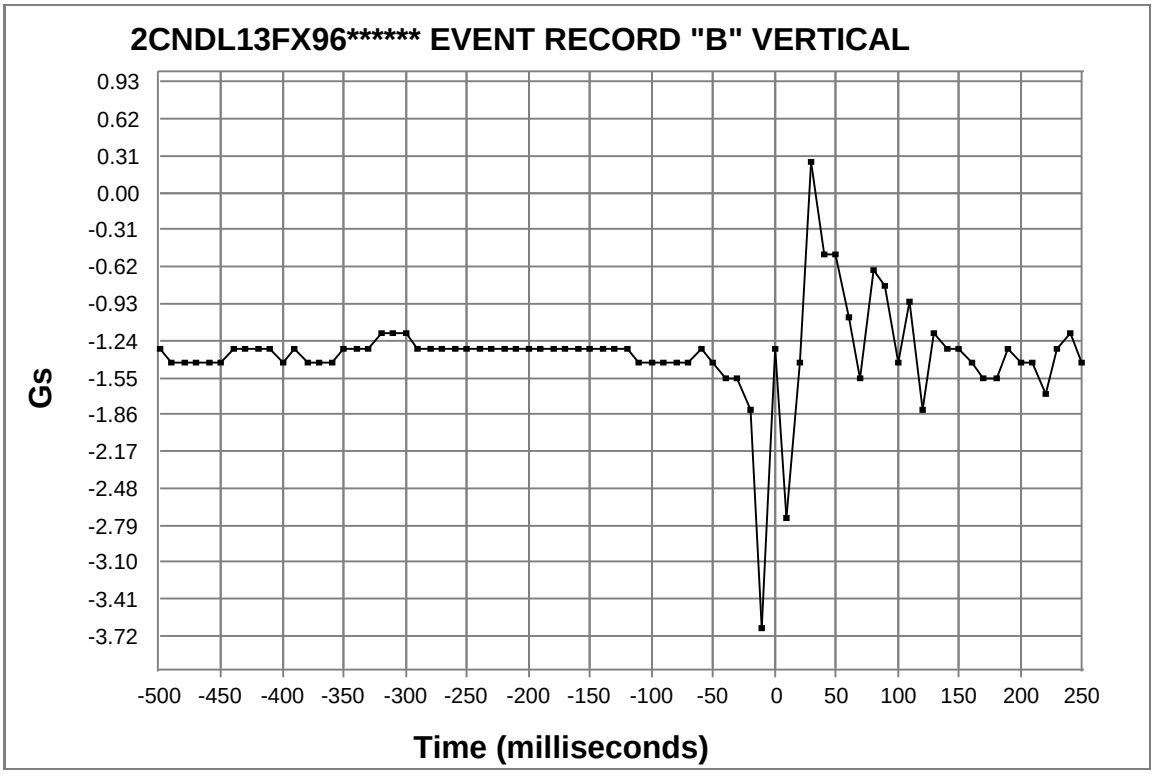
Time (ms)	Acceleration (G)
-120	-0.13
-110	0.00
-100	-0.13
-90	-0.13
-80	-0.13
-70	0.00
-60	1.04
-50	3.00
-40	3.91
-30	6.78
-20	6.12
-10	4.30
0	4.30
10	1.43
20	2.21
30	2.35
40	0.39
50	-0.26
60	0.13
70	-0.26
80	-0.65
90	-1.04
100	-1.17
110	-0.52
120	-0.52
130	-0.39
140	-0.65
150	-0.65
160	-0.13
170	-0.65
180	-0.78
190	-0.39
200	-0.65
210	-0.39
220	-0.39
230	-0.78
240	-0.78
250	-2.21


2CNDL13FX96****** EVENT RECORD "B" LATERAL
Gs
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0 50 100 150 200 250
Time (milliseconds)

Event Record "B" ROS Recorded Vehicle Vertical Acceleration

Time (ms)	Acceleration (G)
-500	-1.30
-490	-1.43
-480	-1.43
-470	-1.43
-460	-1.43
-450	-1.43
-440	-1.30
-430	-1.30
-420	-1.30
-410	-1.30
-400	-1.43
-390	-1.30
-380	-1.43
-370	-1.43
-360	-1.43
-350	-1.30
-340	-1.30
-330	-1.30
-320	-1.17
-310	-1.17
-300	-1.17
-290	-1.30
-280	-1.30
-270	-1.30
-260	-1.30
-250	-1.30
-240	-1.30
-230	-1.30
-220	-1.30
-210	-1.30
-200	-1.30
-190	-1.30
-180	-1.30
-170	-1.30
-160	-1.30
-150	-1.30
-140	-1.30
-130	-1.30

