On-Site Side Air Bag Investigation
Dynamic Science, Inc. (DSI), Case Number DS10012
2006 Buick LaCrosse
Arizona
March 2010

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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 the deployed side air bag and the injuries sustained by the driver of a 2006 Buick LaCrosse involved in a vehicle-to-vehicle crash. The Buick was being driven by a restrained 60-year-old female who was traveling southbound through a four-leg intersection. The other vehicle was a 2008 Ford F-150 that was being driven by a 19-year-old male who was traveling westbound through the intersection. The Buick crossed the path of the Ford and the front end of the Ford impacted the left side of the Buick. The Buick was equipped with frontal air bags and side impact inflatable curtain (IC) air bags and at impact the driver's frontal air bag and the left IC air bag deployed. The driver of the Buick sustained serious injuries and was transported to a local hospital where she was admitted for treatment. Both vehicles were towed due to damage and the Buick was later declared a total loss by the insurance company. The Ford was not inspected.

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Crash Investigation
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Background

The focus of this on-site investigation was the deployed side air bag and the injuries sustained by the driver of a 2006 Buick LaCrosse involved in a vehicle-to-vehicle crash (**Figure 1**). The Buick was being driven by a restrained 60-year-old female who was traveling southbound through a four-leg intersection. The other vehicle was a 2008 Ford F-150 that was being driven by a 19-year-old male who was traveling westbound through the intersection. The Buick crossed the path of the Ford and the front end of the Ford impacted the left side of the Buick. The Buick was equipped with frontal air bags and side impact inflatable curtain (IC) air bags and at impact the driver's frontal air bag and the left IC air bag deployed. The driver of the Buick sustained serious injuries and was transported to a local hospital where she was admitted for treatment. Both vehicles were towed due to damage and the Buick was later declared a total loss by the insurance company. The Ford was not inspected.

Figure 1. Subject vehicle, 2006 Buick LaCrosse

This side air bag investigation was identified by a DSI investigator from a review of an auto auction internet sale list. Photographs of the subject vehicle were obtained from the auction facility website and a copy of the police report was obtained from the insurance company. DSI forwarded images of the vehicle and a copy of the police report to the National Highway Traffic Safety Administration (NHTSA) for review and the case was assigned on June 7, 2010. Permission to inspect the vehicle was obtained from the insurance company and the inspection was completed on June 10, 2010. The Buick's Event Data Recorder (EDR) was supported by the Bosch Crash Data Retrieval (CDR) system and the EDR was imaged during the vehicle inspection. A summary of the EDR data is incorporated in this report and the Bosch EDR report is included in this report as Attachment 2.

Summary

Crash Site

The crash occurred within a four-leg intersection consisting of a north/south roadway and an east/west roadway during daylight hours in March 2010. At the time of the crash the weather was clear and the roadway was dry. The temperature at the nearest reporting station was 23.6° C (74.5° F), the wind direction was south at 7.4 km/h (4.6 mph), and visibility was 16.0 km (10.0 mi). The intersection was controlled by three-phase traffic signals that were located at the roadsides, the center medians, and above the travel lanes. According to the police report the three-phase signals were functioning properly at the time of the crash.

The north leg of the intersection consisted of an undivided north/south roadway including two northbound lanes and three southbound lanes. The northbound and southbound lanes were separated by double yellow solid painted stripes and the individual lanes were delineated by solid white painted stripes. The three southbound lanes were designated as left turn only, through only, and right turn only, respectively. The outboard roadway edges were bordered by solid white painted fog lines and raised concrete curbs. The roadway curved slightly right where it approached the intersection and the profile was a 2.0 percent uphill grade (**Figure 2**). The roadway surface composition was asphalt in good condition. The speed limit for the southbound lanes of this roadway was 40 km/h (25 mph).

Figure 2. Southbound approach to intersection, subject vehicle

The east leg of the intersection consisted of an east/west roadway divided by a raised median without a positive barrier (**Figure 3**). The roadway included four eastbound lanes and five westbound lanes. The outboard westbound lanes were left turn and right turn only and were separated from the through lanes by solid white painted stripes. The through lanes were delineated by dashed white painted stripes. The east/west roadway surface composition was asphalt and the roadway was straight and level. The outboard roadway edges were bordered by solid white painted fog lines and raised concrete curbs. The speed limit for the westbound lanes of this roadway was 64 km/h (40 mph). A crash scene schematic is included at the end of this report as Attachment A.

