**CRASH RESEARCH & ANALYSIS, INC.**
Elma, NY 14059

# ON-SITE AMBULANCE CRASH INVESTIGATION
# SCI CASE NO: CR13021

## VEHICLE: 2012 CHEVROLET G4500 CUTAWAY
## AMBULANCE: AMERICAN EMERGENCY VEHICLES TRAUMA HAWK TYPE III

## LOCATION: GEORGIA

## CRASH DATE: JUNE 2013

Contract No. DTNH22-12-C-00269

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
Washington, D.C. 20590

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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 are 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*<br>This on-site investigation focused on the frontal crash of a 2012 Chevrolet G4500 Type III ambulance and the injury source(s) for the fatally injured 44-year-old female driver and the 56-year-old male Emergency Medical Technician (EMT) and 65-year-old male patient who were occupying the patient compartment of the vehicle. At the time of the early morning crash, the ambulance was transporting the 65-year-old male patient who required a higher level of care to a medical facility in an adjacent community. The ambulance was westbound on a two-lane road with active lights and siren. An eastbound non-contact vehicle traveling toward the ambulance began to slow and yield to the emergency vehicle. The crash occurred when an eastbound tractor semi-trailer, traveling behind the non-contact vehicle, braked and then attempted to pass the non-contact vehicle. The front plane of the ambulance struck the left drive axles of the tractor and the left front corner of the trailer in a severe offset impact. All three occupants of the ambulance sustained fatal blunt force injuries and were pronounced deceased at the crash site. The driver of the tractor sustained a police-reported non-incapacitating injury. He refused medical treatment. | | | |
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**AMBULANCE: AMERCIAN EMERGENCY VEHICLES TRAUMA HAWK TYPE III**
**LOCATION: GEORGIA**
**CRASH DATE: JUNE 2013**

***BACKGROUND***

This on-site investigation focused on the frontal crash of a 2012 Chevrolet G4500 Type III ambulance (**Figure 1**) and the injury source(s) for the fatally injured 44-year-old female driver, and the 56-year-old male Emergency Medical Technician (EMT) and 65-year-old male patient who were occupying the patient compartment of the vehicle. The front plane of the ambulance struck an opposite-direction tractor semi-trailer that had entered the ambulance's travel path.

**Figure 1: Overhead left front oblique view of the ambulance.**

The crash was identified by the National Highway Traffic Safety Administration's (NHTSA) Office of Emergency Medical Services (EMS) on the day of the crash. That office requested further research of the crash through the NHTSA's Crash Investigation Division (CID). In-turn, CID forwarded notification to the Special Crash Investigations (SCI) team at Crash Research & Analysis, Inc. on June 6, 2013. The SCI team contacted the investigating police agency and began the process of establishing cooperation. Permission to inspect the vehicles was granted on June 12 and the on-site investigation took place June 13 and 14, 2013. The on-site activities included the detailed inspections of the ambulance, tractor, semi-trailer and the crash site. The ambulance was equipped with an Event Data Recorder (EDR) that was removed by the police and imaged for their investigation. A copy of that data was obtained for this SCI investigation. On-scene police images taken at the time of the crash were not available due to the open status of the investigation. In addition to the field activities, partial interviews were conducted with the hospital's management team.

At the time of the early morning crash, the ambulance was transporting the 65-year-old male patient who required a higher level of care to a medical facility in an adjacent community.

The ambulance was westbound on a two-lane road with active lights and siren. An eastbound non-contact vehicle traveling toward the ambulance began to slow and yield to the emergency vehicle. The crash occurred when an eastbound tractor semi-trailer, traveling behind the non-contact vehicle, braked and then attempted to pass the non-contact vehicle. The front plane of the ambulance struck the left drive axles of the tractor and the left front corner of the trailer in a severe offset impact. All three occupants of the ambulance sustained fatal blunt force injuries and were pronounced deceased at the crash site. The driver of the tractor sustained a police-reported non-incapacitating injury. He refused medical treatment.

## *CRASH SUMMARY*

### *Crash Site*

This two-vehicle crash occurred on an east/west asphalt two-lane road (**Figure 2**) that was located in a rural setting. At the time of the crash, it was dark with an overcast sky. It had been raining and the road surface was wet. In the area of the crash, the road was straight and predominately level. The total width of the road measured 7.0 m (22.9 ft) and was comprised of two 3.5 m (11.4 ft) lanes. The travel lanes were delineated by a white fog lines and solid/broken centerlines that represented a passing zone for eastbound traffic. The asphalt road shoulders measured 0.8 m (2.6 ft). The grass roadside beyond the shoulders tapered into drainage ditches that paralleled both the north and south sides of the road. The ditches were approximately 0.6 m (2 ft) in depth. A residential driveway, located west of the area of the impact, intersected the road from the south. The speed limit in the area of the crash was 89 km/h (55 mph).

**Figure 2: Westbound view of the crash site at the area of impact.**

The area of the impact was evidenced by gouge and scratch marks which were located in the westbound travel lane. Pre-crash skid marks attributed to the tractor trailer were identified during the police investigation. There was no physical evidence of pre-crash avoidance that could be ascribed to the ambulance. Post-impact tire marks attributed to the ambulance evidenced that vehicle's travel path to final rest. A Crash Diagram is included on Page 17 of this technical report.

### *Pre-Crash*

The 65-year-old patient arrived at the county hospital from an outlying facility with a reported gastro-intestinal bleed. The severity of his condition subsequently necessitated that he be transported to a referral hospital that could provide a higher level of care. That hospital was

located approximately 72 km (45 miles) west of the county hospital. The patient transport was provided by the county hospital and these EMS transport services were a function of the initial facility. The ambulance crew, comprised of the 44-year-old female driver and the 56-year-old male EMT, were employees of the hospital.

The patient was restrained on a cot in a prone position and loaded into the ambulance for the transport, accompanied by the EMT who was monitoring his condition. The ambulance departed the hospital with active lights and siren. The vehicle was westbound driven by the 44-year-old female. The EDR-reported speed of the ambulance, 2.5 seconds prior to Algorithm Enable (AE), was 135 km/h (84 mph). The ambulance had travelled approximately 31 km (19 miles) of its scheduled transport at the time of the crash.

**Figure 3: Eastbound pre-crash trajectory of the tractor semi-trailer.**

Eastbound traffic consisted of a non-contact 2011 Chevrolet Malibu driven by a 25-year-old female followed by the 2001 International tractor and semi-trailer driven by a 59-year-old male. The International was hauling an empty 14 m (45 ft) hopper-bottom semi-trailer. As the opposite direction traffic approached the ambulance, the driver of the non-contact vehicle applied the brakes and steered right to yield to the emergency vehicle. The driver of the International tractor realized he was overtaking the non-contact vehicle and locked the brakes in avoidance. When the tractor driver realized that he would not be able to stop the unit, he attempted to pass the non-contact vehicle. He steered the tractor to the left and the left side tires of the tractor crossed the centerline (**Figure 3**).

As the ambulance closed on the tractor, the tractor driver recognized an impending crash and steered the tractor back to the right. This steering maneuver exposed the left drive axles of the tractor and the left front corner of the trailer to the opposing ambulance. The ambulance driver recognized the conflicting traffic and applied the brakes 1.0 second prior to AE. The speed of the ambulance reduced to 121 km/h (75 mph) 0.5 seconds prior to AE.

During this sequence, the driver of the non-contact vehicle realized that the tractor semi-trailer was not able to stop. Upon this realization, the driver of the non-contact vehicle accelerated forward and departed the south road edge in order to avoid a rear impact from the tractor. This non-contact vehicle vaulted the center of the ditch and impacted the south ditch embankment with its undercarriage coming to final rest.

***Crash***

The front plane/left aspect of the ambulance struck the left drive axles of the tractor and the left front corner of the trailer in an offset configuration (Event 1). The force of the impact buckled and crushed the left structures of the ambulance and resulted in catastrophic damage to the front, top and left planes of the vehicle. The suspension components of the tractor's drive axles fractured and the drive axles partially separated from the frame. The body of the semi-trailer was holed at the front left corner.

