



# INDIANA UNIVERSITY

## TRANSPORTATION RESEARCH CENTER

School of Public and Environmental Affairs  
222 West Second Street  
Bloomington, Indiana 47403-1501  
(812) 855-3908 Fax: (812) 855-3537

### ON-SITE CERTIFIED ADVANCED 208-COMPLIANT VEHICLE INVESTIGATION

CASE NUMBER - IN-03-006  
LOCATION - Texas  
VEHICLE - 2003 CHEVROLET SILVERADO  
CRASH DATE - January 2003

Submitted:  
February 5, 2004  
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Contract Number: DTNH22-01-C-07022

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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16. <i>Abstract</i> This report covers an on-site investigation of a crash involving a 2003 Chevrolet Silverado 1500 pickup truck (case vehicle) that was impacted by a 1995 Buick Roadmaster sedan (other vehicle). This crash is of special interest because the case vehicle's manufacturer has certified that it meets the advanced air bag requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. In addition, the case vehicle was equipped with an Event Data Recorder (EDR) that was successfully downloaded. The case vehicle was traveling north in the northbound lane of a one-lane, one-way roadway that was part of a divided trafficway (i.e., there was one travel lane in each direction, separated by a narrow curbed median) that served as an exit/entrance ramp allowing access between an east-west Interstate highway and a north-south urban expressway. The Buick was traveling south in the southbound roadway of the same trafficway. It was snowing and the asphalt pavement was wet. The case vehicle had been negotiating a curve to the left and was entering a straight section of the road, traveling up a slope on the approach to an overpass. The case vehicle driver lost control and the case vehicle veered sharply across the median and into the southbound lane. The right front corner of the case vehicle was impacted by the front of the Buick. The case vehicle was redirected in a southwesterly direction while rotating counterclockwise and the Buick was redirected in a southwesterly direction. As the Buick continued forward and to the right, its left rear contacted the right front corner of the case vehicle. Both vehicles slid off the west edge of the roadway and come to rest on the roadside heading approximately east. The air bags in the case vehicle did not deploy while the two frontal air bags in the Buick did deploy. The case vehicle driver (19-year-old male) was restrained by the available, manual, integrated, lap-and-shoulder safety belt system. For the three other case vehicle occupants (44-year-old female, 26-year-old male and 19-year-old male), it is not known if they were restrained by the available safety belts. All four occupants sustained police-reported "C" (possible) or no injuries and declined ambulance transport.					
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TABLE OF CONTENTS

IN-03-006

	<u>Page No.</u>
BACKGROUND . . . . .	1
SUMMARY . . . . .	1
CRASH CIRCUMSTANCES . . . . .	4
CASE VEHICLE: 2003 CHEVROLET SILVERADO 1500 PICKUP TRUCK . . . . .	5
CASE VEHICLE DAMAGE . . . . .	5
AUTOMATIC RESTRAINT SYSTEM . . . . .	6
EVENT DATA RECORDER . . . . .	6
CASE VEHICLE DRIVER KINEMATICS . . . . .	7
CASE VEHICLE FRONT RIGHT PASSENGER KINEMATICS . . . . .	8
CASE VEHICLE BACK LEFT PASSENGER KINEMATICS . . . . .	8
CASE VEHICLE BACK RIGHT PASSENGER KINEMATICS . . . . .	8
OTHER VEHICLE: 1995 BUICK ROADMASTER . . . . .	8
CRASH DIAGRAM . . . . .	10
SENSING AND DIAGNOSTIC MODULE REPORT	
Figure 7: System Status at Non-Deployment . . . . .	11
Figure 8: Non-Deployment Pre-Crash Graph . . . . .	11
Figure 9: Non-Deployment Longitudinal Velocity Change Graph . . . . .	12
Figure 10: SDM Data Limitations . . . . .	13
SELECTED PHOTOGRAPHS	
Figure 1: Case vehicle's northbound approach . . . . .	4
Figure 2: Approximate area of both vehicles' final rest . . . . .	4
Figure 3: Case vehicle's front right damage area . . . . .	5
Figure 4: Case vehicle's front and left side . . . . .	6
Figure 5: Front of other vehicle . . . . .	9
Figure 6: Other vehicle's left rear corner area . . . . .	9

This on-site investigation was brought to the NHTSA's attention on January 29, 2003 by NASS/GES sampling activities. This crash involved a 2003 Chevrolet Silverado (case vehicle) and a 1995 Buick Roadmaster (other vehicle). The crash occurred in January 2003, at 12:00 p.m., in Texas, and was investigated by the applicable municipal police. This crash is of special interest because the case vehicle's manufacturer has certified that it meets the advanced air bag requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. In addition, the case vehicle was equipped with an Event Data Recorder (EDR) that was successfully downloaded. The case vehicle driver (19-year-old male, black, unknown if Hispanic), front right passenger (44-year-old female, race/ethnicity unknown) and left rear passenger (26-year-old male, race/ethnicity unknown) all sustained police-reported "C" (possible) injuries, and the right rear passenger (19-year-old male, race/ethnicity unknown) was police-reported as not injured. This contractor inspected both vehicles on February 5, 2003 and inspected the scene on February 6. The case vehicle driver could not be located and no interview was conducted. This report is based on the police crash report, scene and vehicle inspections, the EDR download information, occupant kinematic principles, and this contractor's evaluation of the evidence.