Figure 3. Westbound approach to intersection, other vehicle

Pre-Crash

The Buick was traveling southbound in the second lane from the right and entered the intersection with a green signal. According to the vehicle's EDR, the Buick's travel speed at one second prior to algorithm enable (AE) was 46.7 km/h (29.0 mph). Based on the EDR report the vehicle's cruise control was not activated, the throttle reading was 0 percent, and the brake switch circuit status was "Off" at the time of the crash.

The Ford was traveling westbound in the fourth lane from the right and entered the intersection against a red signal at a police-reported speed of 64 km/h (40 mph). The southbound Buick crossed over the path of the westbound Ford.

Crash

The crash consisted of one event. The front end of the Ford impacted the left side plane of the Buick forward of the rear axle in the front and passenger zones. The direction of force for the Buick was within the 10 o'clock sector. The impact to the Buick was forward of its longitudinal center of gravity and the vehicle initiated a clockwise rotation and was displaced to the right. The Buick's post-impact travel distance to final rest was unknown. Based on the interview the vehicle came to final rest in the intersection. The Ford initiated a post-impact counterclockwise rotation and was displaced to the left. It traveled an unknown distance to final rest, which was reported by police to be within the intersection.

For the Buick, the Missing Vehicle algorithm of WinSMASH calculated a Total Delta-V of 30.0 km/h (18.6 mph); the longitudinal and lateral components were -15.0 km/h (-9.3 mph) and 26.0 km/h (16.2 mph), respectively. The program calculated a Barrier Equivalent Speed (BES) of 34.9 km/h (21.7 mph). Based on the vehicle's crush profile, the WinSMASH results were considered to be reasonable. The Buick's EDR reported a maximum longitudinal Delta-V of -16.5 km/h (-10.25 mph).

For the Ford, WinSMASH calculated a Total Delta-V of 24.0 km/h (14.9 mph); the longitudinal and lateral components were -20.8 km/h (-12.9 mph) and -12.0 km/h (-7.5 mph), respectively. The program calculated a Barrier Equivalent Speed (BES) of 19.5 km/h (12.1 mph). Since the Ford wasn't inspected, the WinSMASH results were considered borderline.

Post-Crash

Following the crash, the driver of the Buick was conscious but not aware of her situation or surroundings. The vehicle's left side doors were jammed shut and an on-scene responder opened the vehicle's front right door and unbuckled the driver's lap and shoulder safety belt. The driver was removed from her vehicle by on-scene responders and placed on the ground. She was treated on-scene and then was transported to a local hospital. The driver of the Ford sustained non-incapacitating injuries of an unknown nature and was not transported.

Vehicle Data - 2007 Buick LaCrosse

The 2007 Buick LaCrosse four-door sedan was identified by the Vehicle Identification Number (VIN): 2G4WE587661xxxxxx and its date of manufacture was unknown. The odometer reading obtained during the vehicle inspection was 43,893 km (27,274 mi). The Buick was equipped with a 3.6-liter, 6-cylinder engine, automatic transmission, front-wheel drive, power steering with tilt column functionality, and rear parking sensors in the back bumper.

The vehicle manufacturer's recommended tire size was P225/55R17 and the recommended cold tire pressure was 207 kPa (30 psi) for the front and rear tires. The vehicle was equipped with Goodyear Eagle LS2 tires of the recommended size on the front and rear that were manufactured during October 2008 and mounted on original equipment manufacturer (OEM) eight-spoke aluminum rims. The specific tire data at the time of the vehicle inspection was as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	Tire flat	4 mm (5/32 in)	Yes	None
LR	221 kPa (32 psi)	5 mm (6/32 in)	No	None
RR	234 kPa (34 psi)	5 mm (6/32 in)	No	None
RF	186 kPa (27 psi)	4 mm (5/32 in)	No	None

The Buick's interior was equipped with leather-covered five-passenger seating. The front row outboard bucket seats were separated by a center console and padded armrest and equipped with height-adjustable head restraints. The driver's seat was adjusted between the middle and full-forward position and the seat back was slightly reclined. The adjustable head restraint was set to the full-down position at 1.0 cm (0.4 in) above the seat back. The tilt steering wheel was adjusted to the middle position.

