CRASH RESEARCH & ANALYSIS, INC.

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ON-SITE AMBULANCE CRASH INVESTIGATION

SCI CASE NO.: CR14003

VEHICLE: 2010 CHEVROLET G3500 TYPE III AMBULANCE

AMBULANCE BODY: PL CUSTOM MEDALLION SERIES 80

LOCATION: MAINE

CRASH DATE: JANUARY 2014

Contract No. DTNH22-12-C-00269

Prepared for:

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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 This on-site investigation focused on the crash of a 2010 Chevrolet G3500 series chassis with a Type III PL Custom Medallion Series 80 ambulance body. The ambulance was involved in an offset, head-on crash with a 2002 GMC Envoy and subsequently rolled four-quarter turns down a roadside embankment. At the time of the crash, the ambulance was occupied by a restrained 46-year-old male driver, a 33-year-old male paramedic seated unrestrained on the bench seat within the patient compartment, and a 71-year-old female patient restrained in a Semi-Fowler's position on a patient cot. The driver and patient were transported post-crash to a local hospital for evaluation and treatment of police-reported possible (C-level) injuries. Although the male paramedic was transported by ambulance to the hospital, he was police-reported as not injured. The female patient was then airlifted by helicopter from the local hospital to a regional trauma center, where she succumbed to her injuries within 72 hours of the crash.		
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BACKGROUND

Figure 1: Involved 2010 Chevrolet G3500 Type III ambulance at the time of the SCI inspection.

This on-site investigation focused on the crash of a 2010 Chevrolet G3500 series chassis with a Type III PL Custom Medallion Series 80 ambulance body (**Figure 1**). The ambulance was involved in an offset, head-on crash with a 2002 GMC Envoy and subsequently rolled four-quarter turns down a roadside embankment. At the time of the crash, the ambulance was occupied by a restrained 46-year-old male driver, a 33-year-old male paramedic seated unrestrained on the bench seat within the patient compartment, and a 71-year-old female patient restrained in a Semi-Fowler's position on a patient cot. The driver and patient were transported post-crash to a local hospital for evaluation and treatment of police-reported possible (C-level) injuries. Although the male paramedic was transported by ambulance to the hospital, he was police-reported as not injured. The female patient was then airlifted by helicopter from the local hospital to a regional trauma center, where she succumbed to her injuries within 72 hours of the crash.

The crash was identified through online media reports by Crash Research & Analysis, Inc. (CRA) and forwarded to the Crash Investigation Division (CID) of the National Highway Traffic Safety Administration (NHTSA) on January 13, 2014. The CID then assigned the crash to the CRA Special Crash Investigations (SCI) team on January 21, 2014. Efforts were initiated immediately with the local law enforcement and the ambulance agency to secure an on-site inspection of the wheeled ambulance cot and crash site. Cooperation was also achieved with the insurance companies of both the GMC and ambulance, and the on-site portion of the investigation occurred February 4-6, 2014. The on-site investigation included the detailed inspection of the interior and exterior of the ambulance and its patient compartment, the cot and its containment system, an exterior inspection of the GMC, and the documentation of the crash scene. During the vehicle inspection processes, the Event Data Recorder (EDR) of both the Chevrolet and GMC were imaged using the current version of the Bosch Crash Data Retrieval (CDR) software and tool. Demographic and injury information was obtained from multiple sources, including surrogate and occupant interviews, as well as medical records.

SUMMARY

Crash Site

Figure 2: Westbound trajectory view of the ambulance's pre-crash travel path.

The crash occurred on a two-lane roadway during morning daylight hours. According to local observations, weather conditions at the time of the crash were scattered freezing drizzle with a temperature of 2.2 °C (36 °F), 7.4 km/h (4.6 mph) westerly breeze, and 70% relative humidity. The bituminous roadway surface was icy in areas that were untreated. Westbound traffic utilized a 3.4 m (11.2 ft) wide lane that was delineated from the 3.7 m (12.1 ft) wide eastbound lane by a yellow centerline that permitted passing for eastbound traffic in the area of the crash and east of the crash site. Both travel lanes were supported by shoulders that were delineated from the travel lanes by single, solid white fog lines. For the ambulance's westbound direction of travel (**Figure 2**), the straight and level roadway transitioned into a right curve at the top of a hill. In the eastbound direction of travel, the roadway progressed uphill at a 3.5% incline and followed a left curve with a radius of curvature of 305 m (1001 ft). Speed was regulated by a posted limit of 89 km/h (55 mph). In the area of impact at the west end of the curve, the roadway had a superelevation of 5%. At the curve's apex, the superelevation was 7%. A Crash Diagram is included on **Page 24** of this technical report.

Pre-Crash

A privately-owned ambulance agency, consisting of career (non-volunteer) providers and not based out of a healthcare facility, was dispatched to an Emergency Medical Services (EMS) request for a 71-year-old female suffering from recurrent nausea and vomiting relating to gallstones. The nursing facility in which she resided was requesting that she be transported to a local hospital for evaluation. The ambulance agency dispatched the 2010 Chevrolet G3500 ambulance on an emergency response (with the use of lights and siren), staffed by the 46-year-old male driver and 33-year-old male paramedic. Both crewmembers and the ambulance agency declined to disclose any further information concerning their levels of certification and training, details of their length of service in EMS, or information concerning their on-duty time.

After arriving at the nursing facility and evaluating the 71-year-old female, the crew restrained her to the cot in a Semi-Fowler's position using only the lateral straps of the multi-point harness system. The shoulder straps were not used in her restraint. The cot was then secured into the patient compartment of the ambulance using the cot fastening system. The paramedic situated himself on the bench seat in order to render EMS care to the patient, while the other crewmember assumed the vehicle operator's position and utilized the lap and shoulder safety belt system for manual restraint.

The driver initiated operation of the ambulance in a non-emergency mode (without warning lights and siren) toward the local hospital. After a total distance of 2.4 km (1.5 mi), the ambulance traveled westbound on the straight and level portion of a two lane roadway while it approached a right curve.

The GMC traveled eastbound on the same two-lane roadway. It ascended the hill and entered the left curve on approach to the ambulance's location. A loss of traction by the tires of the GMC on the icy roadway surface resulted in the 38-year-old male driver losing control of the GMC while attempting to negotiate the curve. Accordingly, the GMC initiated a counterclockwise (CCW) yaw as the driver applied the brakes and steered left in an attempt to maintain the eastbound travel lane. The GMC maintained its CCW yaw as it continued east through the curve.

The ambulance driver recognized the GMC's control loss as he approached the curve and observed the GMC yawing across the eastbound travel lane toward the roadway's centerline. He subsequently provided a slight right steering input in an attempt to avoid a potential collision. Despite this maneuver, the GMC maintained its yawing trajectory, crossed the roadway centerline, and approached the frontal plane of the ambulance.

Crash

The front plane of the ambulance impacted the front plane of the GMC in an offset, head-on configuration (Event 1, **Figure 3**). Principal directions of force were within the 12 o'clock sector for the ambulance and the 1 o'clock sector for the GMC. As the vehicles crushed to maximum engagement, the left front wheel of the ambulance was displaced rearward. The entire wheel assembly then separated from the suspension assembly. This engagement induced a CCW rotation to the ambulance and redirected it toward the north roadway edge. The GMC maintained its CCW rotation and was redirected toward the south roadway edge.

Figure 3: West facing trajectory view at the Event 1 point of impact.

The ambulance maintained its redirected northwest trajectory and yawed CCW. Its right rear and right front axle positions departed the north roadway edge and furrowed into the deep snow. The increasing drag force load on the right axle positions, in conjunction with the steep negative slope of the roadside embankment and corresponding movement of the vehicle's center of gravity with respect to the right axle positions, tripped the ambulance into a right side-leading rollover sequence (Event 2) as it began to traverse down the embankment. Following the tripping initiation, the ambulance rolled four-quarter turns down the embankment uninterrupted.

During the rollover sequence, medical supplies, equipment bags, and other belongings became dislodged from their secured and/or unsecured positions and were displaced throughout the interior of the patient compartment. As the ambulance completed the rollover sequence, its front plane swiped a tree (Event 3). This impact was not of sufficient magnitude to affect the dynamics of the rollover sequence. The ambulance came to final rest upright (on its wheels) at the bottom of the embankment, facing southwest. **Figure 4** is an on-scene image provided by the investigating law enforcement agency that depicts the ambulance at final rest.

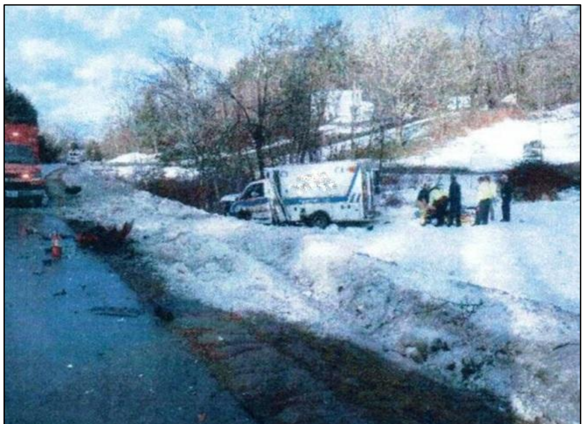


Figure 4: Ambulance at final rest (*On-scene image provided by the investigating law enforcement agency*).

Figure 5: Final rest location of the GMC (*On-scene image provided by the investigating law enforcement agency*).

The GMC maintained its CCW rotation post-impact and traversed back over the roadway centerline and across the eastbound lane. Its rear axle positions departed the south roadway edge and furrowed into the snow. The GMC came to final rest straddling the south roadway edge, facing northeast (**Figure 5**).

Post-Crash

According to documentation within the occupants' medical records and based on the statements of the interviewees, the paramedic was displaced forward during the crash sequence and came to rest positioned on his back on top of the center console that was mounted within the cab between the two front seats. He used the mobile two-way radio and notified the ambulance agency's communications center of the crash, which then notified the local emergency response system. The ambulance agency dispatched several of its own units, while the emergency response system dispatched local fire department, EMS, and law enforcement personnel to the scene.