The impact force from the ambulance was located near the articulation point of the tractor semi-trailer. The force of the impact resulted in a CCW rotation of the tractor and a clockwise rotation of the semi-trailer, as this vehicle separated from the impact. As the tractor slid to the east, it rotated approximately 55 degrees CCW and came to rest straddling the centerline of the road (**Figure 4**) approximately 6 m (21 ft) east the impact. The trailer rotated approximately 25 degrees CW. At final rest, the left tires of the trailer's rear axle were on the centerline of the road. Based on the impact configuration and the distance from the area of impact to the final rest of the tractor semi-trailer, the impact speed of the tractor semi-trailer was approximately 32-48 km/h (20 to 30 mph).

**Figure 4: Northeast view depicting the final rest location of the tractor.**

The ambulance was deflected to the right and separated from the impact with a counterclockwise (CCW) rotation. The right tires of the vehicle departed the north road edge evidenced by arcing tire marks along the roadside and through the ditch. The off-tracking of the ambulance was approximately 20 degrees CCW relative to its original travel direction. A road sign located 33 m (107 ft) from the initial impact was struck by the right corner of the rear step (Event 2) and taken down during the ambulance's post-crash travel. The ambulance continued along its arcing trajectory, returned to the westbound lane (**Figure 5**), crossed the

**Figure 5: Southwest view along the post-crash trajectory of the ambulance. The driveway in the background was the final rest location of the ambulance.**

centerline, and traveled through the eastbound lane coming to final rest in the mouth of the driveway facing south as its momentum was depleted. The distance from the area of the impact to the final rest location of the ambulance was 62 m (203 ft).

A complete analysis of this heavy vehicle crash was beyond the scope of the WinSMASH program. The crash severity (delta-V) was approximated by a damage-based analysis utilizing the WinSMASH program's Barrier Algorithm. The calculated total delta-V of the ambulance was 37 km/h (23 mph). This calculated value underestimated the severity of the impact.

### *Post-Crash*

Police, fire, and ambulance personnel responded to the crash site. The ambulance driver, EMT and patient all sustained blunt force traumatic injuries and were all pronounced deceased at the scene of the crash. The driver was extricated from the front left position of the ambulance. The EMT was displaced within the patient compartment by the force of the crash and came to rest in the right side-entry of the patient compartment. The patient was displaced from the cot and came to rest on the right side-facing bench of the compartment. The cot remained locked and in-place within the patient compartment throughout the crash sequence. The driver of the tractor sustained a police-reported non-capacitating injury to an upper extremity and refused medical transport.

The ambulance and the International tractor sustained disabling damage and were towed from the crash site. The semi-trailer was attached to a tractor owned by the tow company and hauled from the crash site. All the vehicles were impounded by the police pending the conclusion of their investigation.

## *2012 CHEVROLET G4500 TYPE III AMBULANCE*

### *Description*

The involved ambulance was a Type III unit configured on a 2012 Chevrolet G4500 cutaway chassis (**Figure 6**). The Chevrolet was identified by the Vehicle Identification Number (VIN): 1GB6G5CL9C1xxxxxx and was manufactured as an incomplete vehicle. The date of manufacture was unknown. The G4500 cutaway chassis had a Model Number: CG33803 and was configured on a 404 cm (159 in) wheelbase with dual tires at the rear axle positions. This incomplete vehicle was equipped with an ambulance prep package. The rear-wheel drive vehicle had a Gross Vehicle Weight Rating (GVWR) of 6,441 kg (14,200 lb).

**Figure 6: Left front oblique view of the Chevrolet G4500 Type III ambulance.**

The gross weight ratings of the axles were unknown. The power train consisted of a 6.6-liter V8 turbo diesel engine linked to a 6-speed automatic transmission. The brake system was 4-wheel disc with antilock. The Chevrolet was equipped with the vehicle manufacturer's recommended LT225/75R16 tire size. The front tires were Firestone Transforce HT and the rear tires were Uniroyal Laredo. The recommended tire pressures were not identified during the inspection. The label information was missing. Specific tire data measured at the time of the SCI inspection was as follows:

| Position | Measured Pressure | Measured Tread Depth | Restriction | Damage |
|---|---|---|---|---|
| LF | Tire flat | 7 mm (9/32 in) | Yes | Sidewall cut, debeaded, rim deformed |
| LR outer | Tire flat | 6 mm (7/32 in) | No | Sidewall cut, debeaded, rim deformed |
| LR inner | 483 kPa (70 PSI) | 5 mm (6/32 in) | No | None |
| RR outer | Unknown ** | 6 mm (7/32 in) | No | None |
| RR inner | 490 kPa (71 PSI) | 5 mm (6/32 in) | No | None |
| RF | 538 kPa (78 PSI) | 8 mm (10/32 in) | No | None |

**: Valve stem not accessible

The front interior of the Chevrolet was equipped with bucket seats with integral head restraints. Safety features included 3-point lap and shoulder safety belts and frontal air bags for the driver and front right passenger positions. The air bags deployed as a result of the crash. The owner's manual for the 2012 Chevrolet G-series van stated that vehicles with a GVWR greater than 3,885 kg (8,500 lb) were not equipped with safety belt pretensioners. The manual also stated that vehicles with a GVWR greater than 3,885 kg (8,500 lb) were equipped with single stage air bags.

***Patient Compartment***

The patient compartment of the ambulance was a Trauma Hawk Type III manufactured by American Emergency Vehicles (AEV) of Jefferson, NC in August 2012. The patient compartment consisted of the typical Type III interior layout which included: double-rear entry doors for stretcher loading, a three-passenger bench seat along the right side, a rear-facing Captain's seat against the bulkhead immediately forward of the stretcher, right side entry doors, multiple cabinets for storage and a pass-through to the forward occupant compartment. **Figure 7** is an interior of an exemplar AEV Trauma Hawk Type III.

**Figure 7: Interior view of an exemplar AEV Trauma Hawk Type III patient compartment. Image obtained from the AEV website.**

***Exterior Damage***

The front and left planes of the Chevrolet sustained severe damage as a result of the offset impact. The direct contact damage began 21 cm (8.3 in) left of center and extended 68 cm (26.7 in) left to the left front corner. The combined width of the direct and induced damage extended across the entire 178 cm (70 in) frontal end width (**Figure 8**). The residual crush, measured along the front bumper, was as follows: C1 = 89 cm (35.0 in), C2 = 72 cm (28.5 in), C3 = 46 cm (18.0 in), C4 = 31 cm (12.2 in), C5 = 17 cm (6.5 in), C6 = 0. The offset impact force buckled the left frame and left structures of the van chassis (**Figure 9**). The left structure of the engine compartment and left front wheel assembly were compressed into the left cowl structure and lower A-pillar. The right frame rail was deformed to the left 38 cm (14.8 in). The right upper A-pillar separated from the cowl at the beltline as the left structure of cab (greenhouse) impacted the left corner of the trailer. The left aspect of the windshield header exhibited 36 cm (14 in) of direct contact which began at the corner and extended right (**Figure 10**). The left roof side rail was crushed to a vertical depth of 23 cm (9 in). For reference, the comparison measurement of the undeformed roof side rail was 91 cm (36 in). The roof structure rotated counterclockwise approximately 80 degrees during its deformation. The base of the left B-pillar separated from the frame of the chassis and was deflected to a near-horizontal orientation. The right B-pillar deformed laterally to the left. The deflection at the top of the right B-pillar measured 86 cm (34 in).

**Figure 8: Front view of the ambulance.**

**Figure 9: Overall left view of the ambulance.**

**Figure 10: Close view depicting the direct contact damage and the crush of the ambulance roof.**

The left wheelbase was reduced 36 cm (14 in) with direct contact to both the left front wheel assembly and the dual left rear wheel assemblies. The left front axle was displaced rearward 61 cm (24 in) and rotated approximately 80 degrees CCW. The left rear axle position was displaced 25 cm (10 in) rearward. The right wheelbase lengthened 5 cm (2 in) due to distortion of the chassis.

The Truck Deformation Classification (TDC) assigned to this damage pattern 12FYAW8. This heavy truck impact was beyond the scope of the WinSMASH program. For reference purposes, the program's Barrier algorithm was used to estimate the severity of this crash. The estimated total delta-V was 37 km/h (23 mph). The longitudinal and lateral components of the delta-V were -37 km/h (-23 mph) and 0 km/h, respectively. This calculation significantly under-estimated the severity of the impact based on SCI field experience.

