Certified Advanced 208 Compliant Vehicle Investigation / Vehicle to Vehicle
Dynamic Science, Inc. / Case Number: DS05016
2005 Buick Rendezvous
Oregon
August 2005

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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

This on-site investigation focused on the performance of the side and front air bag systems in a Certified Advanced 208-Compliant (CAC) vehicle (2005 Buick Rendezvous CXL). This two vehicle crash occurred in August 2005 at 2002 hours in an urban area of Oregon. The crash occurred within the confines of a four-leg intersection. The case vehicle was a 2005 Buick Rendezvous being driven by a 36-year-old female. There were two additional passengers in the vehicle. The other vehicle was a 1997 Ford Econoline van being driven by a 29-year-old male. The Buick Rendezvous was traveling west. The Ford van was traveling north. The driver of the Ford Econoline did not stop at the posted stop sign, traveled into the intersection and the front of the case vehicle struck the right side of the Ford. At impact, the Buick Rendezvous's dual front air bags and the driver's seat back mounted side air bag deployed. The Ford continued in a northwesterly direction, traveled over the west curb, over a short concrete landscaping edger, through a chain link fence and came to final rest facing northwest, partially in the yard of a private residence. After the initial impact, the Buick traveled over the northwest curb of the intersection and the front of the case vehicle impacted a stop sign, shearing the sign from its base. The Buick came to final rest on the sidewalk, facing northwest. According to the police report, the driver of the Buick sustained "minor" injuries and there were no injuries reported for the other two occupants.

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Crash Investigation
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BACKGROUND:

Description

This on-site investigation focused on the performance of the side and front air bag systems in a Certified Advanced 208-Compliant (CAC) vehicle (2005 Buick Rendezvous CXL). The multi-stage air bags were certified by the manufacturer to meet the advanced air bag requirements of Federal Motor Vehicle Safety Standard No. 208. This two vehicle crash occurred in August 2005 at 2002 hours in an urban area of Oregon. The crash occurred within the confines of a four-leg intersection. The case vehicle was a 2005 Buick Rendezvous being driven by a restrained 36-year-old female. There were two additional passengers in the vehicle. The other vehicle was a 1997 Ford Econoline van being driven by a 29-year-old male. The Buick Rendezvous was traveling west on a two lane, two-way roadway with no traffic controls. The Ford van was traveling north on a two lane, two-way intersecting street controlled by stop signs. The driver of the Ford Econoline did not stop at the posted stop sign, traveled into the intersection and the front of the case vehicle struck the right side of the Ford. At impact, the Buick Rendezvous's dual front air bags and the driver's seat back mounted side air bag deployed. The Ford continued in a northwesterly direction, traveled over the west curb, over a short concrete landscaping edger, through a chain link fence and came to final rest facing northwest, partially in the yard of a private residence. After the initial impact, the Buick traveled over the northwest curb of the intersection and the front of the case vehicle impacted a stop sign, shearing the sign from its base. The Buick came to final rest on the sidewalk, facing northwest.

Figure 1. Front of 2005 Buick Rendevous

Figure 2. Right side damage - 1997 Ford Econoline E250 Cargo van

According to the police report, the driver of the Buick sustained "minor" injuries and there were no injuries reported for the other two occupants. No one in the Buick was transported from the scene but according to the driver, a family friend who is a registered nurse examined all three occupants at their home a short time after the crash. The driver also reported that all three occupants sought medical treatment from their personal physician the following day. According to the police report, the driver of the Ford was not injured. He was arrested and transported from the scene to a police station. Both vehicles were towed from the scene due to damage.

This crash was identified within a group of potential cases provided to the NHTSA by Nationwide Insurance. DSI received the spreadsheet containing the potential cases on September 16, 2005. DSI was assigned the case and located and obtained permission to inspect the case vehicle on September 20, 2005. A police report was obtained on September 21, 2005 and field work was completed on September 26, 2005.

SUMMARY

Crash Site

This two vehicle crash occurred in August 2005 at 2002 hours in an urban area of Oregon. The crash occurred within the confines of a four-leg intersection. The 2005 Buick Rendezvous was traveling west on a two-way roadway consisting of two undivided asphalt travel lanes. The westbound lane had a slight downhill grade of 1.6%. There were narrow dedicated bike lanes adjacent to the travel lanes and dedicated parking lanes between the bike lanes and the curbs.

Figure 3. Approach of case vehicle to intersection-west

The Ford Econoline was traveling north on an intersecting asphalt roadway consisting of two undivided travel lanes. This street had one north and one southbound travel lane. The northbound lane had a slight downhill grade of 1.6%. At the time of the crash, both roadways were dry, the weather conditions were clear and there were no visual obstructions present. It was dark outside but there were street lights illuminating the roadway. The posted speed limit for east/west traffic was 48 km/h (30 mph). The speed limit for north/south traffic was 40 km/h (25 mph).

Figure 4. Approach of other vehicle to intersection-north

Pre-Crash

The 2005 Buick Rendezvous was being driven by a restrained 36-year-old female (163 cm/64 in, 59 kg/130 lbs). There were two other passengers in the vehicle. The front right seat was occupied by a restrained 13-year-old female (150 cm/59 in, 48 kg/105 lbs) and the second row right seat was occupied by a restrained 11-year-old female (145 cm/57 in, 39 kg/85 lbs). The Buick Rendezvous was traveling west in the westbound lane of the two lane, two-way roadway and had no traffic controls.

The other vehicle was a 1997 Ford Econoline van being driven by a 29-year-old male. The van was traveling north on the two lane, two-way roadway. According to the police report, this vehicle was involved in two hit and run accidents prior to this crash. The two hit and run crash configurations are unknown. At the intersection there are stop signs posted for north and southbound traffic. The van did not stop at the posted stop sign and entered the intersection, crossing in front of the case vehicle.

Crash

The driver of the Buick Rendezvous braked but could not stop in time and the front of the case vehicle (71FDEW2) struck the right side of the van (01RYEW2). The impact severity was moderate, and resulted in the deployment of the Buick's left side air bag and both front air bags. The EDR-reported longitudinal delta V was -25.2 km/h (-15.66 mph), 107.5 milliseconds into the crash. The missing vehicle routine of the WinSmash program computed a total delta V of 19.0 km/h (11.8 mph). The longitudinal and lateral components were -14.6 km/h (-9.1 mph) and 12.2 km/h (7.6 mph), respectively.