The paramedic reported that after reporting the crash, he located the patient in "an awkward anatomical position" between the captain's chair and the left wall of the patient compartment. The paramedic performed a rapid assessment of the patient before exiting the ambulance through the right loading door of the patient compartment. He then moved to assess the occupants of the GMC. The paramedic also reported that while he performed those actions, the driver of the ambulance exited the vehicle through the left front glazing opening and then assisted him in his efforts.

Upon the arrival of fire and EMS personnel, the patient was removed from the ambulance and transported by a different ambulance to a local hospital. Both the driver and paramedic were transported by other ambulances to local hospitals for evaluation and treatment.

The 38-year-old male driver of the GMC was transported by an ambulance to a local hospital for evaluation and treatment. A 38-year-old female front right passenger in the GMC was airlifted to a regional trauma center for evaluation and treatment of perceived non-incapacitating (B-level) injuries, and an 11-year-old female second row right passenger was transported by ambulance to a local hospital for evaluation of possible (C-level) injuries.

The ambulance was towed by a local recovery service to a local tow yard and then transferred to a regional specialty vehicle salvage yard. The GMC was also towed from scene and later transferred to a regional salvage facility. No citations were issued relative to the crash.

2010 CHEVROLET G3500

Description

The 2010 Chevrolet G3500 (**Figure 6**) cutaway chassis was manufactured in January 2010 and identified by the Vehicle Identification Number (VIN): 1GB6G2B6XA1xxxxxx. A placard confirmed that the vehicle conformed to all applicable Federal Motor Vehicle Safety Standards (FMVSS) in effect as of its date on manufacture. The chassis was a dual-rear wheel drive platform powered by a 6.6 liter, V-8 diesel engine linked to a 6-speed automatic transmission. The chassis had a 353 cm (139 in) wheelbase and 4-wheel power-assisted hydraulic disc brakes with anti-lock. The ambulance's odometer reading could not be obtained during the SCI vehicle inspection due to inoperability of the vehicle's electric system.

Figure 6: Right front oblique view of the ambulance at the time of the SCI inspection.

The vehicle manufacturer's recommended tire size was LT245/75R16E, with recommended cold tire pressures of 345 kPa (50 PSI) front and 552 kPa (80 PSI) rear. It should be noted that the Chevrolet was equipped with an indirect Tire Pressure Monitoring System (TPMS). The TPMS warning indicator lamp was "Off" at the time of the crash, according to the data imaged from the Chevrolet's EDR. At the time of the SCI inspection, the vehicle was equipped with Cooper SRM II Radial LT tires at the left front, right front, and right rear outer positions. The left rear outer position was equipped with a Cooper Discoverer M+S tire. Both the left rear and right rear inner position tires are unknown due to inaccessibility at the time of the inspection. All visible tires were of the recommended size, mounted on OEM steel wheels.

Specific tire data at the time of the SCI inspection was as follows:

Position	Measured Pressure	Measured Tread Depth	Restriction	Damage
LF	FLAT	6 mm (8/32 in)	Unknown	Tire/wheel separated
LR inner	Unknown	5 mm (6/32 in)	No	None
LR outer	Unknown	6 mm (7/32 in)	No	None
RR outer	Unknown	9 mm (11/32 in)	No	None
RR inner	Unknown	5 mm (6/32 in)	No	None
RF	359 kPa (52 PSI)	7 mm (9/32 in)	No	None

Figure 7: Forward-facing view of the interior of the ambulance's cab.

The interior of the ambulance's cab was configured for the seating of two occupants. Both seats were forward facing, box-mounted seats with manual seat track and seat back recline adjustments. At the time of the SCI inspection, both seats were adjusted to their rearmost track positions with the seat backs slightly reclined. The front seats also featured integrated head restraints and were equipped with 3-point lap and shoulder safety belt systems for manual restraint. A frontal air bag system provided supplemental inflatable restraint for both the driver and front right passenger. The front right air bag was equipped with a manual cut off switch that required insertion of the ignition key. Between the two seats and beneath the center instrument panel's stereo and climate controls was a center console with an array of switches and communications equipment related to the ambulance's emergency response and operational activities. **Figure 7** depicts a forward-facing view the ambulance cab's interior.

PL Custom Medallion Series 80 Type III Ambulance

The Chevrolet chassis was completed as a Type III Certified "Star of Life" ambulance during secondary manufacturing in April 2010. This consisted of the affixation to the Chevrolet chassis of the PL Custom patient compartment module and installation of emergency services operation equipment such as warning lights, sirens, and communications radios. A placard confirmed that the PL Custom Type III ambulance conformed to the Federal Specifications KKK-A-1822 in effect on its date of manufacture. The PL Custom patient compartment had overall dimensions length x width x height of 375 x 251 x 178 cm (147.5 x 99 x 70 in). There were five exterior compartments (three on the left plane, two on the right) and three occupant access doors (one on the right and a double-door on the rear). The exterior compartments served for the storage of and curbside access to large emergency medical equipment and supplies, such as backboards, trauma dressing kits, splints, oxygen cylinders, and roadside safety/vehicle equipment. The double rear doors served for the entry/egress of occupants, as well as the loading and unloading of the cot.

Figure 8 depicts a right rear oblique view of the PL Custom ambulance. The interior of the ambulance was configured for up to six total occupants, with five seat positions surrounding the centralized patient cot. There were numerous wall-mounted cabinets, shelves, and countertops for the storage of medical equipment and supplies. It should be noted that at the time of the SCI inspection, all salvageable equipment and supplies had already been removed from the vehicle by the private ambulance agency.

Figure 8: Right rear oblique view of the PL Custom Medallion Series 80 Type III ambulance.

The ambulance was constructed of aluminum body framework, with .125/5052H34 sheeting, aluminum diamond plate trim, and stainless steel door sills. The interior was constructed of plywood cabinetry and vinyl-covered foam cushions, with aluminum trim and clear polymer cabinetry doors. On the left side of the patient compartment were three storage cabinets and two countertops, with an integrated seating position (designated as the CPR seat). At the forward aspect, a spacious countertop was below an array of switches and controls that were mounted to the bottom of a large overhead cabinet. Aft of the CPR seat was a second countertop with swivel-mount bracket designed for holstering a portable electrocardiographic monitor. This equipment, which remained intact during the crash sequence, was removed from the involved ambulance post-crash by the private ambulance agency. A stack of enclosed shelving occupied the rear aspect of the left plane. An interior view of an exemplar ambulance is depicted in **Figure 9**.

Figure 9: Forward facing view of the interior of a similar PL Custom Medallion Series 80 patient compartment.

At the forward aspect of the patient compartment was the captain's chair, a pass-through to the cab, the heating, ventilation, and air conditioning (HVAC) system, and several lockable cabinets. The captain's chair was mounted on a box base with an adjustable seat track, and could rotate a full 180 degrees to be either forward or rearward facing in orientation. At the time of the crash, the captain's chair was adjusted forward-facing (toward the ambulance's cab) in a full-rear track position (with respect to its orientation). A pass-through to the cab was located immediately forward of the captain's chair, with a hinged door that could be secured in either an open or closed position. At the time of the crash, this door was secured in an open position. To the right of the pass-through was an enclosed stack of cabinetry that had multiple shelves for the storage of equipment. The right side of the patient compartment consisted of a three passenger bench seat with narrow overhead storage. A door was located at the forward aspect of the right side.

Vehicle Weight/Payload

The ambulance was placarded with an overall Gross Vehicle Weight Rating (GVWR) of 5,579 kg (12,300 lb), distributed as Gross Axle Weight Ratings (GAWR) of 2,087 kg (4,600 lb) front and 3,901 kg (8,600 lb) rear. A weight/payload certification sticker stated that the curb weight of the unladen ambulance after secondary manufacturing was 4,336 kg (9,560 lb). The calculated actual available payload capacity was 1,243 kg (2,740 lb). The estimated combined weight of the EMS equipment and supplies on-board the ambulance at the time of the crash was approximately 431 kg (950 lb). According to medical record data, the combined weight of the occupants was 299 kg (659 lb). Based on this data, it was concluded that the ambulance was not operating in excess of its available payload capacity at the time of the crash.

Exterior Damage

Damage to the exterior of the ambulance was identified on the front, left, and top planes. Frontal plane damage included displacement of the bumper beam and the fracture of the grille, with deformation to the hood and disintegration of the headlight assemblies. The left front tire and wheel were sheared from the suspension assembly and completely separated from the vehicle. Longitudinal displacement of the toe pan and lower A-pillar was also identified, the deformation of which had resulted in the deflection of the left front door and disintegration of the left front glazing. The rear aspect of the left front door was deflected outward and deformed at the B-pillar, effectively jamming the door shut and preventing its operation. The forward left corner of the patient compartment was also deformed longitudinally, and the forward most exterior compartment was crushed at its lower aspect.

Associated with the Event 1 frontal impact with the GMC was longitudinal deformation and direct contact damage that began 22 cm (8.7 in) right of center and extended 104 cm (40.9 in) to the left front bumper corner (**Figure 10**). The combined direct and induced damage length measured 164 cm (64.6 in) and spanned the entire frontal width. The direct and induced damage extended 395 cm (155.5 in) down the left plane from the displaced front bumper corner to immediately forward of the center of the left rear axle on the fender flare and wheel well (**Figure 11**). The left front corner of the patient compartment module was displaced rearward 40 cm (15.7 in).

Figure 10: Frontal crush profile to the Chevrolet ambulance.

Figure 11: Damage extension onto the left plane of the ambulance associative to the Event 1 impact.

A residual crush profile consisted of the following measurements: C1 = 47 cm (18.5 in), C2 = 18 cm (7.1 in), C3 = 6 cm (2.4 in), C5 = 1 cm (0.4 in), C5 = 0 cm, and C6 = 1 cm (0.4 in). The Collision Deformation Classification (CDC) assigned to the ambulance for the Event 1 damage pattern was 12FYEW3. Although the ambulance was a modified vehicle, the Damage Algorithm of the WinSMASH model was used to calculate a borderline reconstruction of the Event 1 impact for analysis purposes. The calculated delta-V of the ambulance for the impact with the GMC was 8 km/h (5 mph). Lateral and longitudinal components of the calculated delta-V were 1 km/h (0.6 mph) and -8 km/h (-5 mph), respectively.

