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REMOTE ALLEGED INADVERTENT AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN-01-027
LOCATION - MISSISSIPPI
VEHICLE - 1999 OLDSMOBILE ALERO GL
INCIDENT DATE - September, 2001

Submitted:

February 28, 2003

Contract Number: DTNH22-01-C-07002

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
National Center for Statistics and Analysis
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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

1. *Report No.* IN-01-027	2. *Government Accession No.*	3. *Recipient's Catalog No.*	
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15. *Supplementary Notes* Remote alleged inadvertent air bag deployment investigation involving a 1999 Oldsmobile Alero GL, four-door sedan, with manual safety belts and dual front air bags			
16. *Abstract* This report covers a remote investigation of an alleged inadvertent air bag deployment incident that involved a 1999 Oldsmobile Alero GL (case vehicle). This incident is of special interest because the case vehicle was equipped with redesigned air bags and the case vehicle experienced an asymmetrical, inadvertent deployment of the driver's front air bag. The case vehicle's driver (38-year-old female) sustained only minor injuries from contacting her deploying air bag. The case vehicle was traveling north in the northbound lane of a two-lane, undivided, state highway. The case vehicle's driver reported that without warning and without striking any object, her front air bag inadvertently deployed. The front right passenger air bag did not deploy. There was no indication that the driver made any vehicle maneuver which would have resulted in an air bag deployment. According to the investigating police officer, the scene topography was reported as straight and level and without sags or hill crests that could cause a vehicle to "bottom out". According to the case vehicle's driver, no foreign object was run over by her vehicle. This inadvertent deployment occurred in the northbound lane of the roadway. There was no discernible front plane damage to the case vehicle; however, undercarriage damage was present, but there is no evidence to suggest that this undercarriage damage is related to the deployment. The case vehicle's driver was seated with her seat track located between its middle and forward-most position, and the tilt steering wheel was located in its middle position. She was restrained by her available, active, three-point, lap-and-shoulder, safety belt system and sustained, according to her interview and her medical records, a contused chest and an abrasion to her left thumb. The case vehicle's driver attributed these injuries to her contact with the deploying air bag. The front right passenger (22-year-old female) was seated with her seat track located between its middle and rearmost positions and was restrained by her available, active, three-point, lap-and-shoulder, safety belt system. She did not sustain any injuries as a result of this incident.			
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BACKGROUND

IN-01-027

This remote report was brought to NHTSA's attention on December 14, 2001, by an attorney for the case vehicle's driver. This incident involved a 1999 Oldsmobile Alero GL (case vehicle). The incident occurred in September 2001, at 6:40 p.m., in Mississippi, and was investigated by the applicable state police agency. This incident is of special interest because the case vehicle was equipped with redesigned air bags and the case vehicle experienced an inadvertent deployment of the driver's front air bag. The case vehicle's driver [38-year-old, Black (Hispanic) female] sustained only minor soft tissue injuries from contacting her deploying air bag. The TRC contacted and discussed this incident with the attorney representing the case vehicle's driver on December 20, 2001. The TRC also contacted and discussed this incident with the General Motors Central Claims office on December 20, 2001. Furthermore, this contractor contacted the site investigator for the firm hired by General Motors to download the data from the case vehicle's **E**vent **D**ata **R**ecorder (EDR) on January 3, 2002. The case vehicle's driver was interviewed on January 10, 2002, and a conversation was held with the investigating police officer on January 14, 2002. This report is based on the Incident/Complaint Report; conversations with the attorney representing the case vehicle's driver, a GM claims representative, the individual hired to download the EDR data, and the investigating law enforcement officer; an interview with the case vehicle's driver; occupant kinematic principles; occupant medical records; and this contractor's evaluation of the evidence.