Figure 5. Case vehicle's post-impact trajectory towards the impacted stop sign pole (pole replaced)

The EDR reported speed one second prior to impact was 48 km/h (30 mph). Brake application was based on the EDR pre-crash data, which showed the brake circuit status as "on", one second prior to impact.

After the initial impact, the Buick was redirected, traveled over the northwest curb of the intersection and the front of the case vehicle impacted a stop sign, shearing the metal sign post from its base. The Buick came to final rest on the west sidewalk, facing northwest. The Ford continued traveling in a northwesterly direction, traveled over the west curb, over a short concrete landscaping edger, through a chain link fence and came to final rest facing northwest, partially in the yard of a private residence.

Figure 6. 1997 Ford Econoline's post-impact trajectory. Sidewalk, edger and fence damaged (fence replaced).

Post-Crash

According to the police report, the driver of the Buick sustained "minor" injuries and there were no injuries reported for the other two occupants. No one in the Buick was transported from the scene but according to the driver, a family friend who is a registered nurse examined all three occupants at their home a short time after the crash. The driver also reported that all three occupants sought medical treatment from their personal physician the following day. According to the police report, the driver of the Ford was not injured. He was arrested and transported from the scene to a police station. The driver of the Buick declined to discuss any specific information concerning the crash due to a criminal case that was pending against the driver of the Ford Econoline.

Both vehicles were towed from the scene. The Buick Rendezvous was later declared a total loss.

VEHICLE DATA - 2005 Buick Rendezvous

The 2005 Buick Rendezvous CXL was identified by the Vehicle Identification Number (VIN): 3G5DA03E45Sxxxxxx. The Buick Rendezvous is a four-door, front wheel drive, sport-utility vehicle with a rear liftgate and seating for seven. It was equipped with a 3.4 liter 6-cylinder engine, 4 speed automatic transmission, anti-lock brakes, front and rear disc brakes, and a tilt steering wheel. The vehicle mileage could not be obtained from the digital odometer because the vehicle had no power.

The Rendezvous was equipped with advanced occupant protection systems, dual stage driver and front right passenger air bags with a passenger air bag On/Off Switch, a front right Passenger Sensing System, and a driver's seat belt latch usage detector. The vehicle was also equipped with front row driver and passenger seat back mounted side air bags and dual front seat belt pretensioners.

The 2005 Buick Rendezvous was equipped with Goodyear Integrity P225/60R17 tires. The manufacturer's recommended cold tire pressure for the front and rear tires was 241 kPa (35 psi). The specific tire information is as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	186 kPa (27 psi)	6 mm (8/32 in)	No	None
LR	Flat	7 mm (9/32 in)	No	Tire debeaded/Rim scuffed
RR	193 kPa (28 psi)	7 mm (9/32 in)	No	None
RF	Flat	7 mm (9/32 in)	No	Tire debeaded

The front row seating in the 2005 Buick Rendezvous was configured with dual leather bucket seats. The seats were equipped with adjustable head restraints that were not damaged. The second row was configured as a leather 50/50 split bench seat with folding backs. The second

row left and right seating positions were equipped with adjustable head restraints that were not damaged. The second row center seating position was not equipped with any type of head restraint. The third row was configured as a leather bench with a folding back. Both third row seating positions were equipped with adjustable head restraints that were not damaged.

VEHICLE DAMAGE

Exterior Damage - 2005 Buick Rendezvous

Damage Description:	This vehicle sustained moderate front end damage as a result of the impact with the Ford Econoline van. The Rendezvous sustained 156.0 cm (61.4 in) of direct damage along the front bumper, beginning at the left bumper corner and extending to the right. The hood, front bumper and left/right fenders were damaged. Both frame rails shifted to the right more than 10.2 cm (4.0 in). The right front and left rear tires were debeaded and the left rear tire rim was scuffed. There was no integrity loss and the doors and rear liftgate remained closed and operational. Six crush measurements were documented along the front bumper as follows: C1=3.0 cm (1.2 in), C2=14.0 cm (5.5 in), C3=20.0 cm (7.9 in), C4=28.0 cm (11.0 in), C5=20.0 cm (7.9 in), C6=8.0 cm (3.1 in). The case vehicle sustained moderate front end damage as a result of the impact with the metal stop sign post. The location and width of the direct damage from this impact could not be determined due to overlapping damage from the first crash event, but the impact left a distinct 'V' shaped indentation in the bumper bar. The top of the stop sign fell on the vehicle and left red paint transfers on the left fender and left outside mirror cover.	
CDC:	Impact 1: 71FDEW2 Impact 2: 12FCEN1	
Delta V (Impact 1):	Total	19.0 km/h (11.8 mph)
	Longitudinal	-14.6.0 km/h (-9.1 mph)
	Latitudinal	12.2 km/h (7.6 mph)
	Energy	63016 joules (46,478 ft lbs)

Figure 7. Front, 2005 Buick Rendevous

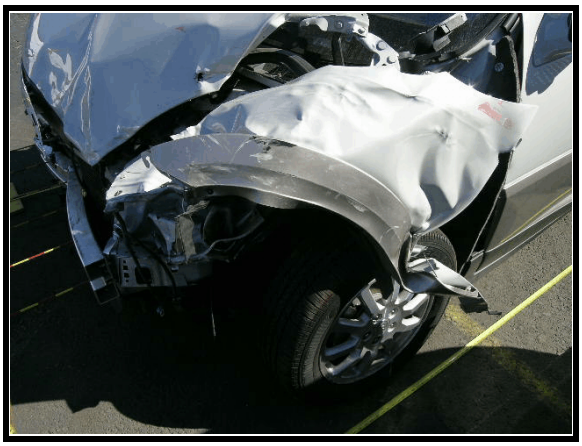


Figure 8. Front/Left damage and red paint transfer (upper fender) from stop sign

Interior Damage - 2005 Buick Rendezvous

The 2005 Buick Rendezvous sustained minor interior damage due to occupant contacts and normal air bag deployment related damage.

There was an oil transfer on the upper left quadrant of the driver's side window. There was a scuff on the right A-pillar, likely due to occupant contact. There were friction marks on the shoulder portions of both front seat belts. The webbing of the second row right shoulder belt was stretched slightly. There was no intrusion and no integrity loss. The side doors and hatch all remained closed and operational. There was no glazing damage except for minor scuffs to the lower right windshield caused by the passenger front air bag cover flap during the air bag deployment.