Rollover damage sustained by the ambulance (Event 2) was minimal. This was attributable to the deep snow present at the time of the crash and the dynamics of the rollover down the steep embankment. Only minor contact evidence was visible along both roof side rails, with no evidence of deformation or deflection to the roof structure of the patient compartment. There was 1 cm (0.4 in) of vertical deflection of the center aspect of the windshield header (**Figure 12**). The CDC for the Event 2 rollover was 00TDDO2.

Figure 12: Visible deformation to the windshield header of the Chevrolet ambulance.

The Event 3 impact with the tree, which occurred during the final quarter turn of the rollover, involved the frontal plane of the ambulance. At the time of the SCI inspection, tree bark and fiber was located embedded into surface scratches on the leading aspect of the center portion of the hood. A broken branch was also lodged within the engine compartment. This damage pattern overlapped the Event 1 frontal damage, and as such an accurate residual crush profile could not be obtained. However, based on the direct contact identified, and in conjunction with the size of the tree and its location with respect to the final rest position of the ambulance, a CDC of 00FCEN1 was assigned to the Event 3 impact damage.

Event Data Recorder

The Chevrolet chassis was equipped with an air bag Sensing and Diagnostic Module (SDM) mounted beneath the left front seat. The SDM had EDR capabilities to record crash data. The SCI Investigator imaged the 2010 Chevrolet ambulance's EDR using the Bosch CDR tool with software version 12.2. A connection was made to the vehicle's Diagnostic Link Connector (DLC) and its 12-V electrical system provided residual power. The imaged data was later read using software version 15.0 and is included at the end of this technical report as **Attachment A**.

The SDM monitored and measured vehicle acceleration in both the longitudinal and lateral directions, and the recording of a distinct crash event could be triggered by a frontal (longitudinal), a side (lateral), and/or a rollover (vertical) crash pulse. The threshold minimal crash pulse was a measured Vehicle Velocity Change of 8 km/h (5 mph).

At Algorithm Enable (AE) and recognition of a longitudinal or lateral event, the EDR had the capacity to record 300 milliseconds of post-AE longitudinal and lateral delta-V data in 10 millisecond intervals for a non-deployment event. The EDR could record two different event types and store a combination of up to three events. Recognized events were termed “Non-Deployment” or “Deployment,” and up to two different deployment and one locked non-deployment events could be stored. Non-deployment events could be overwritten after approximately 250 ignition cycles, whereas deployment events became locked and could not be overwritten. Associated to each event was a 2.5-second pre-crash buffer that recorded Accelerator Pedal Position (%), Vehicle Speed (mph), Engine Speed (RPM), Throttle (%), and Brake Switch Circuit State data. For the 0.5 and 1-second pre-crash intervals, the EDR also recorded Cruise Control usage, Engine Torque, and Reduced Engine Power Mode data.

The imaged data contained one deployment event and one non-deployment event, both of which occurred on ignition cycle 10101. For both recovered events, complete event recording was reported. The time reported between event triggers was 0 milliseconds. The recovered events shared the same pre-crash buffer data, as outlined in the following table:

Time (seconds)	-2.5	-2.0	-1.5	-1.0	-0.5
Vehicle Speed	84 km/h (52 mph)	84 km/h (52 mph)	82 km/h (51 mph)	80 km/h (50 mph)	80 km/h (50 mph)
Brake Switch	OFF	OFF	OFF	OFF	OFF
Accelerator Pedal	0%	0%	0%	0%	0%
Throttle	0%	0%	0%	0%	0%
Engine Speed	1472 RPM	1472 RPM	1472 RPM	1408 RPM	1408 RPM
Cruise Control Active	-	-	-	No	No
Engine Torque	-	-	-	(-84.82 lb-ft)	(-83.72 lb-ft)
Red Engine Power	-	-	-	OFF	OFF

The first trigger commanded deployment of the driver and passenger frontal air bag system at 80 milliseconds after AE. The maximum SDM recorded longitudinal vehicle velocity change of the first trigger was -21.4 km/h (-13.27 mph), which was reported from 60-90 milliseconds after AE. The maximum SDM recorded lateral vehicle velocity change of the first trigger was 4.3 km/h (3.06 mph), which was reported from 80-90 milliseconds after AE. For the second trigger, the maximum SDM recorded longitudinal vehicle velocity change was -8.2 km/h (-5.1 mph), which was reported from 280-300 milliseconds after AE. There was no lateral vehicle velocity change recorded for the second trigger.

Interior Damage

The interior of the ambulance was inspected for crash-related and occupant contact damage. Moderate damage to the interior of the ambulance’s cab was identified, consisting of minor occupant contact and passenger compartment intrusion attributable to the Event 1 impact.

The AS-1 laminated windshield was fractured across its entire surface as a result of the Event 1 impact. No holing of the windshield, crash-related separation, or occupant contact was identified to the windshield glazing. The left front AS-2 tempered glazing, which had been closed at the time of the crash, was disintegrated by the associated Event 1 crash forces. The right front glazing, as well as all remaining glazing of the ambulance, was unremarkable.

The left front door was jammed shut as a result of its rearward deflection, associated with the Event 1 impact. All other doors, including the right front door, right occupant access door to the patient compartment, and rear loading doors, remained operational at the time of the SCI inspection.

Intrusion within the cab of the ambulance was present on the left side, attributable to the Event 1 impact. The left front door was intruded laterally and engaged against the left aspect of the box-mounted driver's seat. A measurement obtained at the forward lower quadrant of the left front door produced a lateral intrusion with magnitude of 14 cm (5.5 in). Longitudinal intrusions were observed to the left front toe pan with a magnitude of 18 cm (7 in), left lower A-pillar with a magnitude of 12 cm (4.7 in), and left instrument panel with a magnitude of 4 cm (1.6 in). **Figure 13** depicts the left portion of the ambulance cab, with identified intrusions visible.

Figure 13: Identified intrusions within the left aspect of the ambulance's cab.

Associative to the intrusions identified were several locations of occupant contact. A discolored scuff was identified to the left lower instrument panel from contact by the driver's left knee. There was also a scuff to the forward upper quadrant of the left front door from the driver's left thigh. Another scuff, probably from the driver's left hand, was located on the left instrument panel immediately left of the steering column. Lastly, a scuff on the rear upper quadrant of the left front door was probably from the driver's left hip. It should be noted that the SCI investigator attempted to highlight occupant contact locations with calibrated tape; however, environmental conditions prevented its successful use.

Minor interior damage within the patient compartment of the ambulance was identified. This damage was located on the left and forward aspects of the patient compartment module, attributed to the Event 1 impact and contact from displaced occupants and EMS equipment/supplies during the rollover sequence. Cabinetry at the left front corner of the patient compartment, immediately left of the captain's chair and forward of the CPR seat, was separated at major joints and displaced rearward. The plywood surface below the CPR seat and forward countertop was fractured, and several pieces of aluminum fascia and trim were separated from the cabinetry.

All of this damage was induced as a result of the deformation sustained to the left front corner of the patient compartment module by the Event 1 impact with the GMC. **Figure 14** depicts the left front area of the patient compartment with the identified damage, while **Figure 15** depicts the fractured plywood and occupant contact.

Figure 14: Forward left area of the patient compartment and damaged object area.

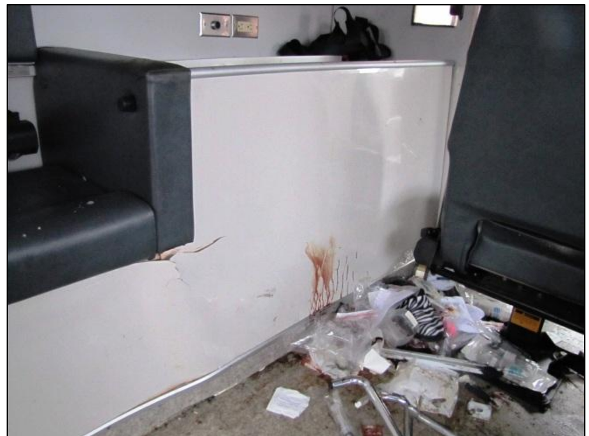


Figure 15: Fractured plywood surface and occupant contact in the forward left area of the patient compartment.

Other interior damage within the patient compartment was attributed to contact from displaced occupant(s) and/or EMS equipment and supplies. The clear polymer face of an analog clock, which was mounted on the angled side of the cabinetry mounted above the countertop forward of the CPR seat on the left side, was fractured. One of the toggle switches that was mounted beneath the cabinetry to which the clock was affixed was broken off. An area of spattered blood was identified on the lower aspect of the plywood fascia beneath the countertop, attributed to the patient.

Manual Restraints

The cab of the ambulance was equipped with manual restraint systems for both seating positions. Each was a 3-point lap and shoulder safety belt system that consisted of continuous loop webbing with a sliding latch plate and was height-adjustable at its respective B-pillar-mounted D-ring anchor position. The driver's safety belt system retracted onto an Emergency Locking Retractor (ELR), while the front right passenger's safety belt utilized an ELR/Automatic Locking Retractor (ALR).

At the time of the SCI inspection, both frontal safety belt systems were intact, operational, and exhibited evidence of historical use. Both D-rings were adjusted to their full-up positions. The webbing of the driver's safety belt was abraded from 143-158 cm (56.3-62.2 in) above the lower anchor from loading on the D-ring. No loading evidence was identified on the latch plate; however, the buckle was visibly angulated toward the driver's seat cushion at the upper aspect of the buckle stalk as a result of occupant loading during the crash. Combined, this evidence confirmed restraint usage by the driver at the time of the crash.

Figure 16: D-ring loading abrasion on the driver's safety belt webbing.

Figure 16 depicts the D-ring loading abrasion identified on the driver's safety belt webbing. There was no loading evidence present on the front right safety belt system; however, the front right seat was unoccupied at the time of the crash. The interior of the patient compartment was equipped with manual lap safety belt systems at all five seating positions. All utilized continuous loop webbing with sewn latch plates and ELR retractors. The components of the safety belts for the CPR seat and bench seat were mounted to the patient compartment walls, whereas that of the captain's chair were mounted to its swivel base. All five lap belts displayed little to no evidence of historical use, and as such restraint usage by the paramedic could not be confirmed or disputed based solely on the post-crash condition of the lap safety belt systems. Based on the paramedic's statements, he did not utilize the available manual restraints at the time of the crash due to his engagement in providing patient care (not specified). The lap belt for the forward-most bench seat position had been cut post-crash, resulting in an unknown length of the webbing having been retracted onto the retractor and thus unable to be inspected.

