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Special Crash Investigations: On-Site Rollover Crash Investigation; Vehicle: 2008 Cadillac Escalade; Location: California; Crash Date: August 2022

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16. Abstract This report documents the on-site investigation of a single-vehicle rollover crash selected by NHTSA's Special Crash Investigations group. The vehicle was a 2008 Cadillac Escalade with combination side-impact/roll-sensing inflatable curtain air bags that deployed during the rollover. The unbelted 41-year-old male driver was fully ejected and had fatal injuries, while the belted 34-year-old female front passenger remained in her seated position and had "C" level (possible) injuries. The crash occurred in the afternoon in August 2022 in California. The Cadillac was traveling at a reported speed of 124 km/h (77 mph) when it departed the roadway on the left edge, returned and crossed over the roadway, departed it on the right edge, tripped, and rolled eight quarter turns. The ejected driver was pronounced deceased on-scene.			
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**Special Crash Investigations
On-Site Rollover Crash Investigation
Case Number: DS22020
Vehicle: 2008 Cadillac Escalade
Location: California
Crash Date: August 2022**

Background

This report documents the on-site investigation of a single-vehicle rollover crash selected by the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration. The SCI team forwarded NHTSA a preliminary crash report, an on-scene photo, and an online news report in August 2022 and the case was assigned in September 2022. The vehicle was a 2008 Cadillac Escalade (Figure 1) with combination side-impact/roll-sensing inflatable curtain (IC) air bags that deployed during the rollover. The unbelted driver was fully ejected and had fatal injuries, while the belted front passenger remained in her seated position and had possible injuries. The Cadillac had a sensing diagnostic module (SDM) and a rollover sensor (ROS) with event data recorder (EDR) capability supported by the Bosch CDR tool. The SCI team imaged the crash data from both modules during the vehicle inspection, completed in September 2022. On-scene police photos were obtained in September 2022 and the complete police report was obtained in May 2023.

The crash occurred in the afternoon in August 2022 in California in the northbound lanes of a two-lane divided Interstate highway. The driver was an unbelted 41-year-old male, and the front passenger was a belted 34-year-old female. The Cadillac was traveling northbound at an EDR-ROS-reported speed of 124 km/h (77 mph)¹ when it departed the roadway on the left edge, returned and crossed over the roadway, departed it on the right edge, tripped, and rolled eight quarter turns on the roadside before coming to rest upright and facing west. The ejected driver was pronounced deceased on-scene. The front passenger stated she would seek her own aid if necessary. The Cadillac was towed due to disabling damage.



Figure 1. The 2008 Cadillac Escalade

¹ Vehicle speed at event enable.

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Summary

Crash Site

The crash site was the northbound lanes of a two-lane divided Interstate highway in California (Figure 2). The roadway was straight and level. It had two lanes each measuring 3.7 m (12.0 ft) wide separated by a dashed white painted lane line and bordered by a solid white painted edge line on the right and a solid yellow painted edge line on the left. The pavement and painted lines were in good condition. The left roadway edge was bordered by an asphalt shoulder measuring 1.5 m (4.9 ft) wide with a milled-in rumble strip. The paved shoulder was bordered on the left by a gravel center median. The right roadway edge was bordered by an asphalt shoulder measuring 3.7 m (12.1 ft) wide with a milled-in rumble strip. The asphalt shoulder was bordered by a gravel roadside measuring 6.4 m (21.0 ft) wide that had a descending slope of -2.2 percent. It was bordered by an unpaved strip of ground measuring 6.2 m (20.3 ft) wide and a barbed wire fence. The posted speed limit was 113 km/h (70 mph). Conditions at the time of the crash were daylight, clear, and dry. A crash diagram is included at the end of this report.

