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ON-SITE ROLLOVER INVESTIGATION

CASE NUMBER - IN08036
LOCATION - MICHIGAN
VEHICLE - 2007 SATURN VUE
CRASH DATE - August 2008

Submitted:

June 9, 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
Washington, D.C. 20590-0003

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

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

Technical Report Documentation Page

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15. *Supplementary Notes* On-Site Rollover Investigation involving a 2007 Saturn Vue.			
16. *Abstract* This report covers an On-Site Rollover Investigation that involved a 2007 Saturn Vue, which rolled over on the roadway following a right side impact with an unknown year Ford passenger car. The focus of this on-site investigation was the Saturn's rollover. The Saturn's restrained 68-year-old female driver was traveling east on a 4-lane city street approaching a 4-leg intersection with another city street. The Saturn's roadway was uncontrolled and the driver had the right-of-way. The Ford's driver was traveling north and failed to stop for a stop sign. The Ford entered the intersection and impacted the Saturn's right rear wheel and quarter panel. The impact caused the Saturn to rotate clockwise and roll over, left side leading, four quarter turns. The rollover triggered deployment of the Saturn's rollover side curtain air bags. The driver sustained minor injuries and was transported by ambulance to a hospital where she was treated and released from the emergency room.			
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IN08036

The focus of this on-site investigation was the rollover of the 2007 Saturn Vue. This crash was brought to National Highway Traffic Safety Administration's attention on October 17, 2008 by the sampling activities of the National Automotive Sampling System. This on-site investigation was assigned on October 27, 2008. The crash involved a 2007 Saturn Vue (**Figure 1**) and an unknown year Ford passenger vehicle. The crash occurred in August, 2008, at 2020 hours, in Michigan and was investigated by the applicable city police department. This contractor inspected the crash scene and Saturn on October 28 and 29, 2008. The driver interview was conducted on November 12, 2008. The Ford was not inspected because the driver fled the scene following the crash and was not located by the police. This report is based on the police crash report, scene and vehicle inspections, an exemplar vehicle inspection, driver medical records, occupant kinematic principles, and this contractor's evaluation of the evidence.

Figure 1: The damaged 2007 Saturn Vue

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which the Saturn was traveling was a level, 4-lane, undivided, city street, traversing in an east-west direction, and the Saturn was approaching a 4-leg intersection. The roadway had two through lanes in each direction and was bordered by barrier curbs 17 cm (6.7 in) in height. The outside eastbound lane was 4 m (13.1 ft) in width and the inside eastbound lane was 3.1 m (10.2 ft) in width. The outside westbound lane was 3.9 m (12.8 ft) in width and the inside westbound lane was 3.6 m (11 ft) in width. The roadway pavement markings consisted of broken white lane lines and a double yellow center line. The Saturn's roadway was uncontrolled and the driver had the right-of-way. The trafficway on which the Ford was traveling was a 2-lane, undivided, city street, traversing in a north-south direction, and the Ford was approaching the same intersection. The roadway had one through lane in each direction and was also bordered by barrier curbs. There were no lane lines and the roadway width was 8.1 m (26.6 ft). The roadway was controlled at the intersection by a stop sign and had a negative 0.7% grade. The speed limit for the Saturn was 56 km/h (35 mph) and the speed limit for the Ford was 48 km/h (30 mph). At the time of the crash the light condition was daylight and the atmospheric condition was clear. The roadway pavement was dry bituminous and the site of the

Figure 2: Approach of the Saturn east to the intersection; number shows meters to impact area; arrow shows approach of Ford

crash was urban residential. See the Crash Diagram on page 10 of this report.

Pre-Crash: The Saturn was traveling east in the outside lane (**Figure 2**) and was occupied by a restrained 68-year-old female driver. She stated in the interview that she was traveling between 40-48 km\h (25-30 mph) and intended to continue east through the intersection. The vehicle's Event Data Recorder (EDR) report indicated that the vehicle was traveling 48 km\h (30 mph) 2.5 to 0.5 seconds prior to Algorithm Enable (AE), and no braking was recorded during this time. The Ford was occupied by a male driver and one passenger and was traveling north approaching the stop sign (**Figure 3**). The Saturn's driver initiated a left steering maneuver in an attempt to avoid the crash, but did not apply the brakes. The crash occurred in the intersection of the two roadways.

Crash: The front of the Ford impacted the right rear side of the Saturn (**Figure 4**, event 1). The impact engaged the rear portion of the right rear door as well as the right rear wheel and quarter panel. The impact caused the Saturn to rotate clockwise and as it traveled into the east leg of the intersection, it rolled over (**Figure 1**, event 2), left side leading, 4 quarter turns. The Saturn's EDR data indicated that the deployment of both side curtain rollover air bags was commanded due to the rollover event. The vehicle came to final rest on its wheels, on the sidewalk, on the south side of the roadway heading southwest (**Figure 5**). The Ford's driver did not stop and fled the scene.

Post-Crash: The police and emergency medical service were notified and responded to the crash scene. The Saturn's driver was transported by ambulance to a hospital and the Saturn was towed from the scene due to damage.

Figure 3: Approach of the Ford north to the intersection; arrow shows approach of the Saturn

Figure 4: Yellow tape on lower portion of right rear door and quarter panel shows location of impact by the front of the Ford

Figure 5: View northwest at Saturn's area of final rest on the sidewalk; orange marks show evidence in roadway from the rollover

ROLLOVER DISCUSSION

The Saturn's rollover mitigation features consisted of a rollover side curtain air bag. The vehicle was not equipped with Electronic Stability

Control (ESC). The NHTSA has given the vehicle a three star rollover rating on a five star scale and a Static Stability Factor (SSF) of 1.19[1]. A three star rating indicates that the vehicle has a 20%-30% chance of a rollover when involved in a single vehicle crash. The specific chance of rollover for this vehicle model was given as 22%. The SSF is a calculation based on the vehicle's track width and height of its center of gravity. The result of the calculation is a measure of a vehicle's resistence to rollover. A higher SSF indicates a more stable vehicle. Most passenger vehicles have an SSF of 1.30 to 1.50[2]. This vehicle model also tipped-up during the dynamic steering maneuver test in which the test vehicle is put through a fish-hook shaped steering maneuver (i.e., hard left and hard right steer) at between 56 km/h-80km/h (35-50 mph).