Supplemental Restraint Systems

The cab of the ambulance was equipped with a frontal air bag system for supplemental restraint. This system consisted of dual-stage air bags available for the driver and front right passenger, mounted within the steering wheel hub and top instrument panel. The vehicle was not subject to the advanced air bag portion of FMVSS No. 208; therefore, the system was not a Certified Advanced 208-Compliant (CAC) air bag system.

The frontal crash impact (Event 1) resulted in the deployment of the Chevrolet's frontal air bag system. **Figures 17** and **18** depict the driver's and front right passenger's frontal air bags at the time of the SCI inspection.

Figure 17: Driver's frontal air bag within the ambulance.

Figure 18: Front right passenger's frontal air bag.

The driver's air bag deployed through the I-configuration cover flaps without damage. An 18 cm (7.1 in) diameter center circular stitching secured the interior tethers to the air bag's face. The air bag was 62 cm (24.4 in) diameter overall in its deflated state. There were two 2 cm (0.8 in) vents on the rear aspect of the air bag. No obvious contact evidence or damage was discernable. The passenger's air bag deployed through the U-configuration cover flap without damage. In its deflated state, the air bag was 56 cm (22 in) wide and 46 cm (18.1 in) tall, with 25 cm (9.8 in) overall rearward excursion. There was no contact evidence or damage present. Both air bags were installed by the original manufacturer and had not required any service or maintenance.

Patient Cot

The patient cot was a 6500 Power-PRO XT power wheeled ambulance cot (**Figure 19**) that was manufactured by Stryker in January of 2007. The cot's serial number (S/N) was: 07013xxxx. It was constructed of a tubular aluminum frame with circumferential weld joints and steel hardware fasteners. The X-frame supporting the mattress platform featured power lift capabilities with infinite height positions between a minimum of 36 cm (14 in) and a maximum of 105 cm (41.5 in). The mattress platform featured 0-73 degrees of positive backrest angular adjustment via a manually controlled gas-pressure cylinder. In a similar fashion, the leg portion featured 15 degrees of positive angular adjustment.

Figure 19: Stryker 6500 Power-PRO XT cot at the time of the SCI inspection.

Overall dimensions of the cot were 58 cm (23 in) wide and 206 cm (81 in) long. A placard declared that the load capacity limit of the cot was 318 kg (700 lb). Electrical power was supplied by a removable 24-V nickel-cadmium (NiCad) direct current battery, manufactured by DeWalt.

The cot was equipped with a multi-point harness system for manual restraint of its occupant (patient). This restraint system consisted of a lateral leg strap, a lateral lap strap, and two shoulder straps that buckled into a lateral chest strap. The harness' safety belt webbing straps were equipped with locking latch plates and sewn buckles. Exact adjusted strap lengths at the time of the crash remains unknown. The ambulance agency's polices dictated that the patient was required to be completely and securely restrained by all lateral and shoulder harness straps at all times while on the cot. Although heavy historical use masked loading evidence, the post-crash positioning of the patient and the observations of emergency response personnel who responded to the crash confirmed only partial restraint of the patient (lack of shoulder strap usage).

Cot Damage

The patient cot sustained minor damage attributable to occupant loading in relation to the first and second crash events (frontal impact and rollover) and was removed from service by the agency. The telescopic support bracket of the cot's frame, located forward of and beneath the reclinable backrest, sustained longitudinal and lateral loading that resulted in the minor deflection of the tubular frame. This deflection limited the support's telescopic adjustment functionality, and in its damaged state, the telescopic frame could not fully retract. **Figure 20** provides an overall view of the forward aspect of the cot at the time of the SCI inspection.

Figure 20: Telescopic support partially retracted at the time of the SCI inspection.

Figure 21: Lateral deflection of the right armrest bracket resultant from occupant loading.

Figure 22: Locking pin affixed to the lower frame rail of the Stryker cot.

The right armrest bracket (with respect to the patient's orientation) was deformed laterally at its forward aspect as a result of direct occupant contact and loading (**Figure 21**). The anchor pin (**Figure 22**), which secured into the locking clamp of the cot fastening system, displayed evidence of significant historical use. Although the set screw was fully tightened, the pin itself was slightly loose and wiggled slightly on the tubular frame rail. This movement was not of a measurable magnitude.

Cot Fastening System

The cot was secured in place within the patient compartment via a Stryker Model 6370 Cot Fastener System. It was manufactured in March of 2010 and was identified by the S/N: 10033xxxx. The system consisted of a forward antler bracket and rearward locking rail-clamp mechanism.

The antler bracket cradled the forward portion of the cot's frame, while the vertically-oriented locking clamp mechanism secured the locking pin affixed to the lower frame rail of the cot. Combined, these two components were intended to restrict the lateral and longitudinal movement of the cot within the ambulance during transport.

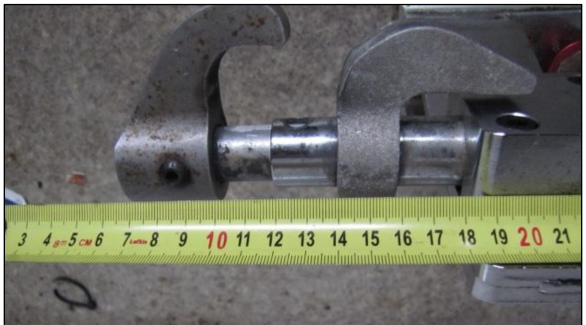


Figure 23: Rail clamp mechanism at the time of the SCI inspection.

During the crash sequence, longitudinal, lateral, and centrifugal forces associated with the crash induced multi-directional movement to the cot. Longitudinal forces associated with the frontal impact (Event 1) resulted in the compression of the cot's telescopic frame as the forward aspect of the cot loaded the antler bracket. In turn, the locking pin affixed to the frame rail of the cot loaded the rail clamp, forcing the clamp forward. This longitudinal loading associated with Event 1 deformed the rail clamp and damaged its internal mechanism. At the time of the SCI inspection, the rail clamp remained 2 cm (0.8 in) from its fully-closed position (**Figure 23**).

The paramedic was unable to recall the positioning of the cot at final rest. Emergency response personnel who responded to the crash site were also unable to confirm the post-crash status of the cot or the rail clamp. None of the on-scene images obtained from the investigating law enforcement agency depicted the interior of the patient compartment, the cot, or the cot fastening system. However, the SCI vehicle inspection observed a lack of evident interior damage within the patient compartment that could have been attributed to contact from the cot during the rollover. Separation of the patient from the cot during the first crash event reduced the loading and moment forces that otherwise would have acted on the rail clamp and cot anchoring system during the rollover sequence. The SCI Investigator ultimately concluded that the cot's frame rail-mounted pin probably remained engaged within the rail clamp during the entire crash sequence and as the vehicle came to rest. Numerous opportunities existed for any one of a multitude of on-scene emergency response personnel to disengage the rail clamp post-crash.

2010 CHEVROLET G3500 OCCUPANTS

Driver Demographics

Age/Sex:	46 years / Male
Height:	188 cm (74 in)
Weight:	102 kg (225 lb)
Eyewear	Unknown
Seat Type:	Box-mounted seat (Van type)
Seat Track Position:	Full-rear
Manual Restraint Usage:	3-point lap and shoulder safety belt system
Usage Source:	Vehicle inspection
Air Bags:	Driver's frontal, deployed
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Exited vehicle without assistance
Transport from Scene:	Ambulance
Type of Medical Treatment:	Treated at a local hospital and released

Driver Injuries

Injury No.	Injury	AIS 2005 / Update 2008	Injury Source	Confidence
1	Left elbow laceration, minor	710602.1,2	Left armrest/hardware in forward upper quadrant of left door panel	Probable
2	Left elbow abrasion	710202.1,2	Left armrest/hardware in forward upper quadrant of left door panel	Probable

Source: Medical records

Driver Kinematics

The 46-year-old male driver was positioned within the driver's seat of the ambulance and restrained by the available 3-point lap and shoulder safety belt system. His restraint usage was determined through a combination of the post-crash condition of the safety belt system and a review of the vehicle's EDR data. The seat was adjusted to a full-rear track position, with the seatback upright.

At the onset of the frontal impact with the GMC, the driver initiated a forward left trajectory. He loaded the safety belt system and his head and face contacted the deployed frontal air bag. The driver's left arm contacted the intruded armrest of left front door, resulting in a contusion and laceration to his left elbow. Due to his restrained status, however, the driver remained within the driver's position during the frontal impact event and as the ambulance was redirected toward the roadway edge and progressed through the rollover sequence. The tertiary impact with the tree was not of sufficient magnitude to affect the driver's kinematics.

Post-crash, the driver exited the ambulance without assistance through the glazing opening of the left front door. The driver of the ambulance was transported by another ambulance to a local hospital for evaluation and treatment of reported C-level injuries.

Bench Seat Occupant Demographics

Age/Sex:	33 years / Male
Height:	185 cm (73 in)
Weight:	82 kg (180 lb)
Eyewear	Unknown
Seat Type:	Bench seat
Seat Track Position:	No seat track adjustment
Manual Restraint Usage:	None
Usage Source:	Vehicle inspection, Surrogate interview
Air Bags:	None available within the patient compartment
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Exited vehicle without assistance
Transport from Scene:	Ambulance
Type of Medical Treatment:	Treated at a local hospital and released

Bench Seat Occupant Injuries

Injury No.	Injury	AIS 2005 / Update 2008	Injury Source	Confidence
1	Posterior scalp laceration, minor	110602,1,6	Center console	Probable
2	Posterior scalp contusion	110402,1,6	Center console	Probable

Source: Medical records

Bench Seat Occupant Kinematics

The 33-year-old male paramedic was positioned on the left-facing bench seat along the right wall of the patient compartment. He did not utilize the available lap belt for manual restraint in order to allow him full range of motion to attend to the patient.

