Certified Advanced 208 Compliant Investigation / Vehicle to Vehicle
Dynamic Science, Inc. / Case Number: DS06009
2006 Chevrolet Impala
Colorado
January, 2006

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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

The focus of this on-site investigation was on the performance of the Certified Advanced 208 Compliant air bags installed in a 2006 Chevrolet Impala. The multi-stage air bags were certified by the manufacturer to meet the advanced air bag requirement of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The Chevrolet Impala was occupied by a 21-year-old female restrained driver. The Impala was traveling westbound on a curved, two lane roadway. A 2002 Toyota Tacoma pickup truck was traveling eastbound. The driver of the Impala lost control of her vehicle in the turn and entered the eastbound travel lane. The driver of the Impala braked and was likely skidding before being struck in the front end by the front of the Tacoma. The impact resulted in sufficient longitudinal deceleration of the Impala to command the deployment of the frontal air bag system. The Impala was pushed rearward and to the north where the rear bumper struck a guardrail. The driver of the case vehicle sustained bilateral knee contusions, a horizontal contusion across her abdomen, and a sternum fracture. She also complained of a stiff neck. She declined any treatment at the time. She was, however, transported from the scene to a local hospital by a friend. She was treated and then released.

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Dynamic Science, Inc.
Crash Investigation
Case Number: DS06009

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BACKGROUND

Description

The focus of this on-site investigation was on the Certified Advanced 208 Compliant air bags installed in a 2006 Chevrolet Impala. The multi-stage air bags were certified by the manufacturer to meet the advanced air bag requirement of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The Chevrolet Impala was occupied by a 21-year-old female restrained driver. The Impala was traveling westbound on a curved, two lane roadway. A 2002 Toyota Tacoma pickup truck was traveling eastbound. The driver of the Impala lost control of her vehicle in the turn and entered the eastbound travel lane. The driver of the Impala braked and was likely skidding before being struck in the front end (see Figure 1) by the front of the Tacoma. The impact resulted in sufficient longitudinal deceleration of the Impala to command the deployment of the frontal air bag system. The Impala was pushed rearward and to the north where the rear bumper struck a guardrail. The driver of the case vehicle sustained bilateral knee contusions, a horizontal contusion across her abdomen, and a sternum fracture. She also complained of a stiff neck. She declined any treatment at the time. She was, however, transported from the scene to a local hospital by a friend. She was treated and then released.

Figure 1. Front, 2006 Chevrolet Impala

This Certified Advanced 208 Compliant case was initially identified by a NHTSA review of GES police reports. DSI was notified on March 31, 2006 by fax with instructions to determine if the case vehicle would be available for inspection. On April 13, 2006, DSI located the vehicle and learned that it was scheduled for sale at an insurance facility. DSI contacted the owner of this fleet vehicle and the vehicle was pulled from the sale list. On April 20, 2006 DSI obtained permission to do the inspection. Field work was completed on April 25, 2006.

SUMMARY

Crash Site

This two-vehicle crash occurred on a two-lane, undivided state highway (see Figures 2 and 3). The crash occurred in January 2006 at 0755 hours. The east/west roadway was configured with single lanes in each direction that were separated by a double yellow centerline. The centerline

was enhanced by perpendicular rumble strips that allow drivers to know by sound and vibration that they are crossing the centerline. The roadway curves to the right for westbound travel. The road is bordered on the south by a white shoulder line and a concrete barrier, and is bordered on the north by a metal guardrail. There is a positive grade in the westbound direction. At the time of the crash, the roadway was snow covered. The speed limit is 64 km/h (40 mph). The scene schematic is included as Attachment 1 at the end of this narrative report.

Figure 2. Area of impact, looking west

Pre-Crash

The case vehicle was a 2006 Chevrolet Impala that was being driven by a 21-year-old female. The other vehicle was a 2002 Toyota Tacoma pickup that was being driven by a 36-year-old female (see Figure 4). The Impala was part of a car rental fleet. The Impala was traveling westbound. The driver lost control of her vehicle and began to cross the centerline. The Electronic Data Recorder (EDR) reported speed 2.5 seconds before Algorithm Enable (AE) was 59.5 km/h (37.0 mph)[1]. The driver was braking at this time. Brake application was based on the EDR pre-crash data which showed the brake switch circuit status as ON and the driver interview. The driver continued braking until impact.