In this crash, the Saturn's initial right side plane impact with the Ford induced a clockwise rotation. The vehicle rotated clockwise approximately 110 degrees across a distance of 11.7 m (38.4 ft), and the opposing force on the left side wheels continued to build as it rotated. The force on the left side wheels was sufficient to induce a roll moment and the vehicle rolled over on the roadway, left side leading, four quarter turns across a distance of approximately 11 m (36.0 ft). The vehicle came to final rest on its wheels on a side walk on the south side of the roadway.

CASE VEHICLE

The 2007 Saturn Vue was a front wheel drive, 4-door sport utility vehicle (VIN: 5GZCZ53477S------) that was manufactured in September of 2006. The vehicle was equipped with a 3.5L, V6 engine, automatic transmission, 4-wheel anti-lock brakes, traction control, a tire pressure monitoring system, an EDR, and a rollover sensor. The front row was equipped with bucket seats with adjustable head restraints, dual stage driver and front right passenger frontal air bags, lap-and-shoulder belts with adjustable upper anchors, and rollover side curtain air bags, which provide protection for both the front and second row passengers. The second row was equipped with a bench seat with folding backs, adjustable head restraints in the outboard seating positions, and lap-and-shoulder belts in all three seating positions. The second row was also equipped with Lower Anchors and Tethers for Children (LATCH) in the outboard seating positions. The mileage at the time of the inspection could not be determined because the vehicle was equipped with an electronic odometer and was without power. The driver was unable to provide an estimate of the mileage. The vehicle's specified wheelbase was 271 cm (106.7 in).

CASE VEHICLE DAMAGE

Exterior Damage: The Saturn's impact with the Ford involved the right rear portion of the vehicle. The right rear door, right rear wheel, and the right quarter panel were all directly damaged (**Figure 4**). The direct damage began 82 cm (32.3 in) forward of the right rear axle and extended 132 cm (52 in) rearward on the right side. The front of the Ford engaged primarily the vehicle's right rear wheel. The contact to this stiff structure resulted in a high pulse, short duration event that produced no residual crush to the side of the vehicle. There were only scuffs

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[1] www.safercar.gov, 5/29/09

[2] "Trends in the Static Stability Factor of Passenger Cars, Light Trucks, and Vans", NHTSA Technical Report, DOT HS 809 868, June 2005

on the sheet metal of the door and quarter panel, and the right rear wheel was negatively cambered approximately 10 degrees. The right side wheelbase was extended 1 cm (0.4 in), and there was no change to the left side wheelbase. Induced damage from this impact involved the back bumper fascia.

The damage from the rollover involved the vehicle's left and right side planes and the top plane (**Figures 6-10**). The left fender, left side view mirror, left roof side rail, left A, B, and C-pillars, right roof side rail, right side view mirror, right rear door, right A, C, and D-pillars, hood, windshield, roof and both luggage racks were directly damaged. The direct damage on the left side plane began 65 cm (25.6 in) rear of the left front axle and extended 241 cm (98.9 in) rearward on the left side. The direct damage on the right side plane began 72 cm (28.3 in) rear of the right rear axle and extended 293 cm (115.3 in) forward on the right side. The direct damage on the top plane began 68 cm (26.8 in) forward of the right front axle and extended 365 cm (143.7 in) rearward on the top and involved the full width of the front portion of the roof and hood. The maximum vertical crush was 7 cm (2.8 in) and occurred on the right A-pillar (**Figure 11**). There was no lateral displacement of either roof side rail or A-pillar. Induced damage involved the front bumper fascia, roof and windshield.

Figure 6: Left side of Saturn; yellow tape outlines damage from the rollover

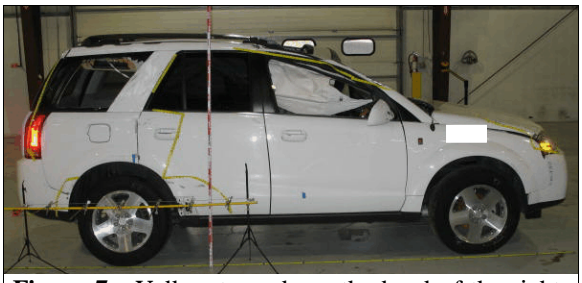


Figure 7: Yellow tape above the level of the right rear wheel outlines the damage from the rollover

Figure 8: Damage from the rollover on the hood, windshield and A-pillars

Figure 9: Damage on the roof from the rollover

Figure 10: Damage on left roof side rail and luggage rack from the rollover

Figure 11: Crush to the right A-pillar

Damage Classification: The Collision Deformation Classifications for the Saturn were **01-RZEW-1** (**30** degrees) for the impact with the Ford (event 1) and **00-TDDO-2** for the rollover (event 2). The WinSMASH program could not be used to calculate the Saturn's Delta V for the right side impact because the Ford was not inspected and the Saturn sustained no residual crush as a result of the impact. The severity of this impact was minor and the extent of the roof crush due to the rollover was minor.