At the onset of the frontal impact event with the GMC, the paramedic initiated a forward and left lateral trajectory toward the impact force. Due to his unrestrained status, his movement was unrestricted. The paramedic separated from the bench seat as he progressed diagonally forward toward the impact force. He entered the pass-through area between the patient compartment and cab of the ambulance, oriented headfirst with his lower extremities extending toward his original position. He contacted the center console between the front seats of the ambulance's cab with the posterior aspect of his head and upper torso, which probably resulted in the posterior scalp contusion and laceration. He maintained his position within the confines of this narrow area as the ambulance departed the roadway and completed its rollover sequence. The third event impact with the tree did not produce forces of sufficient magnitude to affect the unrestrained and displaced paramedic's kinematics.

Post-crash, the paramedic exited the vehicle under his own power. He was transported by ambulance to a local hospital for evaluation, but was reported by the police to have no injuries.

Cot Occupant Demographics

Age/Sex:	71 years / Female
Height:	163 cm (64 in)
Weight:	115 kg (254 lb)
Eyewear	Unknown
Seat Type:	Occupant in a Semi-Fowler's position on cot
Seat Track Position:	Not applicable
Manual Restraint Usage:	Lateral restraint straps only of a multi-point harness system (without use of shoulder straps)
Usage Source:	Vehicle and cot inspection, Surrogate interview
Air Bags:	None available within patient compartment
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Removed from vehicle due to perceived level of injuries
Transport from Scene:	Ambulance
Type of Medical Treatment:	Treated at local hospital, transferred by helicopter to a regional trauma center, hospitalized for treatment, expired within 72 hours of the crash

Cot Occupant Injuries

Injury No.	Injury	AIS 2005 / Update 2008	Injury Source	Confidence
1	Intertrochanteric right hip fracture	853151.3,1	Left wall of patient compartment beneath countertop, forward of CPR seat	Probable
2	Fracture of the T-12 vertebrae	650216.2,8	Left wall of patient compartment beneath countertop, forward of CPR seat	Probable
3	Liver contusion, low grade	541810.2,0	Left wall of patient compartment beneath countertop, forward of CPR seat	Probable
4	Posterior scalp laceration	110602.1,6	Switch panel array on left wall of patient compartment	Probable
5	Right thigh abrasion	810202.1,1	Right cot armrest rail	Certain

Source: Medical records

Cot Occupant Kinematics

Prior to the crash, the 71-year-old female patient was in the process of being transported from the nursing facility in which she resided to a local hospital for evaluation and treatment related to inoperable gallstones and recurrent nausea with vomiting. She was restrained to the cot in a Semi-Fowler's position by only the lateral restraint straps of the multi-point harness system (shoulder straps not utilized).

The frontal impact event with the GMC initiated a forward and lateral trajectory to the female patient. The posterior aspects of her head, torso, and lower extremities depressed the cushion of the cot mattress as she loaded the cot.

The patient's loading of the mattress was transferred to the cot, which had also initiated a forward trajectory toward the impact force. The forward aspect of the cot's frame loaded the antler bracket of the cot fastener system. The combined forces of the occupant loading, in conjunction with the loading force of the cot, compressed the telescopic support bracket of the cot. Loading forces also acted at the locking pin location, which deformed the rail clamp mechanism forward.

As the loaded into the cot's mattress, the effectiveness of the multi-point harness system was reduced as slack was created by the compression of the mattress. Due to the lack of shoulder restraint usage, the patient began to ride up the slightly inclined backrest of the cot. During this movement, the lateral component of the patient's displacement resulted in the contact of the patient's right thigh with the right arm rest of the cot. This contact resulted in an abrasion to the patient's right thigh and deformed the right arm rest rail of the cot.

The patient maintained her trajectory and completely separated from the cot as the GMC and the ambulance achieved maximum engagement. Her head and shoulders contacted the rear aspect of the captain's chair seat back, resulting in unknown injuries (*no head injuries were documented in the obtained medical records*).

As the ambulance progressed off of the roadway and entered its rollover sequence, the patient initiated a sharp right lateral trajectory toward the left wall of the patient compartment. Her right flank contacted the left wall beneath the countertop, forward of the CPR seat. As she loaded the wall and the ambulance completed the rollover, her upper torso flexed rightward and her head contacted the switch array above the countertop. These contacts resulted in the intertrochanteric right hip fracture, T-12 vertebrae fracture, low-grade liver contusion, and posterior scalp laceration. The patient was then directed downward by gravitational forces and came to final rest positioned between the captain's chair and the left wall of the patient compartment.

Post-crash, the patient was removed from the ambulance by emergency response personnel. She was immobilized in a supine position on a long spine board with cervical collar and then transported by a different ambulance to a local hospital. She was treated in the emergency department and then transferred 3 hours and 22 minutes later to a regional trauma center via helicopter. She was admitted to the trauma center for treatment, and ultimately expired within 72 hours of the time of the crash. The patient's exact cause of death remains unknown due to a lack of cooperation in obtaining certain medical records.

2002 GMC ENVOY

Description

The 2002 GMC Envoy was manufactured in June of 2001 and was identified by the VIN: 1GKDT13S62xxxxxx. At the time of the SCI inspection, the vehicle's odometer reading was 177,688 km (110,410 mi).

The GMC (**Figure 24**) was a four-wheel drive platform powered by a 4.2 liter, V-6 gasoline engine linked to a 4-speed automatic transmission. Its chassis had a 287 cm (113 in) wheelbase. The vehicle manufacturer's recommended tire size was 245/65R17, with recommended cold tire pressures of 221 kPa (32 PSI) front and rear. The vehicle was equipped with Mastercraft Courser HTR tires at all four axle positions. All four tires were of the recommended size, mounted on OEM aluminum wheels. Specific tire data at the time of the SCI inspection was as follows:

Figure 24: Front left oblique view of the 2002 GMC Envoy at the time of the SCI inspection.

Position	Measured Pressure	Measured Tread Depth	Restriction	Damage
LF	FLAT	7 mm (9/32 in)	Yes	None visible
LR	241 kPa (35 PSI)	6 mm (8/32 in)	No	None
RR	241 kPa (35 PSI	6 mm (8/32 in)	No	None
RF	248 kPa (36 PSI)	7 mm (9/32 in)	No	None

The interior of the GMC was configured for the seating of up to five occupants. The front and second row outer positions were equipped with 3-point lap and shoulder safety belts for manual restraint. The GMC was also equipped with a frontal air bag system.

Exterior Damage

Damage to the exterior of the GMC was identified on the front plane, associative to the Event 1 impact with the ambulance. Front plane damage included displacement of the bumper beam and fracture of the grille, with deformation to the hood and disintegration of the headlight assemblies. There was visible lateral displacement of frontal plane components, with moderate longitudinal deformation. The crankshaft of the left front axle was separated at the universal joint, though the left front tire and wheel assembly remained attached to the vehicle by the suspension and shock absorber.

Deformation to the left front fender and longitudinal crush to frontal components further restricted the left front tire. In the left front tire/wheel's restricted position, the left wheelbase was shortened by 10 cm (4 in). Direct contact damage associated with the Event 1 frontal impact with the ambulance spanned the entire 165 cm (65 in) frontal end width.

Deflection and deformation to the bumper beam resulted in a Field-L length of just 92 cm (36.2 in). A residual crush profile consisted of the following measurements: C1 = 43 cm (16.9 in), C2 = 38 cm (15 in), C3 = 34 cm (13.4 in), C5 = 22 cm (8.7 in), C5 = 23 cm (9.1 in), and C6 = 3 cm (1.2 in). The left frame rail was shifted left laterally by 40 cm (15.7 in), while the right frame rail was shifted 45 cm (17.7 in) left laterally.

Based on the damage measurements, the CDC assigned to the GMC for the Event 1 impact damage pattern was 81FDEW2. **Figure 25** depicts the Event 1 frontal damage and crush profile, while **Figure 26** depicts an overhead view of the front plane damage.

Figure 25: Front damage profile of the GMC.

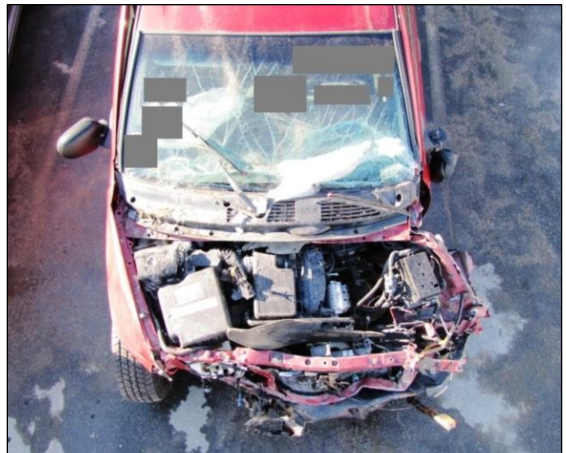


Figure 26: Overhead view of the frontal damage and shifted components of the 2002 GMC Envoy.

The Damage Algorithm of the WinSMASH model was used to calculate a borderline reconstruction of the Event 1 impact for analysis purposes. The calculated delta-V of the GMC for the impact with the Chevrolet ambulance was 40 km/h (24.9 mph). Lateral and longitudinal components of the calculated delta-V were -35 km/h (-21.7 mph) and -20 km/h (-12.4 mph), respectively.

Event Data Recorder

The GMC chassis was equipped with an air bag Sensing and Diagnostic Module (SDM) mounted within the center tunnel. The SDM had EDR capabilities to record crash data. The SCI Investigator imaged the 2002 GMC Envoy's EDR using the Bosch CDR tool with software version 12.2 via a connection to the DLC. An external power source was supplied directly to the interface and through engine compartment fuse panel. Imaged data were subsequently read using software version 15.0, included at the end of this technical report as **Attachment B**.

The SDM monitored and measured vehicle acceleration in the longitudinal direction, and the recording of a distinct crash event could be triggered by a frontal crash pulse. The threshold minimal crash pulse was a measured Vehicle Velocity Change of 8 km/h (5 mph). At Algorithm Enable (AE) and recognition of a longitudinal or lateral event, the EDR had the capacity to record 150 milliseconds of longitudinal delta-V data in 10 millisecond intervals.

The EDR could record two different event types and store a combination of up to three events. Recognized events were termed "Non-Deployment" or "Deployment," and up to two different deployment and one locked non-deployment events could be stored. Non-deployment events could be overwritten after approximately 250 ignition cycles, whereas deployment events became locked and could not be overwritten.