INCIDENT CIRCUMSTANCES

The case vehicle was traveling north in the northbound lane of a two-lane, undivided, state highway and intended to continue its northbound travel path. The case vehicle's driver reported that without warning and without striking any object, her front air bag inadvertently deployed. The front right passenger air bag did not deploy. There was no indication that the driver made any vehicle maneuver which would have resulted in an air bag deployment. According to the investigating police officer, the scene topography was reported as straight and level and without sags or hill crests that could cause a vehicle to "bottom out". According to the case vehicle's driver, no foreign object was run over by her vehicle. She also stated that she was not following any vehicle and no vehicle passed her from the opposing direction, negating the possibility of another vehicle setting in motion a projectile that might have struck the case vehicle's undercarriage. This inadvertent deployment occurred in the northbound lane of the roadway.

The state highway's pavement was most likely bituminous, and the width of the northbound lane was not reported. It is unknown if any improved shoulders were present. Furthermore, the pavement markings most likely consisted of a single broken yellow centerline for both north and southbound traffic, and it is unknown if any edge lines were present. The coefficient of friction is not estimable. According to the Police Incident Report, there were no visible traffic controls present. No regulatory speed limit sign was

Figure 1: Elevated, attorney-provided photo of case vehicle's front showing no obvious evidence of impact damage (case photo #01)

posted near the incident site. At the time of the incident the light condition was either late daylight or dusk, the atmospheric condition was clear, and the road pavement was dry. Traffic density was light, and the site of the incident was rural agricultural.

The investigating law enforcement officer discovered no front plane damage to the case vehicle, nor did he find any undercarriage damage[1] (**Figure 1** above). All information collected by the investigating law enforcement officer was verified by the individual hired to download the EDR data (**Figure 2**), with one exception. This outside consultant discovered a contact area on the left rocker panel under the driver's left front door[2] (**Figure 3**). However, he was unable to determine whether that contact area was recent or old. Based on the photographic evidence provided by the GM's consultant, there was undercarriage damage, but the damage was to both front frame rails and the front crossbar member (**Figure 4** below). The case vehicle's driver does not recall striking anything in the two years she has owned the vehicle that would have caused such damage. She was not the original purchaser of the case vehicle. In this contractor's opinion, undercarriage damage exists, but the origin and time sequence of the damage is undeterminable.

Figure 2: GM consultant's photo of case vehicle's undamaged front (case photo #03)

Figure 3: GM consultant's photo of case vehicle's middle and front undercarriage areas viewed from back showing no obvious contacts to under-carriage beyond frontal area (case photo #19)

CASE VEHICLE

The 1999 Oldsmobile Alero GL was a front wheel drive, five-passenger, four-door sedan (VIN: 1G3NL52T4XC------) equipped with a 2.4L, L-4 engine and a four-speed automatic transmission. Four-wheel, anti-lock brakes and traction control are standard for this model. The case vehicle's wheelbase was 272 centimeters (107.0 inches), and the odometer reading is unknown because the case vehicle was not inspected.

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[1] Initially the applicable county sheriff's department was contacted. After a while the state police agency was contacted (either by the sheriff's department or by the driver) and a state police trooper responded to the scene approximately two hours post-incident. By this time the light condition was dark, and the incident report reflects this officer's cursory examination by flashlight at the scene.

[2] Based on the photographs obtained from the GM's consultant subsequent to this contractor's conversation with him, this contractor must have misunderstood the consultant's remark because the available photographs clearly demonstrate undercarriage scraping on both front frame rails and the front crossbar member. Furthermore, there was no photographic evidence of damage underneath the rocker panel for the driver's left front door.