***Event Data Recorder***

The Chevrolet G4500 was equipped with an Air bag Control Module (ACM) which provided the sensing and diagnostic functions for the vehicle's Supplement Restraint Systems. This ACM also was designed with Event Data Recorder (EDR) capabilities and recorded both pre-crash and crash-related parameters.

The module was located within the forward occupant compartment under the driver seat. It was removed from the vehicle by the police investigator and secured for evidence. To access the ACM, it was necessary to alter the post-crash position of the driver seat with a hydraulic spreader tool. The seat was hydraulically lifted from its mounts and the ACM was removed. It was imaged two weeks post-crash by the police investigators via the bench-top method of connecting the Bosch Crash Data Retrieval tool directly to the module. The data was collected with software version 10.2. A hard copy (PDF) of the imaged data was shared with the SCI investigator and is attached to the end of this technical report as Attachment A.

The Data Limitations indicated that the Chevrolet's EDR was capable of recording two event types. These crash events were termed Non-Deployment and Deployment. By definition, a Non-Deployment event has a minimum recorded vehicle velocity change of 8 km/h (5 mph); however, the sensing system determined the event was not severe enough to require the deployment of an air bag. The ACM could store one Non-Deployment event that could be overwritten by a following event with a greater vehicle velocity change. A Deployment event was a crash with a severity that exceeded the air bag deployment threshold. The ACM could store two Deployment events. Deployment events were locked events that could not be overwritten. The EDR recorded 300 milliseconds of bi-directional crash pulse data. For Deployment events, this crash pulse data was presented as Vehicle Velocity Change data displayed with 220 milliseconds of data after deployment criteria and up to 70 milliseconds before criteria was met. Velocity Change data was reported with respect to the sign convention

in the Society of Automotive Engineering (SAE) standard J1733. Additionally, both event types (Non-Deployment and Deployment) events could record Pre-Crash data parameters related to the vehicle's operation.

The imaged EDR data was collected on Ignition Cycle 2037. A field within the data indicated that two Deployment events were recorded. The recorded events were termed "Deployment" and "Deployment #2." Both events occurred on Ignition Cycle 2036. A logic table within the data report indicated that there were no other associated events which were not recorded. The recorded events were attributed to the offset frontal crash (SCI Event 1).

***Deployment***

At the time of this event, the Air Bag Warning Lamp (SIR) within the instrument cluster was "Off" and had been continuously "Off" for 2032 Ignition Cycles. There were no Diagnostic Trouble Codes (DTC) present. The driver's safety belt circuit status was recorded as "Unbuckled." The front right (passenger) air bag circuit was "Not Suppressed." The driver and front right passenger air bags (Stage 1) deployed 50 milliseconds after AE. The recorded longitudinal delta-V spiked 10 milliseconds after deployment of the air bags with a magnitude of -37.77 km/h (-23.47 mph) and then quickly diminished to -22.18 (-13.78 mph) at 190 milliseconds. The lateral delta-V pulse began with a positive polarity, reaching a maximum value of 7.39 km/h (4.59 mph) 30 milliseconds before air bag deployment and then decreased to -19.71 km/h (-12.25 mph) at 200 milliseconds. The velocity change data was deemed suspect based on impact dynamics, engineering principles and SCI experience. The errant data may be related to the catastrophic damage sustained by the vehicle. A field within the data set indicated that the data was completely written.

The recorded Pre-Crash Vehicle Parameters associated with the Deployment event are listed in the following table.

| | **-2.5 sec** | **-2.0 sec** | **-1.5 sec** | **-1.0 sec** | **-0.5 sec** |
|---|---|---|---|---|---|
| **Speed** | 135 km/h (84 mph) | 134 km/h (83 mph) | 134 km/h (83 mph) | 130 km/h (81 mph) | 121 km/h (75 mph) |
| **Accelerator Pedal Position** | 24% | 32% | 7% | 0% | 0% |
| **Percent Throttle** | 32% | 35% | 37% | 5% | 0% |
| **Engine RPM** | 2496 | 2496 | 2432 | 2304 | 2112 |
| **Brake Switch Circuit Status** | Off | Off | Off | On | On |

***Deployment #2***

A Deployment #2 event was defined as an event which followed a Deployment event that was severe enough to warrant a deployment; however the air bags had previously deployed. In this crash, a Deployment #2 was recorded. The time between the Deployment and Deployment #2

was zero seconds. The SIR Warning Lamp was "On" and the DTC B0052-00 that was related to the (previous) frontal air bag deployment was recorded. The maximum recorded longitudinal delta V was 1.53 mph at 210 milliseconds. The maximum lateral delta-V was -1.53 mph at 120 milliseconds. The data set was completely recorded.

***Interior Damage - Cab***

The forward interior compartment of the Chevrolet sustained severe damage with a complete loss of integrity that was directly attributed to the exterior crash forces (**Figure 11**). The left instrument panel, left bolster and left toe pan intruded to the forward aspect of the driver seat cushion. The steering column was separated from the instrument panel and the column was rotated 90 degrees CW relative to its original location. The steering wheel rim had separated from the top of the column and was missing. The driver seat track position was unknown. Its position had been altered during the removal of the ACM. The seat back was separated from the seat frame and removed by the first responders during the extrication activities.

A driver head contact was identified during the interior inspection (**Figure 12**). The contact was located at the forward right aspect of the roof and measured 30 cm x 18 cm (12 in x 7 in) in overall dimension. The center of the contact was located 30 cm (12 in) aft of the windshield header and 13 cm (5 in) left of the right roof side rail.

**Figure 11: Left lateral view depicting the cab intrusion.**

**Figure 12: Image depicting the head contact at the front right corner of the roof.**

***Manual Restraint Systems***

The manual restraint systems in the Chevrolet consisted of 3-point lap and shoulder safety belts for the driver and front right passenger. The driver's restraint consisted of continuous loop webbing, a sliding latch plate, an adjustable D-ring and an Emergency Locking Retractor (ELR) retractor.

The left B-pillar was oriented in a horizontal position due to its separation from the sill. The base of the pillar and the retractor were located adjacent to the left rear axle. The (orange-colored) safety belt webbing was in a stowed position (**Figure 13**). The exposed webbing was partially cut in several places from contact with edges of the deformed sheet metal during the crash sequence. The webbing was stowed on the retractor spool. Examination of the latch plate was unremarkable for crash-related physical evidence (i.e. loading abrasions). The surface of the D-ring was not abraded. Based on the observations of the SCI inspection, the driver of the ambulance was not restrained by the safety belt at the time of the crash. The unrestrained status of the driver was consistent with the imaged EDR data.

**Figure 13: View of the deformed left B-pillar and stowed driver safety belt (orange-colored webbing).**

***Supplemental Restraint Systems***

The Chevrolet was equipped with a driver and front right passenger air bags. The driver air bag module was located in the center hub of the steering wheel rim. The steering wheel assembly fractured and separated from the top of the steering column during the impact. The steering wheel rim and deployed driver air bag module were missing. The front right passenger air bag was a mid-mount design located in the right aspect of the windshield. This air bag deployed as a result of the crash.

***Patient Compartment***

The AEV Trauma Hawk Type III patient compartment sustained catastrophic damage as a result of the impact (**Figure 14**). The left, back and top planes separated from the vehicle during the crash and were dispersed throughout the crash site. The forward wall of the compartment hinged at the right corner with rearward displacement at the left and center aspects. Comparative (longitudinal) measurements of the patient compartment indicated that the residual location of the left front corner was 99 cm (39 in) aft of its original position. The rear facing jump seat was deflected rearward and displaced from its box-mount. All the left cabinetry was dislodged.

**Figure 14: Left rear oblique view of the patient compartment.**

The right wall of the compartment was primarily intact. The right entry door was operational. Body matter was observed on the center aspect of the door panel and was likely related to the impact kinematics of the EMT. At final rest, the EMT was located in the right entry. The right side-facing bench was intact with forward displacement of the back rests. The police investigator stated that the patient came to rest on the bench seat.

***Patient Cot and Fastener System***

The on-scene police images were reviewed at the time of the on-site SCI inspection. Visual review of the images indicated that the patient cot remained locked to the ambulance during the impact. The cot was adjusted in the prone (flat) position. There was no reported damage to the cot or any components of the fastening system.