Associated to each respective event was a 5-second pre-crash buffer that recorded Percent Throttle, Engine Speed (RPM), and Vehicle Speed (mph). There were 8-seconds of pre-crash Brake Switch Circuit State data. All pre-crash data was recorded in 1-second intervals.

The imaged data contained a deployment event, which occurred on ignition cycle 12,941. Complete event recording was reported by the EDR. The recovered event contained the following pre-crash buffer data:

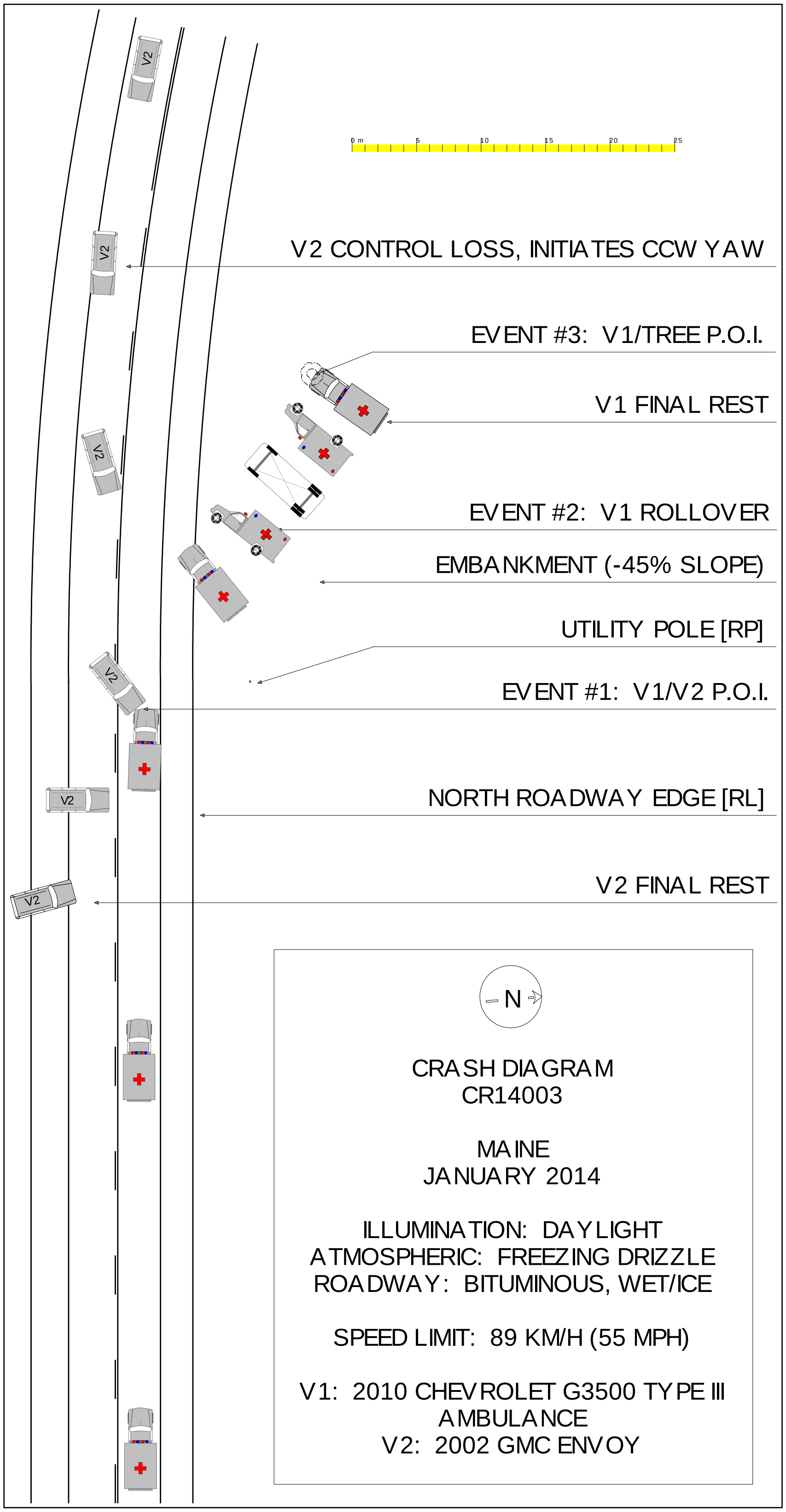
Time (seconds)	-8	-7	-6	-5	-4	-3	-2	-1
Vehicle Speed	-	-	-	89 km/h (55 mph)	89 km/h (55 mph)	92 km/h (57 mph)	84 km/h (52 mph)	63 km/h (39 mph)
Engine Speed	-	-	-	1728 RPM	1728 RPM	1664 RPM	1600 RPM	1216 RPM
Percent Throttle	-	-	-	32%	32%	32%	0%	0%
Brake Switch	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON

The SDM commanded deployment of the 1st stage driver and passenger frontal air bag system at 15 milliseconds after AE. The 2nd stage deployment was commanded at 17.5 milliseconds after AE. The maximum SDM recorded longitudinal vehicle velocity change was -39.4 km/h (-24.5 mph), which was reported to have been recorded 145 milliseconds after AE.

Occupant Data

The GMC was occupied by the 38-year-old male driver, 38-year-old female front right passenger, and 11-year-old female second row right passenger. Post-crash, both the driver and second row passenger were transported by ambulances to a local hospital for evaluation and treatment of police-reported possible (C-level) injuries. The female front right passenger was airlifted to a regional trauma center for treatment of police-reported non-incapacitating (B-level) injuries.

CRASH DIAGRAM



Attachment A

2010 Chevrolet G3500 Event Data Recorder (EDR) Report

CDR File Information

User Entered VIN	1GB6G2B6XA1******
User	
Case Number	CR14003
EDR Data Imaging Date	02/05/2014
Crash Date	
Filename	CR14003_V1_ACM.CDRX
Saved on	Wednesday, February 5 2014 at 12:35:34
Collected with CDR version	Crash Data Retrieval Tool 12.2
Reported with CDR version	Crash Data Retrieval Tool 15.0
EDR Device Type	Airbag Control Module
Event(s) recovered	Deployment Non-Deployment

Comments

No comments entered.

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. The 0.5 second Pre-crash data value (most recent recorded data point) is the data point last sampled before AE. That is to say, the last data point may have been captured just before AE but no more

than 0.5 second before AE. All subsequent Pre-crash data values are referenced from this data point.
-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.
-If more than one event is recorded, use the follow to determine which event the Multiple Event Data is associated with:
  -If a Deployment event and not locked Non-Deployment event are recorded, the Multiple Event Data is associated with the Deployment event.
  -If a Deployment event and a locked Non-Deployment event are recorded, then the Multiple Event Data is associated with both events.
  -If a Deployment event and Deployment event #2 are recorded, then the Multiple Event Data is associated with both events.
-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.

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 tool.

01006_SDMCG_r003

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

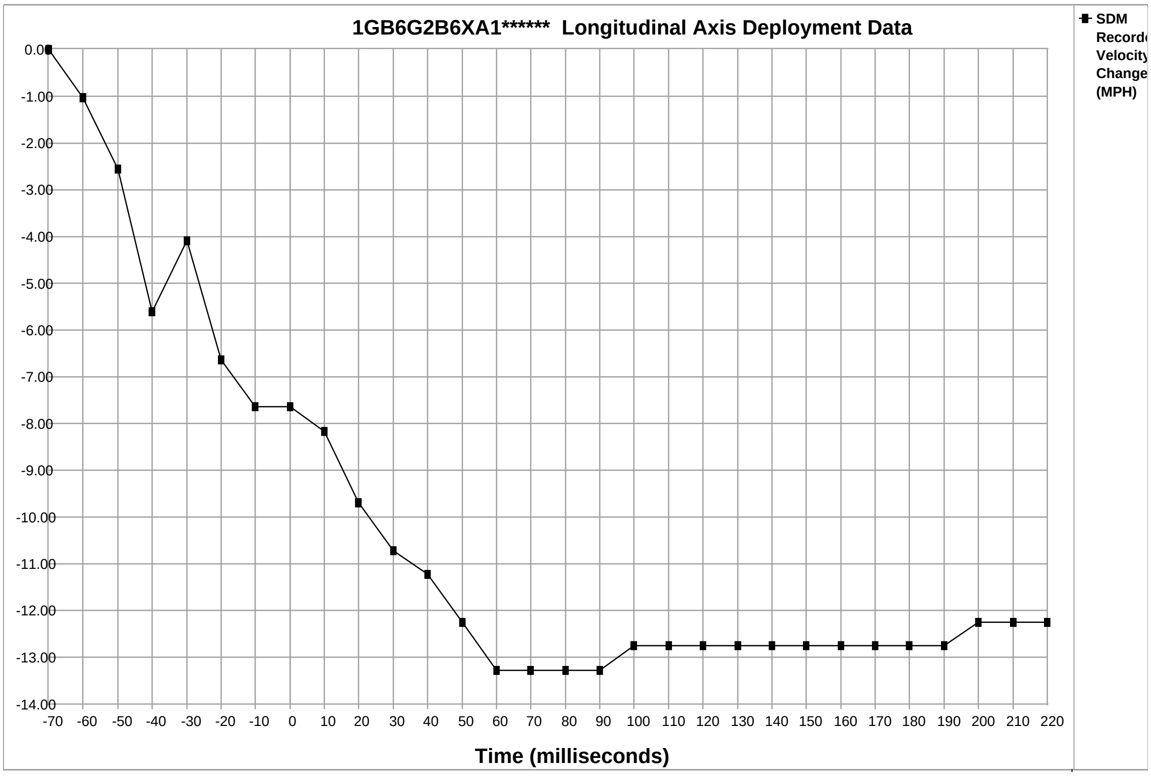
Parameter	-1.0 sec	-0.5 sec
Reduced Engine Power Mode	OFF	OFF
Cruise Control Active (If Equipped)	No	No
Cruise Control Resume Switch Active (If Equipped)	No	No
Cruise Control Set Switch Active (If Equipped)	No	No
Engine Torque (foot pounds)	-84.82	-83.72