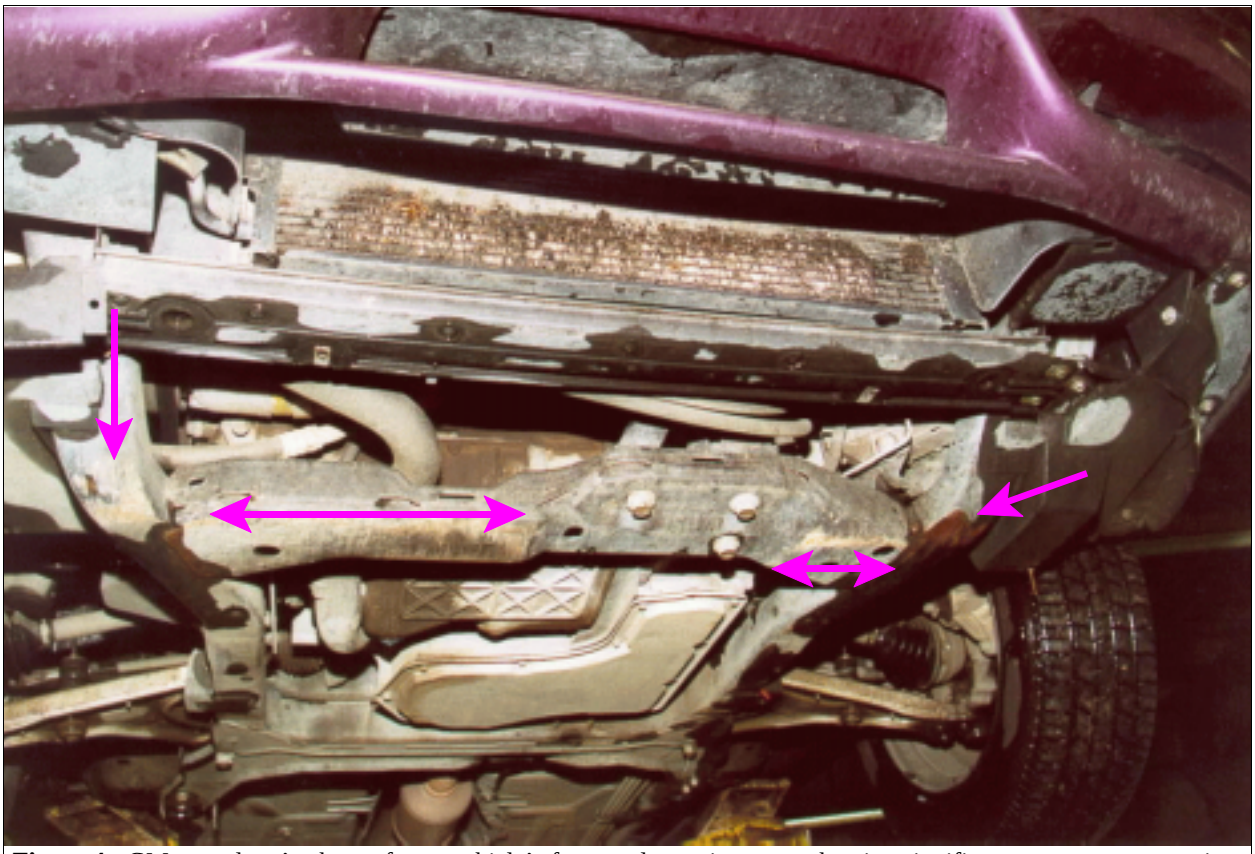


Figure 4: GM consultant's photo of case vehicle's front undercarriage area showing significant scrapes across entire frontal frame members; Note: left front wheel on right of photo (case photo #09)

The interior of the case vehicle was most likely equipped with adjustable front bucket seats; a non-adjustable back bench seat; continuous loop, three-point, lap-and-shoulder, safety belt systems at the front and back outboard positions; and a two-point, lap belt system at the back center position. The adjustability (i.e., integral versus adjustable) and location of the head restraints (i.e., back as well as front) is unknown. It is also unknown whether the front seat belt systems were equipped with manually operated height adjusters for the "D"-rings. The vehicle was equipped with knee bolsters for both the driver and front right passenger. Automatic restraint was provided by a Supplemental Restraint System (SRS) that consisted of a frontal air bag for the driver and front right passenger seating positions. Only the driver's air bag deployed inadvertently as the case vehicle was traversing the roadway.

Based on the interior photographs (**Figures 5** through **7** below), the case vehicle's interior revealed no obvious evidence of occupant contact on the interior surfaces of the case vehicle.

It was driven from the scene of the inadvertent deployment. According to the case vehicle's driver, she was traveling approximately 72-80 km.p.h. (45-50 m.p.h.) just prior to the incident. Without a verifiable impact, no reconstruction program could be run. Again, without a verifiable impact, no damage severity could be described or assessed. All that can be stated with certainty is that the case vehicle's driver air bag deployed and the front right passenger air bag did not deploy (**Figure 5** below), with no discernible front plane damage.