Figure 9. Driver shoulder belt scuff and oily transfer to left front glazing

Figure 10. Scuff to the right A-pillar.

Manual Restraint Systems - 2005 Buick Rendezvous

The 2005 Buick Rendezvous was configured with manual 3-point lap and shoulder belts for each of the seven seating positions. Both front seat belts were equipped with B-pillar pretensioners with load limiters and seat belt height adjusters. The driver and right front passenger's B-pillar pretensioners actuated during the crash. The driver's seat belt height adjuster was in the full up position and the right front passenger's was in the full down position. The driver's safety belt was configured with a sliding latch plate and an emergency locking retractor (ELR). The right front safety belt had a sliding latch plate and an unknown type of retractor (belt locked in place). The second row outboard seating positions were equipped with seat belt anchorage adjustments that were in the full down position. Both outboard safety belts had lightweight locking/cinching latch plates and ELR belt retractors. The second row center belt was configured with a manual lap belt with no retractor and a locking latch plate. The shoulder portion of the center restraint system can be stored in the ceiling of the vehicle and has a ELR retractor. The shoulder portion of this belt can be connected to the latch plate of the lap belt to form a 3-point lap and shoulder belt. The third row seating position safety belts were configured with lightweight locking/cinching latch plates and ELR belt retractors**.** The second row outboard seating positions were equipped with the lower anchor points that are part of this vehicle's Lower Anchors and Tethers for Children (LATCH) system. All three seating positions were also equipped with child safety seat top tether anchor points, located on the second row seat backs.

Supplemental Restraint System - 2005 Buick Rendezvous

Figure 11. Driver's front air bag.

The case vehicle was equipped with advanced occupant protection systems. These systems consist of the Sensing and Diagnostic Module (SDM), Certified Advanced 208 Compliant dual stage driver and front right passenger air bags, a front right Passenger Sensing System with a Cutoff Sensor, and a driver's seat belt latch usage detector. The system is controlled by the SDM. The primary function of the SDM is to control the deployment of the occupant protection system. The system records the vehicle's forward velocity change. The SDM will record 100 milliseconds of data after the deployment criteria is met and up to 50 milliseconds of data before the deployment criteria is met. For non-deployments, the SDM will record the first 150 milliseconds of data after algorithm enable. The SDM data was downloaded using the Vetronix Crash Data Retrieval System. There were two events recovered. The first was a deployment event that was related to this crash. The second was a non deployment event that occurred 155 ignition cycles (1000 v. 846) prior to the deployment event and was not related to this crash.

Figure 12. Right front passenger's front air bag

The driver and front right passenger positions are also equipped with seat back mounted side air bags and B-pillar seat belt pretensioners. The driver's front and side air bags deployed and the seat belt pretensioner actuated as a result of the longitudinal and lateral deceleration of the Buick during the impact with the Ford Econoline.

The driver's air bag was mounted in the center of the steering wheel hub. The air bag module had an I configuration. The left flap measured 6.0 cm (2.4 in) wide by 10 cm (3.9 in) high. The right flap measured 11.0 cm (4.3 in) wide by 10.0 cm (3.9 in) high. The air bag was circular in shape and in its deflated state, measured 55.0 cm (21.7 in) in diameter. There were no signs of occupant contact but there were black cover flap deployment streaks located in the center left section and the upper left quadrant. Between the 11 and 12 o'clock positions there was a 2.0 cm (0.8 in) by 1.0 cm (0.4 in) piece of material that was slightly melted, which likely occurred during the deployment. On the back of the air bag, there were black cover flap deployment streaks in several locations. The air bag had three internal tethers. There were two circular vent ports on the back of the bag at the 11 and 1 o'clock positions. The distance between the maximum deployment area of the air bag and the front left seat back was 38.0 cm (15.0 in).

The front right passenger air bag was a top instrument panel mount. The module had a single forward opening cover flap that was rectangular in shape and measured 37.0 cm (14.6 in) wide

by 20.0 cm (7.9 in) high. The air bag measured 47.0 cm (18.5 in) seam to seam laterally and was 70.0 cm (27.6 in) high. The distance between the maximum deployment area of the air bag and the front right seat back was 60.0 cm (23.6 in). There were two circular vent ports on the sides of the air bag at the 3 and 9 o'clock positions. There was no damage to the air bag or cover flap but the cover flap scuffed the windshield during deployment.

Figure 13. Driver's side air bag

The driver's seat back mounted side air bag module was located between the middle and upper portion of the seat back cushion. The module had a single cover flap that was rectangular in shape and measured 8.0 cm (3.1 in) wide by 22.0 cm (8.7 in) high. The deployed side air bag was semi-rectangular in shape and had rounded edges. In its deflated state, the bag had a height of 80.0 cm (31.5 in) and an excursion of 45.0 cm (17.7 in) at the top edge and 25.0 cm (9.8 in) along the bottom edge. There were black transfers found on the inside top center section of the bag, which likely occurred during the deployment. On the outer portion of the bag there were black cover flap deployment streaks in the upper left and center section of the bag. The air bag was not equipped with tethers or vent ports and there was no damage to the module cover flap.

Deployment Event

1. The SIR warning lamp status was OFF.
2. The driver's belt switch circuit status was BUCKLED.
3. Ignition cycles at deployment were 1001.
4. Ignition cycles at investigation were 1006.
5. Maximum SDM recorded velocity change was -25.2 km/h (-15.66 mph).
6. The time from algorithm enable (AE) to maximum recorded velocity change was 107.5 milliseconds
7. Driver first stage time algorithm enabled to deployment command criteria met was 12.5 milliseconds.
8. There was no driver's second stage deployment.
9. Passenger first stage time algorithm enabled to deployment command criteria met was 12.5 milliseconds.
10. There was no passenger second stage deployment.
11. The brake switch circuit status was ON one second before AE.
12. The vehicle speed was 46.7 km/h (29 mph) five seconds before AE. The vehicle speed remained generally constant at 48.3 km/h (30 mph) one second before AE.

Non Deployment Event

1. The SIR warning lamp status was OFF.
2. The driver's belt switch circuit status was BUCKLED.
3. Ignition cycles at non deployment were **846**.
4. Ignition cycles at investigation were **1006**.
5. Maximum SDM recorded velocity change was -0.29 km/h (-0.18 mph).
6. The time from algorithm enable (AE) to maximum recorded velocity change was 30 milliseconds.

