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ON-SITE SIDE IMPACT INFLATABLE OCCUPANT PROTECTION INVESTIGATION

CASE NUMBER - IN08015
LOCATION - NEBRASKA
VEHICLE - 2004 CADILLAC CTS
CRASH DATE - February 2008

Submitted:

February 11, 2009

Contract Number: DTNH22-07-C-00044

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
National Center for Statistics and Analysis
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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*

This report covers an on-site Side Impact Inflatable Occupant Protection Investigation that involved a 2004 Cadillac CTS, a 1995 Jeep Grand Cherokee, and a 2007 Chevrolet Impala LT. The focus of this on-site investigation was on the Cadillac, which was equipped with side impact curtain air bags and seat back-mounted side impact air bags. The Cadillac and Chevrolet were stopped heading north at a 4-leg urban intersection. The Cadillac was in the through lane and the Chevrolet was in the left turn lane. The Jeep was proceeding east approaching the intersection. The Cadillac and Chevrolet proceeded into the intersection on a green light and the front of the Jeep impacted the Chevrolet's left side. The Chevrolet rotated counterclockwise and the Jeep continued east and its front impacted the Cadillac's left side. The impact force was sufficient to deploy the Cadillac's driver's seat back-mounted side impact air bag and side impact curtain air bag. All the vehicles came to rest within the intersection. The Cadillac's restrained 82-year-old female driver was transported by ambulance to a hospital where she was hospitalized for 6 days. The occupants of the Jeep and Chevrolet were also transported by ambulance to a hospital. All the vehicles were towed from the crash scene due to damage.

17. *Key Words* Side Curtain Air Bag Air Bag Deployment	Motor Vehicle Traffic Crash Injury Severity	18. *Distribution Statement* General Public		
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Figure 1: The damaged 2004 Cadillac CTS

This crash was brought to the National Highway Traffic Safety Administration's attention on April 2, 2008 by the sampling activities of the National Automotive Sampling System-General Estimates System. This on-site investigation was assigned on April 10, 2008. The crash occurred in February 2008 in Nebraska and was investigated by the applicable city police department. The crash involved a 2004 Cadillac CTS, a 1995 Jeep Grand Cherokee, and a 2007 Chevrolet Impala LT. The focus of this on-site investigation was on the Cadillac (**Figure 1**), which was equipped with side impact curtain air bags and seat back-mounted side impact air bags. This contractor inspected the Cadillac and imaged the Event Data Recorder (EDR) on April 15, 2008. The crash scene inspection and driver interview were completed on April 16, 2008. The Jeep and Chevrolet were not inspected. This report is based on the police crash report, crash scene inspection, Cadillac inspection, the Cadillac driver's interview and medical records, EDR data, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which the Cadillac and Chevrolet were traveling was a 5-lane, divided, city street, traversing in an north-south direction and both vehicles were initially stopped heading north at a 4-leg intersection. The Cadillac and Chevrolet's roadway had one through lane, a left turn lane, and a right turn lane. The roadway was separated from the south roadway by a raised concrete median 1.5 m (4.9 ft) in width. Each lane was nominally 3.4 m (11.2 ft) in width and the pavement markings consisted of solid white lane lines and a white right turn arrow. The trafficway on which the Jeep was traveling was a 6-lane, divided, state highway, traversing in an east-west direction and the Jeep was traveling east. The Jeep's roadway was curved right and had two through lanes, a right turn lane, and a left turn lane. The roadway was separated from the west roadway by a raised grass median 8.5 m (27.9 ft) in width. Each lane was nominally 3.7 m (12.1ft) in width and the pavement markings consisted of broken white center line and solid white turn lane lines. The intersection was controlled by multiple three-phase traffic signals and the speed limit for the involved trafficways was 72 km/h (45 mph). At the time of the crash, the light condition was daylight, the atmospheric condition was cloudy, and the roadway pavement was dry concrete with a positive 3.8% grade for the Cadillac and Chevrolet and a negative 1.5% grade for the Jeep. Traffic density was moderate to heavy, and the site of the crash was suburban/commercial. See the Crash Diagram on page 8 of this report.