Figure 3. Area of impact, looking east

Figure 4. Exemplar view, 2002 Toyota Tacoma double cab

Crash

The Impala crossed the centerline and entered the eastbound travel lane. The 2002 Toyota Tacoma pickup truck was traveling eastbound and was unable to stop in time. The front of the Tacoma struck the left front of the Impala. The impact severity was moderate and resulted in the deployment of the driver's air bag and the actuation of the front seat belt pretensioners. The EDR-reported longitudinal velocity change was -39.01 km/h (-24.24 mph) at 160 milliseconds. The maximum lateral change was -9.2 km/h (-5.7 mph) at 150 milliseconds. The missing vehicle routine of the WinSmash program computed a total

[1]The EDR report is included as Attachment 2 to this report

delta V of 39.0 km/h (24.2 mph)[2]. The longitudinal and lateral components were -38.4 km/h (-23.9 mph) and -6.8 km/h (-4.2 mph), respectively. The Impala was pushed rearward in a counterclockwise direction. The rear of the Impala struck the metal guardrail on the northern side of the roadway.

Post-Crash

According to the driver, the driver's door was jammed shut after the crash. The driver remained seated until the fire department arrived. The fire department forced open the door. The driver of the case vehicle sustained bilateral knee contusions, a horizontal contusion across her abdomen, and a sternum fracture. She also complained of a stiff neck. She declined any treatment at the time. She was, however, transported from the scene to a local hospital by a friend. She was treated and then released. Both vehicles were towed from the scene due to damage. The Chevrolet Impala was later declared a total loss by the insurance company.

VEHICLE DATA - 2006 Chevrolet Impala

The 2006 Chevrolet Impala LS was identified by the Vehicle Identification Number (VIN): 2G1WB55K469xxxxxx. The Impala was a four-door sedan that was equipped with a 3.5 liter V6 flex fuel engine, an automatic transmission, front/rear disc brakes, power steering, and a tilt steering wheel. The Impala was configured with Goodyear Integrity P225/60R16 tires. The manufacturer's recommended maximum tire pressure was 303 kPa (44 psi). The specific tire information is as follows:

Tire	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	221 kPa (32 psi)	7 mm (9/32 in)	No	None
LR	241 kPa (35 psi)	5 mm (6/32 in)	No	None
RR	241 kPa (35 psi)	7 mm (9/32 in)	No	None
RF	248 kPa (36 psi)	7 mm (9/32 in)	Yes	None

The seating in the Chevrolet Impala was configured with fabric covered front bucket seats with adjustable head restraints. There is a center front seat which converts to an armrest or storage when not in use. It was not in use during this crash. The second row was configured with a cloth covered bench seat. At the time of the inspection, both front seats were found in the full rearward track position. The driver reported that the seat was in the middle track position at the time of the crash. The driver's seat back angle was 20 degrees, the seat bottom angle was 8 degrees.

[2]Calculated using stiffness values derived from NCAP test 5547 for Impala and test 4478 for Tacoma

VEHICLE DAMAGE

Exterior Damage - 2006 Chevrolet Impala

Damage Description:	The 2006 Chevrolet Impala sustained moderate front end damage as a result of the impact with the Tacoma pickup and minor damage to the rear bumper from the impact with the metal guardrail. The direct damage on the front began at the right bumper corner and extended 102.0 cm (40.1 in) laterally across the frontal plane. There was damage to the hood, the backing bar, right fender, and the upper radiator support. The plastic frontal fascia was broken away. The right wheelbase was shortened by 13.0 cm (5.1 in). The front right tire was restricted but not flattened. The damage to the rear bumper began at the left rear bumper corner and extended 79.0 cm (31.1 in) laterally across the rear plane.	
CDC:	Impact 1: 12FZEW2 Impact 2: 06BYLW1	
Delta V:	Total	39.0 km/h (24.2 mph)
	Longitudinal	-38.4 km/h (-23.9 mph)
	Latitudinal	-6.8 km/h (-4.2 mph)
	Energy	123,274 joules (90,922 ft lbs)

Six crush measurements were documented at the front bumper/backing bar level as follows: C1 = 12.0 cm (4.7 in), C2 = 23.0 cm (9.0 in), C3 = 37.0 cm (14.6 in), C4 = 44.0 cm (17.3 in), C5 = 43.0 cm (16.9 in), C6 = 46.0 cm (18.1 in). The maximum crush fell between C3 and C4 and measured 48.0 cm (18.9 in).