VEHICLE DATA - 1997 Ford Econoline E250

Description:	1997 Ford Econoline E250 4x2 Cargo Van	
VIN:	1FTFE2423VHxxxxxx	
Odometer:	248,461 km (154,391 miles)	
Engine:	6 cylinder/4.2 liter	
Reported Defects:	None noted	
Cargo:	Mattress, box springs, plywood 27.2 kg (60.0 lbs)	
CDC:	Impact 1: 01RYEW2 Impact 2: 12FYEW1	
Delta V (Impact 1):	Total	16.0 km/h (9.9 mph)
	Longitudinal	-12.3 km/h (-7.6 mph)
	Latitudinal	-10.3 km/h (-6.4 mph)
	Energy	17,679 joules (13,039 ft lbs)

The 1997 Ford Econoline E250 sustained moderate right side damage as a result of the impact with the front of the Buick Rendezvous. The CDC for this event was 01LYEW2. There was 254.0 cm (100.0 in) of direct contact along the Econoline's right side that began 65.0 cm (25.6 in) forward of the right rear axle and extended forward. The location of maximum crush was 158.0 cm (62.2 in) forward of the right rear axle and consisted of 12.0 cm (4.7 in) of crush. The right front tire was torn, debeaded and flat and the right front glazing disintegrated during the impact. The two double doors located just behind the right front door were damaged in the crash. The right rear door was found ajar. It was tied to the second right rear door which was jammed shut. The Econoline sustained light front end damage as a result of the impact with the chain link fence. There was 94.0 cm (37.0 in) of direct contact to the front bumper beginning 2.0 cm (0.8 in) to the right of the post-crash centerpoint, extending left along the front plane. This damage was attributed to the impact between the front of the Econoline and the chain link fence. There were scrapes extending

Figure 14. Right side damage - 1997 Ford Econoline E250 Cargo van

diagonally across the mid to left side of the hood and damage to the left side of the windshield, which likely occurred when the Econoline drove through the fence. There was crimping to the left front lower door which was attributed to a continuation of the impact damage that occurred when the Econoline drove through the chain link fence. The metallic fuel tank, mounted forward of the rear axle on the left side, was deformed and abraded, but there was no apparent leakage. This damage may have occurred when the Econoline traveled over the curb. There was additional direct contact on the right front bumper corner and forward aspect of the right fender that is believed to be unrelated to this crash. There was additional unrelated direct damage to the lower left side of the van. The unrelated damage may be attributed to the two hit and run crashes this vehicle was involved in just prior to the crash with the Buick Rendezvous. The available driver and right front passenger air bags did not deploy during the crash.

Figure 16. Left side damage - 1997 Ford Econoline 250 Cargo van

Figure 15. Front bumper, hood, and windshield damage from fence impact

OCCUPANT DEMOGRAPHICS - 2005 Buick Rendezvous

	Driver	Occupant 2	Occupant 3
Age/Sex:	36/Female	13/Female	11/Female
Seated Position:	Front left	Front right	Second row right
Seat Type:	Bucket	Bucket	Split bench with folding backs
Height:	163 cm (64 in)	150 cm (59 in)	145 cm (57 in)
Weight:	59 kg (130 lbs)	48 kg (105 lbs)	39 kg (85 lbs)
Occupation:	Unknown	Not Applicable	Not Applicable
Pre-existing Medical Condition:	Unknown	Not Applicable	Not Applicable
Alcohol/Drug Involvement:	None	Not Applicable	Not Applicable
Driving Experience:	Unknown	Not Applicable	Not Applicable
Body Posture:	Unknown	Unknown	Unknown
Hand Position:	Unknown	Unknown	Unknown
Foot Position:	Unknown	Unknown	Unknown
Restraint Usage:	Lap and shoulder belt available, used	Lap and shoulder belt available, used	Lap and shoulder belt available, used
Air bag:	Steering wheel mounted front air bag - deployed. Seat back mounted side air bag - deployed.	Top instrument panel mounted front air bag - deployed. Seat back mounted side air bag - non-deployed.	None

OCCUPANT DEMOGRAPHICS - 1997 Ford Econoline

	Driver
Age/Sex:	29/Male
Seated Position:	Front left
Seat Type:	Box mounted bucket seat
Height:	Unknown
Weight:	Unknown
Occupation:	Unknown
Pre-existing Medical Condition:	Unknown
Alcohol/Drug Involvement:	Had been drinking; BAL unknown
Driving Experience:	Unknown
Body Posture:	Unknown
Hand Position:	Unknown
Foot Position:	Unknown
Restraint Usage:	Manual 3-point lap and shoulder belt available, used

OCCUPANT INJURIES - 2005 Buick Rendezvous

According to the police report, the driver sustained minor injuries of an unknown nature. No injuries were coded. The two other occupants in the case vehicle were not injured.

OCCUPANT INJURIES - 1997 Ford Econoline E250

Driver: Driver not injured. Injury information obtained from the police report.

OCCUPANT KINEMATICS - 2005 Buick Rendezvous

Driver Kinematics

The 36-year-old female driver of the case vehicle appears to have been seated in an upright posture on the leather covered bucket seat and was restrained by the 3-point manual lap and shoulder belt. The shoulder belt anchorage was in the full up position and the seat track was adjusted to the middle track position. The seat back was reclined at a 105 degree angle and the seat bottom had a 10 degree angle. At impact, the driver's side and front air bags deployed and the left side safety belt pretensioner actuated. The female driver initiated a forward and slightly lateral trajectory towards the 11 o'clock direction of force. She loaded the safety belt and likely engaged the deployed front air bag with her face and the seat back mounted side air bag with her upper left torso, although there were no visible occupant contacts found on either air bag. After the deployed driver's side air bag deflated, the left side of the driver's face may have contacted the left side window glazing, leaving an oily transfer. The driver's right wrist and/or hand may have been pushed off the steering wheel by the deploying front air bag and possibly contacted the rearview mirror, moving it out of position. After the initial impact, the Buick rotated slightly clockwise, traveled towards the northwest corner of the intersection, and departed the roadway. The front of the Buick Rendezvous hit the metal stop sign post, shearing it from its base. This was a low delta V event and even though the driver likely initiated a slightly forward trajectory towards the 12 o'clock direction of force, the seat belt held this occupant in place. The driver sustained "minor" injuries according to the police report. During the interview the driver confirmed that she refused to be transported from the crash scene and instead sought medical treatment with her private physician the following day. She reported that following the crash, a family friend who is a registered nurse examined all three occupants at their home and found no injuries requiring immediate additional medical attention. The driver declined to discuss injury information for any of the Buick's occupants because the criminal case against the other driver was pending at the time of the interview.