Pre-Crash: The Cadillac was occupied by a restrained 82-year-old female driver and was stopped at the intersection in the through lane (**Figure 2**). The driver intended to proceed north through the intersection. The Chevrolet was occupied by a restrained 62-year-old female driver and was stopped at the intersection in the left turn lane (**Figure 2**). The driver intended to turn left and proceed west. The Jeep was occupied by a restrained 31-year-old male driver and a restrained 32-

year-old female front right passenger and was traveling east in the outside through lane (**Figure 3**). The driver intended to continue east through the intersection. The Cadillac's EDR data indicated that the vehicle accelerated to 18 km/h (11 mph) at 1 second prior to Algorithm Enable (AE). The Cadillac's driver stated during the interview that she did not take any actions to avoid the crash. The EDR recorded the brake switch circuit as on from 8 to 6 seconds prior to AE and off from 5 to 1 seconds prior to AE.

Crash: According to the police crash report, the Cadillac and Chevrolet proceeded into the intersection on a green light. As the Chevrolet's driver was proceeding with a left turn and the Cadillac's driver was proceeding straight ahead, the front of the Jeep impacted the left side of the Chevrolet. The impact caused the Chevrolet to rotate counterclockwise and the Jeep continued eastward. The front of the Jeep impacted the Cadillac's left front and rear doors (**Figure 4**). The Cadillac's direction of principal force was within the 10 o'clock sector and the impact force was sufficient to trigger a deployment of the left side impact curtain air bag and the driver's seat back-mounted side impact air bag. The Cadillac rotated counterclockwise and came to final rest in the intersection heading west. The Chevrolet also came to final rest in the intersection heading west, and the Jeep came to final rest heading northeast. The final rest positions were estimated based on the interview with the Cadillac's driver and the police crash report.

Post-Crash: The police, emergency medical service, and rescue service responded to the scene. Rescue personnel removed the Cadillac's left rear door and forced open the left front door in order to extricate the driver. The occupants of all the vehicles were transported by ambulance to a hospital and all the vehicles were towed from the crash scene due to damage.

Figure 2: Cadillac and Chevrolet's approach to the intersection; the Cadillac was stopped in the through lane and the Chevrolet was stopped in the left turn lane

Figure 3: Approach of the Jeep eastbound to the intersection; arrow shows the approach of the Cadillac and Chevrolet to impact in the intersection

Figure 4: Damage to left side of Cadillac from impact with the Jeep

The 2004 Cadillac CTS was a rear wheel drive, 4-door sedan (VIN: 1G6DM577940------) equipped with a 6-cylinder, 3.6 liter engine, automatic transmission, traction control, and an EDR. The front row was equipped with bucket seats with adjustable head restraints, lap-and-shoulder belts, driver and front right passenger dual stage frontal air bags, front seat back-mounted side impact air bags, and side impact curtain air bags. The second row was equipped with a bench seat with folding backs, adjustable head restraints in the outboard seating positions, lap-and-shoulder belts, and Lower Anchors and Tethers for Children (LATCH) in the outboard seating positions. The vehicle's mileage at the time of the inspection was 21,602 kilometers (13,423 miles) and the specified wheelbase was 288 cm (113.4 in).

CASE VEHICLE DAMAGE

Exterior Damage: The Cadillac's impact with the Jeep involved the left side plane. The left front and left rear doors and the left quarter panel all sustained direct damage. The direct damage began 69 cm (27 in) rear of the left front axle and extended 213 cm (83.9 in) along the left side of the vehicle. The crush measurements were taken at the mid-door level and the maximum residual crush was 29 cm (11.4 in) occurring at C_4. The vehicle's sill height was 36 cm (14.8 in) and the height of the maximum door crush was 50 cm (19.7 in). The door sill differential was 21 cm (8.3 in). The crush measurements at C_2 and C_3 (**Figure 5**) were estimated based on the appearance of the crush on the front door and crush at the lower portion of the B-pillar (**Figure 6**) because the left rear door had been removed by rescue personnel. The crush values at C_4 and C_5 were also adjusted to account for the displacement of the left front door when it was forced open during the rescue operations. The table below shows the vehicle's front crush profile.