The case vehicle was equipped with a Supplemental Restraint System (SRS) that contained frontal air bags at the driver and front right passenger positions. Only the driver's air bag deployed inadvertently as the case vehicle was traveling down the roadway. The case vehicle's driver air bag was located in the steering wheel hub. Based on the photographs provided by the attorney (**Figure 6**) and by GM's consultant (**Figure 5**), the air bag module was designed with "I"-configuration cover flaps, and it appears that the cover flaps opened at their designated tear points. Furthermore, there was no visible evidence of damage during the deployment to the air bag or the cover flap. Because this case is a remote investigation, the existence, number, and size of tethers or vent ports could not be assessed nor could the size of the driver's air bag be described. However, the air bag appears to be circular in shape (**Figure 7**). The investigating police officer made no mention of any evidence of contact or damage to the air bag's fabric. Furthermore, no visible driver contact points can be discerned in the available photographs of the air bag's fabric (**Figures 6** and **7**).

Figure 5: GM consultant's photo of case vehicle's driver seating area showing steering wheel hub from which driver's air bag deployed and non-deployed front right passenger air bag module (case photo #07)

Figure 6: Attorney-provided photo of case vehicle's driver seating area and center console showing deployed driver air bag and no obvious evidence of occupant contact (case photo #02)

Figure 7: GM consultant's photo of case vehicle's deployed driver air bag showing no obvious evidence of occupant contact (case photo #08)

Because the front right air bag module did not deploy (**Figure 5**), no information is available concerning the existence, number, and size of tethers or vent ports, and the shape or size of the front right passenger's air bag cannot be described.

The data downloaded from the case vehicle's **EDR** was provided by the consultant hired by General Motors. The **EDR** showed the vehicle's SIR warning lamp status, driver's seat belt buckle status, ignition cycles at deployment, time from algorithm enable to deployment command (i.e., air bag deployment) and velocity change (i.e., Delta V). Downloaded data of interest indicated the following. The case vehicle's driver seat belt status showed it was buckled, and the Delta V was insignificant; see **EVENT DATA RECORDER DOWNLOAD** (**Figures 7** and **8**) below. The first 60 milliseconds showed a 3.17 km.p.h. (1.97 m.p.h.) velocity loss, which changed to a 2.83 km.p.h. (1.76 m.p.h.) velocity loss for the remaining 240 milliseconds of recorded measurement. This inferred slight increase [i.e., -0.34 km.p.h. (-0.21 m.p.h.)] in acceleration might have resulted from an involuntary foot depression on the accelerator pedal as a result of being startled by the deployment of the air bag. This contractor believes that the recorded Delta V supports the allegation that the driver's air bag did not deploy as a result of a crash event and, therefore, deployed inadvertently.

CASE VEHICLE DRIVER

Immediately prior to the incident, the case vehicle's driver [38-year-old, Black (Hispanic) female; 157 centimeters and 86 kilograms (62 inches, 189 pounds)] was seated in an upright posture with her back against the seat back, her left foot on the floor, her right foot on the accelerator, and both hands on the steering wheel. Her seat track was located between its middle and forward-most position, the seat back was upright, and the tilt steering wheel was located in its middle position.

Based on the available evidence, the case vehicle's driver was restrained by her available, active, three-point, lap-and-shoulder, safety belt system. Furthermore, there was a potential belt pattern contusion reported to the driver's chest; however, she attributes her contused chest to contact with the deploying driver's air bag. Again, because this is a remote investigation, no assessment of the driver's seat belt webbing, "D"-ring, or latch plate could be made.

The case vehicle's driver made no known avoidance maneuvers prior to the incident. As a result and independent of the use of her available safety belts, her body position did not change immediately prior to the air bag deploying inadvertently. When the driver's air bag unexpectedly deployed, she was struck in the chest by the air bag and most likely thrust rearward into her seat back. The driver indicated that after being startled for a second, she eased her vehicle to the east shoulder and came to a stop. A passerby stopped and loaned the case vehicle's driver a cell phone to call a law enforcement agency. Some time later a truck driver stopped and allowed the case vehicle's driver to make another cell phone call to the either the same law enforcement agency or another law enforcement agency.