**SUMMARY**

The case vehicle was traveling north in the northbound lane of a one-lane, one-way roadway that was part of a divided trafficway (i.e., there was one travel lane in each direction, separated by a narrow curbed median) that served as an exit/entrance ramp allowing access between an east-west Interstate highway and a north-south urban expressway. The Buick was traveling south in the southbound roadway of the same trafficway. It was snowing and the asphalt pavement was wet. The case vehicle had been negotiating a curve to the left and was entering a straight section of the road, traveling up a slope on the approach to an overpass. The case vehicle driver lost control and the case vehicle veered sharply across the median and into the southbound lane.

The right front corner of the case vehicle was impacted by the front of the Buick. The case vehicle was redirected in a southwesterly direction while rotating counterclockwise and the Buick was redirected in a southwesterly direction. As the Buick continued forward and to the right, its left rear contacted the right front corner of the case vehicle. Both vehicles slid off the west edge of the roadway and come to rest on the roadside heading approximately east. The air bags in the case vehicle did not deploy while the two frontal air bags in the Buick did deploy.

The case vehicle was a 2003 Chevrolet Silverado 1500 rear wheel drive, extended cab, four-door pick-up truck (VIN: 2GCEC19T131-----). The case vehicle was equipped with four-wheel anti-lock brakes and dual stage air bags at the driver and front right passenger seat positions.

The case vehicle's initial contact with the Buick involved the right front fender and wheel, and the right edge of the front bumper and fascia. Direct damage began 370 centimeters [145.7 inches] forward of the right rear axle and extended 78 centimeters [30.7 inches] forward along the fender to the bumper corner. Maximum crush was measured as 11 centimeters [4.3 inches] at C5. The wheelbase was not changed on either side. The case vehicle's right front fender, front bumper, bumper fascia, and right front headlamp and turn signal assemblies were directly

damaged and crushed inward. The case vehicle's right front wheel/tire was not physically restricted, but the leading edge was pushed inward and the wheel was immobile.

Based on the vehicle inspection, CDCs for the case vehicle were determined to be **03-RFEW-2 (100)** for event one and **03-RFMW-1 (90)** for event two. The WinSMASH reconstruction program, damage algorithm, was used on the case vehicle's highest severity (first) impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 10.0 km.p.h. [6.2 m.p.h.], + 1.7 km.p.h. [+ 1.1 m.p.h.], and -9.8 km.p.h. [-6.1 m.p.h.]. WinSMASH values for the second impact could not be determined due to the overlapping damage but the crash severity for this impact was estimated to be minor (2-13 km.p.h. [1-8 m.p.h.]). The case vehicle was towed due to damage.

The case vehicle's driver air bag was located in the steering wheel hub and the front right passenger's air bag was located in the middle of the instrument panel. Neither air bag deployed during this crash. Inspection of the case vehicle's interior revealed that there was no evidence of occupant contact on the interior components other than the driver's safety belt webbing.

The case vehicle's Event Data Recorder (EDR) was successfully downloaded and the Sensing and Diagnostic Module (SDM) report is included at the end of this document. The SDM reporting indicates that two non-deployment events were recorded. The Data Limitations component of the SDM report explains that up to two non-deployment events can be stored, and the first non-deployment event can be overwritten if a second event shows greater longitudinal deceleration. For this crash, the stored data appear to be associated with the case vehicle's front tires impacting the curbed median as the driver lost control. This impact did not produce any wheel/tire damage and is not included in the coded case as a crash event. The second SDM-reported event, which is noted by the system but with no data recorded, appears to be the case vehicle's first impact with the other vehicle, which is the first harmful event in the coded case.

The SDM's System Status report shows that the SIR Warning Lamp was off, meaning there were no faults detected in the automatic restraint system. The driver's safety belt was buckled, the crash occurred on ignition cycle 1,014 and the download was obtained on ignition cycle 1,025. The event recording was noted as complete, with multiple events associated with this record, meaning more than one event occurred within five seconds of the original algorithm enable.

The SDM's Non-Deployment Pre-Crash Data show that the case vehicle was traveling 51.5 km.p.h. [32 m.p.h.] five seconds prior to algorithm enable and accelerated to 62.8 km.p.h. [39 m.p.h.] at three seconds prior. Between -3 and -2 seconds, throttle input dropped to zero, the brakes were activated and the vehicle began to decelerate. At -1 second, the vehicle had slowed to 22.5 km.p.h. [14 m.p.h.].

The SDM's Non-Deployment Velocity Change Data show negative longitudinal delta V accumulating gradually to -4.0 km.p.h. [-2.48 m.p.h.] at 70 milliseconds [0.070 seconds] after algorithm enable, with maximum velocity change -4.2 km.p.h. [-2.62 m.p.h.] at 77.5 milliseconds [0.0775 seconds].

Immediately prior to the crash the case vehicle's driver (19-year-old male, black, unknown if Hispanic, height and weight unknown), was seated in an unknown position but likely with his left foot on the floor his right foot on the accelerator/brake and both his hands on the steering wheel. His seat track was located in its rearmost position, the seat back was slightly reclined, and the tilt steering wheel was adjusted in its middle position.