Figure 5: Top view of crush to left side of Cadillac

Figure 6: Back to front view of crush to lower portion of the left "B"-pillar

Units	Event	Direct Damage		Field L	C_1	C_2	C_3	C_4	C_5	C_6	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	1	213	29	213	2	9	21	29	21	0	-32	-32
in		83.9	11.4	83.9	0.8	3.5	8.3	11.4	8.3	0.0	-12.6	-12.6

The Cadillac's left side wheelbase was lengthened 7 cm (2.8 in) and the right side wheelbase was lengthened 9 cm (3.5 in). Induced damage involved the left B-pillar, roof rail, and roof. Unrelated damage was also present on the left fender. The type of damage was markedly different from that on the doors. The damage was vertical, not horizontal, significantly higher on the fender than on the doors, and did not flow into the damage on the left front door. Also, the police crash report did not mention additional impacts or damage on the Cadillac.

Damage Classification The Cadillac's Collision Deformation Classification was **10-LZEW-3** (**290** degrees) for the impact with the Jeep. The Missing Vehicle algorithm of the WinSMASH program calculated the Cadillac's total Delta V 21 km/h (13.1 mph). The longitudinal and lateral velocity changes were -7.2 km/h (-4.5 mph) and 19.7 km/h (12.2 mph), respectively. The results are considered borderline because they are based only on the damage to the Cadillac. The vehicle's EDR recorded a maximum longitudinal velocity change of 10.17 km/h (-6.32 mph).

The manufacturer's recommended tire size was P225/50R17. The Cadillac was equipped with the recommended size tires. The Vehicle's tire data are shown in the table below.

Tire	*Measured Pressure*		*Vehicle Manufacturer's Recommended Cold Tire Pressure*		*Tread Depth*		*Damage*	*Restricted*	*Deflated*
	kPa	psi	kPa	psi	milli-meters	32nd of an inch			
LF	248	36	207	30	7	9	None	No	No
LR	248	36	207	30	6	8	None	No	No
RR	193	28	207	30	6	8	None	No	No
RF	234	34	207	30	6	8	None	No	No

Vehicle Interior: The inspection of the Cadillac's interior revealed no discernable evidence of occupant contact. There was also no steering rim deformation or compression of the energy absorbing steering column. The left front and left rear doors had been jammed shut while the right front and right rear doors remained closed and operational. All of the window glazing was either fixed or closed and the left front and left rear window glazing was disintegrated by impact forces. The windshield glazing was in placed and cracked from impact forces.

Figure 7: Intruded driver's seat back

The passenger compartment sustained intrusions of the left front door, left rear door, left B-pillar, sill, and the left roof side rail. The left B-pillar and left front door intruded laterally 15

cm (6 in) into the front left sector while the sill intruded 6 cm (2.4 in), and the left roof side rail was estimated to have intruded between 3 and 8 cm (1.2 and 3.1 in) The driver's seat back (**Figure 7**) was also displaced to the right and intruded laterally 22 cm (8.6 in) into the front center sector. Due to the displacement of the left front door and upper B-pillar/roof side rail during the rescue operations, the door and side rail intrusions were estimated.

AUTOMATIC RESTRAINT SYSTEM

The Cadillac was equipped with dual stage driver and front right passenger frontal air bags, but it was not certified by the manufacturer to be compliant to the Advanced Air Bag portion of the Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The driver's frontal air bag was located within the steering wheel hub and the front right passenger frontal air bag was located within the middle of the instrument panel. Neither of these air bags deployed as a result of the crash.

The Cadillac's side air bag system consisted of front seat back-mounted side impact air bags and roof side rail-mounted side impact curtain air bags. Based on the Holmatro Rescuer's Guide to Vehicle Safety Systems, the vehicle's side impact sensors were located on each side of the vehicle within the lower B-pillars. The inflation cylinders for the side impact curtain air bags were located within the roof side rail.

Figure 8: Driver's seat back-mounted side impact air bag

The left front seat back-mounted side impact air bag was located in the left side of the driver's seat back and deployed through a rectangular-shaped module cover flap that was 24 cm (9.4 in) in length.. The deployed air bag was approximately oval in shape (**Figure 8**) and was 36 cm (14 in) in width and 32 cm (13 in) in height. A few deployment scuffs and grease/dirt smears were noted on the inboard and outboard sides of the air bag, but no discernable occupant contacts or damage were observed.

The left side impact curtain air bag (**Figure 9**) was located along the left roof side rail, inside the head liner and extended from the A-pillar to the C-pillar. The side curtain air bag was 127 cm (50 in) in length and 40 cm (16 in) in height. The front portion of the air bag had been cut away.