Physical inspection of the antler bracket positioned on the floor at the forward aspect of the cot was unremarkable. It was not damaged (**Figure 15**). The Stryker rail clamp system was intact and operational (**Figure 16**). At inspection, the locking jaw opened and closed as designed. The rail clamp was identified as Model No. 6370 and Serial No. 120841138.

The police investigator stated that numerous items scattered from ambulance during the crash and were retrieved from the crash site by an adjacent ambulance company. These items included various equipment (backboards, oxygen tanks, medical equipment, supplies etc.) housed within the patient compartment and utilized during the ambulance runs. The items were subsequently cleaned and returned to the county hospital (the origin of the ambulance run).

The patient cot was returned to the hospital and locked in secure storage at the direction of its legal representatives. It was not available for inspection at the time of the SCI investigation. A subsequent follow-up request from the SCI team to establish cooperation with the hospital was denied by the hospital's legal representation.

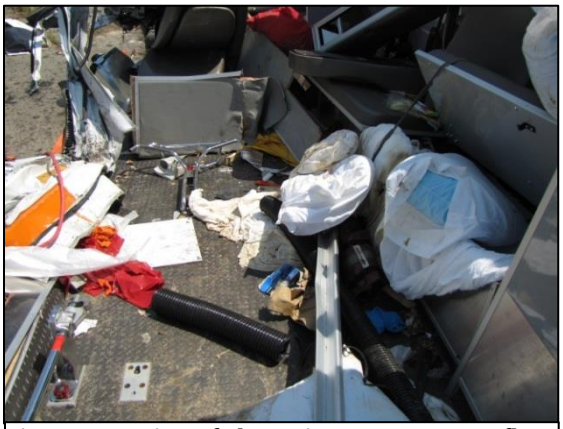


**Figure 15: View of the patient compartment floor, rail clamp and the antler bracket.**

**Figure 16: Close-up view of the rail clamp.**

### *2012 CHEVROLET G4500 TYPE III AMBULANCE*

#### *Driver Demographics*

| | |
|---|---|
| Age / Sex: | 44 years / Female |
| Height: | Unknown |
| Weight: | Unknown |
| Eyewear: | None |
| Seat Type: | Bucket seat |
| Seat Track Position: | Unknown |
| Manual Restraint Usage: | None used |
| Usage Source: | SCI inspection |
| Air Bags: | Deployed frontal |
| Alcohol/Drug Involvement: | None (PAR-reported) |
| Egress from Vehicle: | Fatal prior to removal from vehicle |
| Transport from Scene: | Ambulance to the County Coroner |
| Medical Treatment: | None, fatally injured |

#### *Driver Injuries*

| Injury No. | Injury | AIS 2005/08 | Injury Source | Confidence Level |
|---|---|---|---|---|
| 1 | Blunt force head trauma | 100999.9,0 | Roof | Probable |

*Source: Coroner Report. No autopsy was performed*

#### *Driver Kinematics*

The driver was seated in an unknown posture as she operated the ambulance in the westbound direction. She was not restrained by the vehicle's manual safety belt. At impact, the driver air bag deployed. The unrestrained driver initiated a forward trajectory in response to the 12 o'clock direction of the impact force. The driver contacted and loaded the deployed air bag. The drivers' lower extremities contacted and loaded the knee bolster.

The force of the impact overloaded and buckled the left structures of the chassis. The left interior components intruded into the driver space. The left front corner of the ambulance roof impacted the left corner of the semi-trailer. This engagement compressed the left roof side rail to a residual depth of 23 cm (9 in) and caused the roof structure to rotate CCW as the support pillars separated. The driver's head impacted the front right aspect of the roof and was the probable source of her head trauma.

The driver came to rest mechanically pinned in the driver seat by the intrusion. She was pronounced deceased at the scene and transported by ambulance to a county facility.

***EMT Demographics***

| | |
|---|---|
| Age / Sex: | 56 years / Male |
| Height: | Unknown |
| Weight: | Unknown |
| Eyewear: | None |
| Seat Type: | Rear-facing bucket |
| Seat Track Position: | Unknown |
| Manual Restraint Usage: | None used |
| Usage Source: | SCI inspection |
| Air Bags: | None available |
| Alcohol/Drug Involvement: | Not reported |
| Egress from Vehicle: | Fatal prior to removal from vehicle |
| Transport from Scene: | Ambulance to the County Coroner |
| Medical Treatment: | None, fatally injured |

***EMT Injuries***

| Injury No. | Injury | AIS 2005/08 | Injury Source | Confidence Level |
|---|---|---|---|---|
| 1 | Blunt force head trauma | 100999.9,0 | Right entry door | Probable |

*Source: Coroner Report. No autopsy was performed.*

***EMT Kinematics***

Based on the final rest position and kinematics of the EMT, this occupant was presumably sitting on the rear-facing attendant's seat (directly behind the driver). At impact, he was displaced forward with respect to the patient compartment due to the 12 o'clock direction of force and loaded the seat back. He was then propelled rearward and right (with respect to the vehicle) due to the deformation along the vehicle's left plane and intrusion of the patient compartment's forward wall. Body matter was observed on the interior panel of the right side entry door indicative of the EMT's probable impact and loading. Reportedly, he came to rest on the stairs in the right entry of the patient compartment.

The first responders opened the right door of the patient compartment at the crash site. The EMT reportedly fell out of the right door at that time. He was not ejected. He was pronounced deceased and transported by ambulance to a county facility.

***Patient Demographics***

| | |
|---|---|
| Age / Sex: | 65 years / Male |
| Height: | Unknown |
| Weight: | Unknown |
| Eyewear: | None |
| Seat Type: | Lying prone on an ambulance cot |
| Seat Track Position: | Not adjustable |
| Manual Restraint Usage: | Unknown |
| Usage Source: | N/A (Stretcher unavailable for inspection) |

| | |
|---|---|
| Air Bags: | None available |
| Alcohol/Drug Involvement: | Not reported |
| Egress from Vehicle: | Fatal prior to removal from vehicle |
| Transport from Scene: | Ambulance to the County Coroner |
| Medical Treatment: | None, fatally injured |

***Patient Injuries***

| Injury No. | Injury | AIS 2005/08 | Injury Source | Confidence Level |
|---|---|---|---|---|
| 1 | Blunt force head trauma | 100999.9,0 | Unknown | Unknown |

*Source: Coroner Report. No autopsy was performed.*

***Patient Kinematics***

At the time of the crash, the patient was being transported by the ambulance to a neighboring medical facility that possessed a higher level of care. Reportedly, the 65-year-old patient was restrained on the cot by the lateral restraints in a prone position. This information was provided by the transport hospital as their protocol. Further details were not available due to the lack of cooperation with the transport hospital. The restraint use could not be corroborated and was coded as unknown.

At impact, the patient responded to the 12 o'clock direction of force with a forward trajectory and was displaced from the cot. He rebounded within the patient compartment and then came rest on the right bench seat.

The patient was pronounced deceased at the crash site. He was removed from the ambulance and transported to a county facility. The source of his head trauma was not identified.

***2001 INTERNATIONAL TRACTOR/HOPPER-BOTTOM SEMI-TRAILER***

***Description***

The International 9200i tractor was identified by the VIN: 3HSCEAXR51N0xxxxxx. The Class-8 tractor (**Figure 17**) was configured on a 470 cm (185 in) wheelbase with a 6x4 drivetrain and a conventional day cab. The maximum Gross Vehicle Weight Rating (GVWR) was 25,855 kg (52,000 lb). The International was pulling a Wilson Pacesetter 14 m (45 ft) hopper-bottom grain trailer at the time of the crash. The trailer was not loaded.

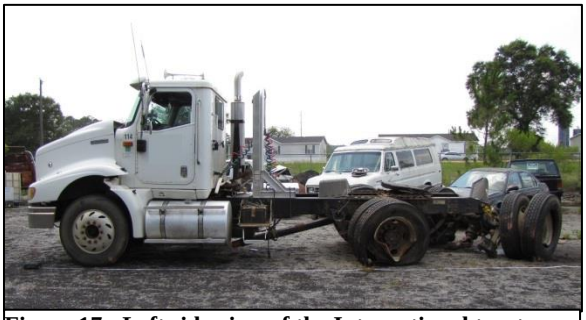


**Figure 17: Left side view of the International tractor.**

***Exterior Damage***

The tractor semi-trailer was impacted at the left drive axles and left front corner of the trailer. The force of the impact fractured the suspension components at both left drive axles. There was complete separation of the second axle and drive shaft. The outer rims at both axles were deformed. The drive tires aired out and debeaded. The ladder frame of the tractor was deformed to the right from the force of the impact.