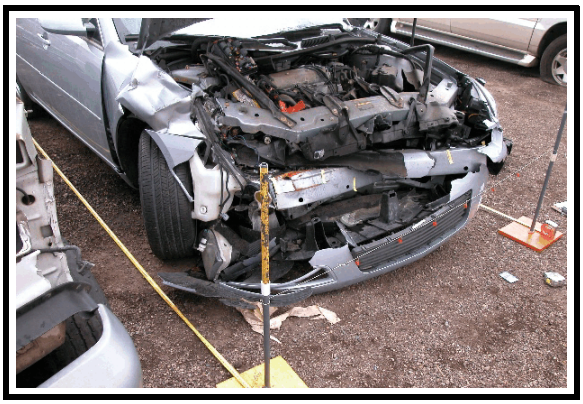


Figure 5. Impala frontal damage from impact with truck

Figure 6. Impala rear damage from impact with guardrail

Interior Damage

The Chevrolet Impala sustained moderate interior damage as a result of the air bag deployment and occupant contacts. There was loading to the steering wheel column and complete left and right shear capsule separation. The plastic panel beneath the steering column was dislodged by the movement of the column. The glove box was found fully opened at the time of the inspection. The center panel that contains the two power hookups was dislodged but power was still available through the hookups. The driver's door was jammed shut immediately after the crash and had to be opened by rescue personnel. The other doors remained closed and operational. There was no intrusion and no integrity loss.

Figure 7. Steering column separation (Chevrolet Impala)

Figure 8. Left shear capsule (Chevrolet Impala)

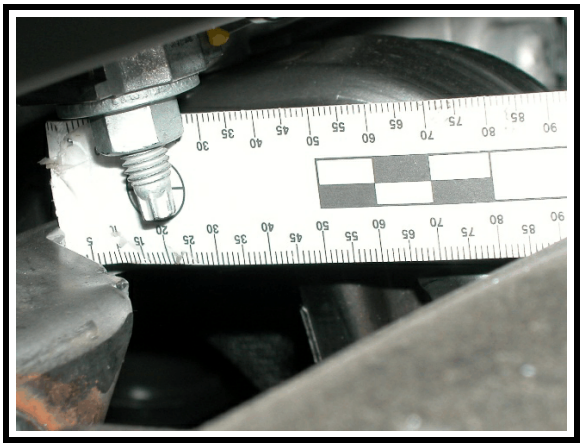


Figure 9. Right shear capsule (Chevrolet Impala)

Manual restraints - 2006 Chevrolet Impala

The 2006 Chevrolet Impala was configured with manual 3-point lap and shoulder belts for the front outboard seats and all three rear seating positions. The front center seat was configured with a manual lap belt. Both front seat safety belts were configured with retractor pretensioners and adjustable shoulder belt D rings that were in the full down position. The driver's safety belt was configured with a sliding latch plate and an Emergency Locking Retractor (ELR). At the time of the vehicle inspection, the driver's belt was locked in the used position as a result of pretensioner actuation. The front right passenger belt was locked in the stowed position as a result of pretensioner actuation. The remaining lap and shoulder belts were configured with sliding latch plates and switchable ELR/Automatic Locking Retractor (ALR) retractors.

Supplemental Restraint System - 2006 Chevrolet Impala

The 2006 Chevrolet Impala was equipped with an advanced occupant protection system. The system consists of the Sensing and Diagnostic Module (SDM), dual-level (dual stage) driver and front right passenger air bags, a front right passenger sensing system, and driver's and front right passenger's seat belt latch usage detectors. The system is controlled by the SDM, the primary function of which is to control the deployment of the occupant protection systems. The system records the vehicle's forward velocity change. For Deployment Events and Deployment Level Events, the SDM will 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 will record up to the first 300 milliseconds of data after algorithm enable. The minimum SDM Recorded Vehicle Velocity Change that is needed to record a Non-Deployment Event is 8.0 km/h (5.0 mph).

A single Deployment Event was recorded by the SDM. The Deployment Event occurred as a result of the impact with the Tacoma pickup truck. The Vetronix system status at deployment report indicates that:

1. Supplemental Inflatable Restraint (SIR) warning lamp status was OFF.
2. The driver's belt switch status was BUCKLED.
3. Ignition cycles at deployment 415.
4. Ignition cycles at investigation 415.
5. Maximum SDM recorded longitudinal velocity change was -39.01 km/h (-24.24 mph) at 160 milliseconds. The maximum lateral change was -9.2 km/h (-5.7 mph) at 150 milliseconds.
6. Driver first stage time algorithm enabled to deployment command criteria met was 18 milliseconds.
7. Driver second stage time algorithm enabled to deployment command criteria met was 18 milliseconds.
8. Passenger first stage time algorithm enabled to deployment command criteria met was SUPPRESSED.
9. Passenger second stage time algorithm enabled to deployment command criteria met was SUPPRESSED.
10. The driver and passenger pretensioner loops commanded was YES.
11. Time between non-deployment and deployment events N/A.