Figure 9: Left side curtain air bag; front portion of air bag cut out by fire department

The Cadillac's EDR was imaged during the vehicle inspection via the Diagnostic Link Connector (DLC) using version 2.9 of the Crash Data Retrieval (CDR) tool and subsequently read using version 3.1. Both versions of the CDR tool imaged the identical data. The EDR recorded a non-deployment event and the report is attached at the end of this report[1]. The report indicated that the crash record was not locked and the event recording was complete. The SIR warning lamp was recorded as off and the driver's seat belt switch circuit was recorded as buckled. The time from AE to the maximum velocity change was 107.5 msec and the maximum recorded longitudinal velocity change was 10.17 km/h (-6.32 mph). The EDR's pre-crash data is discussed in the pre-crash section on page 1.

MANUAL RESTRAINT SYSTEM

The Cadillac was equipped with integrated lap-and-shoulder belts for the driver and front right seating positions and lap-and-shoulder belts for the three second row seating positions. The driver's seat belt consisted of continuous loop belt webbing, sliding latch plate, buckle-mounted pretensioner, an Emergency Locking Retractor (ELR), and a fixed upper anchor. The front right seat belt was similar but had a switchable ELR/Automatic Locking Retractor (ALR). The second row seat belts were equipped with continuous loop belt webbing, sliding latch plates, switchable ELR/ALR retractors, and fixed upper anchors.

The driver's seat belt had been used to tie the damaged left front door closed at the tow yard and as a result, the belt webbing was heavily abraded and dirty. While the latch plate showed evidence of historical usage, no evidence of loading or use in this crash was discernable. There was no evidence that the pretensioner had actuated during the crash. The driver stated during the interview that she was restrained by the lap-and-shoulder belt. The remaining seat positions were unoccupied.

CASE VEHICLE DRIVER KINEMATICS

The Cadillac's driver [82-year-old, female; 163 cm and 59 kgs (64 in and 130 lbs] was seated in an upright driving posture with her back against the seat back. Her left foot was on the floor, her right foot on the accelerator, and both hands were on the steering wheel. The seat track was in the middle track position and the seat back was slightly reclined. The tilt steering column was located between its middle and full down position. The driver was not wearing glasses or contact lenses at the time of the crash.

The Cadillac's impact with the Jeep displaced the driver to the left and forward, opposite the vehicle's 10 o'clock direction of principal force. While there was no discernable occupant contact evidence, occupant kinematic principles indicate that the driver's left upper arm and torso contacted her deployed seat back-mounted side impact air bag and her head probably contacted the side impact curtain air bag. The driver sustained four fractured left ribs with pneumothorax and

[1] Please note that the attached EDR report is a truncated version of the report devoid of the hexadecimal data for confidentiality reasons.

hemothorax, which probably resulted from riding down the seat back-mounted side impact air bag and loading the intruding left front door. The driver also sustained contusions on the left upper arm and shoulder due to contact with the air bag, as well as contusions on the left hand and forearm from contact with the left front door.

CASE VEHICLE DRIVER INJURIES

The driver was hospitalized for 6 days and had one follow-up visit to her doctor. The table below shows the driver's injuries and injury sources.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Fractured left ribs, posteriorly: 4th, 5th, 6th, 7th, with small left pneumothorax, left hemothorax, and bibasilar atelectasis	severe 450232.4,2	Left rear upper door quadrant[2]	Certain	Hospitalization records
2	Contusion {bruise}, 6.8 cm (2.7 in) left dorsal hand	minor 790402.1,2	Left forward upper door quadrant	Probable	Emergency room records
3	Contusion {bruise} left upper arm and lateral shoulder	minor 790402.1,2	Air bag, driver's side impact[2]	Probable	Interviewee (same person)
4	Contusion {bruise} left forearm, not further specified	minor 790402.1,2	Left forward upper door quadrant	Probable	Interviewee (same person)

1ST OTHER VEHICLE

The 1995 Jeep Grand Cherokee was a 4-wheel drive, 4-door, sport utility vehicle (VIN: 1J4GZ78Y7SC------). It was equipped with an 8-cylinder, 5.2 liter engine, 4-wheel anti-lock brakes, and a driver air bag, which deployed in the crash. The Jeep had been sold at auction and was not inspected.

The Chevrolet's 62-year-old female driver sustained a police reported B (non-incapacitating) injury.