Vehicle Damage - 2007 Buick LaCrosse

Exterior Damage

The Buick sustained direct and induced damage to the left side and induced damage to the top plane. The left front rim sustained direct damage and the tire was flattened. The left side view mirror was fractured and displaced from the side panel. The direct damage to the left side began 98.0 cm (38.6 in) forward of the left rear axle, extended forward 218.0 cm (85.8 in), and ended 44.0 cm (17.3 in) forward of the left front axle. The direct damage extended from the lower door panels to 12.0 cm (4.7 in) above the belt line on the B-pillar. The Field L began 22.0 cm (8.7 cm) forward of the left rear axle, extended 318.0 cm (125.2 in) forward, and ended 68.0 cm (26.8 in) forward of the left front axle (**Figure 4**).

Figure 4. Left side crush documentation showing maximum crush to front left door panel.

Six crush measurements were taken at mid-door level as follows: C_1 = 0 cm, C_2 = 23.0 cm (9.1 in), C_3 = 38.0 cm (15.0 in), C_4 = 23.0 cm (9.1 in), C_5 = 6.0 cm (2.4 in), C_6 = 0 cm. Maximum crush was located 156.0 cm (61.4 in) forward of the rear axle at the left front door panel between C_3 and C_4 and measured 39.0 cm (15.4 in). The Collision Deformation Classification (CDC) for Event 1 was 10LYAW3.

The impact resulted in direct damage to the Buick's left A-pillar and B-pillar and left side doors. The height of maximum door crush to the left front door panel measured 69.0 cm (27.2 in), the sill height measured 28.0 cm (11.0 in), and the Door Sill Differential (DSD) was 23.0 cm (9.1 in).

Interior Damage - 2007 Buick LaCrosse

The Buick sustained moderate interior damage resulting from impact forces, passenger compartment intrusion, occupant loading, and occupant contacts. The windshield and front left side glass were fractured and the second row left side glass and the roof glazing were disintegrated. The left front and rear side doors were jammed shut. The interior occupant compartment was reduced in size by lateral intrusion of the left side door panels, left A-pillar and B-pillar, left sill, left roof side rail, front left seat back, front row center console, left instrument panel (IP) and vertical intrusion of the second row left roof.

The front left safety belt webbing revealed loading marks and the left frontal air bag and IC air bag showed skin oil transfers from occupant loading. Additionally, the front left door panel was scuffed and the center console was fractured by occupant contact. The driver's seat cushion and seat back were deformed by the intruding right side B-pillar and door panel. The seat back was compressed by 6.0 cm (2.4 in), the seat cushion was compressed by 10.0 (3.9 in), and the center console was displaced 4.0 cm (1.6 in) to the right. The front left door panel was fractured in the lower forward quadrant. The left IP was buckled and fractured above the gauges and the steering column trim was fractured and displaced by lateral intrusion.

Manual Restraints - 2007 Buick LaCrosse

The vehicle's front row seating was equipped with 3-point manual lap and shoulder safety belts with continuous loop webbing, sliding latch plates, adjustable D-rings, and buckle pretensioners. The driver's safety belt was equipped with an Emergency Locking Retractor (ELR) and the front right passenger's safety had a switchable ELR/Automatic Locking Retractor (ALR).

Figure 5. Driver's safety belt webbing showing occupant loading evidence

The driver's safety belt D-ring anchorage was set between the middle and full-up positions and the latch plate was scratched, indicating historical usage. The safety belt buckle pretensioner had actuated at impact and the stalk had compressed 2.0 cm (0.8 in) from its original length. The safety belt webbing was loaded by the driver and showed scuff marks measuring 5.0 x 5.0 cm (2.0 x 2.0 in) beginning 92.0 cm (36.2 in) above the stop button near the D-ring anchorage (**Figure 5**). Based on the vehicle inspection it was determined that the front left safety belt was used to restrain the driver during the crash.

The front row passenger's safety belt D-ring was in the full-up position and the latch plate was scratched, indicating historical usage. The second row safety belts utilized switchable ELR/ALR integral retractors, continuous loop webbing, and sliding latch plates. The second row seats were not occupied during the crash.

Supplemental Restraint System - 2007 Buick LaCrosse

The Buick was equipped with Certified Advanced 208-Compliant (CAC) frontal air bags and side impact inflatable curtain (IC) air bags. The vehicle manufacturer has certified that this model is compliant with the advanced air bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The CAC system included dual-stage frontal air bags for the driver and front right passenger positions, seat track positioning sensors, safety belt buckle pretensioners, and a front right occupant weight-recognition sensor with an automatic air bag switch. The vehicle also had side impact IC air bags for the front row. Based on the interview the air bags were original to the vehicle and had not been recalled or serviced.