The manufacturer's recommended tire size was P235/60R17 and the vehicle was equipped with tires of this size. The Saturn'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	207	30	241	35	5	6	None	No	No
LR	207	30	241	35	6	7	None	No	No
RR	214	31	241	35	6	7	None	No	No
RF	207	30	241	35	5	6	None	No	No

Vehicle Interior: Inspection of the Saturn's interior revealed no discernable evidence of occupant contact. All of the vehicle's doors remained closed and operational. All of the window glazing was either closed or fixed at the time of the crash. The sun roof, right front, right rear, and second right rear window glazing all disintegrated due to impact force during the rollover. The windshield glazing was in place and cracked due to impact forces. There was no deformation of

the steering wheel or compression of the energy absorbing steering column.

The Saturn sustained 7 intrusions into the center and right front row areas, all of which occurred on the vertical axis (**Figure 12**). The intrusions involved the roof, windshield header, windshield, right roof side rail, right A-pillar and the roof console. The most severe intrusions occurred in the front right passenger's occupant space. The right A-pillar and right roof side rail intruded 7 and 6 cm (2.8 and 2.4 in), respectively while the windshield header and roof both intruded 5 cm (2 in).

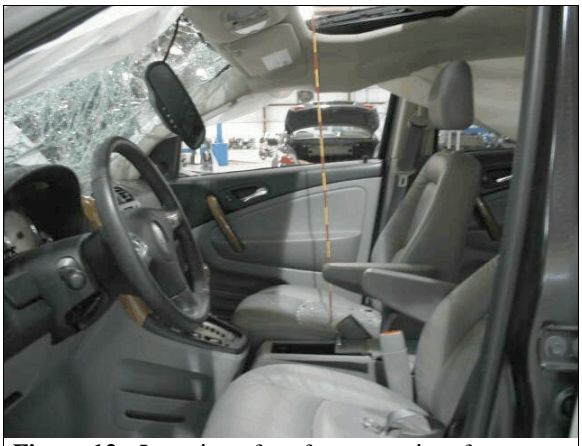


Figure 12: Intrusion of roof structure into front row

EVENT DATA RECORDER

The Saturn's EDR was downloaded using version 3.0 of the Bosch Crash Data Retrieval tool via direct connection to the Sensing and Diagnostic Module. Attempts to download the data through the vehicle's diagnostic link connector were unsuccessful. The EDR recorded a deployment event and a non-deployment event.

The EDR recorded the time between events as 0 milliseconds. The data for the deployment event indicated that the SIR warning lamp was off and the side curtain air bags were commanded to deploy due to the rollover (event 2). The data also recorded the driver's seat belt switch circuit as buckled and indicated that both the driver's and front right passenger's pretensioners were commanded to actuate. The longitudinal Delta V was recorded as 0.0 km/h (0.0 mph) and the lateral Delta V reached a value of 6.14 km/h (3.82 mph) at 220 msec after the deployment criteria were met. The maximum recorded Delta V for the non-deployment event occurred on the lateral axis and was reported on the System Status at Non-Deployment record as 11.27 km/h (7.00 mph) occurring 110 msec following AE. However, the initial Delta V recorded on the lateral velocity change graph was 5.12 km/h (3.18 mph), which appeared to indicate an overlap between the recording of the deployment and non-deployment events.

The pre-crash data was recorded in 5 sample points of 0.5 seconds each. The data indicated that the vehicle was traveling 48.3 km/h (30 mph) for each of the five sample points prior to AE. The vehicle's brake switch circuit was recorded as off for each sample point. The EDR report is attached at the end of this report[3].

AUTOMATIC RESTRAINT SYSTEM

The Saturn was equipped with a frontal air bag system that was certified by the manufacturer to be compliant to the Advanced Air Bag portion of Federal Motor Vehicle Safety Standard

[3] Pages 11-13 of the EDR report have been deleted for confidentiality reasons.

(FMVSS) No. 208. The system consisted of dual stage driver and front right passenger frontal air bags, driver seat position sensor, a capacitance sensor for determining the presence of a front right passenger, front seat belt buckle switch sensors, and retractor mounted pretensioners. Neither of the frontal air bags deployed in this crash.

Figure 14: The left side curtain air bag

The Saturn was also equipped with roof side rail-mounted rollover side curtain air bags. Based on the Holmatro "Rescuer's Guide to Vehicle Safety Systems," the inflators for the side curtain air bags were located within the roof side rails between the C and D-pillars. Both side curtain air bags deployed as a result of the rollover event.

The deployed left side curtain air bag (**Figures 14**) was 171 cm (67.3 in) in width and 46 cm (18.1 in) in height. It extended 10 cm (4 in) below the belt line and was not equipped with any visible vent ports. A triangular shaped fabric, 42 cm (16.5 in) in length, tethered the side curtain air bag to the A-pillar. The side curtain air bag was also tethered to the D-pillar by a nylon rope that was 32 cm (12.6 in) long and 1 cm (0.4 in) wide. There was no damage or discernable occupant contacts located on the side curtain air bag. The right side curtain air bag was of the same dimensions and features as the left.

MANUAL RESTRAINT SYSTEM

The Saturn was equipped with lap-and-shoulder belts for all five front and second row seating positions. The driver's seat belt consisted of continuous loop belt webbing, an Emergency Locking Retractor (ELR), sliding latch plate, and an adjustable upper anchor that was in the full down position. The front right seat belt was equipped with a switchable ELR/Automatic Locking Retractor (ALR), sliding latch plate, and adjustable upper anchor that was located in the full down position. The front row seat belts were equipped with retractor-mounted pretensioners and both actuated in this crash. The second row outboard seat belts consisted of continuous loop belt webbing, switchable ELR/ALRs, sliding latch plates and fixed upper anchors. The center seat belt was an integral lap-and-shoulder belt and consisted of continuous loop belt webbing, an ELR and a sliding latch plate.