The case vehicle's driver was restrained by his available, active, three-point, lap-and-shoulder, integrated safety belt system. The inspection of the driver's safety belt showed evidence of loading, most notably a scuff on the webbing near the latch plate. Furthermore, the SDM report shows the driver's belt being buckled at the time of the crash. The driver braked as the out-of-control vehicle was veering sharply to the left, but it is not known if there was any steering input. As a result of the braking, his body probably moved slightly forward and to the right just prior to impact.

The case vehicle's wheel impact with the curbed median probably caused the driver to move forward as the vehicle decelerated. The case vehicle's primary impact with the Buick caused the case vehicle driver to move rightward, toward the 3:00 o'clock direction of force, as the case vehicle decelerated further and was redirected. His position at final rest is not known, but he probably remained in an approximately normal posture as his safety belt held him in place. The driver sustained police-reported "C" (possible) injuries and refused ambulance transport to a medical facility. His treatment status and specific injuries, if any, are not known.

The case vehicle's front right passenger (44-year-old female, race/ethnicity, height and weight unknown) was seated in an unknown posture. Her seat track was located between its middle and rearmost positions and the seat back was slightly reclined. She was police-reported as having been restrained by her available, active, three-point, lap-and-shoulder, integrated safety belt system, but there was no physical evidence to support this. She sustained police-reported "C" (possible) injuries and refused ambulance transport to a medical facility. Her treatment status and specific injuries, if any, are not known.

The case vehicle's left rear passenger (26-year-old male, race/ethnicity, height and weight unknown) was seated in an unknown posture. His seat track and seat back positions were not adjustable. He was police-reported as having been restrained by his available, active, three-point, lap-and-shoulder safety belt system, but there was no physical evidence to support this. He sustained police-reported "C" (possible) injuries and refused ambulance transport to a medical facility. His treatment status and specific injuries, if any, are not known.

The case vehicle's right rear passenger (19-year-old male, race/ethnicity, height and weight unknown at this time) was seated in an unknown posture. His seat track and seat back positions were non adjustable. He was police-reported as having been restrained by his available, active, three-point, lap-and-shoulder safety belt system, but there was no physical evidence to support this. According to the police crash report, this passenger was not injured in this crash.

The other vehicle was a 1995 Buick Roadmaster, rear wheel drive, four-door, six passenger sedan (VIN: 1G4BT52P5SR-----). The Buick was equipped with driver and front right

passenger front air bags that did deploy. The Buick's front bumper underrode the case vehicle's fender and the side profile of the case vehicle's front bumper, and most of the damage on the Buick was above-bumper. The secondary damage on the Buick's left rear corner area was very minor. The CDCs for the Buick were determined to be: **12-FLEW-2 (350)** for event one (maximum crush was 37 centimeters [14.6 inches] on the radiator support bracket slightly inboard of the front left corner) and **09-LBMW-1 (270)** for event two. The WinSMASH reconstruction for the Buick's frontal impact with the right side of the case vehicle indicated Total, Longitudinal and Lateral DeltaVs, respectively: 11.0 km.p.h. [6.8 m.p.h.], -10.8 km.p.h. [-6.7 m.p.h.] and + 1.9 km.p.h. [+ 1.2 m.p.h.]. The Buick was towed due to damage.

All four occupants of the Buick were transported to a hospital via ambulance for medical treatment, with police-reported "B" (evident, not incapacitating) or "C" (possible) injuries. Their treatment status and specific injuries are not known.

### CRASH CIRCUMSTANCES

The case vehicle was traveling north in the northbound lane of a one-lane, one-way roadway that was part of a divided trafficway (i.e., there was one travel lane in each direction, separated by a curbed narrow median) that served as an exit/entrance ramp allowing access between an east-west Interstate highway and a north-south urban expressway. The Buick was traveling south in the southbound roadway of the same trafficway. It was snowing and the asphalt pavement was wet. The posted speed limit was 56 km.p.h. [35 m.p.h.]. The case vehicle had been negotiating a curve to the left and was entering a straight section of the road, traveling up a slope on the approach to an overpass. The case vehicle driver lost control and the case vehicle veered sharply across the separator and into the southbound lane (**Figure 1**).

The right front corner of the case vehicle was impacted by the front of the Buick. The case vehicle was redirected in a southwesterly direction while rotating counterclockwise and the Buick was redirected in a southwesterly direction. As the Buick continued forward and to the right, its left rear contacted the right front corner of the case vehicle. Both vehicles slid off the west edge of the roadway and come to rest on the roadside heading approximately east (**Figure 2**).



**Figure 1:** Case vehicle's northbound path of travel, at the approximate location where the driver lost control and crossed into the southbound lane (case photo #04)



**Figure 2:** Approximate final rest area for both vehicles, on the grassy slope along the west edge of the southbound roadway (case photo #13)



The case vehicle was a 2003 Chevrolet Silverado 1500 rear wheel drive, extended cab, four-door, six-passenger pick-up truck (VIN: 2GCEC19T131-----), equipped with a V8, 5.3 liter gasoline engine and an automatic transmission with a column-mounted selector lever. The case vehicle was equipped with four-wheel anti-lock brakes and dual stage air bags at the driver and front right passenger seat positions. Its wheelbase was 364 centimeters [143.5 inches] and the odometer reading was 12,218 kilometers [7,592 miles]. The case vehicle was towed due to disabling damage.