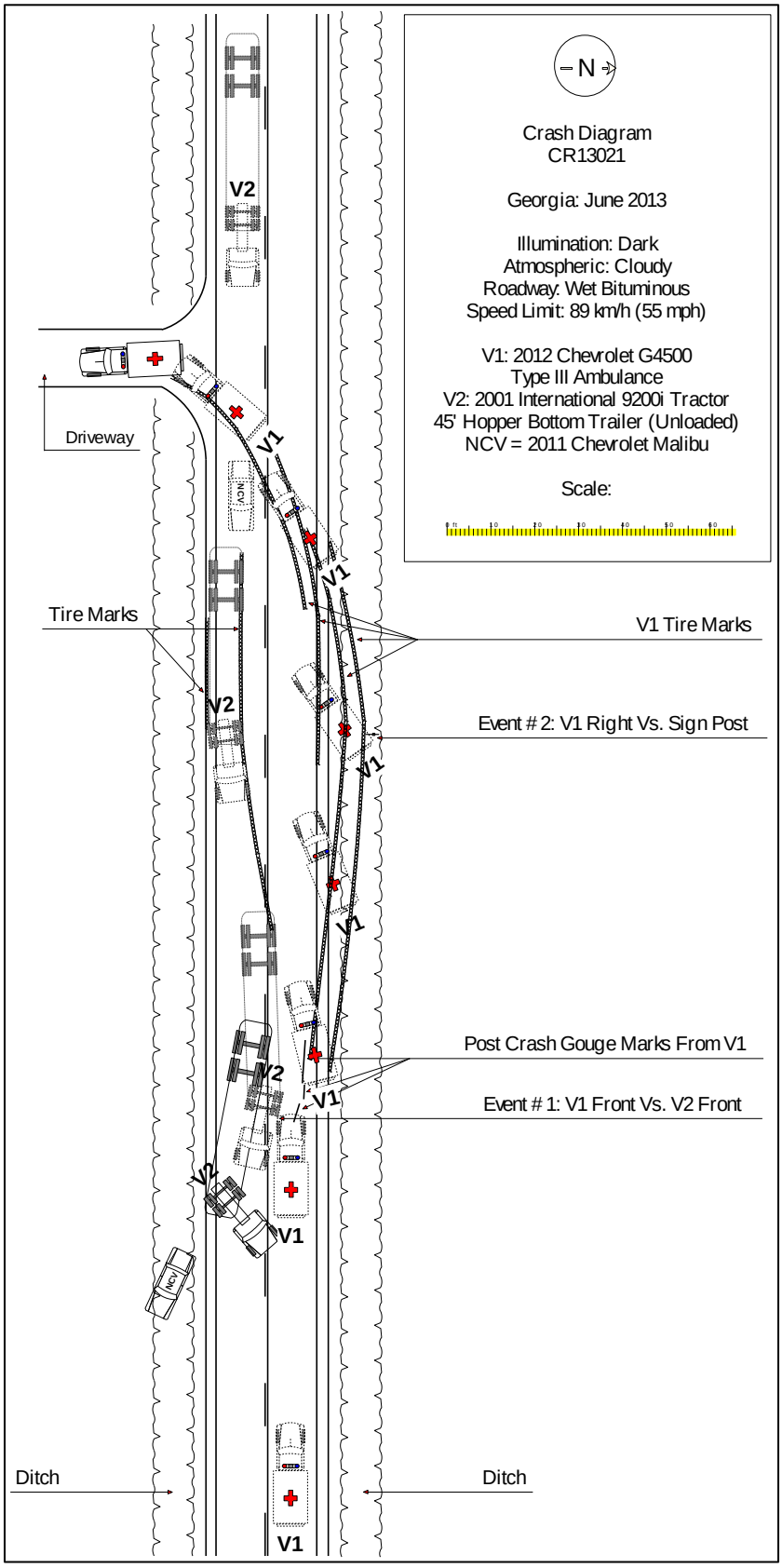
The left front corner of the trailer was holed due to its impact with the ambulance (**Figure 18**). The trailer's front plane at the floor elevation exhibited 48 cm (19 in) of direct contact damage. This direct contact began at the corner and extended to the right. The aluminum wall of the trailer sheared in the area of this direct contact and tore resulting in a 183 cm by 79 cm (72 in by 31 in), height by width, opening at the front plane. This opening extended along the left plane 2.2 m (7 ft) as the side wall buckled/deformed rearward. For reference, the floor of the trailer was located 119 cm (47 in) above the ground. The TDC assigned to the damage pattern of the tractor semi-trailer was 12LKEW4.

**Figure 18: Front left oblique view of the hopper-bottom semi-trailer.**

***Freightliner Occupants***

The 59-year-old male driver of the International was restrained by the 3-point lap and shoulder safety belt at the time of the crash. He sustained a police-reported non-incapacitating injury to his upper extremity. He refused medical attention at the crash site.

## *CRASH DIAGRAM*



**ATTACHMENT A:**

**2012 Chevrolet G4500 Event Data Recorder Report**

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

## CDR File Information

| | |
|---|---|
| User Entered VIN | 1GB6G5CL9C1xxxxxx |
| User | |
| Case Number | |
| EDR Data Imaging Date | |
| Crash Date | 06/06/2013 |
| Filename | |
| Saved on | |
| Collected with CDR version | Crash Data Retrieval Tool 10.2 |
| Reported with CDR version | Crash Data Retrieval Tool 10.2 |
| EDR Device Type | Airbag Control Module |
| Event(s) recovered | Deployment<br>Deployment #2 |

## Comments

## Data Limitations

**Recorded Crash Events:**

There are two types of recorded crash events. The first is the Non-Deployment Event. A Non-Deployment Event records data but does not deploy the air bag(s). The minimum SDM Recorded Vehicle Velocity Change, that is needed to record a Non-Deployment Event, is five MPH. A Non-Deployment Event may contain Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded vehicle velocity change. This event will be cleared by the SDM, after approximately 250 ignition cycles. This event can be overwritten by a second Deployment Event, referred to as Deployment Event #2, if the Non-Deployment Event is not locked. The data in the Non-Deployment Event file will be locked, if the Non-Deployment Event occurred within five seconds of a Deployment Event. A locked Non Deployment Event cannot be overwritten or cleared by the SDM.
The second type of SDM recorded crash event is the Deployment Event. It also may contain Pre-Crash and Crash data. The SDM can store up to two different Deployment Events. If a second Deployment Event occurs any time after the Deployment Event, the Deployment Event #2 will overwrite any non-locked Non-Deployment Event. Deployment Events cannot be overwritten or cleared by the SDM. Once the SDM has deployed an air bag, the SDM must be replaced.

**Data:**

-SDM Recorded Vehicle Velocity Change reflects the change in velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. For Deployment Events, the SDM will record 220 milliseconds of data after Deployment criteria is met and up to 70 milliseconds before Deployment criteria is met. For Non-Deployment Events, the SDM can record up to the first 300 milliseconds of data after algorithm enable. Velocity Change data is displayed in SAE sign convention.

-The CDR tool displays time from Algorithm Enable (AE) to time of Deployment command in a Deployment event and AE to time of maximum SDM recorded vehicle velocity change in a Non-Deployment event. Time from AE begins when the first air bag system enable threshold is met and ends when Deployment command criteria is met or at maximum SDM recorded vehicle velocity change. Air bag systems such as frontal, side, or rollover, may be a source of an enable. The time represented in a CDR report can be that of the enable of one air bag system to the Deployment time of another air bag system.

-Maximum Recorded Vehicle Velocity Change is the maximum square root value of the sum of the squares for the vehicle's combined "X" and "Y" axis change in velocity.

-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has been interrupted and not fully written.