The inspection of the driver's seat belt assembly revealed a load abrasion on the D-ring and usage scratches on the latch plate. The retractor was jammed due to the actuation of the pretensioner and a length of belt, which measured 109 cm (42.9 in) from the stop button to the D-ring was extended out of the retractor. This evidence indicated that the driver was restrained at the time of the crash and supported the EDR indication of restraint usage. The remaining seat positions were unoccupied.

The driver [68-year-old, female 165 cm and 88 kg (65 in, 195 lbs)] stated during the interview that she was seated in an upright posture with both hands on the steering wheel and her right foot on the accelerator. The driver's seat track was located between the middle and rear most position and the seat back was adjusted to the upright position. The tilt steering column was located in the center position.

The Saturn's impact with the Ford displaced the driver forward and to the right opposite the 1 o'clock direction of force and she loaded the seat belt. Occupant kinematic principles indicate that as the vehicle rolled over with the left side leading, the driver was redirected to the left and toward the roof within the restraint system. While there was no discernable occupant contact evidence on the left side curtain air bag, it is probable that the driver contacted the air bag during the rollover. The driver sustained contusions on her left neck, left shoulder, chest, and both hips from loading the seat belt. The driver also sustained lacerations on her left fingers. While there was no discernable evidence of occupant contact on the cracked windshield, the driver's left hand possibly contacted the windshield during the rollover causing the lacerations. The driver remained restrained in her seat position and was removed from the vehicle by medical personnel and was transported by ambulance to a hospital.

CASE VEHICLE DRIVER INJURIES

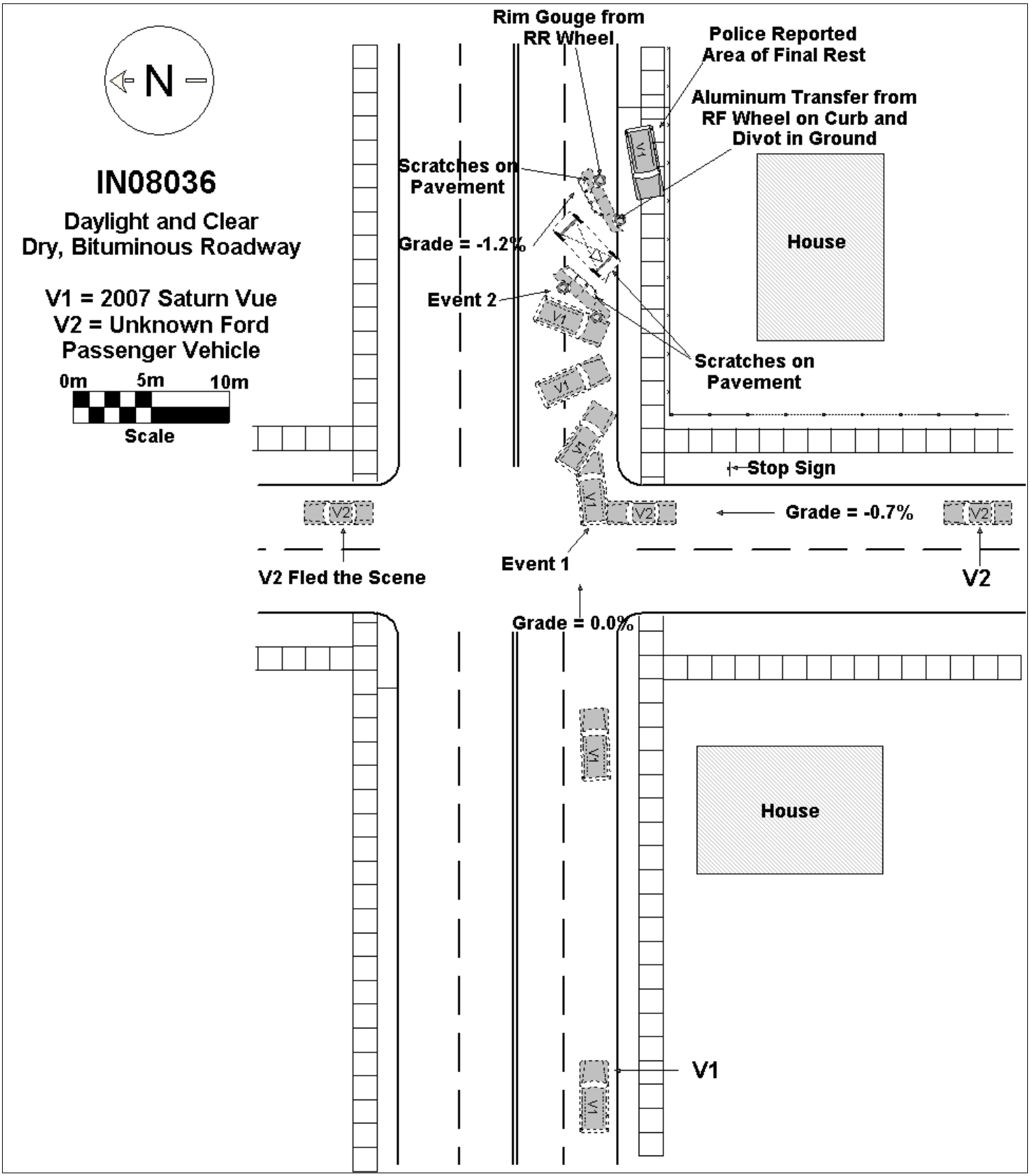
The driver's injuries were minor and she was treated and released from the hospital emergency room. She made one follow up visit to her doctor to have the stitches removed from her finger lacerations. The table below shows the driver's injuries and injury sources.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Contusion on left neck	minor 390402.1,2	Torso portion of safety belt system	Certain	Interviewee (same person)
2	Contusion across left chest	minor 490402.1,2	Torso portion of safety belt system	Certain	Interviewee (same person)
3 4	Contusion on both left and right hips, not further specified	minor 590402.1,1 590402.1,2	Lap portion of safety belt system	Certain	Interviewee (same person)
5	Contusion on left shoulder, not further specified	minor 790402.1,2	Torso portion of safety belt system	Certain	Interviewee (same person)
6	Lacerations left fingers[4]: 2 cm (0.8 in) left middle finger; 1.5 cm (0.6 in) left ring finger	minor 790602.1,2	Front left windshield's glazing	Possible	Emergency room records

[4] Interviewee also indicated that the left index finger was lacerated.