**CASE VEHICLE DAMAGE**

The case vehicle's initial contact with the Buick involved the right front fender and wheel, and the front bumper and fascia (**Figure 3**). Direct damage began 370 centimeters [145.7 inches] forward of the right rear axle and extended 78 centimeters [30.7 inches] forward along the fender to the bumper corner. Maximum crush was measured as 11 centimeters [4.3 inches] at C5. The wheelbase was not changed. The case vehicle's right front fender, front bumper, bumper fascia, and right front headlamp and turn lamp assemblies were directly damaged and crushed inward. There was no glazing damage (**Figure 4**).

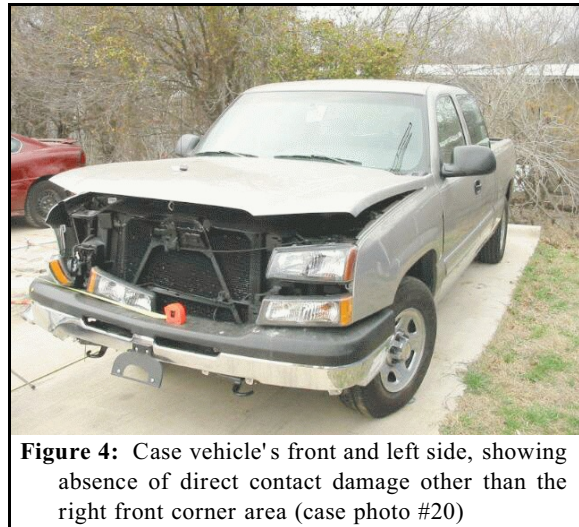


**Figure 3:** Case vehicle's right front corner, showing direct and induced damage (case photo #25)

The case vehicle manufacturer's recommended tire size was P235/75R16 and the case vehicle was equipped with four Goodyear “Wrangler ST” tires of the recommended size. The right front wheel/tire was not physically restricted or damaged, but the leading edge was pushed inward with damage to the suspension/steering mechanism, and the wheel was immobile (**Figure 3**). There was no other wheel/tire damage.

Tire	Measured Pressure		Recommend Pressure		Tread Depth		Damage	Restricted	Deflated
	kPa	psi	kPa	psi	milli-meters	32 <sup>nd</sup> of an inch			
LF	221	32	241	35	6	8	None	No	No
RF	214	31	241	35	7	9	None	No	No
LR	214	31	241	35	8	10	None	No	No
RR	207	30	241	35	8	10	None	No	No

Based on the vehicle inspection, CDCs for the case vehicle were determined to be: **03-RFEW-2 (100)** for event one and: **03-RFMW-1 (90)** for event two. The WinSMASH reconstruction program, damage algorithm based on the measured crush profile of both vehicles, was used on the case vehicle's highest severity (first) impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 10.0 km.p.h. [6.2 m.p.h.], + 1.7 km.p.h. [+ 1.1 m.p.h.], and -9.8 km.p.h. [-6.1 m.p.h.]. WinSMASH values for the second impact could not be determined due to the overlapping damage but the crash severity for this impact was estimated to be minor (2-13 km.p.h. [1-8 m.p.h.]).



**Figure 4:** Case vehicle's front and left side, showing absence of direct contact damage other than the right front corner area (case photo #20)

Inspection of the case vehicle's interior revealed that there was no evidence of occupant contact on the interior components other than the driver's safety belt webbing.

#### **AUTOMATIC RESTRAINT SYSTEM**

The case vehicle's driver air bag was located in the steering wheel hub and the front right passenger's air bag was located in the middle of the instrument panel. Neither air bag deployed during this crash.

#### **EVENT DATA RECORDER**

The case vehicle's Event Data Recorder (EDR) was successfully downloaded in the field via the diagnostic port (i.e., the case vehicle's electrical system was functional) and the Sensing and Diagnostic Module (SDM) report is included as **Figures 7 - 10**. The SDM report indicates that two non-deployment events were recorded. The Data Limitations component of the SDM report explains that up to two non-deployment events can be stored, and the first non-deployment event can be overwritten if a second event shows greater deceleration (the SDM Data Limitations text is presented as **Figures 10.1** and **10.2**)<sup>1</sup>. For this crash, the stored data appear to be associated with the case vehicle's front tires impacting the curbed median as the driver lost control. This impact did not produce any wheel/tire damage and is not included in the coded case as a crash event. The second SDM-reported event, which is noted by the system but with no data recorded, appears to be the case vehicle's first impact with the other vehicle, which is the first harmful event in the coded case.

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<sup>1</sup>The Vetronix 1.68 software (an early release or "beta" version) was used to download this vehicle's EDR. Different SDM reports are produced for various specific vehicles. Documentation for model year 2003 vehicles was not complete when this beta version was released.

The SDM's System Status report (**Figure 7**) shows that the SIR Warning Lamp was off, meaning there were no faults detected in the automatic restraint system. The driver's safety belt was buckled, the crash occurred on ignition cycle 1,014 and the download was obtained on ignition cycle 1,025. The event recording was noted as complete, with multiple events associated with this record, meaning more than one event occurred within five seconds of the original algorithm enable.

The SDM's Non-Deployment Pre-Crash Data show that the case vehicle was traveling 51.5 km.p.h. [32 m.p.h.] five seconds prior to algorithm enable and accelerated to 62.8 km.p.h. [39 m.p.h.] at three seconds prior. Between -3 and -2 seconds, throttle input dropped to zero, the brakes were activated and the vehicle began to decelerate. At -1 second, the vehicle had slowed to 22.5 km.p.h. [14 m.p.h.]. The pre-crash data are presented as a table in **Figure 7** and shown graphically in **Figure 8**.