12. Estimated Principal Direction of Force (PDOF) degrees is 15.
13. Event recording complete YES.
14. The vehicle speed was 60 km/h (37 mph) 2.5 seconds before Algorithm Enable (AE) and decelerated to 0 km/h (0 mph) at 0.5 seconds before AE. The actual over the ground speed is not known. Speed is picked up at the vehicle speed sensor at the drive wheels and the wheels had likely locked up at this time.
15. The brake switch status was ON from 2.5 through 0.5 seconds before AE.

The driver's air bag deployed from the center of the steering wheel hub through symmetrical I-configuration module cover flaps. Each flap measured 13.0 cm (5.1 in) high by 6.0 cm (2.4 in) wide. The deployed driver's air bag measured 52.0 cm (20.5 in) in diameter in its deflated state. The air bag was tethered by a single internal strap attached to the center stitching. Two circular vent ports were located at the 11 and 1 o'clock positions on the rear of the air bag.

The front right passenger air bag was a mid mount design and did not deploy in this crash.

The Chevrolet Impala was also equipped with head-curtain side-impact air bags that did not deploy.

Figure 10. Driver's air bag

Figure 11. Driver's air bag, module covers

VEHICLE DATA - 2002 Toyota Tacoma pickup

Description:	2002 Toyota Tacoma pick, double cab, 4x4	
VIN:	5TEHN72N32Zxxxxxx	
Odometer:	Unknown	
Engine:	Unknown	
Reported Defects:	None noted	
Cargo:	Unknown	
Damage Description:	Moderate front end damage, per police report	
CDC:	Unknown	
Delta V:	Total	38.0 km/h (23.6 mph)
	Longitudinal	-37.4 km/h (-23.3 mph)
	Latitudinal	6.6 km/h (4.1 mph)
	Energy	85,896 joules (63,354 ft lbs)

OCCUPANT DEMOGRAPHICS - 2006 Chevrolet Impala

	Driver
Age/Sex:	21/Female
Seated Position:	Front left
Seat Type:	Bucket, seat adjusted to middle track position
Height:	157 cm (62 in)
Weight:	66 kg (146 lbs)
Occupation:	Ski instructor
Pre-existing Medical Condition:	None
Alcohol/Drug Involvement:	None
Driving Experience:	3-4 years
Body Posture:	Normal, upright
Hand Position:	Hands at 10 and 2 o'clock positions
Foot Position:	Right foot on brake, left on floor
Restraint Usage:	Manual 3-point lap and shoulder belt available, used
Air bag:	Steering wheel mounted driver's air bag, deployed. Head curtain side impact air bag, nondeployed.

OCCUPANT DEMOGRAPHICS - 2002 Toyota Tacoma

Age/Sex:	36/Female
Seated Position:	Front left
Seat Type:	Unknown
Height:	Unknown
Weight:	Unknown
Occupation:	Unknown
Pre-existing Medical Condition:	None noted
Alcohol/Drug Involvement:	None
Driving Experience:	Unknown
Body Posture:	Unknown
Hand Position:	Unknown
Foot Position:	Unknown
Restraint Usage:	“Restraints used” per police report

OCCUPANT INJURIES - 2006 Chevrolet Impala

Driver: Injuries obtained from interview.

Injury	OIC Code	Injury Mechanism	Confidence Level
Contusion, right knee	890402.1,1	Knee bolster	Probable
Contusion, left knee	890402.1,2	Knee bolster	Probable
Contusion, abdomen	590402.1,4	Seat belt webbing	Probable
Fracture, sternum	450804.2,4	Seat belt webbing	Probable