Pre-Crash Data

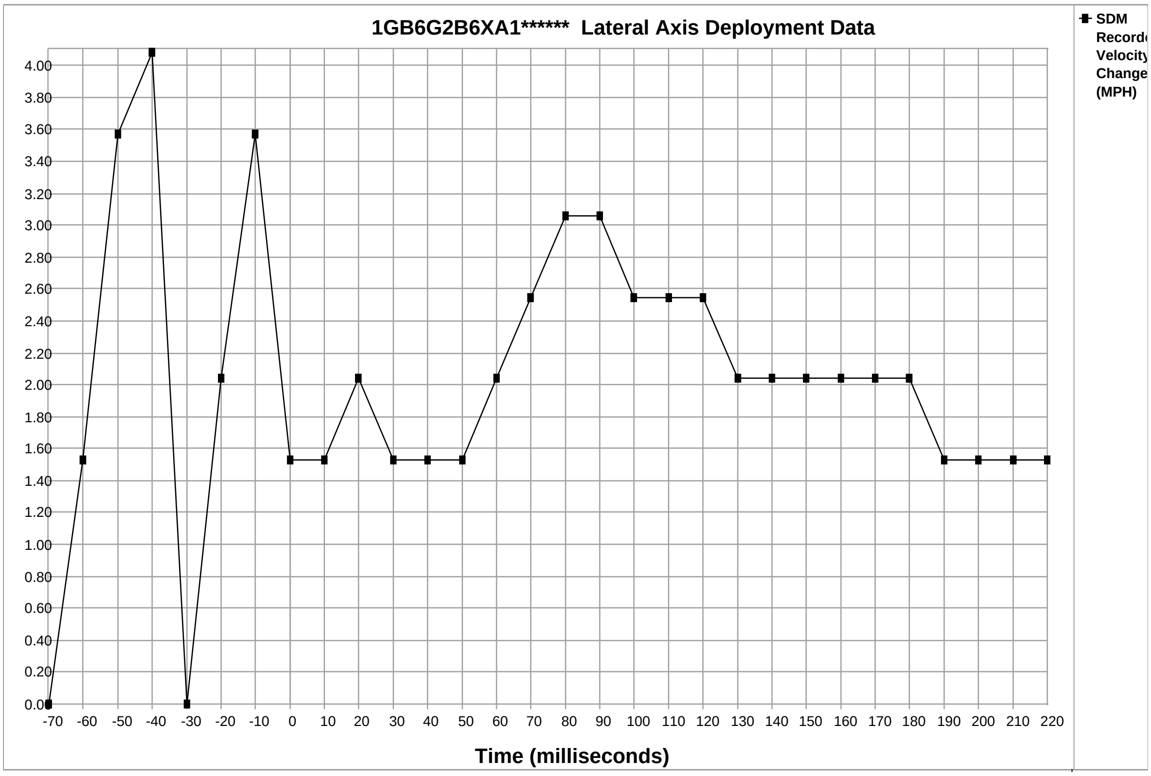
Parameter	-2.5 sec	-2.0 sec	-1.5 sec	-1.0 sec	-0.5 sec
Accelerator Pedal Position (percent)	0	0	0	0	0
Vehicle Speed (MPH)	52	52	51	50	50
Engine Speed (RPM)	1472	1472	1472	1408	1408
Percent Throttle	0	0	0	0	0
Brake Switch Circuit State	OFF	OFF	OFF	OFF	OFF

System Status At Deployment

Ignition Cycles At Investigation	10104
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	10093
Ignition Cycles At Event	10101
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
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)	80
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)	80
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



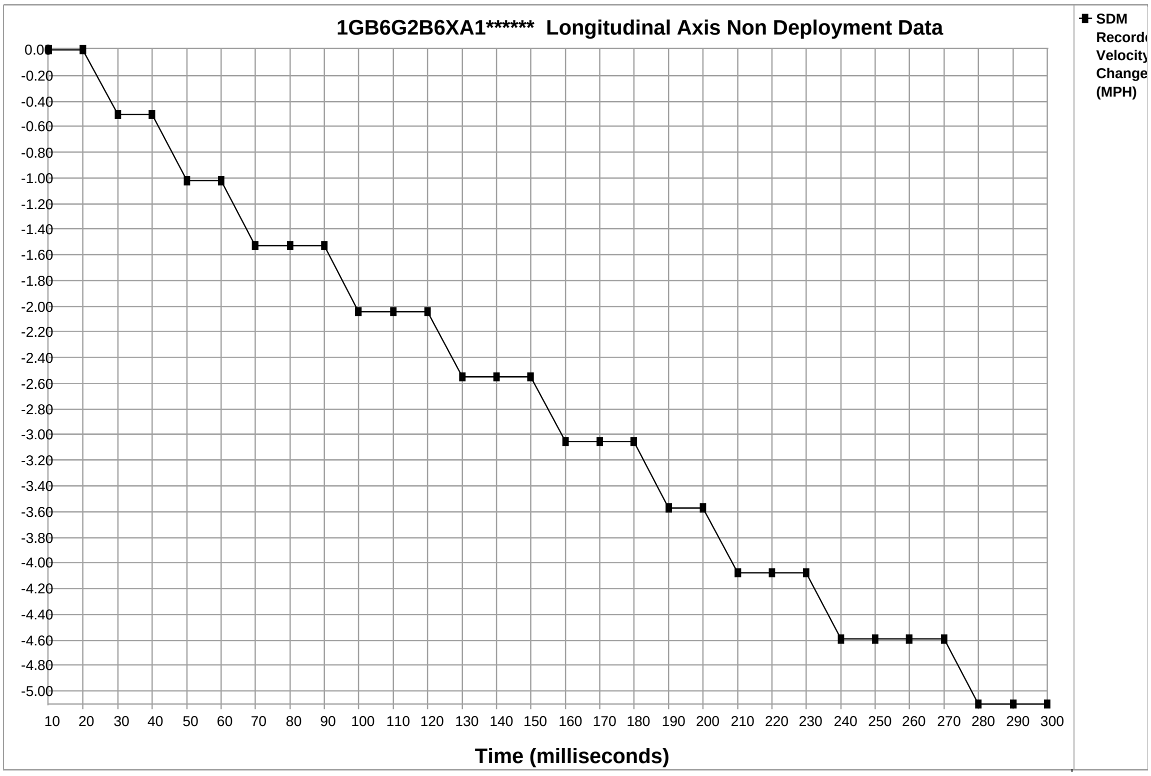
Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.00	-1.02	-2.55	-5.61	-4.08	-6.63	-7.65	-7.65	-8.16	-9.69	-10.72	-11.23	-12.25	-13.27	-13.27
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Longitudinal Axis Recorded Velocity Change (MPH)	-13.27	-13.27	-12.76	-12.76	-12.76	-12.76	-12.76	-12.76	-12.76	-12.76	-12.76	-12.76	-12.25	-12.25	-12.25



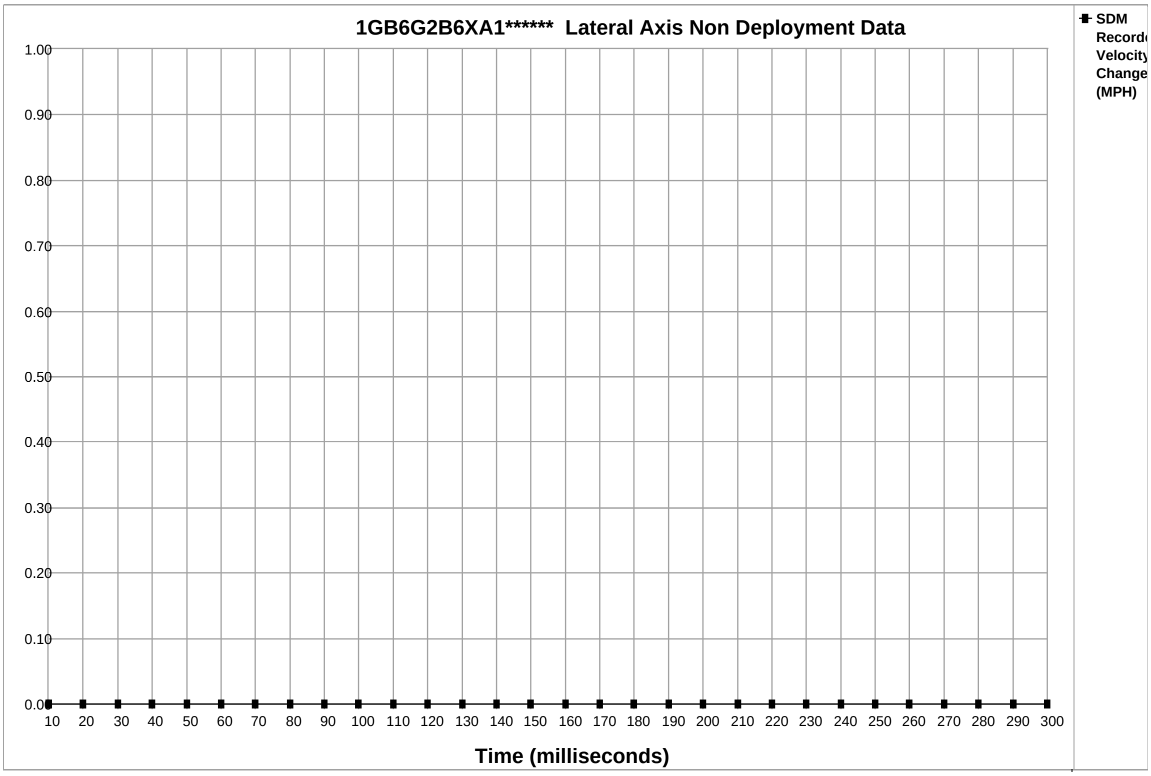
Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Lateral Axis Recorded Velocity Change (MPH)	0.00	1.53	3.57	4.08	0.00	2.04	3.57	1.53	1.53	2.04	1.53	1.53	1.53	2.04	2.55
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Lateral Axis Recorded Velocity Change (MPH)	3.06	3.06	2.55	2.55	2.55	2.04	2.04	2.04	2.04	2.04	2.04	1.53	1.53	1.53	1.53