-SDM Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:

- -Significant changes in the tire's rolling radius
- -Final drive axle ratio changes
- -Wheel lockup and wheel slip

-Brake Switch Circuit Status indicates the open/closed state of the brake switch circuit.
-Pre-Crash data is recorded asynchronously.
-Pre-Crash Electronic Data Validity Check Status indicates “Data Invalid” if:
    -The SDM receives a message with an “invalid” flag from the module sending the pre-crash data
    -No data is received from the module sending the pre-crash data
    -No module is present to send the pre-crash data
-Driver’s and Passenger’s Belt Switch Circuit Status indicates the status of the seat belt switch circuit.
-The Time Between Non-Deployment to Deployment Events is displayed in seconds. If the time between the two events is greater than five seconds, “N/A” is displayed in place of the time. If the value is negative, then the Deployment Event occurred first. If the value is positive, then the Non-Deployment Event occurred first.
-If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.
-The ignition cycle counter relies upon the transitions through OFF->RUN->CRANK power-moding messages, on the GMLAN communication bus, to increment the counter. Applying and removing of battery power to the module will not increment the ignition cycle counter.
-All data should be examined in conjunction with other available physical evidence from the vehicle and scene

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

01006_SDMCG_r002

## Multiple Event Data

| | |
|---|---|
| Associated Events Not Recorded | 0 |
| Event(s) was an Extended Concatenated Event | No |
| An Event(s) was in Between the Recorded Event(s) | No |
| An Event(s) Followed the Recorded Event(s) | No |
| The Event(s) Not Recorded was a Deployment Event(s) | No |
| The Event(s) Not Recorded was a Non-Deployment Event(s) | No |

## System Status At AE

| | |
|---|---|
| Low Tire Pressure Warning Lamp (If Equipped) | OFF |
| Vehicle Power Mode Status | Run |
| Remote Start Status (If Equipped) | Inactive |
| Run/Crank Ignition Switch Logic Level | Active |

### Pre-crash data

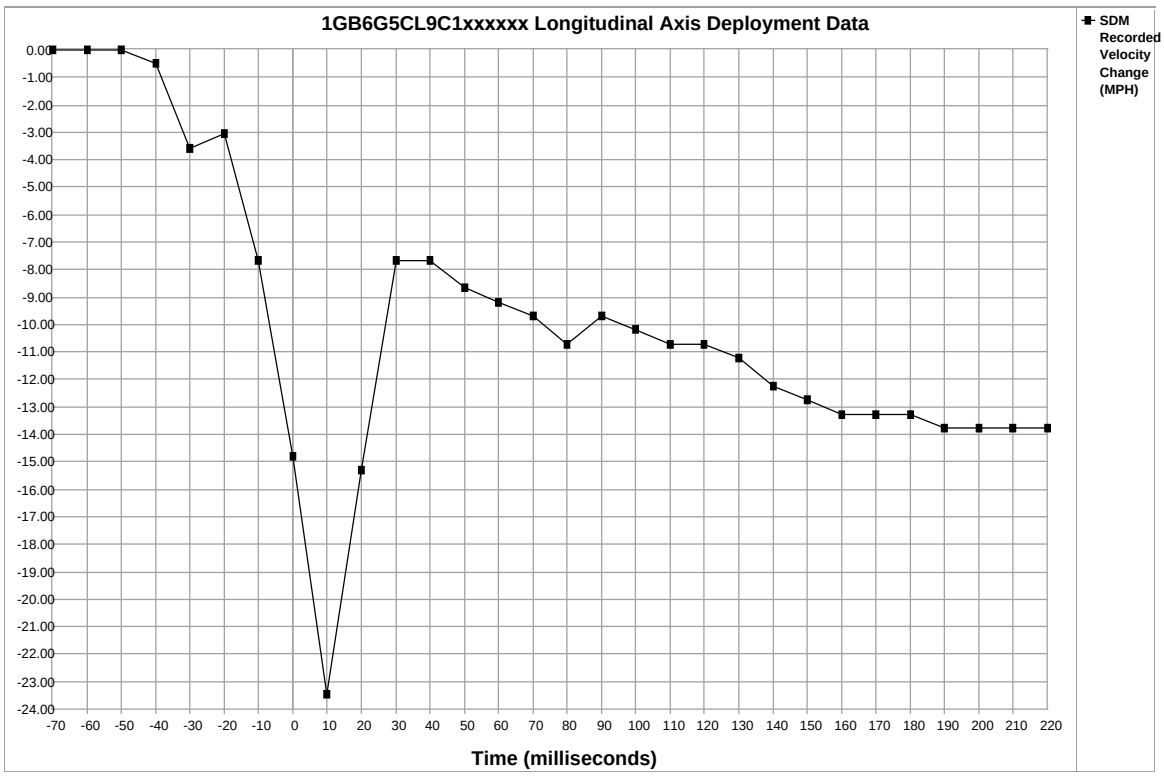
| Parameter | -1.0 sec | -0.5 sec |
|---|---|---|
| Reduced Engine Power Mode | OFF | OFF |
| Cruise Control Active (If Equipped) | No | No |
| Cruise Control Resume Switch Active (If Equipped) | No | No |
| Cruise Control Set Switch Active (If Equipped) | No | No |
| Engine Torque (foot pounds) | -69.7 | -105.85 |

### Pre-Crash Data

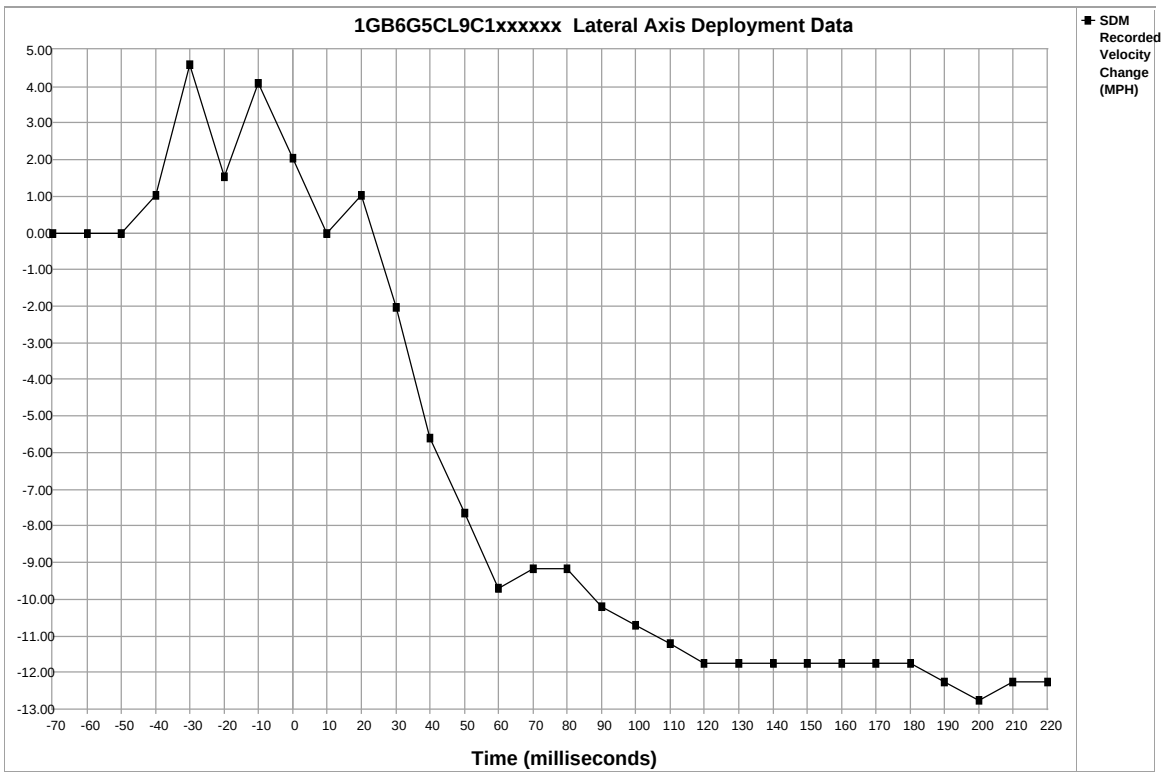
| Parameter | -2.5 sec | -2.0 sec | -1.5 sec | -1.0 sec | -0.5 sec |
|---|---|---|---|---|---|
| Accelerator Pedal Position (percent) | 24 | 32 | 7 | 0 | 0 |
| Vehicle Speed (MPH) | 84 | 83 | 83 | 81 | 75 |
| Engine Speed (RPM) | 2496 | 2496 | 2432 | 2304 | 2112 |
| Percent Throttle | 32 | 35 | 37 | 5 | 0 |
| Brake Switch Circuit State | OFF | OFF | OFF | ON | ON |