OCCUPANT KINEMATICS - 2006 Chevrolet Impala

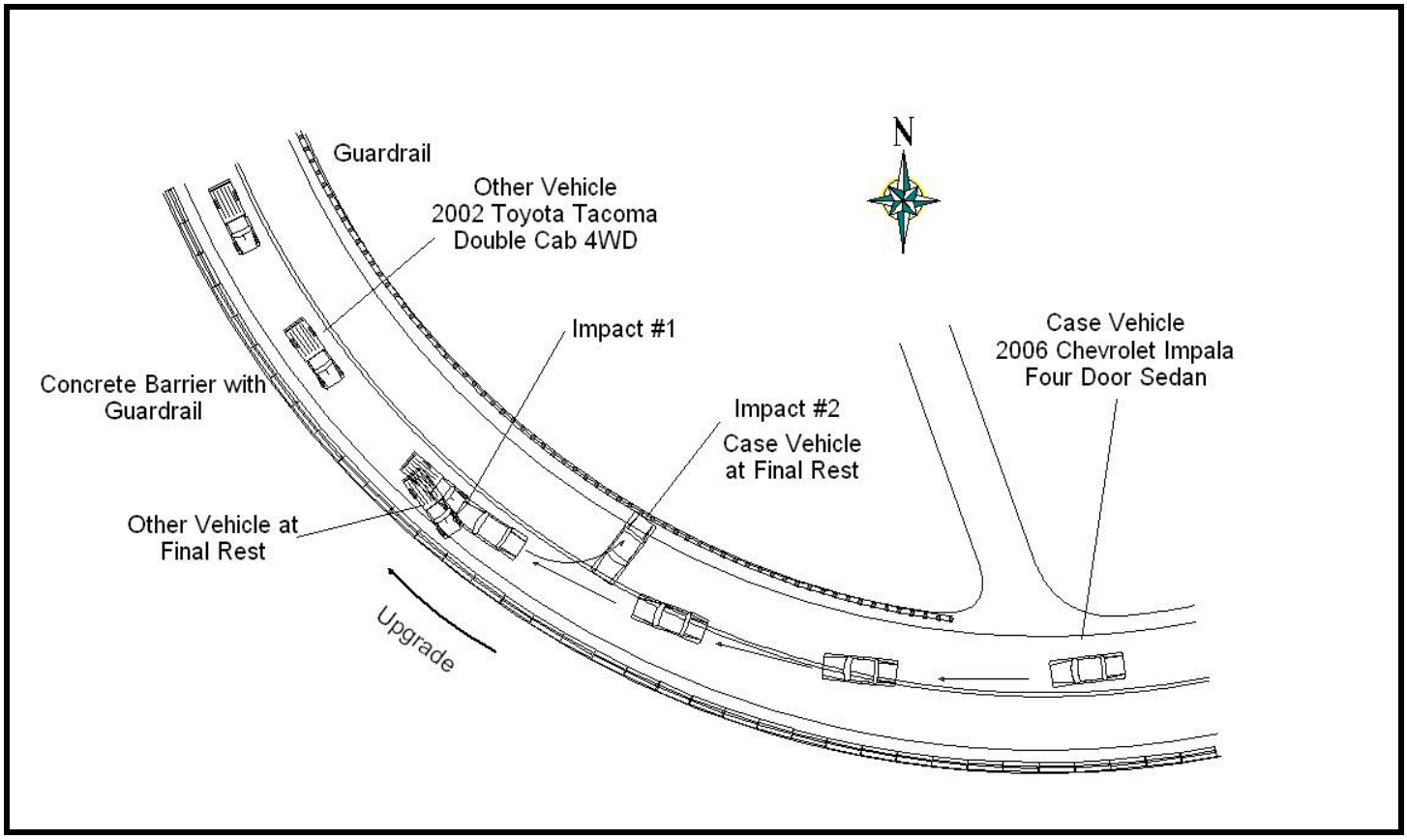
Driver Kinematics

The 21-year-old driver of the case vehicle was seated in an upright fashion. She was wearing the manual 3-point lap and shoulder belt. The shoulder harness adjustment was in the full down position. The seat was in the middle track position. The driver was not wearing eyeglasses or contacts. Her hands were at the 10 and 2 o'clock positions on the steering wheel. Prior to impact, she was braking. Her right foot was on the brake, the left on the floor. At impact, the driver's air bag deployed and the safety belt pretensioner actuated. The driver initiated a forward and slightly left trajectory. Both knees contacted the knee bolster, causing minor contusions. She loaded the safety belt, causing the abdominal contusion. As the driver pitched forward she loaded the shoulder portion of the safety belt, as well as the air bag and steering wheel column. There was complete left and right shear capsule separation due to loading. The driver sustained a sternum fracture that was most likely sustained due to loading the shoulder harness. The driver remained seated post crash until the fire department arrived. The fire department forced open the driver's door.

Figure 12. Impala driver's seated area

Figure 13. Impala lower instrument panel, knee bolster

Attachment 1. Scene Diagram



Attachment 2. Vetronix Report

CDR File Information

Vehicle Identification Number	2G1WB55K469******
Investigator	
Case Number	
Investigation Date	
Crash Date	
Filename	06009 WITHOUT VIN.CDR
Saved on	Tuesday, April 25 2006 at 08:38:29 AM
Collected with CDR version	Crash Data Retrieval Tool 2.800
Collecting program verification number	9238B95E
Reported with CDR version	Crash Data Retrieval Tool 2.800
Reporting program verification number	9238B95E
Interface used to collected data	Block number: 00 Interface version: 4A Date: 11-08-05 Checksum: 7500
Event(s) recovered	Deployment

SDM Data Limitations

SDM Recorded Crash Events:
There are two types of SDM 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). The minimum SDM Recorded Vehicle Forward Velocity Change, that is needed to record a Non-Deployment Event, is 5 MPH. It can contain Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by a Deployment Level Event, if the Non-Deployment Event is not locked. This event will be cleared by the SDM, after 250 ignition cycles.
The second type of SDM recorded crash event is the Deployment Event. It also can contain Pre-Crash and Crash data. The SDM can store up to two different Deployment Events. 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 a Deployment Level Event occurs any time after the Deployment Event, the Deployment Level Event will overwrite any non-locked Non-Deployment Event.