The police crash report indicated that the other vehicle was a Ford passenger vehicle. There was no other information available on the Ford.

Other Vehicle's Occupants: The Ford was occupied by a male driver and one passenger.


N
IN08036
Daylight and Clear
Dry, Bituminous Roadway
V1 = 2007 Saturn Vue
V2 = Unknown Ford
Passenger Vehicle
0m 5m 10m
Scale
Rim Gouge from RR Wheel
Police Reported Area of Final Rest
Aluminum Transfer from RF Wheel on Curb and Divot in Ground
Scratches on Pavement
Grade = -1.2%
Event 2
House
Scratches on Pavement
Stop Sign
Grade = -0.7%
V2 Fled the Scene
Event 1
V2
Grade = 0.0%
House
V1

CDR File Information

User Entered VIN	5GZCZ53477S******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	IN08036.CDR
Saved on	Wednesday, October 29 2008 at 09:37:27 AM
Collected with CDR version	Crash Data Retrieval Tool 3.00
Reported with CDR version	Crash Data Retrieval Tool 3.2
EDR Device Type	airbag control module
Event(s) recovered	Deployment 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 records data but does not deploy the air bag(s). The minimum SDM Recorded Vehicle Velocity Change, that is needed to record a Non-Deployment Event, is five MPH. A Non-Deployment Event 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 velocity change. This event will be cleared by the SDM, after approximately 250 ignition cycles. This event can be overwritten by a second Deployment Event, referred to as Deployment Event #2, if the Non-Deployment Event is not locked. The data in the Non-Deployment Event file will be locked, if the Non-Deployment Event occurred within five seconds of 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 a second Deployment Event occurs any time after the Deployment Event, the Deployment Event #2 will overwrite any non-locked Non-Deployment Event. Deployment Events cannot be overwritten or cleared by the SDM. Once the SDM has deployed an air bag, the SDM must be replaced.

Data:

-SDM Recorded Vehicle Velocity Change reflects the change in velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. For Deployment Events, the SDM will record 230 milliseconds of data after deployment criteria is met and up to 70 milliseconds before deployment criteria is met. For Non-Deployment Events, the SDM can record up to the first 300 milliseconds of data after algorithm enable. Velocity Change data is displayed in SAE sign convention.
-Maximum Recorded Vehicle Velocity Change is the maximum square root value of the sum of the squares for the vehicle's combined "X" and "Y" axis change in velocity.
-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has been interrupted and not fully written.
-SDM Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:
- -significant changes in the tire's rolling radius
- -final drive axle ratio changes
- -wheel lockup and wheel slip

-Brake Switch Circuit Status indicates the 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 and Passenger's Belt Switch Circuit Status indicates the status of the seat belt switch circuit.

-The Time Between Non-Deployment to Deployment Events is displayed in seconds. If the time between the two events is greater than five seconds, “N/A” is displayed in place of the time. If the value is negative, then the Deployment Event occurred first. If the value is positive, then the Non-Deployment Event occurred first.
-If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.
-All data should be examined in conjunction with other available physical evidence from the vehicle and scene.

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

Multiple Event Data

Associated Events Not Recorded	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