## System Status At Deployment

| | |
|---|---|
| Ignition Cycles At Investigation | 2037 |
| SIR Warning Lamp Status | OFF |
| SIR Warning Lamp ON/OFF Time Continuously (seconds) | 655350 |
| Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously | 2032 |
| Ignition Cycles At Event | 2036 |
| Ignition Cycles Since DTCs Were Last Cleared | 255 |
| Driver's Belt Switch Circuit Status | UNBUCKLED |
| Passenger Air Bag Indicator Status at Event Enable | Undefined |
| Passenger SIR Suppression Switch Circuit Status | Air Bag Not Suppressed |
| Diagnostic Trouble Codes at Event, fault number: 1 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 2 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 3 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 4 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 5 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 6 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 7 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 8 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 9 | N/A |
| Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec) | 50 |
| Driver 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec) | N/A |
| Passenger 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec) | 50 |
| Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec) | N/A |
| Driver Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec) | N/A |
| Passenger Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec) | N/A |
| Crash Record Locked | Yes |
| Vehicle Event Data (Pre-Crash) Associated With This Event | Yes |
| Time Between Events (sec) | 0 |
| Event Recording Complete | Yes |
| Driver First Stage Deployment Loop Commanded | Yes |
| Passenger First Stage Deployment Loop Commanded | Yes |
| Driver Second Stage Deployment Loop Commanded | No |
| Driver 2nd Stage Deployment Loop Commanded for Disposal | No |
| Passenger Second Stage Deployment Loop Commanded | No |
| Passenger 2nd Stage Deployment Loop Commanded for Disposal | No |
| Driver Pretensioner Deployment Loop Commanded (If Equipped) | No |
| Passenger Pretensioner Deployment Loop Commanded (If Equipped) | No |
| Driver Side Deployment Loop Commanded (If Equipped) | No |
| Passenger Side Deployment Loop Commanded (If Equipped) | No |
| Second Row Left Side Deployment Loop Commanded (If Equipped) | No |
| Second Row Right Side Deployment Loop Commanded (If Equipped) | No |
| Driver (Initiator 1) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Passenger (Initiator 1) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Driver (Initiator 2) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Passenger (Initiator 2) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Driver (Initiator 3) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Passenger (Initiator 3) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Driver Knee Deployment Loop Commanded (If Equipped) | No |
| Passenger Knee Deployment Loop Commanded (If Equipped) | No |
| Second Row Left Pretensioner Deployment Loop Commanded (If Equipped) | No |
| Second Row Right Pretensioner Deployment Loop Commanded (If Equipped) | No |
| Second Row Center Pretensioner Deployment Loop Commanded (If Equipped) | No |



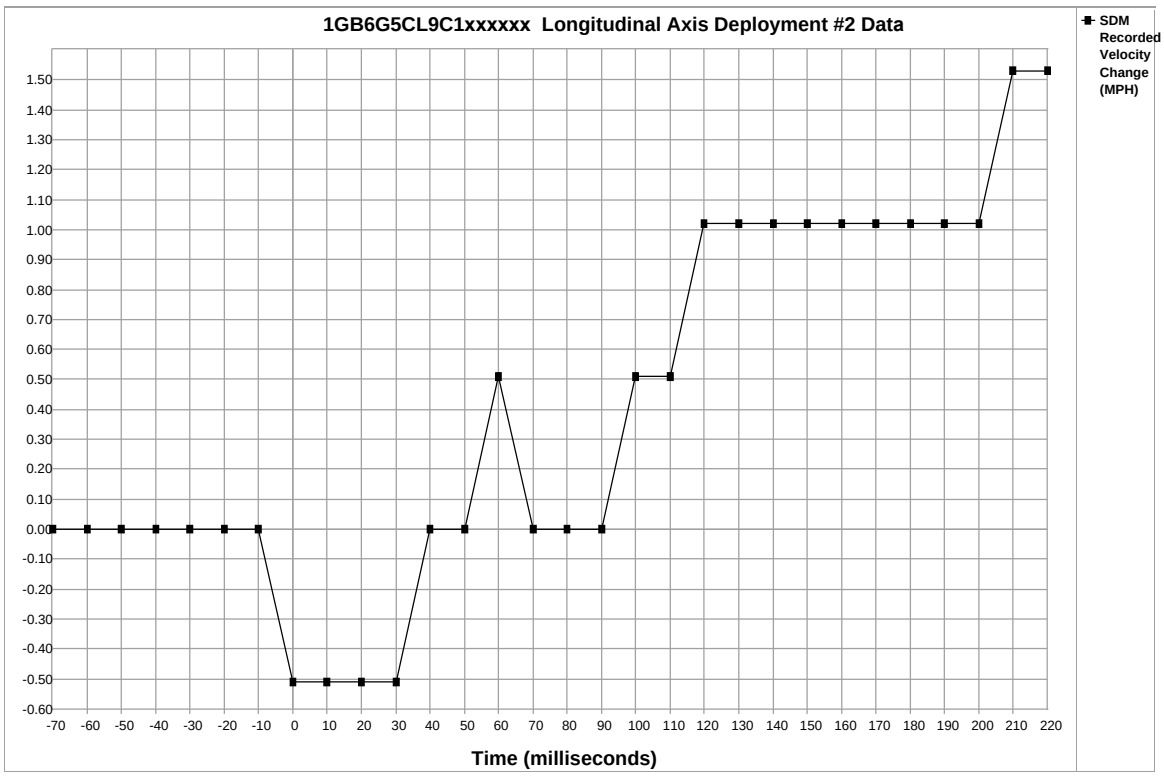

| Time (milliseconds) | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SDM Longitudinal Axis Recorded Velocity Change (MPH) | 0.00 | 0.00 | 0.00 | -0.51 | -3.57 | -3.06 | -7.65 | -14.80 | -23.47 | -15.31 | -7.65 | -7.65 | -8.67 | -9.18 | -9.69 |
| Time (milliseconds) | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
| SDM Longitudinal Axis Recorded Velocity Change (MPH) | -10.72 | -9.69 | -10.20 | -10.72 | -10.72 | -11.23 | -12.25 | -12.76 | -13.27 | -13.27 | -13.27 | -13.78 | -13.78 | -13.78 | -13.78 |