SDM Data Limitations:
-SDM Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Forward 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 forward velocity change. For Deployment Events and Deployment Level Events, the SDM will 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 will record up to the first 300 milliseconds of data after algorithm enable. The minimum SDM Recorded Vehicle Forward Velocity Change, that is needed to record a Non-Deployment Event, is 5 MPH.
-Maximum Recorded Vehicle Velocity Change is the maximum recorded velocity change in the vehicle's combined "X" and "Y" axis.
-Calculated Principal Direction of Force (PDOF) is the arctangent of the maximum observed lateral velocity change divided by the maximum observed longitudinal velocity change. PDOF is displayed where zero degrees is located at the front of the vehicle, with 90 degrees is displayed to the right side of the vehicle and so on, clockwise around the vehicle.
-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.
-The Time Between Non-Deployment and Deployment Events is displayed in seconds. If the time between the two events is greater than 5 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.
-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.
SDM 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.

System Status At AE

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

Pre-crash data

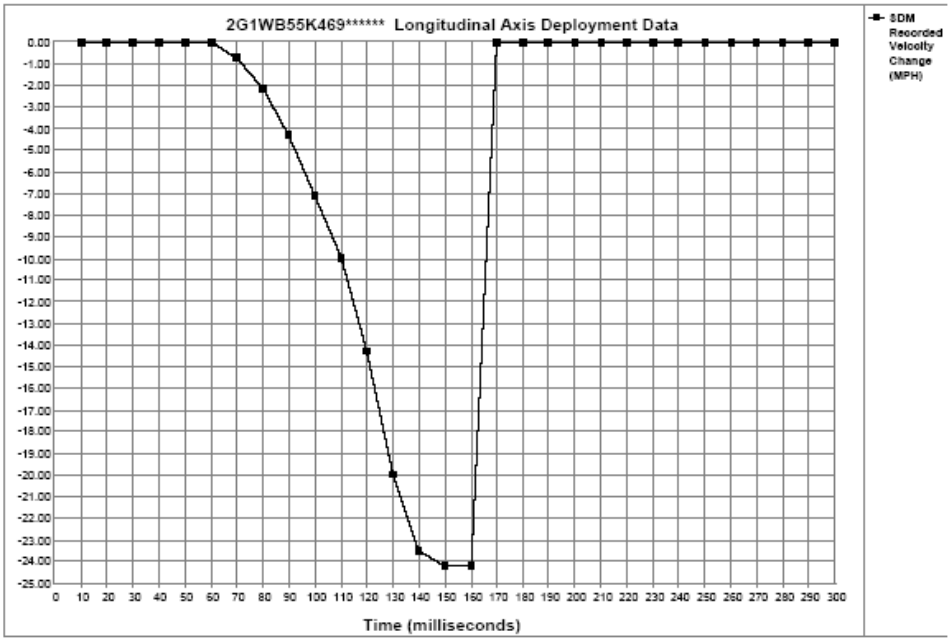
Parameter	-1 sec	-.5 sec
Reduced Engine Power Mode	OFF	OFF
Cruise Control Active (If Equipped)	No	No
Cruise Control Resume Switch Active (If Equipped)	No	No
Cruise Control Set Switch Active (If Equipped)	No	No
Engine Torque (foot pounds)	15.86	16.04