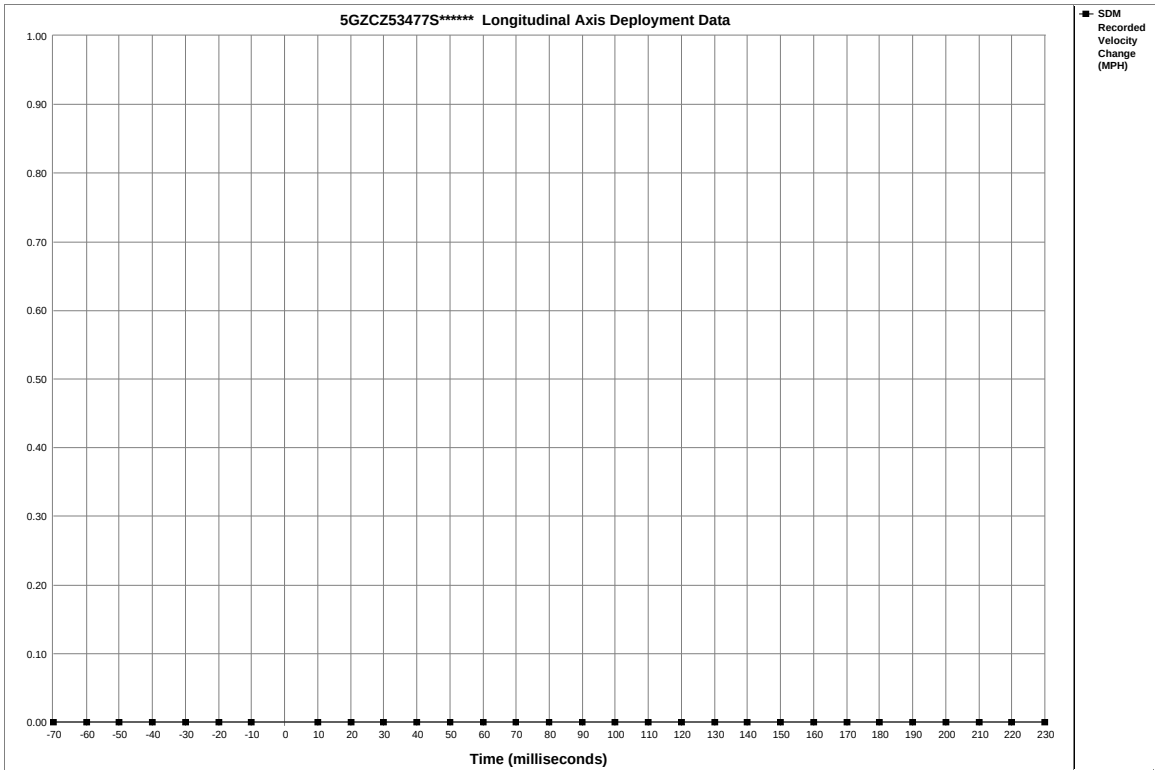
Pre-Crash Data

Parameter	-2.5 sec	-2.0 sec	-1.5 sec	-1.0 sec	-0.5 sec
Vehicle Speed (MPH)	30	30	30	30	30
Engine Speed (RPM)	1536	1600	1536	1472	1088
Percent Throttle	14	14	9	2	2
Brake Switch Circuit Status	OFF	OFF	OFF	OFF	OFF