The SDM's Non-Deployment Velocity Change Data show negative longitudinal delta V accumulating gradually to -4.0 km.p.h. [-2.48 m.p.h.] at 70 milliseconds [0.070 seconds] after algorithm enable, with maximum velocity change -4.2 km.p.h. [-2.62 m.p.h.] at 77.5 milliseconds [0.0775 seconds]. The velocity change data are presented as a table in **Figure 7** and are shown graphically in **Figure 9**.

#### **CASE VEHICLE DRIVER KINEMATICS**

Immediately prior to the crash the case vehicle's driver (19-year-old male, black, unknown if Hispanic, height and weight unknown) was seated in an unknown position but likely with his left foot on the floor his right foot on the accelerator/brake and both his hands on the steering wheel. His seat track was located in its rearmost position, the seat back was slightly reclined, and the tilt steering wheel was located in its middle position.

The case vehicle's driver was restrained by his available, active, three-point, lap-and-shoulder, integrated safety belt system. The inspection of the driver's seat belt webbing, D-ring, and latch plate showed evidence of loading, most notably a scuff on the webbing near the latch plate. Furthermore, the SDM report shows the driver's belt being buckled at the time of the crash. The driver braked as the out-of-control vehicle was veering sharply to the left, but it is not known if there was any steering input. As a result of the braking, his body probably moved slightly forward and to the right just prior to impact.

The case vehicle's wheel impact with the curbed median probably caused the driver to move forward as the vehicle decelerated. The case vehicle's primary impact with the Buick caused the case vehicle driver to move rightward, toward the 3:00 o'clock direction of force, as the case vehicle decelerated further and was redirected. His position at final rest is not known, but he probably remained in an approximately normal posture as his safety belt held him in place. The driver sustained police-reported "C" (possible) injuries and refused ambulance transport to a medical facility. His treatment status and specific injuries, if any, are not known.

The case vehicle's front right passenger (44-year-old female, race/ethnicity, height and weight unknown) was seated in an unknown posture with unknown feet/leg and hand/arm positions. Her seat track was located between its middle and rearmost positions and the seat back was slightly reclined. She was police-reported as having been restrained by her available, active, three-point, lap-and-shoulder, integrated safety belt system, but there was no physical evidence to support this. She sustained police-reported "C" (possible) injuries and refused ambulance transport to a medical facility. Her treatment status and specific injuries are not known.

#### CASE VEHICLE LEFT REAR PASSENGER KINEMATICS

The case vehicle's left rear passenger (26-year-old male, race/ethnicity, height and weight unknown) was seated in an unknown posture with unknown feet/leg and hand/arm positions. His seat track and seat back positions were not adjustable and. He was police-reported as having been restrained by his available, active, three-point, lap-and-shoulder safety belt system, but there was no physical evidence to support this. He sustained police-reported "C" (possible) injuries and refused ambulance transport to a medical facility. His treatment status and specific injuries are not known.

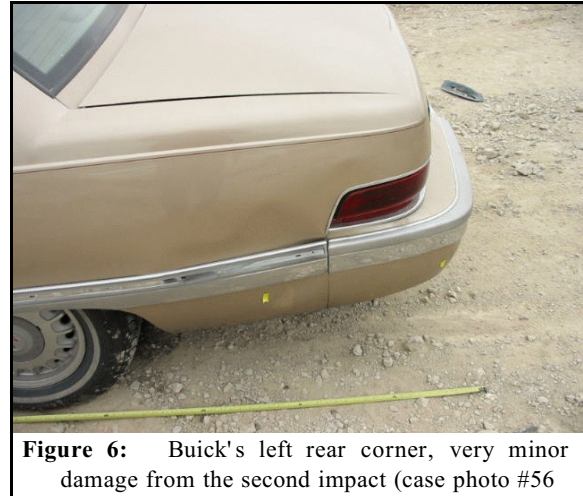
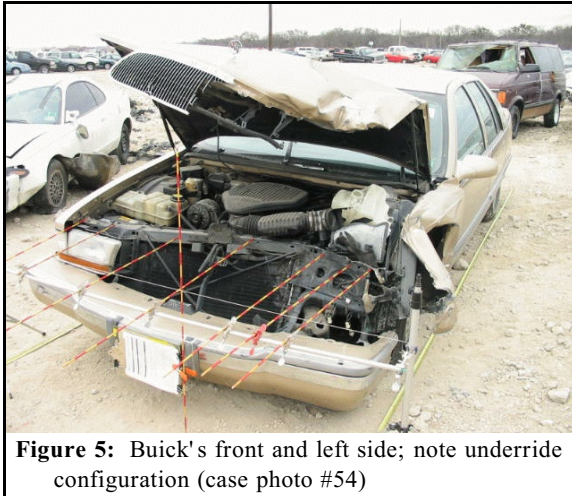
#### CASE VEHICLE RIGHT REAR PASSENGER KINEMATICS