Figure 6. Driver's frontal air bag showing occupant loading to upper left quadrant

The Buick's advanced dual-stage frontal air bags were designed to deploy in two stages according to impact severity. Based on the EDR report the left frontal air bag deployed at the 1st stage. The left frontal air bag deployed from the steering wheel hub through an I-configured cover flap. The air bag was circular in shape and measured 67.0 cm (26.4 in) in diameter from seam to seam. It was configured with two vent ports on the back panel and two internal tethers attached to the center of the front panel. A skin oil transfer measuring 2.0 x 4.0 cm (0.8 x 1.6 in) was located 10.0 cm (3.9 in) from the center of the front panel in the upper left quadrant (**Figure 6**) indicating occupant loading during the crash.

Figure 7. Left IC air bag

The left IC air bag deployed from the left roof side rail above the front and second rows (**Figure 7**) and it measured 170.0 cm (66.9 in) in length and 40.0 cm (15.7 in) in height. The deployed IC air bag covered the front and second row left side windows entirely and extended 8.0 cm (3.1 in) below the bottom edge of the side glass. The air bag's forward aspect was attached to the left A-pillar by a 21.0 cm (8.3 in) tether and the rear aspect was attached to the left C-pillar without a tether. The IC air bag revealed a skin oil transfer measuring 4.0 x 12.0 cm (1.6 x 4.7 in) located 4.0 cm (1.6 in) above the bottom edge and 40.0 cm (16.0 in) aft of the leading edge indicating occupant loading during the crash.

The right passenger air bag was located in the right top IP and did not deploy. The frontal air bag was suppressed by the automatic switch utilizing a weight recognition system. The right IC air bag did not deploy.

Event Data Recorder - 2007 Buick LaCrosse

The EDR was imaged during the vehicle inspection by supplying power to the vehicle's supplemental restraint system and connecting the Bosch CDR Tool to the Diagnostic Link Connector (DLC) port under the left IP. The EDR data was collected using Software Version 3.3 and it was reported using Version 3.5.1. The recorded data included one non-deployment event and one deployment event and both recorded events contained pre-crash and crash data. The non-deployment event occurred at 5735 engine cycles (5821 at investigation) and the deployment event occurred at 5818 engine cycles (5821 at investigation). The time between the two recorded events was unknown but based on the EDR default value it was greater than 5 seconds. Based on the number of ignition cycles separating the two events it was determined the non-deployment event was unrelated to the crash with the Ford.

For the deployment event, the driver's safety belt switch circuit status was "Buckled" and the passenger belt circuit status was "Unbuckled". The driver seat and passenger seat position status was "Forward". The driver's frontal air bag 1st stage time from AE to deployment command criteria met was 10 msec and the driver 2nd stage time form AE to deployment command met was "N/A"[1].

The EDR reported five seconds of Pre-Crash data for vehicle speed, engine speed (RPM), and percent throttle, and eight seconds of data for brake switch circuit status. Pre-Crash vehicle speed ranged from 48 km/h (30 mph) at -5 seconds to AE to 47 km/h (29 mph) at -1 second to AE. Engine speed ranged from 1664 RPM at -5 seconds to AE to 1408 RPM at -1 second to AE. Percent Throttle ranged from 11 at -5 seconds to AE to 0 at -1 second to AE. The brake switch circuit status was "Off" from -8 seconds before AE to -1 second before AE.

The recorded longitudinal velocity change was reported in 10 msec intervals beginning at 10 msec to 110 msec after deployment criteria were met. There were no recorded velocity changes prior to deployment criteria being met. The vehicle's maximum recorded longitudinal velocity change was -16.5 km/h (-10.25 mph) and it occurred 105.5 milliseconds (msec) after algorithm enable (AE). The imaged EDR report, with the hexidecimal data omitted, is included at the end of this report as Attachment B.

Vehicle Data - 2008 Ford F-150

The 2008 Ford F-150 full size pickup was identified by the VIN: 1FTRF12258Kxxxxxxs and its date of manufacture was unknown. The vehicle was equipped with a 4.2-liter, 6-cylinder engine, automatic transmission, rear-wheel drive, 4-wheel anti-lock brakes, and power steering. According to the police report, the vehicle sustained damage to the front end in the center and right zones.