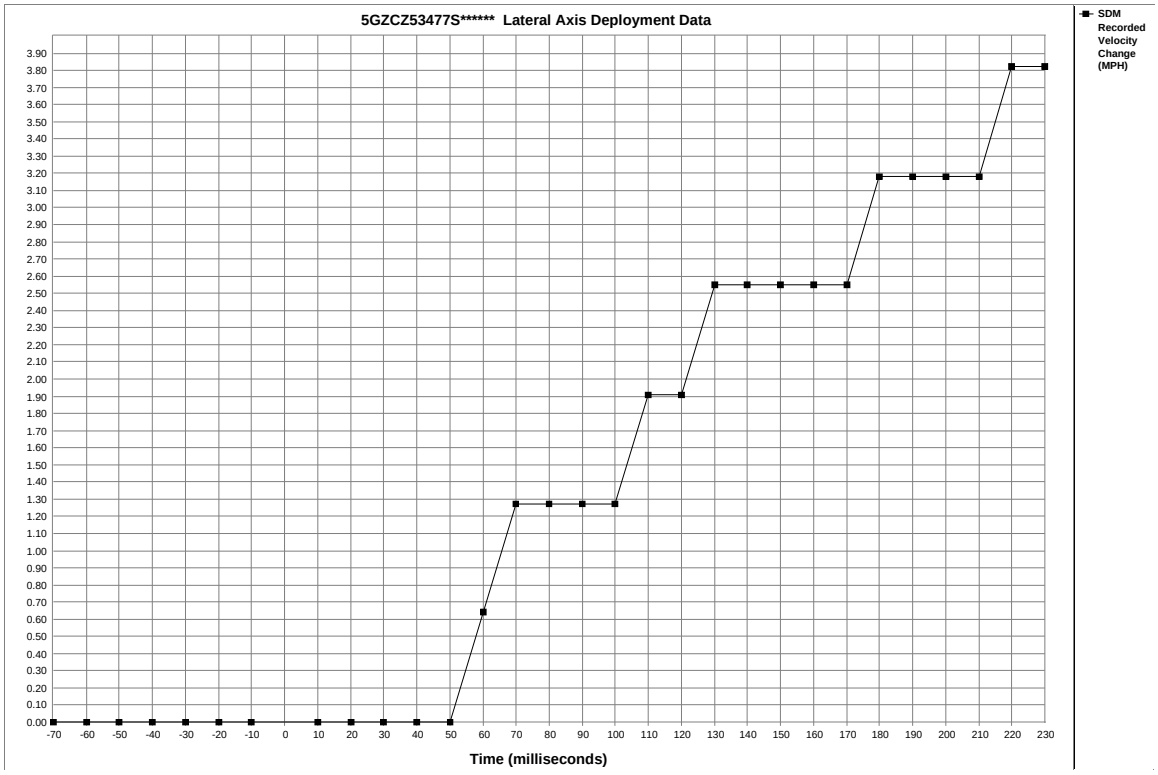
System Status At Deployment

SIR Warning Lamp Status	OFF
SIR Warning Lamp ON/OFF Time Continuously (seconds)	655350
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	3260
Ignition Cycles At Investigation	3266
Ignition Cycles At Event	3260
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
Passenger's Belt Switch Circuit Status	UNBUCKLED
Automatic Passenger SIR Suppression System Status at AE	Air Bag Suppressed
Rollover Sensor Status	Rollover Event
Number of Consecutive Error Free Messages Received From Rollover Sensor	Last 8 Consecutive Messages Were Error Free
SDM Synchronization Counter	4127
Side Air Bag(s) Were First Commanded to Deploy Due to Side Impact Event	No
Side Air Bag(s) Were First Commanded to Deploy Due to Rollover Event	Yes
Time Between Events (sec)	0
Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Driver 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Passenger 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Driver 1st Stage Time From Arming Signal to Deployment Command Signal	N/A
Driver 2nd Stage Time From Arming Signal to Deployment Command Signal	N/A
Passenger 1st Stage Time From Arming Signal to Deployment Command Signal	N/A
Passenger 2nd Stage Time From Arming Signal to Deployment Command Signal	N/A
Driver 1st Stage Field Effect Transistor (FET) on time	N/A
Driver 2nd Stage Field Effect Transistor (FET) on time	N/A
Passenger 1st Stage Field Effect Transistor (FET) on time	N/A
Passenger 2nd Stage Field Effect Transistor (FET) on time	N/A
Driver 1st Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded	No
Driver Side Deployment Loop Commanded	No
Driver Pretensioner Deployment Loop Commanded	Yes
Driver Roof Rail/Head Curtain Loop Commanded (If Equipped)	Yes
Supplemental Deployment Loop #1 Commanded (If Equipped)	No
Passenger 1st Stage Deployment Loop Commanded	No
Passenger 2nd Stage Deployment Loop Commanded	No
Passenger Side Deployment Loop Commanded	No
Passenger Pretensioner Deployment Loop Commanded	Yes
Passenger Roof Rail/Head Curtain Loop Commanded (If Equipped)	Yes
Supplemental Deployment Loop #2 Commanded (If Equipped)	No
Second Row Left Side Deployment Loop Commanded	No
Second Row Left Pretensioner Deployment Loop Commanded (If Equipped)	No
Supplemental Deployment Loop #3 Commanded (If Equipped)	No
Second Row Right Side Deployment Loop Commanded (If Equipped)	No
Second Row Right Pretensioner Deployment Loop Commanded	No
Supplemental Deployment Loop #4 Commanded (If Equipped)	No
Supplemental Deployment Loop #4 Suppressed (If Equipped)	No
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
Crash Record Locked	Yes
Vehicle Event Data (Pre-Crash) Associated With This Event	Yes
Driver 1st Stage Deployment Algorithm Mode (Unbelted)	No Trigger Mode
Driver 1st Stage Deployment Algorithm Mode (Belted)	No Trigger Mode

Passenger 1st Stage Deployment Algorithm Mode (Unbelted)	No Trigger Mode
Passenger 1st Stage Deployment Algorithm Mode (Belted)	No Trigger Mode
Event Recording Complete	Yes



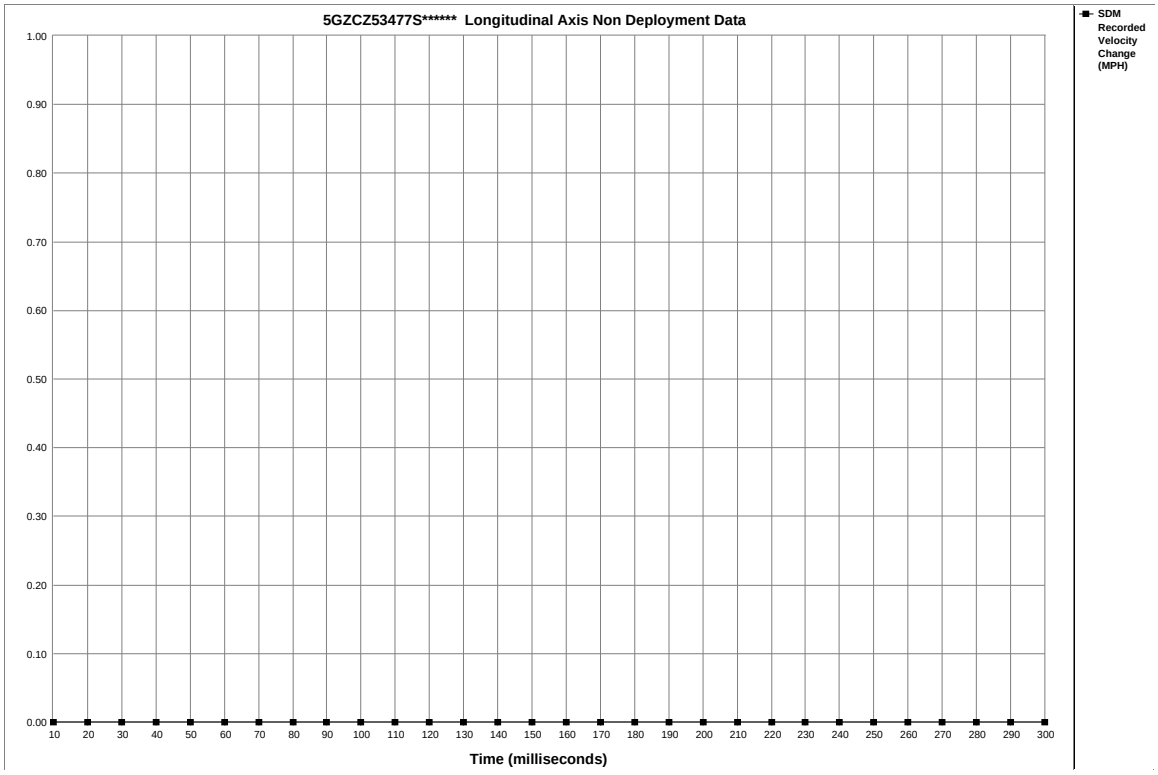
Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	10	20	30	40	50	60	70	80
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Time (milliseconds)	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230
SDM Longitudinal Axis Recorded Velocity Change (MPH)	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	0.00