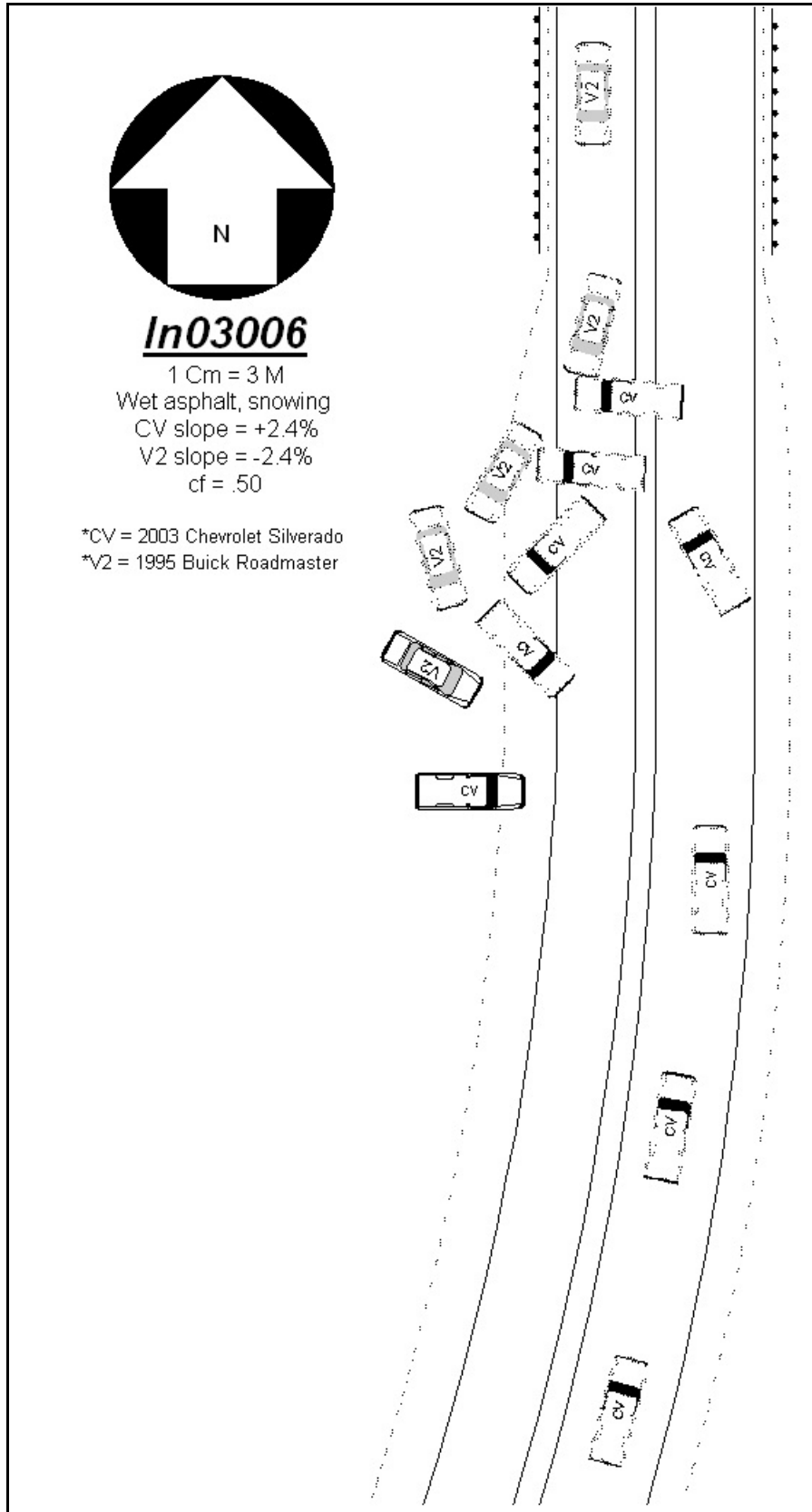
The case vehicle's right rear passenger (19-year-old male, race/ethnicity, height and weight unknown) was seated in an unknown posture with unknown feet/leg and hand/arm positions. His seat track and seat back positions were not adjustable. He was police-reported as having been restrained by his available, active, three-point, lap-and-shoulder safety belt system, but there was no physical evidence to support this. According to the police crash report, this passenger was not injured in this crash.

#### OTHER VEHICLE

The other vehicle was a 1995 Buick Roadmaster, rear wheel drive, four-door, six passenger sedan (VIN: 1G4BT52P5SR-----). The Buick was equipped with driver and front right passenger front air bags that did deploy. The Buick's front bumper underrode the case vehicle's fender and the side profile of the case vehicle's front bumper, and most of the damage on the Buick was above-bumper (**Figure 5**). The secondary damage on the Buick's left rear corner area was very minor (**Figure 6**). The CDCs for the Buick were determined to be: **12-FLEW-2 (350)** for event one (maximum crush was 37 centimeters [14.6 inches] on the radiator support bracket slightly inboard of the front left corner) and **09-LBMW-1 (270)** for event two. The WinSMASH reconstruction for the Buick's frontal impact with the right side of the case vehicle indicated Total, Longitudinal and Lateral DeltaVs, respectively: 11.0 km.p.h. [6.8 m.p.h.], -10.8 km.p.h. [-6.7 m.p.h.] and + 1.9 km.p.h. [+ 1.2 m.p.h.]. The Buick was towed due to damage.

All four occupants of the Buick were transported to a hospital via ambulance for medical treatment, with police-reported “B” (evident, not incapacitating) or “C” (possible) injuries. Their treatment status and specific injuries are not known.