Pre-Crash

The Cadillac was traveling northbound in the left lane at an EDR-ROS reported speed of 124 km/h (77 mph) at event enable.² The focus of the driver's attention prior to the crash was not known. The front passenger later told police the driver may have fallen asleep. The vehicle's left tires traveled onto the center median in a partial departure and deposited tire furrows on the ground as it passed under an overpass. In response to the departure, the driver overcorrected to the right, returning the vehicle to the roadway where its tires deposited yaw marks in the left and right lanes. It continued traveling right and departed the roadway on the right edge. The driver likely steered left in response to this departure and the vehicle initiated a counterclockwise yaw depositing furrows in the gravel shoulder. At the time of the scene inspection, the furrows (Figure 3) measured 13.2 m (43.3 ft) long for the right front tire and 19.5 m (64.0 ft) long for the right rear tire.



Figure 2. The crash site looking north

² The EDR report did not include pre-crash data for the rollover event.



Figure 3. Furrows in gravel leading to trip rollover, looking north on the roadside

Crash

The rollover was the only crash event. The Cadillac rotated in a counterclockwise yaw until its right-side tires dug into the ground with sufficient opposing lateral force to cause a right-side-leading trip rollover (Event 1). It rolled about its longitudinal axis for eight quarter turns and came to rest facing west and upright (Figure 4). Disintegrated glass from the roof, side windows, and backlight were deposited in a debris field measuring 24 m (79 ft) long in the rollover path. The estimated roll distance was 44 m (144 ft). The left and right IC air bags deployed during the rollover event. According to EDR-ROS data, time from algorithm enable to deployment command criteria met was 637.5 ms and time from rollover event enable to deployment was 4,360 ms. Added together, time from algorithm enable to deployment was 4,997.5 ms. Based on the time sequence, vehicle speed, and distance traveled, it appears algorithm enable occurred at the left-side road departure, and deployment occurred when the vehicle tripped right-side leading. The unbelted driver was fully ejected during the rollover, most likely through the closed left side glass of the front row. Based on police photos, the driver came to rest on the ground approximately 2 m (6 ft) north of the Cadillac's at-rest location.

Post-Crash

The Cadillac came to rest upright. A witness stopped and administered CPR to the driver. Once the witness detected a pulse, she turned the driver over to a semi-prone position until paramedics arrived. Paramedics continued lifesaving efforts on-scene for an unknown duration and the driver was pronounced deceased 45 minutes after the crash. According to police, the front passenger exited the vehicle unassisted through a hole in the windshield. The police report indicated she complained of pain and had a possible injury. She indicated she would seek her own aid if necessary. The Cadillac was towed due to disabling damage.



Figure 4. Debris field and rollover path to final rest looking north, the 2008 Cadillac Escalade (police photo)

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2008 Cadillac Escalade

Vehicle Description

The 2008 Cadillac Escalade was identified using the VIN 1GYFK63878Rxxxxxx. The manufacture date was January 2008. The odometer was unknown due to the absence of power to the instrument panel. The Cadillac was a 5-door, truck-based SUV with three rows of seats for 6 passengers. It had rear-wheel drive, an 8-cylinder, 6.2-liter gasoline engine, hydraulic brakes, and a moon roof. The vehicle manufacturer recommended size P265/65R18 tires. The Cadillac had a Goodyear Assurance tire on the left front, Goodyear Wrangler tires on the left rear and right front, and a Bridgestone Dueler tire on the right rear. The tires were of the recommended size.

The vehicle had front-row bucket seats with adjustable head restraints. The driver's and front passenger's seat tracks were in the middle position at inspection. The seats were outfitted with Masque brand aftermarket seat covers. For each seat, separate covers were installed for the seat cushion, seat back, and head restraint using a combination of form-fitting panels, elastic, and hooks to keep them in place. The covers were made from synthetic fabric and vinyl trim. The steering column had tilt and telescoping functionality. At inspection it was in a fixed position, possibly due to damage.