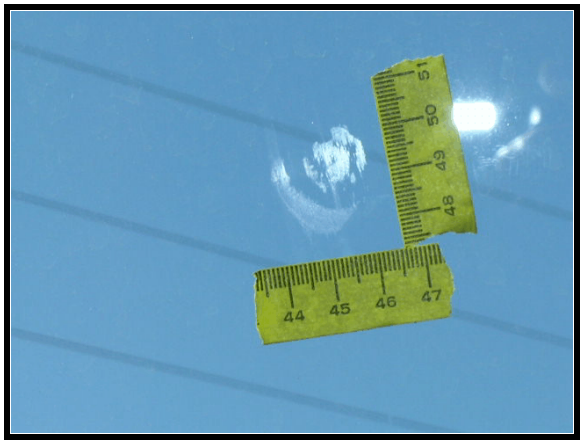


Figure 17. Oily transfer to left front side glazing

Figure 18. Evidence of loading to driver's seat belt

Front Right Occupant Kinematics

The 13-year-old front right female passenger was seated forward facing on the leather covered bucket seat and was restrained by the 3-point manual lap and shoulder belt. The shoulder belt anchorage was in the full down position. The seat was adjusted between the middle and rearmost track position. The seat back was reclined at a 100 degree angle and the seat bottom had a 0 degree angle. At impact, the front right passenger's front air bag deployed. This passenger initiated a forward and slightly lateral trajectory towards the 11 o'clock direction of force. She loaded the safety belt and may have engaged the deployed passenger front air bag with her face, although there were no visible occupant contacts. It appears that this passenger's right wrist may have contacted and scuffed the right A-pillar. After the initial impact, the Buick rotated slightly clockwise, traveled towards the northwest corner of the intersection, and departed the roadway. The front of the Buick hit the metal stop sign post, shearing it from its base. This passenger initiated a slightly forward trajectory towards the 12 o'clock direction of force. This was a low delta V event and even though the passenger likely initiated a slightly forward trajectory, the seat belt held this occupant in place.

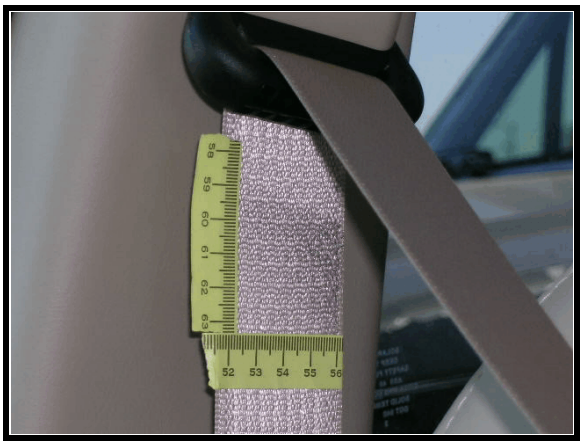


Figure 19. Evidence of loading to front right passenger's seat belt

Figure 20. Close-up of occupant contact to right A pillar

Per the police report, there was no indication of any injury to this occupant. According to the driver, this passenger was also checked by the family friend on the night of the crash and sought additional medical treatment with her private physician the next day.