CASE VEHICLE DRIVER INJURIES

The driver drove home from the scene of the incident and, thus, was not transported by ambulance to a medical facility. Approximately four hours after the deployment, she drove herself to a hospital emergency room. She reportedly sustained minor injuries and was treated and released. Based upon her interview and her medical records, her self-reported injuries included

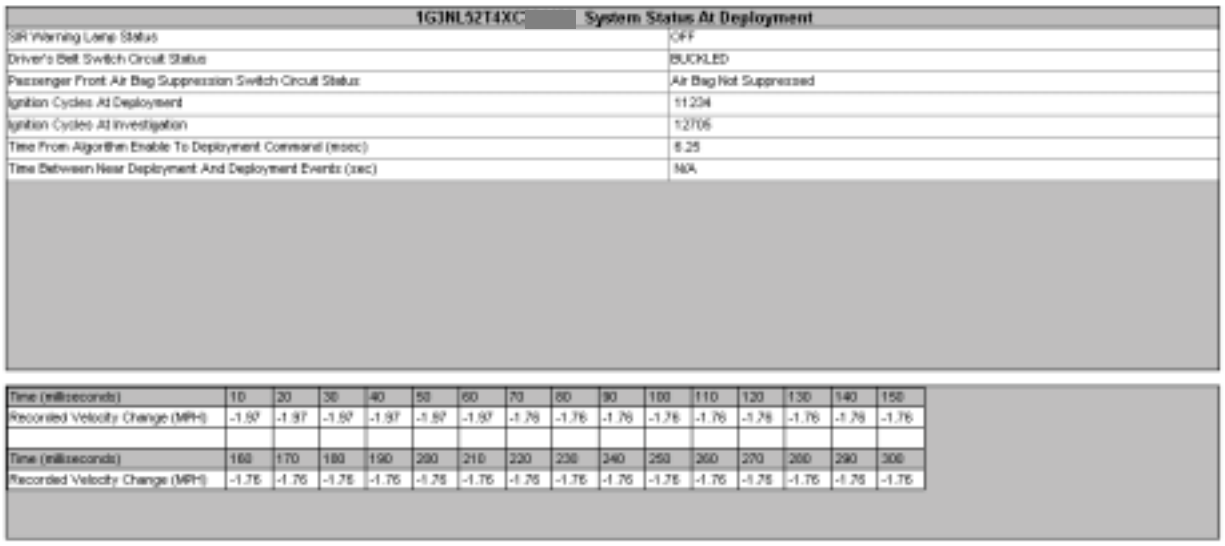
a contused chest and an abrasion to her left thumb. The driver's medical records support but do not confirm the driver's self-reported chest contusion. The case vehicle's driver attributed these injuries to her contact with the deploying air bag.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Contusion chest, most likely central, but not precisely specified	490402.1 minor	Air bag, driver's	Probable	Interviewee (same person)
2	Abrasion left thumb	790202.1 minor	Air bag, driver's	Probable	Interviewee (same person)

CASE VEHICLE FRONT RIGHT PASSENGER

The case vehicle's front right passenger [22-year-old, Black (non-Hispanic) female; 157 centimeters and 88 kilograms (62 inches, 195 pounds)] was seated in an upright posture with her back against the seat back and her feet on the floor, but the exact position of her hands is unknown. Her seat track was located between its middle and rearmost positions, and the seat back was slightly reclined. She was restrained by her available, active, three-point, lap-and-shoulder, safety belt system.

The case vehicle's driver made no known avoidance maneuvers prior to the incident. As a result and independent of the use of her available safety belts, the front right passenger's body position did not change immediately prior to the driver's air bag deploying inadvertently. When the driver's air bag unexpectedly deployed, the front right passenger was also momentarily startled; however, as the case vehicle's driver eased the vehicle to the east shoulder and came to a stop, the front right passenger most likely retained her pre-incident posture during the transition. She was uninjured and, thus, not transported by ambulance to a medical facility.