Exterior Damage

During the rollover, the vehicle's right rear tire and wheel struck the ground causing the wheel to fracture. All four tires were de-beaded, and all glazing was fractured or disintegrated. The greenhouse was crushed laterally and vertically. The left side view mirror was broken off entirely and the right one was fractured and hanging by wires. The rollover caused direct and induced damage to the right, left, and top planes (Figures 5 and 6). The front grille and bumper fascia were displaced as a single component. Direct damage to the roof extended laterally from roof side rail to roof side rail and measured 140 cm (55.1 in); it extended longitudinally beginning at the windshield header and ending near the left D-pillar. The OEM roof rack was fractured, bent, and some trim was missing. The moon roof glass was disintegrated. The hood was crushed and scraped. Direct damage to the left plane of the greenhouse began at the left A-pillar and extended rearward to the left C-pillar. Maximum vertical crush was located on the left roof at 110 cm (43.3 in) aft of the left front axle and measured 24 cm (9.4 in). Maximum lateral crush was located on the left roof side rail at 127 cm (50.0 in) aft of the left front axle and measured 15 cm (5.9 in). The collision deformation classification for the Cadillac in Event 1 was 00TDDO3.



Figure 5. Rollover damage, left and top planes, the 2008 Cadillac Escalade

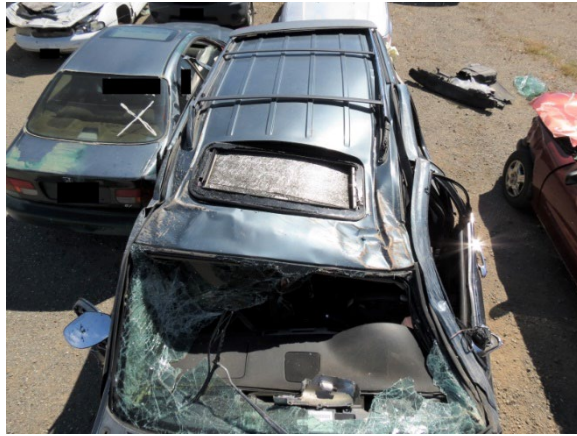


Figure 6. Rollover damage, top plane, the 2008 Cadillac Escalade

Rollover Discussion

According to NHTSA's online safety rating,³ the Cadillac had a rollover rating of 3 stars out of 5 possible. The rollover resistance test used to rate vehicles measures the risk of rollover in a single-vehicle, loss-of-control scenario, which seems to fit the scenario of this crash. The test revealed a rollover risk of 23.7 percent. The New Car Assessment Program rollover resistance program includes at-rest measurements, known as the static stability factor (SSF)⁴ and a dynamic rollover test starting MY 2004. Across all passenger cars and light trucks and vans, the SSF typically ranges from 1.00 to 1.50. The weighted average of SSF MY 2008 truck-based SUVs was 1.16, and the SSF for the 2008 Cadillac Escalade with rear-wheel drive was 1.12.

The Cadillac had the following passenger restraint, rollover mitigation, and stability control features.

- Front seat belt retractor pretensioners that deploy in rollover crashes. The pretensioners were commanded to deploy in this crash.
- IC air bags that deploy in rollover crashes.⁵ According to the vehicle owner's manual, in a rollover event, IC air bag deployment is determined by the direction of the roll. The manual further states that they are designed to help reduce the risk of full or partial ejection in rollover events.⁶ The IC air bags deployed in this crash.
- StabiliTrak combines antilock brake, traction, and stability control features. The traction control disable button is located on the instrument panel. Due to the absence

³<https://www.nhtsa.gov/vehicle/2008/CADILLAC/ESCALADE%252520ESV/4%252520DR/2WD%25252FAWD#safety-ratings-rollover>

⁴The static stability factor is a value used to represent the vehicle geometric properties associated with single-vehicle rollover events, in particular, track width and center of gravity height. The test determines whether a vehicle is vulnerable to tipping up on the road in a severe maneuver.

⁵ The IC air bags were not certified to FMVSS No. 226, *Ejection mitigation*.

⁶ The 2008 Cadillac Escalade does not meet the requirements of FMVSS No. 226, to reduce the partial and complete ejection of vehicle occupants through side windows, particularly in rollover crashes.

of power at the time of the vehicle inspection, the traction control setting for this vehicle was unknown.