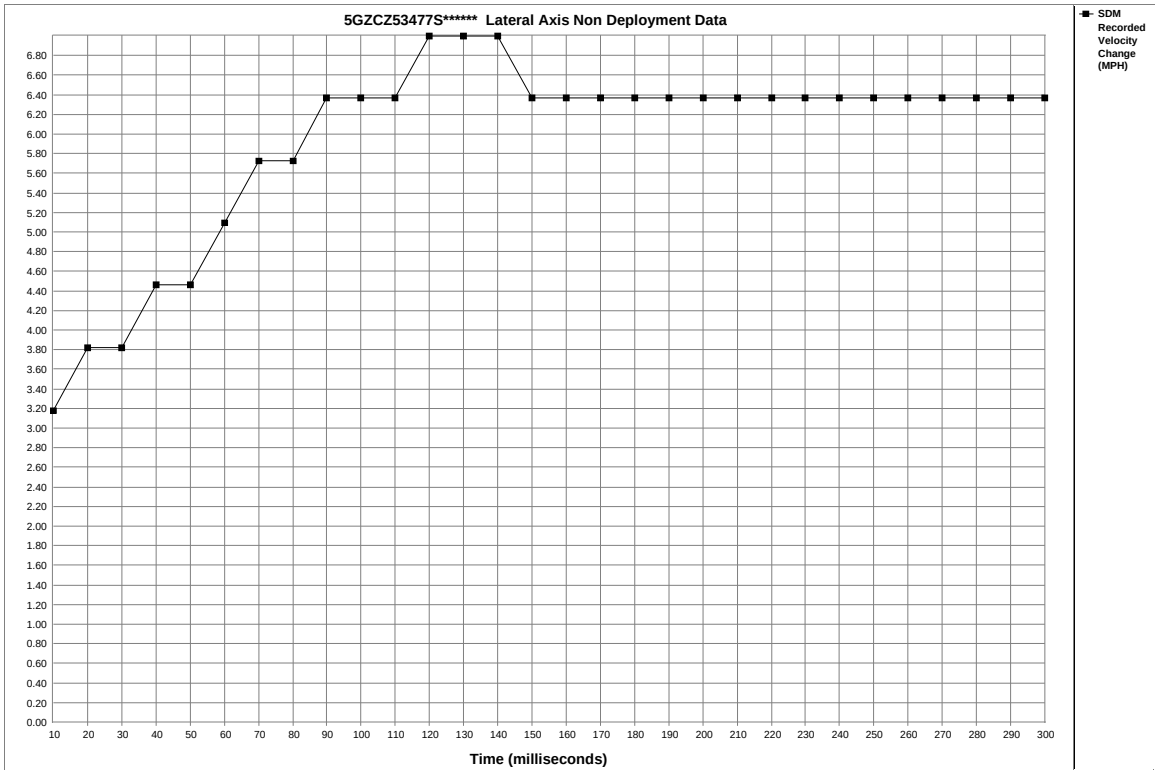
Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	10	20	30	40	50	60	70	80
SDM Lateral Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64	1.27	1.27
Time (milliseconds)	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230
SDM Lateral Axis Recorded Velocity Change (MPH)	1.27	1.27	1.91	1.91	2.55	2.55	2.55	2.55	2.55	3.18	3.18	3.18	3.18	3.82	3.82

System Status At Non-Deployment

SIR Warning Lamp Status	ON
SIR Warning Lamp ON/OFF Time Continuously (seconds)	10
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	0
Ignition Cycles At Investigation	3266
Ignition Cycles At Event	3260
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
Passenger's Belt Switch Circuit Status	UNBUCKLED
Automatic Passenger SIR Suppression System Status at AE	Air Bag Suppressed
Rollover Sensor Status	Rollover Event
Number of Consecutive Error Free Messages Received From Rollover Sensor	Last 8 Consecutive Messages Were Error Free
SDM Synchronization Counter	4127
Side Air Bag(s) Were First Commanded to Deploy Due to Side Impact Event	No
Side Air Bag(s) Were First Commanded to Deploy Due to Rollover Event	No
Driver 1st Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded	No
Driver Side Deployment Loop Commanded	No
Driver Pretensioner Deployment Loop Commanded	No
Driver Roof Rail/Head Curtain Loop Commanded (If Equipped)	No
Supplemental Deployment Loop #1 Commanded (If Equipped)	No
Passenger 1st Stage Deployment Loop Commanded	No
Passenger 2nd Stage Deployment Loop Commanded	No
Passenger Side Deployment Loop Commanded	No
Passenger Pretensioner Deployment Loop Commanded	No
Passenger Roof Rail/Head Curtain Loop Commanded (If Equipped)	No
Supplemental Deployment Loop #2 Commanded (If Equipped)	No
Second Row Left Side Deployment Loop Commanded	No
Second Row Left Pretensioner Deployment Loop Commanded (If Equipped)	No
Supplemental Deployment Loop #3 Commanded (If Equipped)	No
Second Row Right Side Deployment Loop Commanded (If Equipped)	No
Second Row Right Pretensioner Deployment Loop Commanded	No
Supplemental Deployment Loop #4 Commanded (If Equipped)	No
Supplemental Deployment Loop #4 Suppressed (If Equipped)	No
Diagnostic Trouble Codes at Event, fault number: 1	B0051
Diagnostic Trouble Codes at Event, fault number: 2	B0059
Diagnostic Trouble Codes at Event, fault number: 3	B0066
Diagnostic Trouble Codes at Event, fault number: 4	B0068
Diagnostic Trouble Codes at Event, fault number: 5	B0071
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
Maximum SDM Recorded Velocity Change (MPH)	7.00
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	110
Crash Record Locked	Yes
Deployment Event Recorded in the Non-Deployment Record	No
Vehicle Event Data (Pre-Crash) Associated With This Event	No
Driver 1st Stage Deployment Algorithm Mode (Unbelted)	No Trigger Mode
Driver 1st Stage Deployment Algorithm Mode (Belted)	No Trigger Mode
Passenger 1st Stage Deployment Algorithm Mode (Unbelted)	No Trigger Mode
Passenger 1st Stage Deployment Algorithm Mode (Belted)	No Trigger Mode
Event Recording Complete	Yes



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Longitudinal Axis Recorded Velocity Change (MPH)	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	0.00
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
SDM Longitudinal Axis Recorded Velocity Change (MPH)	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	0.00



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Lateral Axis Recorded Velocity Change (MPH)	3.18	3.82	3.82	4.46	4.46	5.09	5.73	5.73	6.37	6.37	6.37	7.00	7.00	7.00	6.37
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
SDM Lateral Axis Recorded Velocity Change (MPH)	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37