Pre-crash data

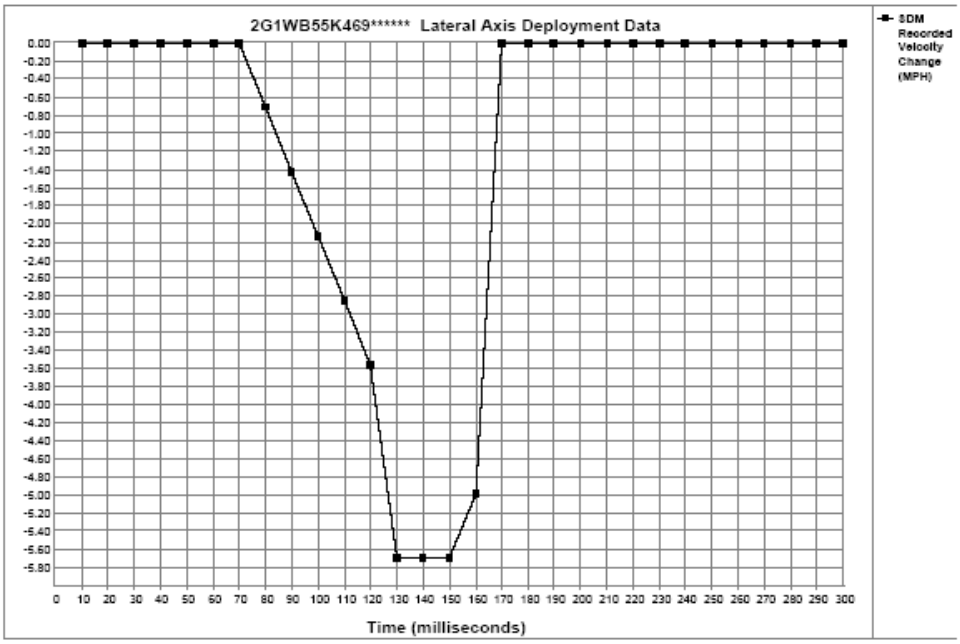
Parameter	-2.5 sec	-2.0 sec	-1.5 sec	-1.0 sec	-0.5 sec
Vehicle Speed (MPH)	37	7	0	2	0
Engine Speed (RPM)	832	576	512	640	576
Percent Throttle	7	6	7	6	7
Brake Switch Circuit Status	ON	ON	ON	ON	ON

System Status At Deployment

Ignition Cycles At Investigation	415
SIR Warning Lamp Status	OFF
SIR Warning Lamp ON/OFF Time (seconds)	0
Number of Ignition Cycles SIR Warning Lamp was ON Continuously	409
Ignition Cycles At Event	415
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 First Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	18
Driver Second Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	26
Passenger First Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	Suppressed
Passenger Second Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	Suppressed
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)	N/A
Crash Record Locked	Yes
Vehicle Event Data (Pre-Crash) Associated With This Event	Yes
SDM Synchronization Counter	414
Event Recording Complete	Yes
Driver First Stage Deployment Loop Commanded	Yes
Passenger First Stage Deployment Loop Commanded	No
Driver Second Stage Deployment Loop Commanded	Yes
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	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
Multiple Event Counter	0
An Event(s) Preceded the Recorded Event(s)	No
An Event(s) was in Between the Recorded Event(s)	No
An Event(s) Followed the Recorded Event(s)	No
The Event(s) Not Recorded was a Deployment Event(s)	No
The Event(s) Not Recorded was a Non-Deployment Event(s)	No
Estimated Principal Direction of Force (PDOF) degrees	15



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Longitudinal Axis Recorded Velocity	0.00	0.00	0.00	0.00	0.00	0.00	-0.71	-2.14	-4.28	-7.13	-9.98	-14.26	-19.96	-23.52	-24.24
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
Longitudinal Axis Recorded Velocity	-24.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Lateral Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.71	-1.43	-2.14	-2.85	-3.56	-5.70	-5.70	-5.70
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
Lateral Axis Recorded Velocity Change (MPH)	-4.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Hexadecimal Data