- The antilock brake system is intended to improve a vehicle's stability when hard braking is applied on a slippery road surface.
- Rollover sensor (ROS) module. GM vehicles model year 2007 and newer are equipped with ROS modules that store EDR data retrievable by the CDR tool. This data was imaged from this vehicle's ROS during the vehicle inspection.

The Cadillac's tires were of the manufacturer's recommended size and had tread depths measuring between 4 and 7 mm, an acceptable level. Tire pressures were unknown, but the EDR report indicated the vehicle's low tire pressure warning lamp was "off" at event enable. The investigation determined the condition of the tires likely did not contribute to the rollover.

Possible factors contributing to the rollover included excessive vehicle speed; a drowsy or sleeping driver; steering over-correction; and a relatively low rollover rating/high risk of rollover. The ROS-reported vehicle speed at event enable was 124 km/h (77 mph), which was 10 percent above the speed limit of 113 km/h (70 mph). The front passenger told police the driver may have fallen asleep. The evidence suggests the driver lost control during the initial left edge departure and never regained control. He overcorrected his steering to the right causing the vehicle to return and then depart the roadway on the right edge. At departure, the surface changed from asphalt shoulder to gravel roadside. This change in surface likely added to vehicle instability. On the right roadside, the driver again over-corrected his steering. The vehicle was in a counterclockwise yaw with its right side leading when it tripped.

The ROS-reported vehicle speed was 124 km/h (77 mph) at event enable. According to EDR-ROS data, time from algorithm enable to deployment command criteria met was 637.5 ms and time from rollover event enable to deployment was 4,360 ms. Added together, time from algorithm enable to deployment was 4,997.5 ms. Based on the time sequence, vehicle speed, and distance traveled, it appears algorithm enable occurred at the left side road departure and deployment occurred when the vehicle tripped right side leading. The distance traveled from algorithm enable to deployment was approximately 117 m (384 ft) and the vehicle covered this distance in approximately 4.9 seconds. The vehicle tripped, rolled eight quarter turns, and came to rest in an upright orientation. It was not known at what point during the rollover the driver was ejected through the left side window. The estimated roll distance was 44 m (144 ft).

Event Data Recorder

The Cadillac had an SDM with EDR capability that was imaged during the vehicle inspection using the direct-to-module method with the Bosch CDR CANplus tool. The crash data was imaged using CDR software version 21.5.1 and reported using version 24.3.576. The report captured two events. A prior event – System Status at Deployment – occurred at ignition cycle 26,530 and was not associated with this crash. A subsequent event – System Status at Deployment #2 – occurred at ignition cycle 31,503 and was the rollover event in this crash.⁷ Both events were locked deployment events. A vehicle history report revealed a prior deployment crash in 2018 that caused severe front plane damage. Following that crash the vehicle was deemed a total loss, sold as salvage, and returned to the roadway with a salvaged

⁷ Ignition cycle at investigation was 35,504.

title. Data reported by the EDR, including the prior deployment event and diagnostic trouble codes discussed below, suggest the SDM was not replaced following the prior crash. The data limitations state “Once the sensing diagnostic module (SDM) has deployed an air bag, the SDM must be replaced.”

The EDR report did not include pre-crash data for the rollover event. For the rollover event, the report indicated the driver’s seat belt was unbuckled and the front passenger’s seat belt was buckled. According to EDR data, time from algorithm enable to deployment command criteria met was 637.5 ms and time from rollover event enable to deployment was 4,360 ms. Added together, time from algorithm enable to deployment was 4,997.5 ms. The vehicle had a separate set of IC air bags for the third row, and they also deployed. The driver’s and front passenger’s seat belt pretensioners were commanded to deploy but did not reference times. Evidence suggests the seat belt pretensioners may not have deployed during the rollover. The belts were not locked by the retractors. This is discussed further in the Manual Restraint Systems and Supplemental Restraint Systems of this report. The reported maximum longitudinal delta V was -5.12 km/h (-3.18 mph) and the maximum lateral delta V was -9.22 km/h (-5.73 mph). The complete EDR report is included in Appendix A of this report.