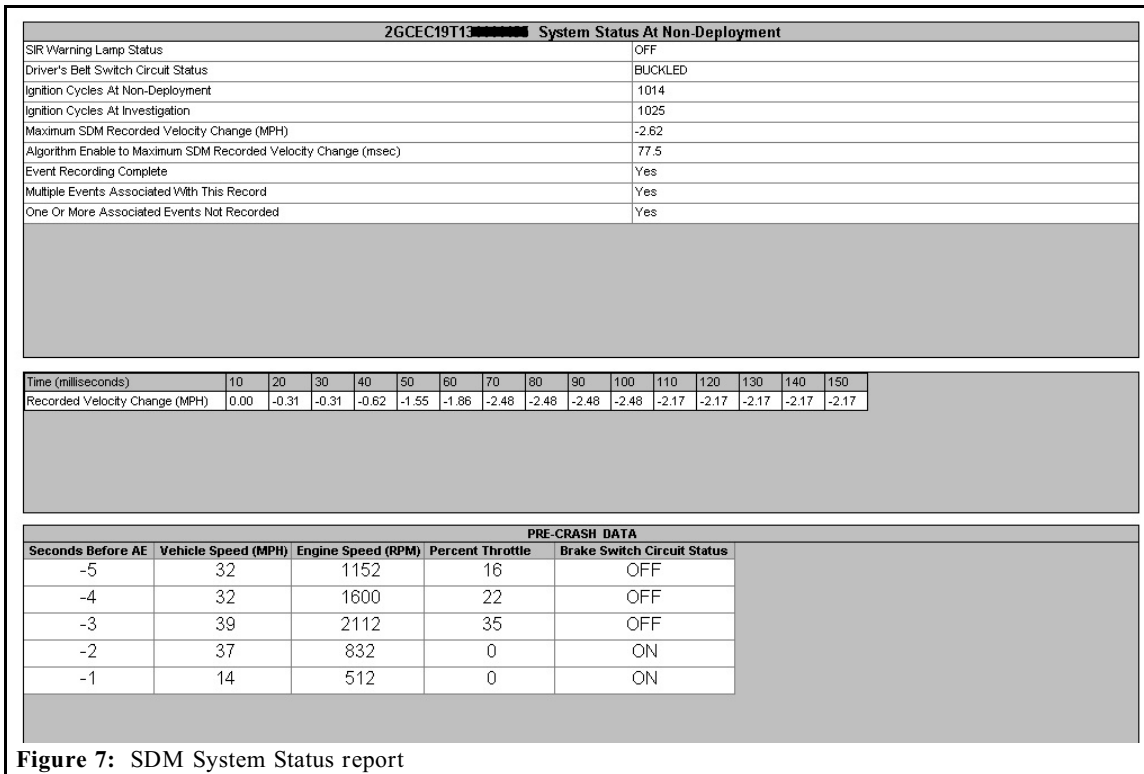


Figure 7: SDM System Status report

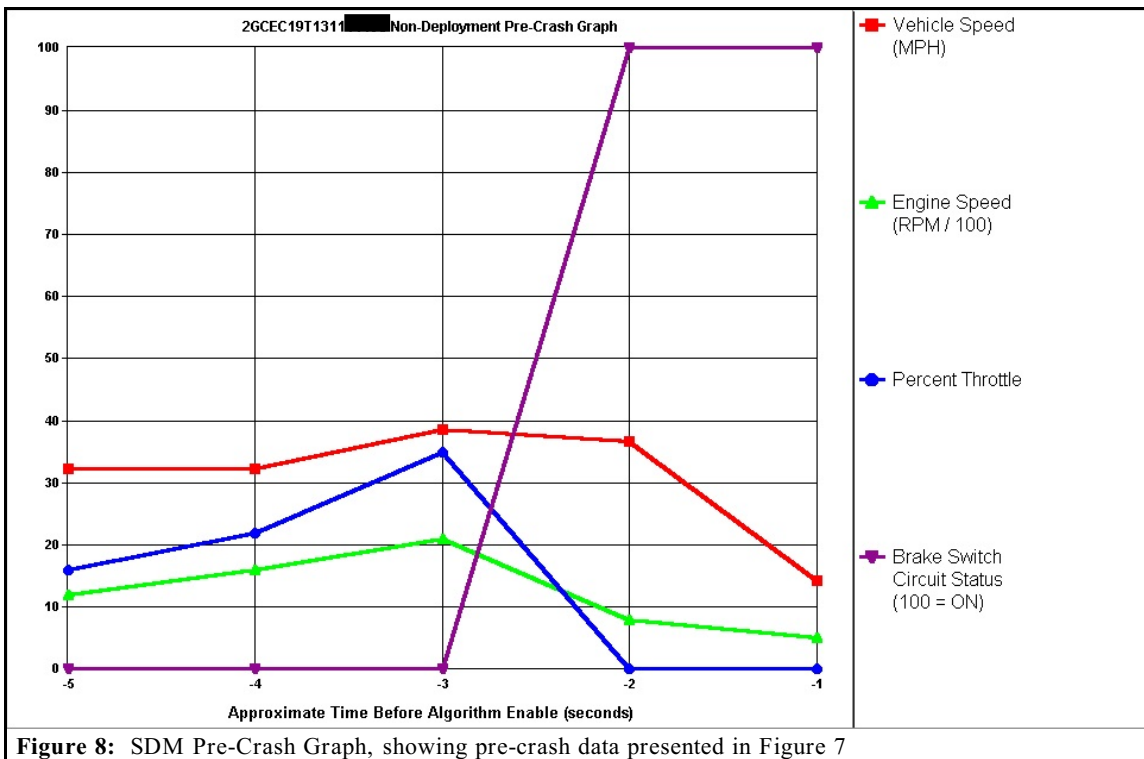
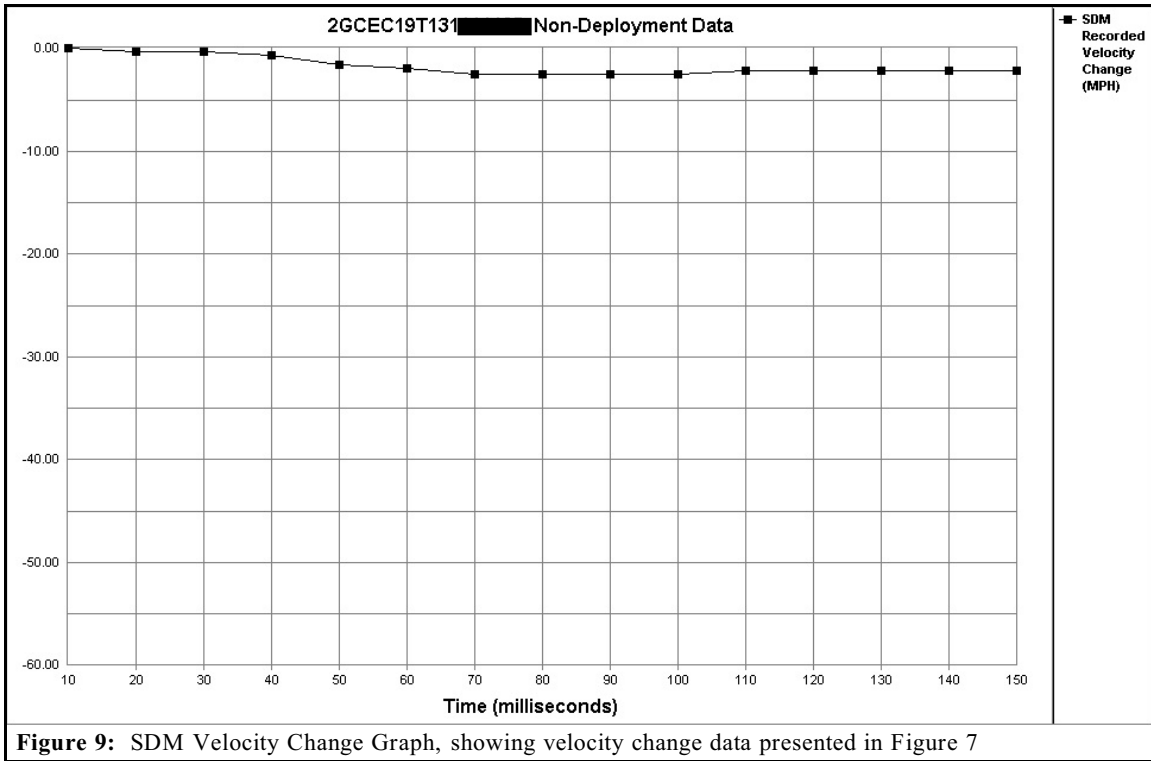


Figure 8: SDM Pre-Crash Graph, showing pre-crash data presented in Figure 7





## SDM Data Limitations Text

## 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). It contains Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded vehicle forward velocity change. This event will be cleared by the SDM after the ignition has been cycled 250 times.

The second type of SDM recorded crash event is the Deployment Event. It also contains Pre-Crash and Crash data. The SDM can store up to two different Deployment Events, if they occur within five seconds of one another. Deployment events can not 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 file will be locked after a deployment, if the non-deployment occurred within 5 seconds before the deployment or a deployment level event occurs within 5 seconds after the deployment.

## SDM Data Limitations:

-SDM Recorded Vehicle Forward Velocity Change is one of the measures used to make air bag deployment decisions. SDM Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced during the recorded portion of the event. 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. The SDM will record 100 milliseconds of data after deployment criteria is met and up to 50 milliseconds before deployment criteria is met. The SDM will also record 150 milliseconds of data after non-deployment criteria is met.

-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 does not receive a valid message for any of the four Pre-Crash data parameters (Vehicle Speed, Engine Speed, Percent Throttle, and Brake Switch Circuit Status).

-Driver's Belt Switch Circuit Status indicates the status of the driver's 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 25.4 seconds, "N/A" is displayed in place of the time.

-If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.

**Figure 10.1:** SDM Data Limitations information, part 1

## SDM Data Source:

All SDM recorded data is measured, calculated, and stored internally, except for the following:

-Vehicle Speed, Engine Speed, and Percent Throttle data are transmitted once a second by the Powertrain Control Module (PCM), via the Class 2 data link, to the SDM.

-Brake Switch Circuit Status data is transmitted once a second by either the ABS module or the PCM, via the Class 2 data link, to the SDM.

-In most vehicles, the Driver's Belt Switch Circuit is wired directly to the SDM. In some vehicles, the Driver's Belt Switch Circuit Status data is transmitted from the Body Control Module (BCM), via the Class 2 data link, to the SDM.

**Figure 10.2:** SDM Data Limitations information, part 2