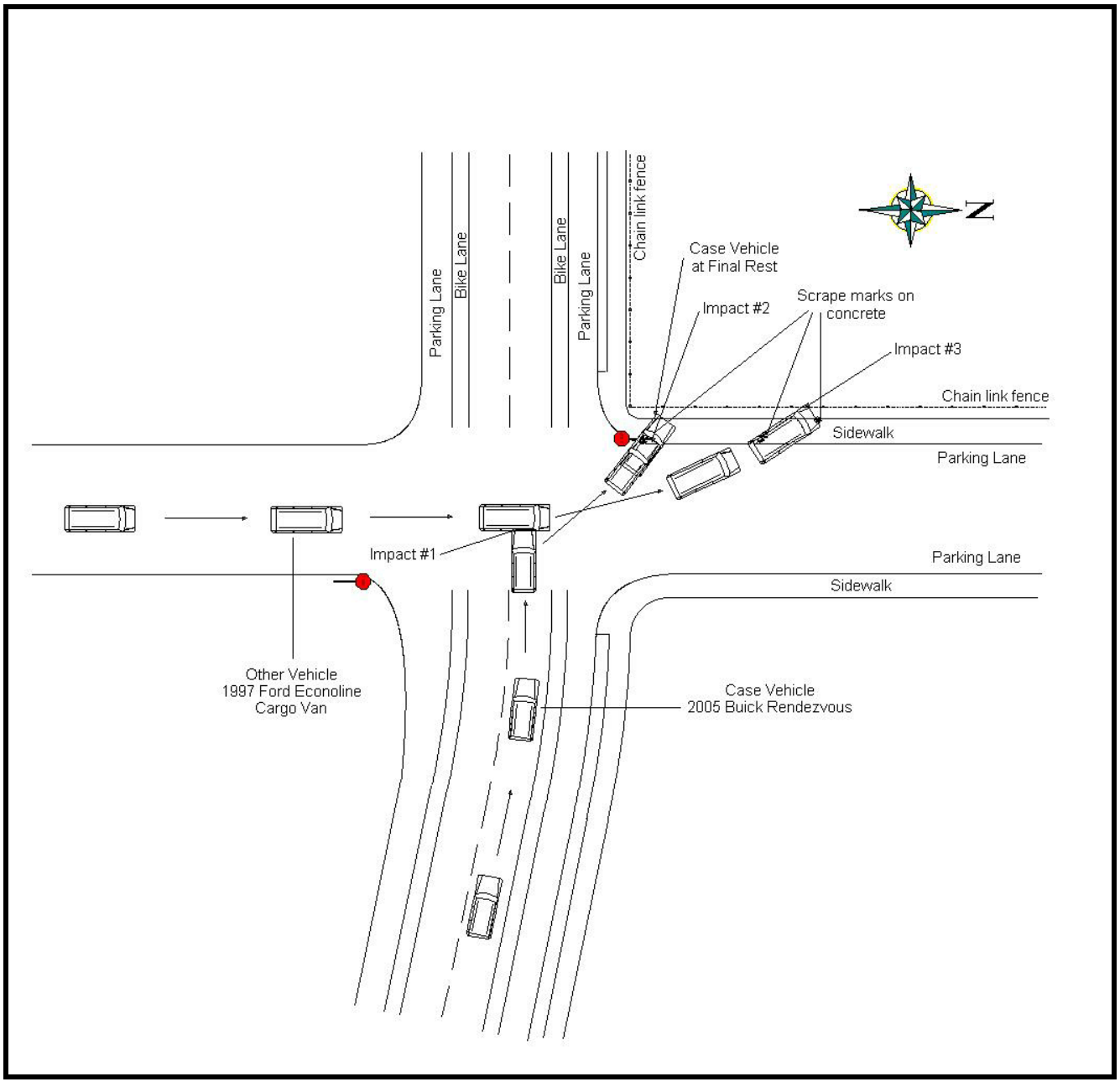
Second Row Right Occupant Kinematics

Figure 21. Location of faint stretch mark to second row right seat belt

The 11-year-old second row right seat female passenger was seated forward facing on the leather covered split bench seat and was restrained by the 3-point manual lap and shoulder belt. The seat back was reclined at a 110 degree angle and the seat bottom had a 20 degree angle. At impact, this passenger initiated a forward and slightly lateral trajectory towards the 11 o'clock direction of force. After the initial impact, the Buick rotated slightly clockwise, traveled towards the northwest corner of the intersection, and departed the roadway. The front of the Buick hit the metal stop sign post, shearing it from its base. This passenger initiated a slightly forward trajectory towards the 12 o'clock direction of force. Because this was a low delta V event, it is likely that this passenger pitched forward to some degree but remained in position due to her seat belt.

Per the police report, there was no indication of any injury to this occupant. According to the driver, this passenger was also checked by the family friend on the night of the crash and sought additional medical treatment with her private physician the next day.

Attachment 1. Scene Diagram



Attachment 2. Vetronix Report

CDR File Information

Vehicle Identification Number	3G5DA03E45S******
Investigator	
Case Number	
Investigation Date	
Crash Date	
Filename	DS05016.CDR
Saved on	Thursday, October 6 2005 at 09:22:05 AM
Collected with CDR version	Crash Data Retrieval Tool 2.710
Collecting program verification number	3F8F669A
Reported with CDR version	Crash Data Retrieval Tool 2.710
Reporting program verification number	3F8F669A
Interface used to collected data	Block number: 00 Interface version: 42 Date: 03-10-05 Checksum: 1300
Event(s) recovered	Deployment Non-Deployment

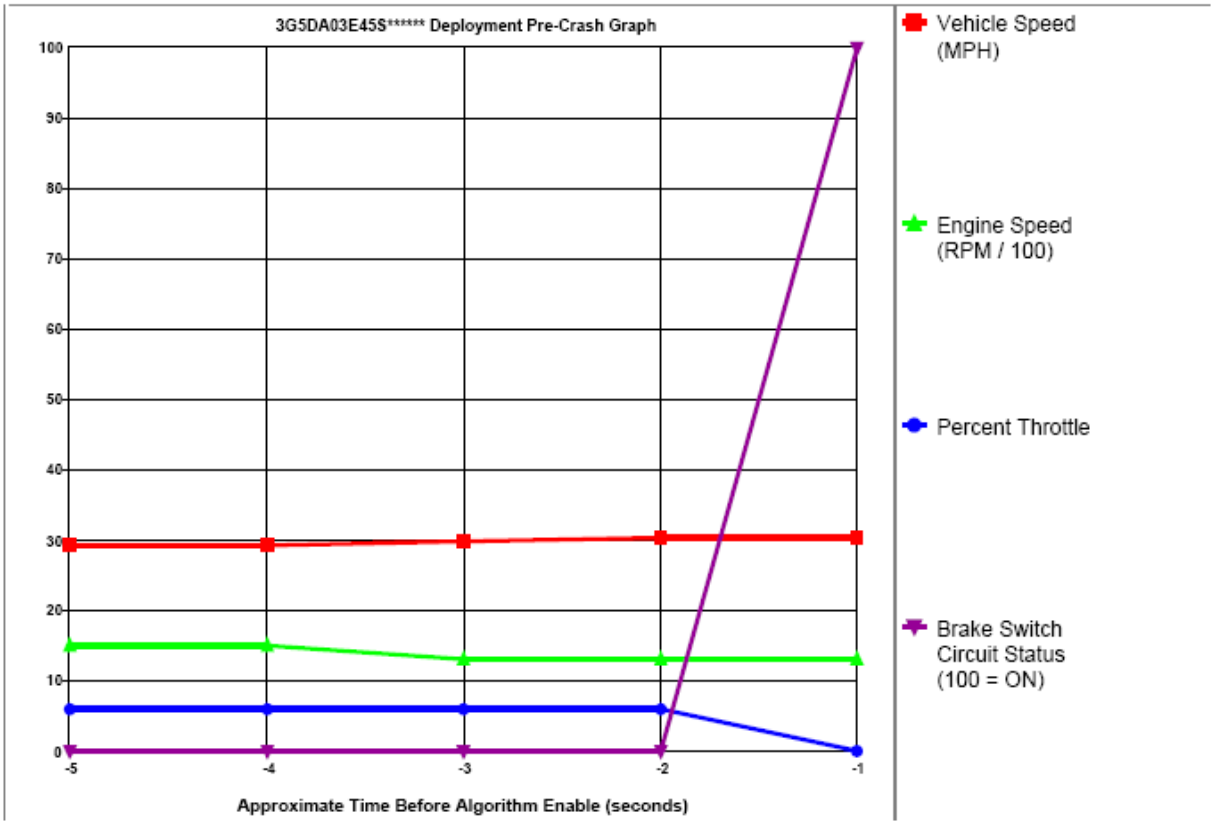
SDM Data Limitations

SDM Recorded Crash Events:
There are two types of SDM recorded crash events. The first is the Non-Deployment Event. A Non-Deployment Event is an event severe enough to "wake up" the sensing algorithm but not severe enough to deploy the air bag(s). 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 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 cannot be overwritten or cleared from the SDM. Once the SDM has deployed the air bag, the SDM must be replaced.
The data in the non-deployment 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.