Diagnostic Trouble Codes

The EDR report indicated 4 DTCs were present as follows.

B0012-0E, General Motors code for Driver Frontal Deployment Loop Stage 1 Low Resistance.

The driver’s frontal air bag was not commanded to deploy in this crash. It was commanded to deploy in a prior crash. Possible causes for this code are as follows.⁸

- Faulty steering wheel air bag
- Faulty steering wheel air bag coil
- Steering wheel air bag harness is open or shorted
- Steering wheel air bag circuit poor electrical connection
- Faulty SDM

B0015-04, GM code for Driver Seat Belt Retractor Pretensioner Deployment Loop Open.

The driver’s seat belt pretensioner was commanded to deploy in this crash and a prior crash. Evidence suggests the seat belt pretensioners may not have deployed during the rollover. At the time of the vehicle inspection, the belt was not locked by the retractor pretensioner. This is discussed further in the Manual Restraint Systems and Supplemental Restraint Systems of this report. A possible symptom of this code is the air bag warning light on. The EDR report stated the SIR warning lamp status this ignition cycle (at event) was “ON.” Possible causes for this code are as follows.

- Faulty driver seat belt retractor pretensioner
- Driver seat belt retractor pretensioner harness is open or shorted
- Driver seat belt retractor pretensioner circuit poor electrical connection
- Faulty SDM

B0022-04, GM code for Passenger Seat Belt Retractor Pretensioner Deployment Loop Open.

⁸ https://www.engine-codes.com/b0012_chevrolet.html

The front passenger's seat belt pretensioner was commanded to deploy in this crash and a prior crash. Evidence suggests the seat belt pretensioners may not have deployed during the rollover. At the time of the vehicle inspection, the belt was not locked by the retractor pretensioner. A possible symptom of this code is the air bag warning light on. The EDR report stated the SIR warning lamp status this ignition cycle (at event) was "ON." Possible causes for this code are as follows.

- Faulty passenger seat belt retractor pretensioner
- Passenger seat belt retractor pretensioner harness is open or shorted
- Passenger seat belt retractor pretensioner circuit poor electrical connection
- Passenger SDM

B0052-00, GM code for Deployment Commanded.

Ignition voltage is from 9 to 16 volts. Deployments relating to this code were commanded for this crash and a prior crash. Possible causes for this code are as follows.⁹

- The SDM detects a frontal impact of sufficient force to warrant deployment of the frontal air bags.
- The SDM detects a side impact of sufficient force to warrant deployment of a side impact air bag and/or roof rail air bag.
- The SDM has deployed the seat belt buckle pretensioner for three separate deployments.

Rollover Sensor Module

The Cadillac had an ROS module with EDR capability that was imaged during the vehicle inspection using the direct-to-module method with the Bosch CDR CANplus tool. The crash data was imaged using CDR software version 21.5.1 and reported using version 24.3.576. According to the data limitations, the ROS can store one non-rollover event and up to two rollover events. Rollover events cannot be cleared or overwritten. Once the ROS records two rollover events, the ROS must be replaced. The ROS captured one rollover event - Event Record "A." The number of non-rollover events during the ignition cycle was 0. The ROS reported lateral acceleration, vertical acceleration, and roll rate. The complete ROS report is included in Appendix B of this report.

Interior Damage

The Cadillac had interior damage caused by impact forces, air bag deployments, and post-crash activities. The windshield was fractured and holed, and all other glazing was disintegrated. The right-side doors were jammed shut. Trim was missing from the lower left instrument panel and the front-row D-rings. The rear-view mirror was hanging by electrical wires and trim pieces from the roof header were missing. The left and right IC air bags were deployed. The front row had vertical intrusion at the left windshield header (17 cm [6.7 in]); middle windshield header (7 cm [2.8 in]); left roof (22 cm [8.7 in]); middle roof (10 cm [3.9 in]); left roof side rail (22 cm [8.7 in]); and right roof side rail (7 cm [2.8 in]) (Figure 7). The second row had vertical intrusion at the left roof (13 cm [5.1 in]), and middle roof (3 cm [1.2 in]). The driver's head restraint was

⁹ <https://www.dtcdecode.com/Cadillac/B0052-00>

bent downward and forward by roof intrusion. Possible driver contacts were identified on the left roof above the driver's seat, the left sun visor, and the left IC air bag.