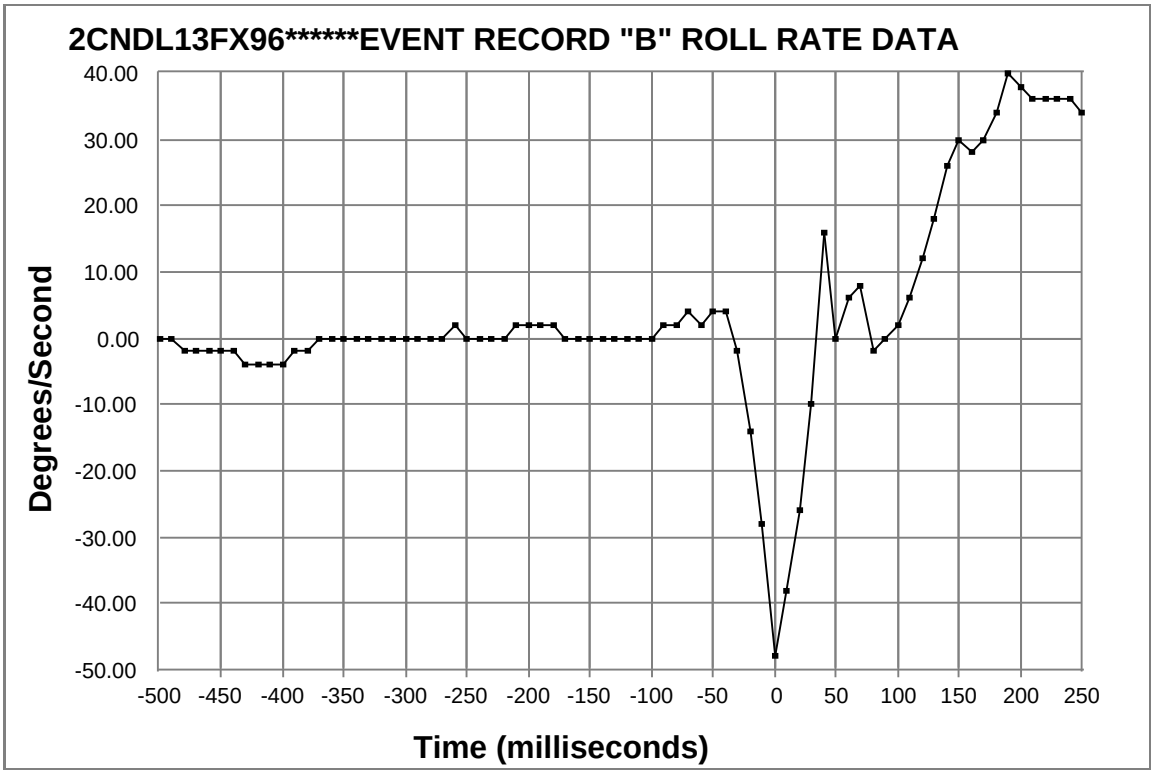
Time (ms)	Acceleration (G)
-120	-1.30
-110	-1.43
-100	-1.43
-90	-1.43
-80	-1.43
-70	-1.43
-60	-1.30
-50	-1.43
-40	-1.56
-30	-1.56
-20	-1.82
-10	-3.65
0	-1.30
10	-2.74
20	-1.43
30	0.26
40	-0.52
50	-0.52
60	-1.04
70	-1.56
80	-0.65
90	-0.78
100	-1.43
110	-0.91
120	-1.82
130	-1.17
140	-1.30
150	-1.30
160	-1.43
170	-1.56
180	-1.56
190	-1.30
200	-1.43
210	-1.43
220	-1.69
230	-1.30
240	-1.17
250	-1.43


2CNDL13FX96****** EVENT RECORD "B" VERTICAL
Gs
0.93
0.62
0.31
0.00
-0.31
-0.62
-0.93
-1.24
-1.55
-1.86
-2.17
-2.48
-2.79
-3.10
-3.41
-3.72
-500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0 50 100 150 200 250
Time (milliseconds)

Event Record "B" ROS Recorded Vehicle Roll Rate Data

Time (ms)	ACC (degrees/second)
-500	0.00
-490	0.00
-480	-2.00
-470	-2.00
-460	-2.00
-450	-2.00
-440	-2.00
-430	-4.00
-420	-4.00
-410	-4.00
-400	-4.00
-390	-2.00
-380	-2.00
-370	0.00
-360	0.00
-350	0.00
-340	0.00
-330	0.00
-320	0.00
-310	0.00
-300	0.00
-290	0.00
-280	0.00
-270	0.00
-260	2.00
-250	0.00
-240	0.00
-230	0.00
-220	0.00
-210	2.00
-200	2.00
-190	2.00
-180	2.00
-170	0.00
-160	0.00
-150	0.00
-140	0.00
-130	0.00

Time (ms)	ACC (degrees/second)
-120	0.00
-110	0.00
-100	0.00
-90	2.00
-80	2.00
-70	4.00
-60	2.00
-50	4.00
-40	4.00
-30	-2.00
-20	-14.00
-10	-28.00
0	-48.00
10	-38.00
20	-26.00
30	-10.00
40	16.00
50	0.00
60	6.00
70	8.00
80	-2.00
90	0.00
100	2.00
110	6.00
120	12.00
130	18.00
140	26.00
150	30.00
160	28.00
170	30.00
180	34.00
190	40.00
200	38.00
210	36.00
220	36.00
230	36.00
240	36.00
250	34.00


2CNDL13FX96******EVENT RECORD "B" ROLL RATE DATA
Degrees/Second
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0 50 100 150 200 250
Time (milliseconds)