This page displays all the data retrieved from the air bag module.
It contains data that is not converted by this program.

```
$01  00 00 00 00 00 00 00
$02  00 00 00 00 00 00 00
$03  00 00 00 00 00 00 00
$04  00 00 00 00 00 00 00
$05  28 22 00 00 00 00 00
$06  C0 00 00 00 00 00 00
$0A  08 00 00 20 00 00 00
$0B  00 00 00 00 00 00 00
$0C  00 00 00 00 00 00 00
$0D  00 00 00 00 00 00 00
$0E  00 00 00 00 00 00 00
$0F  00 00 00 00 00 00 00
$10  00 00 00 00 00 00 00
$11  01 15 15 00 00 00 00
$12  FF 00 F0 F0 C0 00 00
$13  F3 00 C0 30 40 00 00
$14  F3 00 C0 30 40 00 00
$15  01 02 03 04 00 00 05
$16  06 00 00 00 00 00 00
$17  00 00 00 00 00 00 00
$18  01 03 04 05 00 00 00
$19  07 02 07 02 07 07 07
$1A  07 00 00 00 00 00 00
$1B  00 00 00 00 00 00 00
$1C  00 00 00 00 00 00 00
$1D  00 00 00 00 00 00 00
$1E  01 00 00 00 00 00 00
$1F  00 00 00 00 00 00 00
$20  00 00 00 00 00 00 00
$21  00 00 00 00 00 00 00
$22  00 00 00 00 00 00 00
$23  00 00 00 00 00 00 00
$24  00 00 00 00 00 00 00
$25  00 00 00 00 00 00 00
$26  00 50 54 A7 83 56 05
$27  02 99 00 00 00 00 00
$28  00 00 00 00 00 00 00
$29  00 00 00 00 00 00 00
$2A  00 A0 00 00 00 00 00
$2B  01 01 50 00 00 00 00
$2C  00 FF 00 FF FF 00 00
$2D  FF FF FF FF FF 80 00
$2E  00 80 00 80 00 80 00
$2F  FF FF FF FF FF 80 00
$30  0F FF 0F FF 80 00 00
$31  FF FF FF FF FF 80 00
$32  FF FF FF FF FF 80 00
$33  00 00 00 00 00 00 00
$34  00 00 00 00 00 00 00
$35  00 00 00 00 00 00 00
$36  00 00 00 00 00 00 00
$37  00 00 00 00 00 00 00
$38  00 00 00 00 00 00 00
$39  00 00 00 00 00 00 00
$3A  00 FF 00 00 00 00 00
$3B  00 00 00 01 99 00 00
$3C  00 FF 01 9F FF 01 9F
$3D  B4 C0 00 00 00 00 00
$40  00 00 00 00 00 00 00
$41  F8 00 00 00 00 80 90
$42  09 0A 08 09 0D 00 00
```

```
$43  03 77 03 76 00 00 00
$44  11 10 11 10 13 00 00
$45  00 03 00 0C 3B 00 00
$46  00 B4 C0 00 00 00 00
$50  00 00 00 00 00 00 00
$51  00 00 00 00 00 00 00
$52  00 00 00 00 00 00 00
$53  00 00 00 00 00 00 00
$54  00 00 00 00 00 00 00
$55  00 00 00 00 00 00 00
$56  00 00 00 00 00 00 00
$57  00 00 00 00 00 00 00
$58  00 00 00 00 00 00 00
$59  00 00 00 00 00 00 00
$5A  00 00 00 00 00 00 00
$5B  00 00 00 00 00 00 00
$5C  00 00 00 00 00 00 00
$5D  00 00 00 00 00 00 00
$5E  00 00 00 00 00 00 00
$5F  00 00 00 00 00 00 00
$60  00 00 00 00 00 00 00
$61  00 00 00 00 00 00 00
$62  00 00 00 00 00 00 00
$63  00 00 00 00 00 00 00
$64  00 00 00 00 00 00 00
$65  00 00 00 00 00 00 00
$66  00 00 00 00 00 00 00
$90  A0 A5 00 00 00 00 00
$91  A3 00 00 00 00 00 00
$92  00 00 00 01 99 00 00
$93  FF 01 9F 01 9E 00 00
$94  00 00 00 00 00 00 00
$95  00 00 00 00 00 00 00
$96  00 00 00 00 00 00 00
$97  00 00 00 00 00 00 00
$98  00 00 00 00 00 00 00
$99  00 00 00 00 00 00 00
$9A  00 00 00 00 00 00 00
$9B  01 00 03 FF 06 FE 00
$9C  0A FD 0E FC 14 FB 00
$9D  1C F8 21 F8 22 F8 00
$9E  22 F9 00 00 00 00 00
$9F  00 00 00 00 00 00 00
$A0  00 00 00 00 00 00 00
$A1  00 00 00 00 00 00 00
$A2  00 00 00 00 00 00 00
$A3  84 54 54 50 00 00 00
$A4  00 00 01 20 01 20 00
$A5  09 0D 00 00 00 00 00

$01  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$02  00 00 00 00
$03  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$04  00 00 00 00
$05  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$06  00 00 00 00
$07  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$08  00 00 00 00
$09  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$0A  00 00 00 00
$0B  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$0C  00 00 00 00
$0D  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$0E  00 00 00 00
$0F  74 43 00 00
$22  28 22
$23  47 31 57 FA 35 35 FA FA
```

```
$24  47 31 57 FA 35 35 FA FA
$25  47 31 57 FA 35 35 FA 35
$26  47 31 57 FA 35 35 FA 35
$40  00 00
$42  D4 10 10
$43  00 00 FC 9E
$44  C6 00 00 FC 80 00
$45  00 00 0A 0A 64 64 64 64
$46  00 00 00 00 00 00 00 00 00 00 04 64
$47  18 08 08
$B4  41 53 32 30 35 36 45 35 32 30 52 58 55 33 32 30
$C1  00 E9 6A 20
$C2  00 F1 96 F6
$CB  00 E9 56 98
$CC  00 E9 56 98
$DB  47 41
$DC  47 41
```