[1] Assumed to mean 2nd stage deployment command criteria was not met.

Occupant Demographics - 2007 Buick LaCrosse

Driver

Age/Sex:	60 years/Female
Height:	155 cm (61 in)
Weight:	61 kg (134 lb)
Seat type:	Bucket with adjustable head restraint
Seat track position:	Middle to full-forward
Manual restraint usage:	Lap and shoulder belt used properly
Usage source:	Vehicle inspection
Air bags:	Frontal air bag and IC air bag deployed
Alcohol, drug involvement:	None
Type of medical treatment:	Transported and admitted for 14 days

Occupant Kinematics - 2007 Buick LaCrosse

Driver

The 60-year-old female driver was seated in an upright posture and was restrained by the vehicle's lap and shoulder belt. She was actively steering the vehicle and her right foot was on the accelerator. The driver's seat track was adjusted between the middle and full-forward positions and her seat back was reclined slightly. She was wearing clear lens prescription eyeglasses.

At impact with the Ford, the Buick's left frontal air bag and left IC curtain air bag deployed and the driver's safety belt buckle pretensioner actuated. In response to the 10 o'clock direction of force, the driver was displaced left and slightly forward and she loaded the safety belt system, the deployed left IC air bag, and the deployed left frontal air bag. Her left face and head loaded the IC air bag and she sustained a contusion to her left face and deposited a skin oil transfer to the air bag in the forward sector.

The driver's left flank contacted the left door panel in the rear upper quadrant resulting in multiple left rib fractures, left lung contusion, and left pneumothorax. Her left pelvis and hip contacted the left door hardware/armrest resulting in multiple fractures to the acetabulum and pelvic ring, and a contusion to the left hip. The rear upper quadrant of the front left door panel intruded 13.0 cm (5.1 in) laterally and the rear lower quadrant intruded 15.0 cm (5.9 in) laterally into the occupant compartment further contributing to the severity of the injuries. The driver's left lower leg sustained a minor laceration and contusion possibly from contacting the parking brake pedal.

Intrusion by the left door panel compressed the driver's seat back and cushion 6.0 cm (2.4 in) and the driver was displaced to the right. Her right hip contacted the center console fracturing the component and displacing it 4.0 cm (1.6 in) to the right. The Buick initiated a clockwise rotation and was displaced to the right. The driver was held in place in her seat by the pretensioner safety belt until the vehicle came to rest in the intersection.