2ND OTHER VEHICLE

The 2007 Chevrolet Impala LT was a front wheel drive, 4-door sedan (VIN: 2G1WC58R779------) equipped with a 3.9 liter, V-6 engine, 4-wheel anti-lock brakes, and depowered frontal air bags. The vehicle could not be located and was not inspected.

The Jeep's 31-year-old male driver and a 32-year-old female front right passenger both sustained a police reported B (non-incapacitating) injury.

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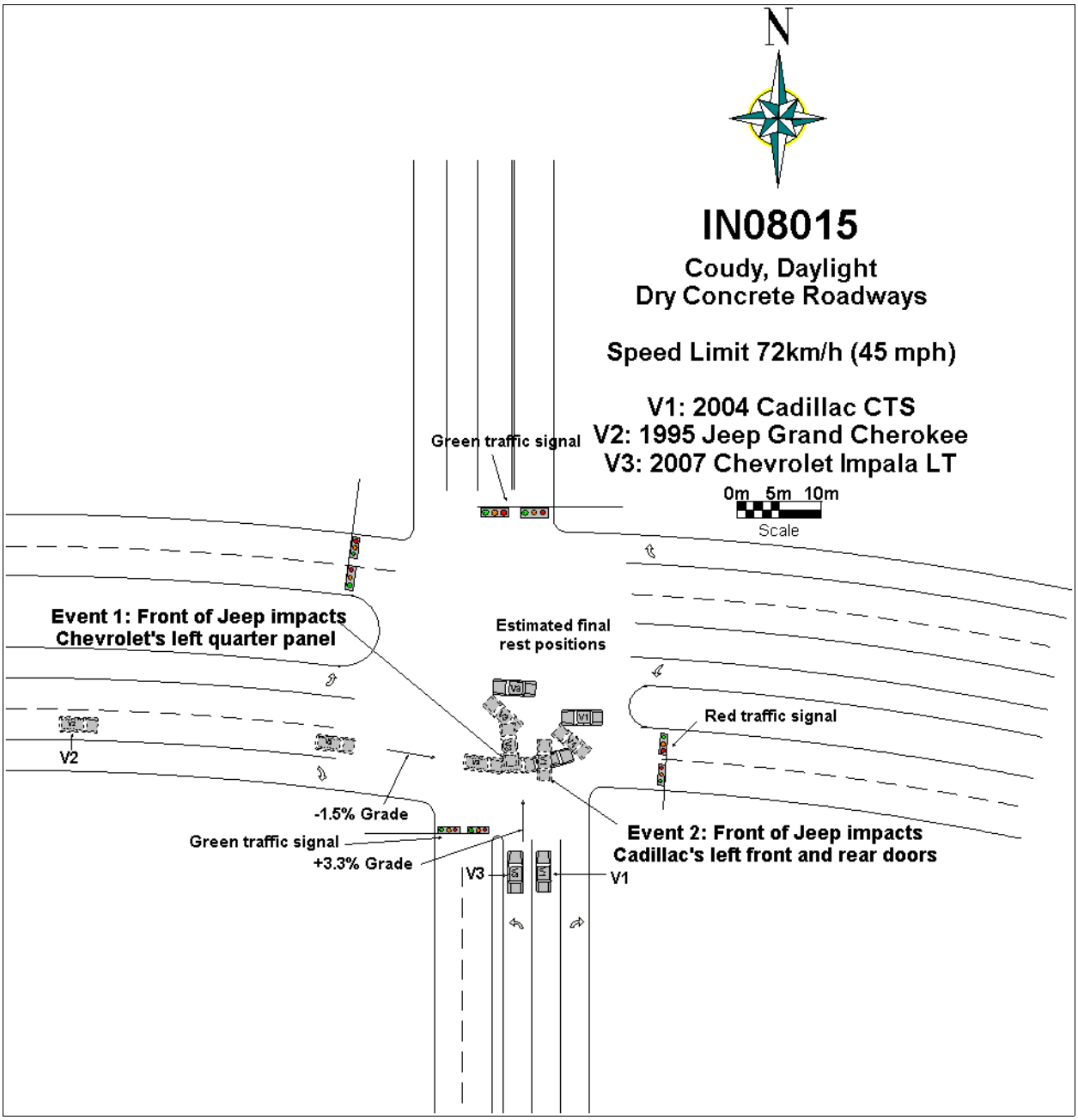
[2] Driver rode down driver's seat back-mounted side impact air bag and loaded intruding interior surface of driver's door.