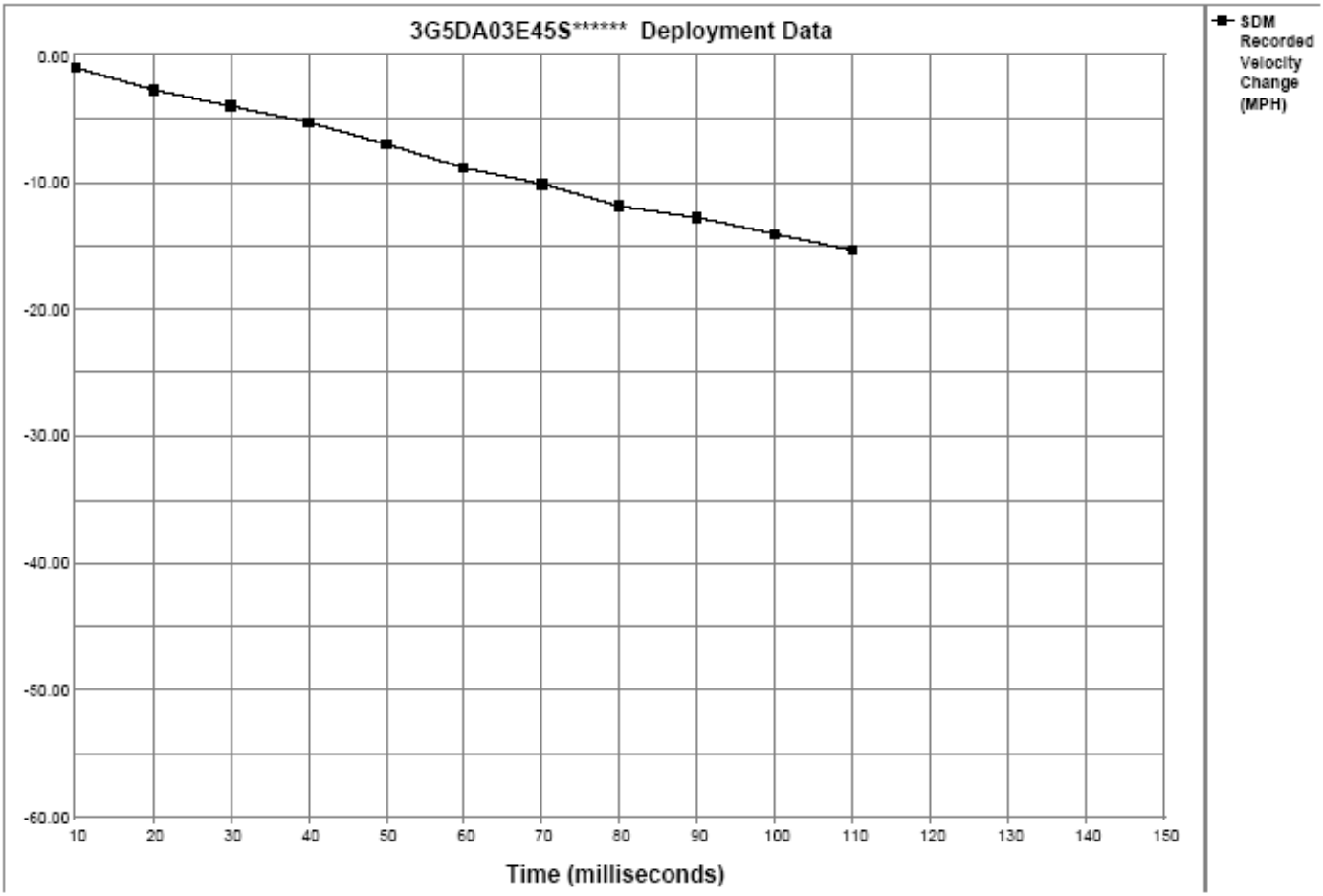
SDM Data Limitations:
-SDM Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Forward Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle forward velocity change. For deployments and deployment level events, the SDM will record 100 milliseconds of data after deployment criteria is met and up to 50 milliseconds before deployment criteria is met. For non-deployments, the SDM will record the first 150 milliseconds of data after algorithm enable.
-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has been interrupted and not fully written.
-SDM Recorded Vehicle Speed accuracy can be affected if the vehicle has had the tire size or the final drive axle ratio changed from the factory build specifications.
-Brake Switch Circuit Status indicates the status of the brake switch circuit.
-Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if the SDM does not receive a valid message.
-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 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.

System Status At Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Ignition Cycles At Deployment	1001
Ignition Cycles At Investigation	1006
Maximum SDM Algorithm Forward Velocity Change (MPH)	-15.66
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	107.5
Driver First Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	12.5
Driver Second Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	N/A
Passenger First Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	12.5
Passenger Second Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	N/A
Time Between Non-Deployment And Deployment Events (sec)	N/A
Event Recording Complete	Yes