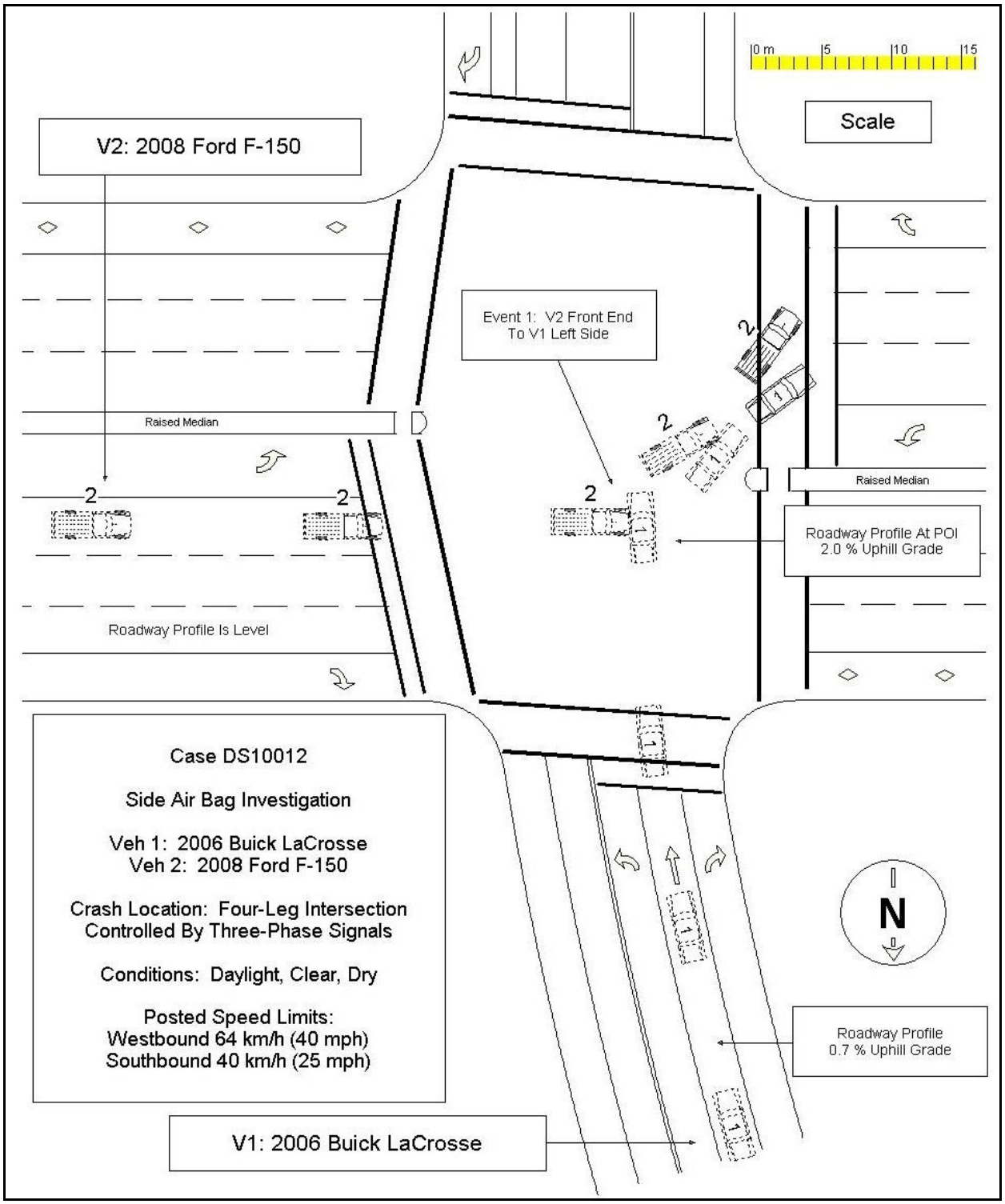
She arrived in the emergency department at 1100 hours with a Glasgow Coma Score (GCS) of 15. The driver stated during the interview that she was amnesic of the crash and did not regain awareness of her surroundings until approximately 30-45 minutes after the crash. She sustained serious injuries including fractures of the ribs and pelvis. She was admitted to the hospital's trauma unit for two weeks and then was transferred to an inpatient rehabilitative care facility for six weeks. During her recovery she was ambulatory with the assistance of a front wheel walker. Due to her inpatient status she missed approximately eight weeks of work. The driver was then discharged and continued to undergoing physical therapy for several weeks.

Occupant Injuries

Driver

Injury	Injury Severity AIS 05/Update 08	Injury Mechanism	Confidence Level
Acetabulum fracture, partial articular (involving one column), left	856251.2,2	Left hardware/armrest, rear lower quadrant	Certain
Pelvic ring fractures, posterior arch intact, sacrum, superior and inferior pubic rami, left	856151.2,2	Left hardware/armrest, rear lower quadrant	Certain
Pneumothorax NFS, left	442202.2,2	Left door panel, rear upper quadrant	Certain
Fractures > 5 flail ribs, left (L1 - L7)	450213.4,2	Left door panel, rear upper quadrant	Certain
Contusion, left face	210402.1,2	IC air bag	Probable
Contusion, left hip	810402.1,2	Left door panel, rear lower quadrant	Certain
Lung contusion NFS, lower lobe, left	441402.3,2	Left door panel, rear upper quadrant	Certain
Contusion, right upper arm	710402.1,1	Unknown	Unknown
Contusion, left lower leg Laceration, minor, left lower	810402.1,2 810602.1,2	Foot controls including parking brake pedal	Possible

Attachment 1. Scene Diagram



Attachment 2. Bosch CDR Report

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	2G4WE587661******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	EDRNOVIN.CDR
Saved on	Wednesday, June 9 2010 at 03:14:59 PM
Collected with CDR version	Crash Data Retrieval Tool 3.3
Reported with CDR version	Crash Data Retrieval Tool 3.5.1
EDR Device Type	airbag control module
Event(s) recovered	Deployment Non-Deployment

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). It contains Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event may be overwritten by another Non-Deployment Event. This event will be cleared by the SDM, after approximately 250 ignition cycle. This event can be overwritten by a second Deployment Event, referred to as a Deployment Level Event, if the Non-Deployment Event is not locked. The data in the Non-Deployment Event file will be locked, if the Non-Deployment Event occurred within five seconds before a Deployment Event. A locked Non Deployment Event cannot be overwritten or cleared by the SDM.