N
IN08015
Coudy, Daylight
Dry Concrete Roadways
Speed Limit 72km/h (45 mph)
V1: 2004 Cadillac CTS
V2: 1995 Jeep Grand Cherokee
V3: 2007 Chevrolet Impala LT
Green traffic signal
0m 5m 10m
Scale
Event 1: Front of Jeep impacts Chevrolet's left quarter panel
Estimated final rest positions
Red traffic signal
V2
-1.5% Grade
Green traffic signal
+3.3% Grade
V3
V1
Event 2: Front of Jeep impacts Cadillac's left front and rear doors

CDR File Information

User Entered VIN	1G6DM577940******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	IN08015.CDR
Saved on	Tuesday, April 15 2008 at 01:41:26 PM
Collected with CDR version	Crash Data Retrieval Tool 2.900
Reported with CDR version	Crash Data Retrieval Tool 3.1
EDR Device Type	airbag control module
Event(s) recovered	Non-Deployment

IMPORTANT NOTICE: Robert Bosch LLC recommends that the latest production release of Crash Data Retrieval software be utilized when viewing, printing or exporting any retrieved data from within the CDR program. This ensures that the retrieved data has been translated using the most recent information including but not limited to that which was provided by the manufacturers of the vehicles supported in this product.

Data Limitations

Recorded Crash Events:
There are two types of Recorded Crash Events. The first is the Non-Deployment Event. A Non-Deployment Event is an event severe enough to "wake up" the sensing algorithm but not severe enough to deploy the air bag(s). It contains Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded vehicle Longitudinal velocity change. This event will be cleared by the SDM after the ignition has been cycled 250 times.
The second type of SDM recorded crash event is the Deployment Event. It also contains Pre-Crash and Crash data. The SDM can store up to two different Deployment Events, if they occur within 25.4 seconds of one another. Deployment Events cannot be overwritten or cleared from the SDM. Once the SDM has deployed the air bag, the SDM must be replaced.
The data in the Non-Deployment Event file will be locked after a Deployment Event, if the Non-Deployment Event occurred within 5 seconds before the Deployment Event. If multiple Non-Deployment Events occur within 5 seconds prior to a Deployment Event, then the most severe Non-Deployment Event will be recorded and locked. If multiple Non-Deployment Events precede a Deployment Event, and multiple Non-Deployment Events occur within 5 seconds of each other (but not necessarily all within 5 seconds of the Deployment Event), and subsequent Non-Deployment Events are less severe than prior Non-Deployment Events, and the last of the multiple Non-Deployment Events occurs within 5 seconds of a Deployment Event, then the most severe of the Non-Deployment Events (which may have occurred more than 5 seconds prior to the Deployment Event) will be recorded and locked.

Data Limitations:
-SDM Recorded Vehicle Longitudinal velocity Change reflects the change in Longitudinal velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Longitudinal 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. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle Longitudinal velocity change. For Deployment Events and Deployment Level Events, the SDM will record 100 milliseconds of data after deployment criteria is met and up to 50 milliseconds before deployment criteria is met. For Non-Deployment Events, the SDM will record the first 150 milliseconds of data after algorithm enable.
-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 if the vehicle has had the tire size or the final drive axle ratio changed from the factory build specifications.
-Brake Switch Circuit Status indicates the status of the brake switch circuit.
-Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if the SDM receive an invalid message from the module sending the pre-crash data.
-Driver's and Passenger's Belt Switch Circuit Status indicates the status of the seat belt switch circuit. If the vehicle's electrical system is compromised during a crash, the state of the Belt Switch Circuit may be reported other than the actual state.
-The Time Between Non-Deployment and Deployment Events is displayed in seconds. If the time between the two events is greater than 25.4 seconds, "N/A" is displayed in place of the time.
-If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.

-Multiple Events Associated with this Record: This parameter will indicate whether one or more associated events preceded the recorded event.
-One or More Associated Events Not Recorded: If a single event is recorded, this parameter will indicate whether one

or more associated events, prior to the recorded event, was not recorded.
If two associated events are recorded, this parameter for the first event will indicate whether one or more associated events, prior to the first event, was not recorded.
If two associated events are recorded, this parameter, for the second event, will indicate whether one or more associated events, between the first and second events, was not recorded.