Figure 7. Vertical intrusion, the 2008 Cadillac Escalade

Manual Restraint Systems

The Cadillac had lap and shoulder seat belts for all seat positions. Both front-row seat belts revealed evidence of historical usage; neither revealed evidence of occupant loading. Based on evidence obtained from the vehicle inspection, EDR report, and police report, the driver was unbelted, and the front passenger was belted. The EDR report indicated the pretensioners were commanded to deploy. The vehicle owner's manual indicated that the pretensioners will deploy in a rollover only if the vehicle is equipped with outboard seat-mounted side-impact air bags; the vehicle in this crash did not have those air bags, and the EDR report indicated side (air bag) deployment loops were not commanded during the rollover event. At inspection, the belts were not locked by the retractor pretensioners. When extended, the shoulder portion of the driver's seat belt did not smoothly retract into the B-pillar but would retract if manually assisted. The front passenger's belt responded similarly. DTCs relevant to pretensioner deployment were present in the EDR event record (System Status at Deployment #2). The vehicle history (prior frontal crash with pretensioner deployment), the DTCs, and non-locked belt retractors suggested the retractor pretensioners may not have actuated in this rollover.

Supplemental Restraint Systems

The Cadillac had driver's and passenger's frontal air bags, and combination side-impact/roll-sensing IC air bags for all three rows. It also had front-row seat belt pretensioners. According to a vehicle history report, the Cadillac was involved in a prior frontal crash in 2018. According to the EDR report, the vehicle had a prior deployment level event 4,973 ignition cycles prior to the rollover crash. In the prior event, the driver's frontal air bag and both front-row seat belt pretensioners were commanded to deploy. Following the prior crash, the vehicle was deemed a total loss and was sold with a salvage title in 2018. It appears the ACM was not replaced or reset following the prior crash and it was unknown if any air bags or pretensioners were replaced. The EDR rollover event record included diagnostic trouble codes relating to air bag deployments, pretensioner deployments, and the sensing diagnostic module (SDM). The vehicle history report

and DTC's identified in the EDR report suggest the vehicle's supplemental restraint systems may not have been fully functional at the time of the rollover.

The left and right IC air bags deployed during the rollover event. According to EDR-ROS data, time from algorithm enable to deployment command criteria met was 637.5 ms and time from rollover event enable to deployment was 4,360 ms. Added together, time from algorithm enable to deployment was 4,997.5 ms. Based on the time sequence, vehicle speed, and distance traveled, it appears algorithm enable occurred at the left-side road departure and deployment occurred when the vehicle tripped right-side leading. The IC air bags deployed from the roof side rails above the front and second rows (Figure 8). Another set of IC air bags deployed from roof side rails above the third row. The left IC air bag was likely contacted by the driver during the rollover. It had what appeared to be a blood deposit at the bottom edge of the sail. According to the vehicle owner's manual, in a rollover event, IC air bag deployment is determined by the direction of the roll.



Figure 8. Deployed left IC air bag, the 2008 Cadillac Escalade

The driver's and front passenger's seat belt pretensioners were commanded to deploy in the rollover crash, but the EDR report did not reference deployment times. At inspection, the seat belts were not locked in place by the retractors. The seat belt retractor pretensioners had been commanded to deploy in a prior crash and their functionality in this crash was unknown. This is discussed further in the Manual Restraints section of this report.

NHTSA Recalls and Investigations

VIN-based NHTSA recall searches queried in October 2022 and January 2025 revealed one unrepaired recall and one open investigation for the Cadillac as noted in the tables below.