1G3NL52T4XC	System Status At Deployment
SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Passenger Front Air Bag Suppression Switch Circuit Status	Air Bag Not Suppressed
Ignition Cycles At Deployment	11234
Ignition Cycles At Investigation	12706
Time From Algorithm Enable To Deployment Command (msec)	6.25
Time Between Near Deployment And Deployment Events (sec)	N/A

Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	-1.97	-1.97	-1.97	-1.97	-1.97	-1.97	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
Recorded Velocity Change (MPH)	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76	-1.76

Figure 8: Case vehicle's pre-crash restraint system status at deployment, and the case vehicle's change in velocity (Delta V) over the first 300 milliseconds post deployment

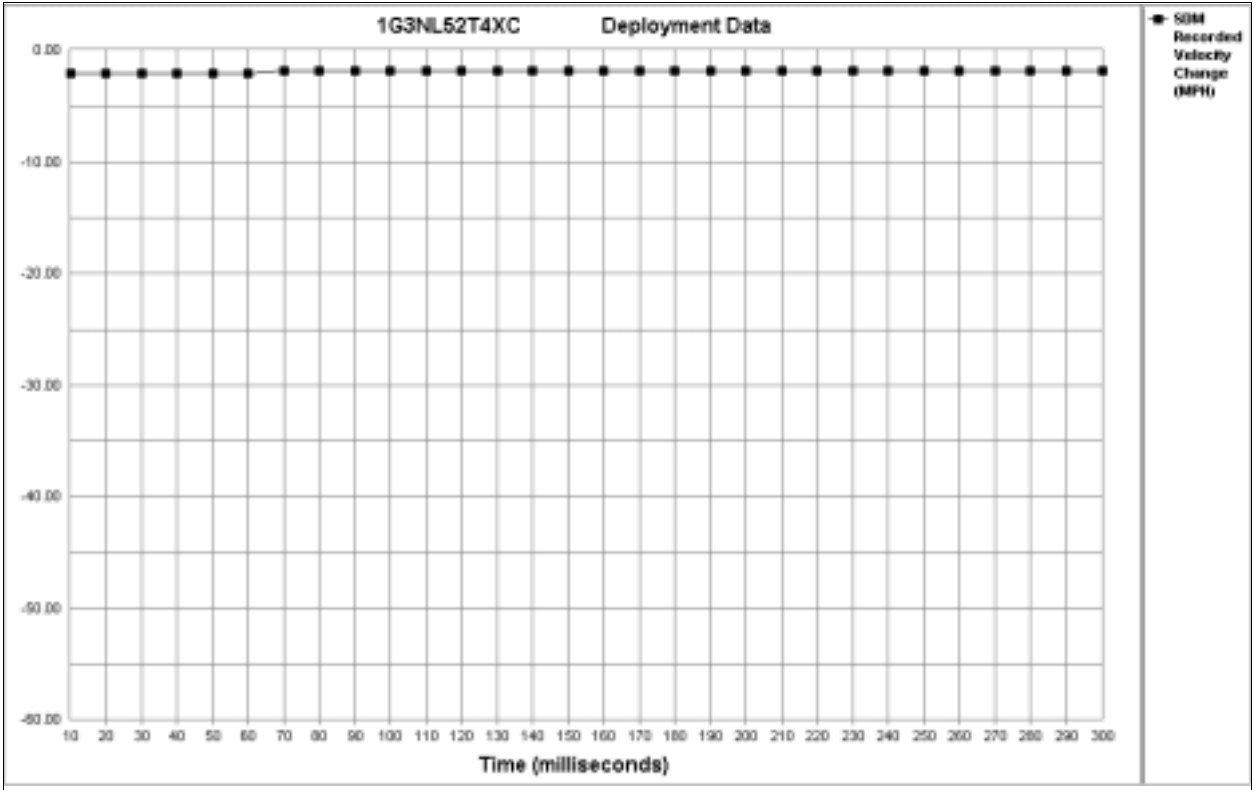


Figure 9: The case vehicle did not sustained any significant velocity change during the first 300 milliseconds after the incident was detected