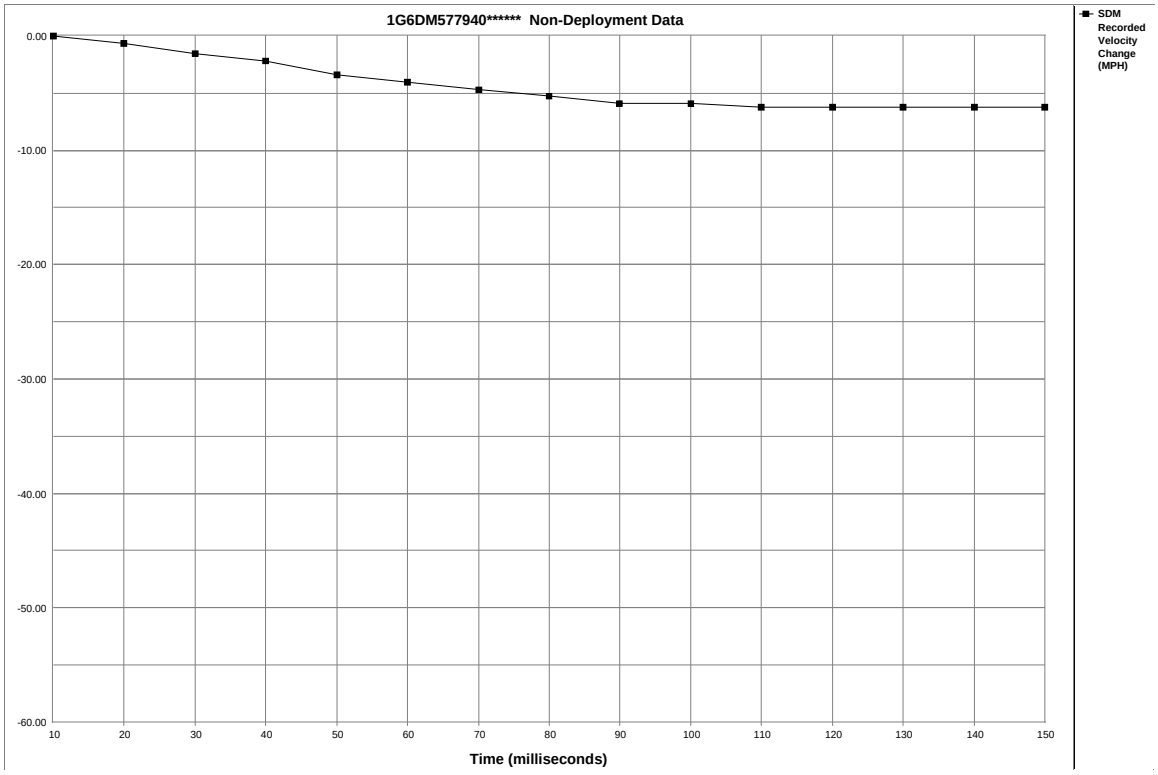
Data Source:
All SDM recorded data is measured, calculated, and stored internally, except for the following:
-Vehicle Speed, Engine Speed, and Percent Throttle data are transmitted once a second by the Powertrain Control Module (PCM), via the vehicle's communication network, to the SDM.
-Brake Switch Circuit Status data is transmitted once a second by either the ABS module or the PCM, via the vehicle's communication network, to the SDM.
-The SDM may obtain Belt Switch Circuit Status data a number of different ways, depending on the vehicle architecture. Some switches are wired directly to the SDM, while others may obtain the data from various vehicle control modules, via the vehicle's communication network.

System Status At Non-Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Ignition Cycles At Non-Deployment	1460
Ignition Cycles At Investigation	1467
Maximum SDM Recorded Velocity Change (MPH)	-6.32
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	107.5
Crash Record Locked	No
Event Recording Complete	Yes
Multiple Events	No
Multiple Events Not Recorded	No

Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle
-5	0	576	2
-4	0	832	13
-3	2	1536	20
-2	7	1920	20
-1	11	2304	9

Seconds Before AE	Brake Switch Circuit Status
-8	ON
-7	ON
-6	ON
-5	OFF
-4	OFF
-3	OFF
-2	OFF
-1	OFF



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	0.00	-0.62	-1.55	-2.17	-3.41	-4.03	-4.65	-5.27	-5.89	-5.89	-6.20	-6.20	-6.20	-6.20	-6.20