System Status At Non-Deployment

Ignition Cycles At Investigation	10104
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	10101
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
Diagnostic Trouble Codes at Event, fault number: 1	B0012-04
Diagnostic Trouble Codes at Event, fault number: 2	B0019-04
Diagnostic Trouble Codes at Event, fault number: 3	B0052-00
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
Maximum SDM Recorded Velocity Change (MPH)	5.86
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	310
Crash Record Locked	Yes
Deployment Event Recorded in the Non-Deployment Record	No
Vehicle Event Data (Pre-Crash) Associated With This Event	No
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)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.00	0.00	-0.51	-0.51	-1.02	-1.02	-1.53	-1.53	-1.53	-2.04	-2.04	-2.04	-2.55	-2.55	-2.55
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
SDM Longitudinal Axis Recorded Velocity Change (MPH)	-3.06	-3.06	-3.06	-3.57	-3.57	-4.08	-4.08	-4.08	-4.59	-4.59	-4.59	-4.59	-5.10	-5.10	-5.10



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

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.

```
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```
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$0B  41 5A 30 30 30 30 58 30 30 30 30 30 30 30 30 30
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$0F  00 00 00 00
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$44  56 3E E0 C0 FF FC
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$47  1D 09 08
$B4  41 53 38 38 33 31 4B 52 39 33 32 33 4B 32 45 39
$C1  01 3C E2 0E
$C2  01 8B A1 82
$CB  01 3D 0F 4F
$CC  01 3D 0F 4F
$DB  41 41
$DC  41 41
```

Disclaimer of Liability

Attachment B

2002 GMC Envoy Event Data Recorder (EDR) 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	1GKDT13S622******
User	
Case Number	CR14003
EDR Data Imaging Date	02/04/2014
Crash Date	
Filename	CR14003_V2_ACM.CDRX
Saved on	Tuesday, February 4 2014 at 12:16:12
Collected with CDR version	Crash Data Retrieval Tool 12.2
Reported with CDR version	Crash Data Retrieval Tool 15.0
EDR Device Type	Airbag Control Module
Event(s) recovered	Deployment

Comments

No comments entered.

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). It contains Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded vehicle longitudinal 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 a Deployment Level Event, 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 before a Deployment Event. A locked Non Deployment Event cannot be overwritten or cleared by the SDM.
The second type of SDM recorded crash event is the Deployment Event. It also contains Pre-Crash and Crash data. The SDM can store up to two different Deployment Events, if they occur within five seconds of one another. If multiple Non-Deployment Events occur within five seconds prior to a Deployment Event, then the most severe Non-Deployment Event will be recorded and locked. If multiple Non-Deployment Events precede a Deployment Event, and occur within five seconds of each other (but not necessarily all within five seconds of the Deployment Event), then the most severe of the Non-Deployment Events (which may have occurred more than five seconds prior to the Deployment Event) will be recorded and locked. If a Deployment Level Event occurs within five seconds after the Deployment Event, the Deployment Level Event will overwrite any non-locked Non-Deployment Event. If multiple Non-Deployment Events occur within five seconds prior to a Deployment Event, and one or more of those events was a Pretensioner Deployment Event, then the most recent Pretensioner Deployment Event will be recorded and locked. 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 Longitudinal Velocity Change reflects the change in longitudinal velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Longitudinal 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 100 milliseconds of data after Deployment criteria is met and up to 50 milliseconds before Deployment criteria is met. For Non-Deployment Events, the SDM can record up to the first 150 milliseconds of data after algorithm enable. Velocity Change data is displayed in SAE sign convention.
-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. The 1.0 second Pre-crash data value (most recent recorded data point) is the data point last sampled before AE. That is to say, the last data point may have been captured just before AE but no more than 1.0 second before AE. All subsequent Pre-crash data values are referenced from this data point.
-Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if:

-The SDM receives a message with an “invalid” flag from the module sending the pre-crash data
-No data is received from the module sending the pre-crash data
-No module present to send the pre-crash data

-Driver’s Belt Switch Circuit Status indicates the status of the driver’s seat belt switch circuit. If the vehicle’s electrical system is compromised during a crash, the state of the Driver’s Belt Switch Circuit may be reported other than the actual state.
-The Time Between Non-Deployment to Deployment Events is displayed in seconds. If the time between the two events is greater than 25.4 seconds, “N/A” is displayed in place of the time.
-If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.
-Multiple Events will indicate whether one or more associated events preceded the recorded event.
-Multiple Events Not Recorded can be used in the following scenarios:

-If a single event is recorded, this parameter will indicate whether one or more associated events prior to the recorded event was not recorded due to insufficient record space (because there were more events than there were available event records).
-If two associated events are recorded, this parameter for the first event will indicate whether one or more associated events prior to the first event was not recorded due to insufficient record space.
-If two associated events are recorded, this parameter for the second event will indicate whether one or more associated events between the first and second events was not recorded due to insufficient record space.

-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 Speed, Engine Speed, and Percent Throttle data are transmitted by the Powertrain Control Module (PCM), via the vehicle’s communication network, to the SDM.
-Brake Switch Circuit Status data is transmitted by either the ABS module or the PCM, via the vehicle’s communication network, to the SDM.
-The Belt Switch Circuit is wired directly to the SDM.

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 tool.

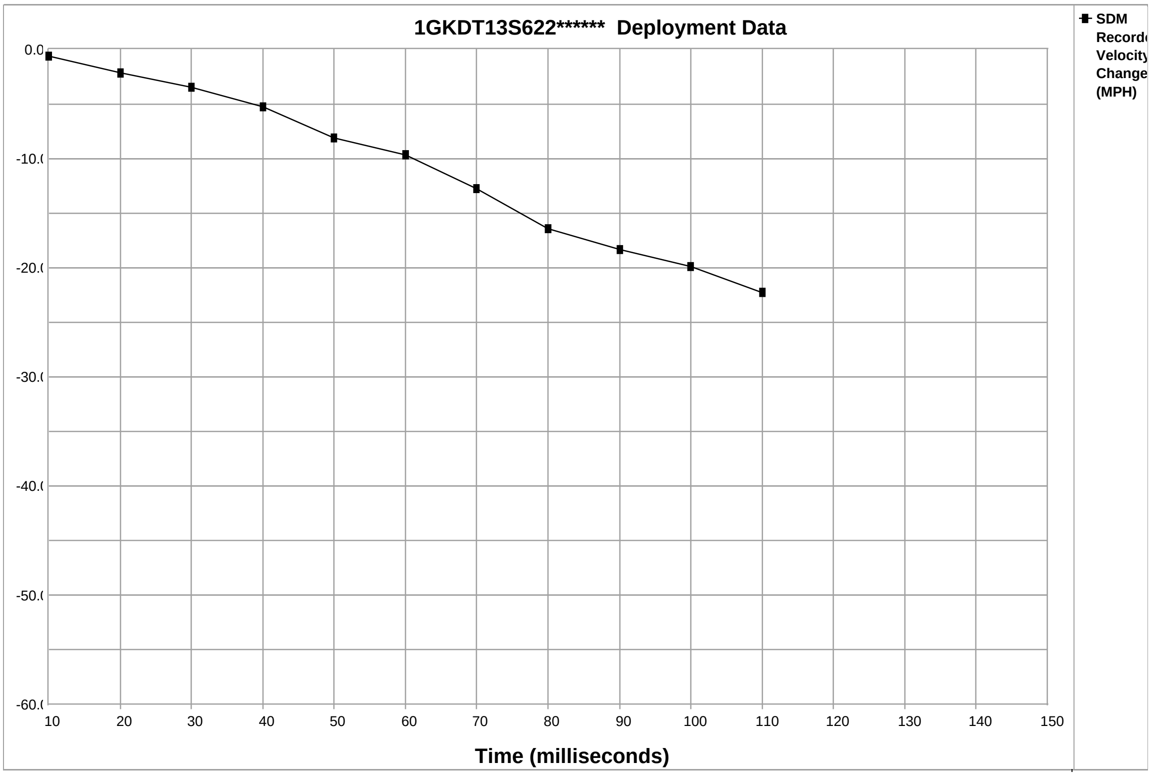
01030_SDMGT-2002_r005

System Status At Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Ignition Cycles At Deployment	12941
Ignition Cycles At Investigation	12944
Maximum SDM Recorded Velocity Change (MPH)	-24.50
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	145
Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	15
Driver 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	17.5
Passenger 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	15
Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	17.5
Time Between Non-Deployment And Deployment Events (sec)	N/A
Frontal Deployment Level Event Counter	1
Event Recording Complete	Yes
Multiple Events Associated With This Record	No
One Or More Associated Events Not Recorded	No

Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle
-5	55	1728	32
-4	55	1728	32
-3	57	1664	32
-2	52	1600	0
-1	39	1216	0

Seconds Before AE	Brake Switch Circuit State
-8	OFF
-7	OFF
-6	OFF
-5	OFF
-4	OFF
-3	OFF
-2	ON
-1	ON



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	-0.62	-2.17	-3.41	-5.27	-8.06	-9.61	-12.71	-16.43	-18.29	-19.84	-22.32	N/A	N/A	N/A	N/A

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.

```
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$35  00 50 0D 06 03 00
$36  50 0E 07 03 00 50
$37  0E 07 03 04 EF 5D
$38  3A 07 69 34 00 00
$39  0F 00 00 01 FF FF
$3A  02 07 0B 11 1A 1F
$3B  29 35 3B 40 48 00
$3C  00 00 00 0B F9 AE
$3D  E0 A5 00 00 00 00
$40  3F 54 5B 59 58 00
$41  C0 00 00 00 52 52
$42  52 00 13 19 1A 1B
$43  1B 00 44 FC 00 00
$44  FF FF FF FF FF FF
$45  FF FF FF FF FF FF
$46  FF FF FF FF FF FF
$47  FF FF FF FF 00 00
$48  FF FF FF FF FF FF
$49  FF FF FF FF FF FF
$4A  FF FF FF FF FF FF
$4B  FF FF FF FF 00 00
$4C  FF FF FF FF FF FF
```

```
$4D  FF FF FF FF FF FF
$4E  FF FF FF FF FF FF
$4F  FF FF FF FF 00 00
$50  FF FF FF FF FF FF
$51  FF FF FF FF FF FF
$52  FF FF FF FF FF FF
$53  FF FF FF FF FF FF
$54  FF FF FF FF FF FF
```

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