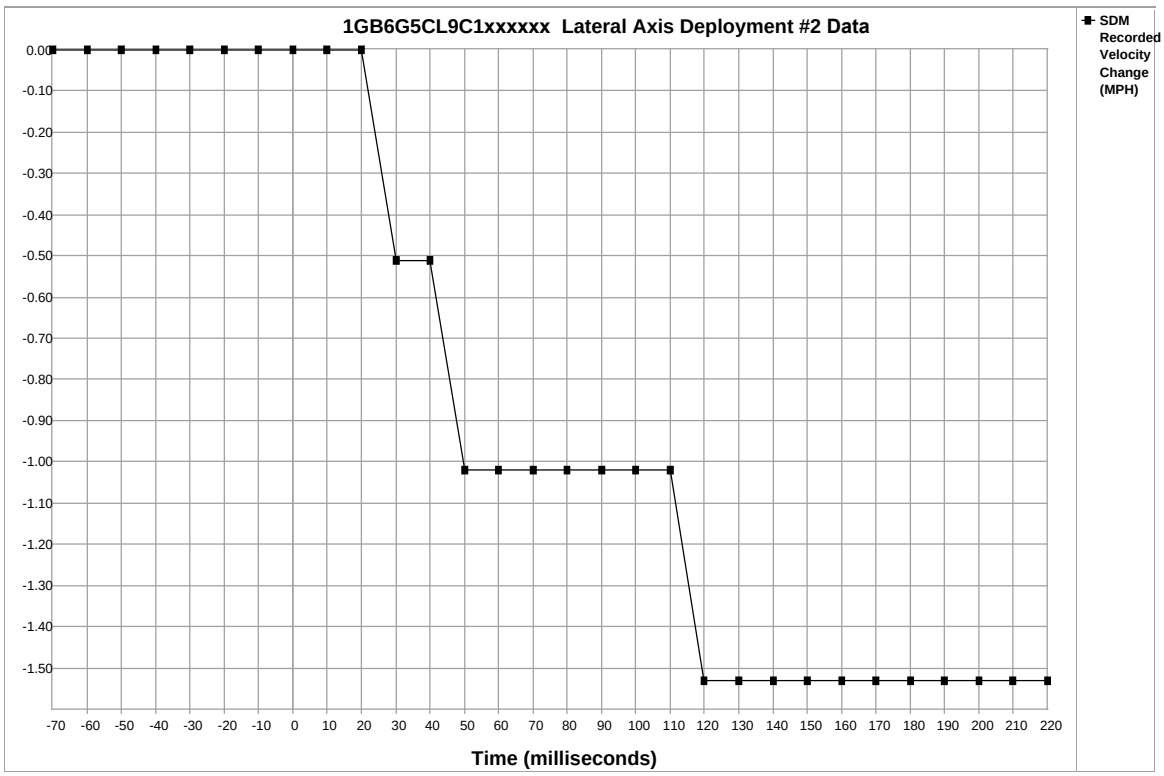

| Time (milliseconds) | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SDM Lateral Axis Recorded Velocity Change (MPH) | 0.00 | 0.00 | 0.00 | 1.02 | 4.59 | 1.53 | 4.08 | 2.04 | 0.00 | 1.02 | -2.04 | -5.61 | -7.65 | -9.69 | -9.18 |
| Time (milliseconds) | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
| SDM Lateral Axis Recorded Velocity Change (MPH) | -9.18 | -10.20 | -10.72 | -11.23 | -11.74 | -11.74 | -11.74 | -11.74 | -11.74 | -11.74 | -11.74 | -12.25 | -12.76 | -12.25 | -12.25 |

## System Status At Deployment #2

| | |
|---|---|
| Ignition Cycles At Investigation | 2037 |
| SIR Warning Lamp Status | ON |
| SIR Warning Lamp ON/OFF Time Continuously (seconds) | 0 |
| Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously | 0 |
| Ignition Cycles At Event | 2036 |
| Ignition Cycles Since DTCs Were Last Cleared | 255 |
| Driver's Belt Switch Circuit Status | UNBUCKLED |
| Passenger Air Bag Indicator Status at Event Enable | Undefined |
| Passenger SIR Suppression Switch Circuit Status | Air Bag Not Suppressed |
| Diagnostic Trouble Codes at Event, fault number: 1 | B0052-00 |
| Diagnostic Trouble Codes at Event, fault number: 2 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 3 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 4 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 5 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 6 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 7 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 8 | N/A |
| Diagnostic Trouble Codes at Event, fault number: 9 | N/A |
| Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec) | N/A |
| Driver 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec) | N/A |
| Passenger 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec) | N/A |
| Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec) | N/A |
| Driver Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec) | N/A |
| Passenger Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec) | N/A |
| Crash Record Locked | Yes |
| Deployment Event Recorded in the Non-Deployment Record | Yes |
| Vehicle Event Data (Pre-Crash) Associated With This Event | No |
| Time Between Events (sec) | 0 |
| Event Recording Complete | Yes |
| Driver First Stage Deployment Loop Commanded | No |
| Passenger First Stage Deployment Loop Commanded | No |
| Driver Second Stage Deployment Loop Commanded | No |
| Driver 2nd Stage Deployment Loop Commanded for Disposal | No |
| Passenger Second Stage Deployment Loop Commanded | No |
| Passenger 2nd Stage Deployment Loop Commanded for Disposal | No |
| Driver Pretensioner Deployment Loop Commanded (If Equipped) | No |
| Passenger Pretensioner Deployment Loop Commanded (If Equipped) | No |
| Driver Side Deployment Loop Commanded (If Equipped) | No |
| Passenger Side Deployment Loop Commanded (If Equipped) | No |
| Second Row Left Side Deployment Loop Commanded (If Equipped) | No |
| Second Row Right Side Deployment Loop Commanded (If Equipped) | No |
| Driver (Initiator 1) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Passenger (Initiator 1) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Driver (Initiator 2) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Passenger (Initiator 2) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Driver (Initiator 3) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Passenger (Initiator 3) Roof Rail/Head Curtain Loop Commanded (If Equipped) | No |
| Driver Knee Deployment Loop Commanded (If Equipped) | No |
| Passenger Knee Deployment Loop Commanded (If Equipped) | No |
| Second Row Left Pretensioner Deployment Loop Commanded (If Equipped) | No |
| Second Row Right Pretensioner Deployment Loop Commanded (If Equipped) | No |
| Second Row Center Pretensioner Deployment Loop Commanded (If Equipped) | No |




| Time (milliseconds) | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SDM Longitudinal Axis Recorded Velocity Change (MPH) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.51 | -0.51 | -0.51 | -0.51 | 0.00 | 0.00 | 0.51 | 0.00 |
| Time (milliseconds) | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
| SDM Longitudinal Axis Recorded Velocity Change (MPH) | 0.00 | 0.00 | 0.51 | 0.51 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.53 | 1.53 |




| Time (milliseconds) | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SDM Lateral Axis Recorded Velocity Change (MPH) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.51 | -0.51 | -1.02 | -1.02 | -1.02 |
| Time (milliseconds) | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 |
| SDM Lateral Axis Recorded Velocity Change (MPH) | -1.02 | -1.02 | -1.02 | -1.02 | -1.53 | -1.53 | -1.53 | -1.53 | -1.53 | -1.53 | -1.53 | -1.53 | -1.53 | -1.53 | -1.53 |

## Hexadecimal Data

Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR system.

```
$01  00 00 00 00 00 00 00
$02  00 00 00 00 00 00 00
$03  00 00 00 00 00 00 00
$04  00 00 00 00 00 00 00
$05  00 00 00 00 00 00 00
$06  C5 00 00 00 00 00 00
$0A  00 00 00 00 00 00 00
$0B  00 00 00 00 00 00 00
$0C  00 00 00 00 00 00 00
$0D  00 00 00 00 00 00 00
$0E  00 00 00 00 00 00 00
$0F  00 00 00 00 00 00 00
$10  00 00 00 00 00 00 00
$11  27 FF FF 80 81 00 00
$12  FF 00 F0 F0 E0 00 00
$13  C0 00 80 20 20 00 00
$14  C0 00 80 20 20 00 00
$15  01 02 00 00 00 00 00
$16  00 00 00 00 00 00 00
$17  00 00 00 00 00 00 00
$18  02 0A 0A 0A 0A 0A 0A
$19  07 07 00 00 00 00 00
$1A  00 00 00 00 00 00 00
$1B  00 00 00 00 00 00 00
$1C  00 00 00 00 00 00 00
$1D  00 00 00 00 00 00 00
$1E  01 00 00 00 00 00 00
$1F  00 00 00 00 00 00 00
$20  00 00 00 00 00 00 00
$21  00 00 00 00 00 00 00
$22  00 00 00 00 00 00 00
$23  00 00 00 00 00 00 00
$24  00 00 00 00 00 00 00
$25  00 00 00 00 00 00 00
$26  00 00 00 00 00 00 00
$27  00 00 00 00 00 00 00
$28  00 00 00 00 00 00 00
$29  00 00 00 00 00 00 00
$2A  00 8C 00 00 00 00 00
$2B  23 23 50 00 00 00 00
$2C  7F 80 7F 7E 7E 7E 00
$2D  FF FF FF FF FF 80 00
$2E  00 80 00 80 00 00 00
$2F  FF FF FF FF FF 80 00
$30  0F FF 0F FF 80 00 00
$31  FF FF FF FF FF 80 00
$32  FF FF FF FF FF 80 00
$33  00 00 00 00 00 00 00
$34  00 00 00 00 00 00 00
$35  00 00 00 00 00 00 00
$36  00 00 00 00 00 00 00
$37  00 00 00 00 00 00 00
$38  00 00 00 00 00 00 00
```

```
$39  00 00 00 00 00 00 00
$3A  00 00 00 00 00 00 00
$3B  80 00 00 00 01 00 00
$3C  00 FF 07 F5 00 07 F5
$3D  2F C0 00 00 00 00 00
$40  00 00 11 52 3E 00 00
$41  C0 00 00 00 00 00 90
$42  21 24 26 27 27 00 00
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