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 five seconds of one another. If a Deployment Level Event occurs within five seconds after the Deployment Event, the Deployment Level Event 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 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 Changeis 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 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 can record up to the first 150 milliseconds of data after algorithm enable. Velocity Change data is displayed in SAE sign convention.

-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 open/closed state 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 Belt Switch Circuit Status indicates the status of the driver's seat belt switch circuit. If the vehicle's electrical system is compromised during a crash, the state of the Driver's Belt Switch Circuit may be reported other than the actual state.

-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 power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.
-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 Speed, Engine Speed, and Percent Throttle data are transmitted by the Powertrain Control Module (PCM), via the vehicle's communication network, to the SDM.
-Brake Switch Circuit Status data is transmitted by either the ABS module or the PCM, via the vehicle's communication network, to the SDM. Depending on vehicle option content, the Brake Switch Circuit Status data may not be available.
-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.

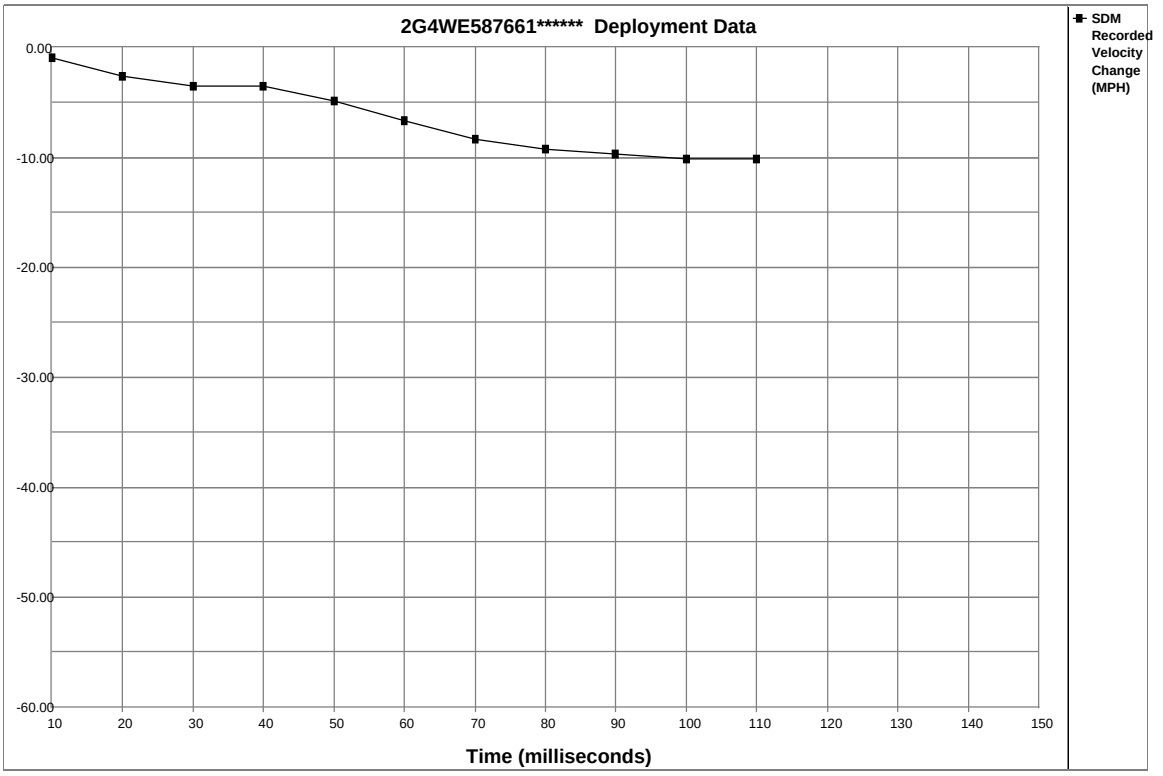
01014_SDMDW_r002

System Status At Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Passenger Belt Switch Circuit Status (If Equipped)	UNBUCKLED
Driver Seat Position Status (If Equipped)	Forward
Passenger Seat Position Status (If Equipped)	Forward
Passenger SIR Suppression Switch Circuit Status (if equipped)	Air Bag Not Suppressed
Ignition Cycles At Deployment	5818
Ignition Cycles At Investigation	5821
Maximum SDM Recorded Velocity Change (MPH)	-10.25
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	107.5
Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	10
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)	10
Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Time Between Non-Deployment And Deployment Events (sec)	N/A
Event Recording Complete	Yes

Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle
-5	30	1664	11
-4	30	1600	11
-3	30	1600	11
-2	30	1536	11
-1	29	1408	0

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



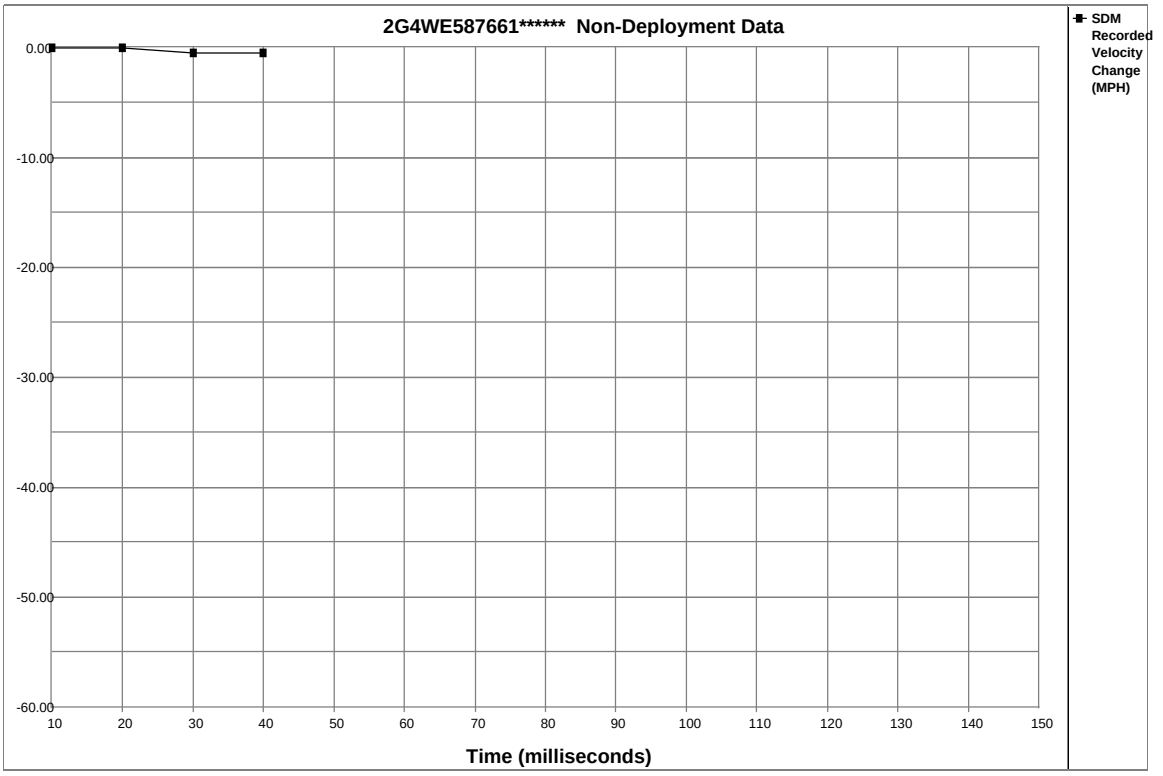
Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Recorded Velocity Change	-0.88	-2.63	-3.51	-3.51	-4.83	-6.58	-8.34	-9.21	-9.65	-10.09	-10.09	N/A	N/A	N/A	N/A

System Status At Non-Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Passenger Belt Switch Circuit Status (If Equipped)	BUCKLED
Driver Seat Position Status (If Equipped)	Forward
Passenger Seat Position Status (If Equipped)	Forward
Passenger SIR Suppression Switch Circuit Status (if equipped)	Air Bag Not Suppressed
Ignition Cycles At Non-Deployment	5735
Ignition Cycles At Investigation	5821
Maximum SDM Recorded Velocity Change (MPH)	-0.66
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	47.5
A Deployment was Commanded Prior to this Event	No
Event Recording Complete	Yes

Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle
-5	45	1472	0
-4	45	1472	0
-3	42	1088	0
-2	38	1152	0
-1	34	1024	0

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



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Recorded Velocity Change	0.00	0.00	-0.44	-0.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A