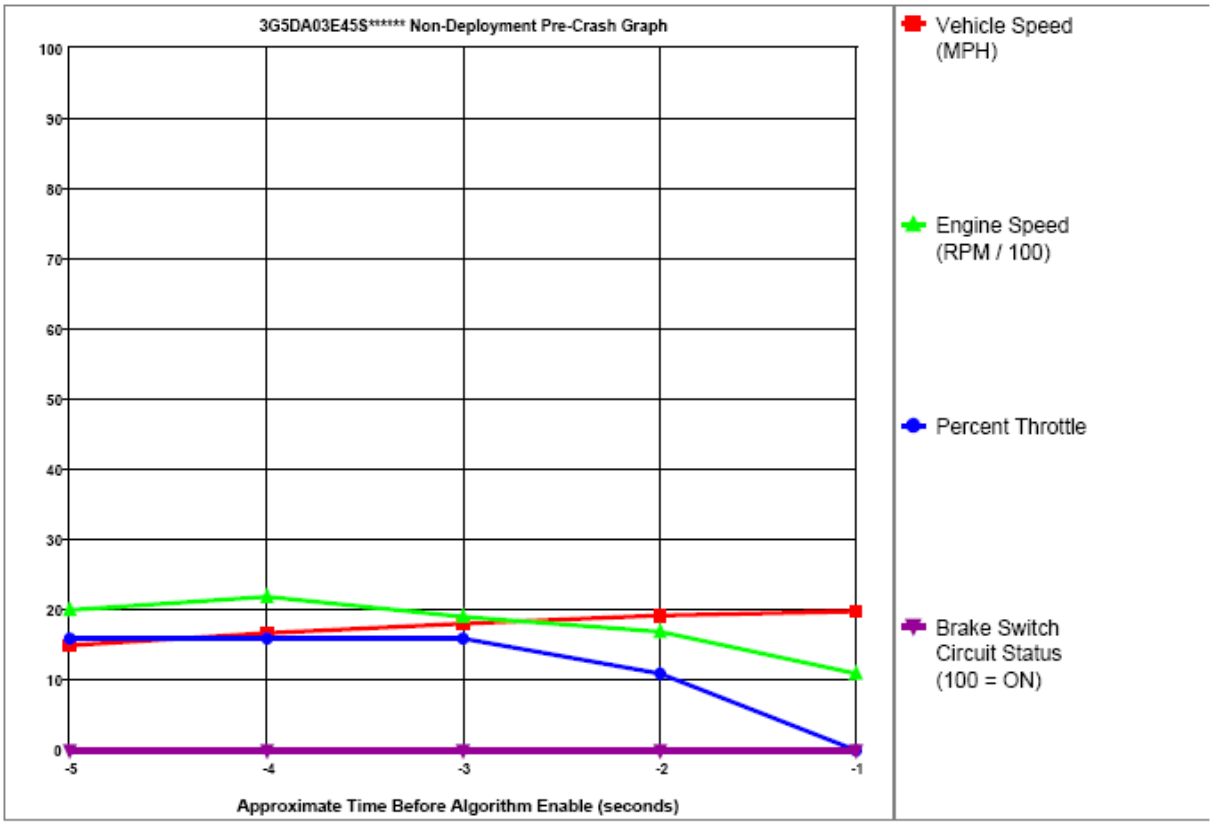
Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle	Brake Switch Circuit Status
-5	29	1472	6	OFF
-4	29	1472	6	OFF
-3	30	1280	6	OFF
-2	30	1280	6	OFF
-1	30	1344	0	ON



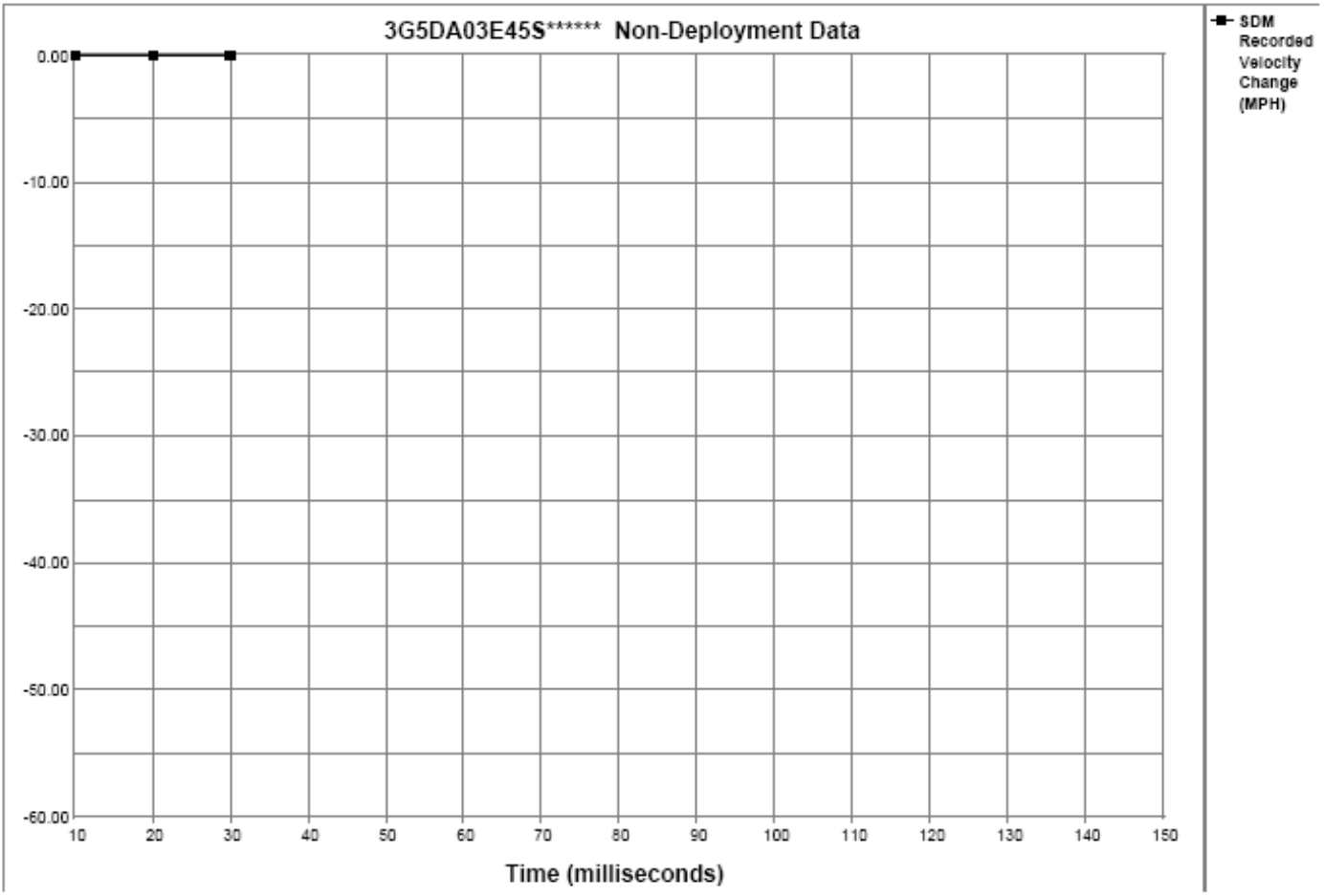
Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Recorded Velocity Change	-0.88	-2.63	-3.95	-5.27	-7.02	-8.78	-10.09	-11.85	-12.73	-14.04	-15.36	N/A	N/A	N/A	N/A

System Status At Non-Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Ignition Cycles At Non-Deployment	846
Ignition Cycles At Investigation	1006
Maximum SDM Algorithm Forward Velocity Change (MPH)	-0.18
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	30
A Deployment was Commanded Prior to this Event	No



Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle	Brake Switch Circuit Status
-5	15	2048	16	OFF
-4	17	2240	16	OFF
-3	18	1856	16	OFF
-2	19	1664	11	OFF
-1	20	1088	0	OFF



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	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A