Recall	
Recall Date	February 5, 2021
Manufacturer Recall Number	N212328760
NHTSA Recall Number	21V050
Recall Status	Recall Incomplete
Summary (abbreviated)	TK Holdings Inc. ("Takata") has decided that a defect that relates to motor vehicle safety exists in the passenger-side frontal air bag inflators installed as original equipment in certain 2007 to

Recall	
	2014 model year Cadillac Escalade. The determination was made that the propellant in these inflators may degrade after long-term exposure to high humidity and temperature cycling, which could cause the inflator to rupture during a deployment.
Safety Risk	An inflator rupture may cause metal fragments to pass through the air bag and into the vehicle interior at high speed, which may result in injury or death to vehicle occupants.
Remedy	Dealers will replace the passenger-side frontal air bag inflator.

Investigation	
Investigation Name	Desiccated Air Bag Inflator Rupture
NHTSA Action Number	EA21002
Components	Air Bags
Opened From	September 17, 2021–Present
Summary (abbreviated)	The Office of Defects Investigation is opening this investigation to examine whether a safety defect related to propellant degradation exists in non-recalled desiccated PSAN frontal inflators manufactured by Takata.

2008 Cadillac Escalade Occupants

Driver Demographics

Age/sex: 41 years/male
 Height: 157 cm (62 in)
 Weight: 83 kg (184 lb)
 Eyewear: Unknown
 Seat type: Bucket with adjustable head restraint
 Seat track position: Middle track at inspection
 Manual restraint usage: Lap and shoulder belt available, not used
 Usage source: Vehicle inspection, EDR report
 Air bags: Frontal and IC air bags available; IC air bag deployed
 Alcohol/drug data: None
 Egress from vehicle: Complete ejection
 Transport from scene: None
 Type of medical treatment: None

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Base skull fracture (right temporal, depressed)	150206.4	Ground Roof	Probable Possible
2	Vault skull fracture (left parietal)	150404.3	Ground Roof	Probable Possible
3	Fractures, right ribs R2-R4	450203.3	Ground	Probable
4	Subarachnoid hemorrhage, left cerebrum	140693.2	Ground Roof	Probable Possible
5	Subarachnoid hemorrhage, left cerebellum	140466.2	Ground Roof	Probable Possible
6	Intraventricular hemorrhage, cerebrum	140678.2	Ground Roof	Probable Possible
7	Fracture, sternum	450804.2	Ground	Probable
8	Subgaleal hemorrhage (hematoma), frontal and right scalp	110402.1	Ground	Probable
9	Contusions, face	210402.1	Ground	Probable
10	Contusions, left anterior thigh	810402.1	Left door panel, unknown quadrant	Possible
11	Lacerations, superficial, face	210602.1	Ground	Probable

Source: Autopsy report.

Driver Kinematics

Following the roadside departure, the vehicle rotated counterclockwise and tripped, causing the driver to be displaced from his seat. The vehicle rolled right-side leading for eight quarter turns and the occupant was displaced in several directions while likely contacting the roof and other components. The left IC air bag deployed at some point during the rollover. Possible driver

contacts were identified on the left roof above the driver's seat, the left sun visor, and left IC air bag. The driver was fully ejected, most likely through the closed left side window of the front row. He came to rest on the ground approximately 2 m (6 ft) north of the vehicle's at-rest location. His injuries included basilar and vault skull fractures, brain hemorrhages, rib and sternum fractures, and facial lacerations and contusions. The driver's injuries were likely caused by a combination of vehicle component and ground contacts. A witness administered CPR and paramedics continued lifesaving efforts on-scene for an unknown duration. The driver was pronounced deceased 45 minutes after the crash.

Front-Row Right Occupant Demographics

Age/sex:	34 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Bucket with adjustable head restraint
Seat track position:	Middle track at inspection
Manual restraint usage:	Lap and shoulder belt available, used
Usage source:	Vehicle inspection, EDR, police report
Air bags:	Frontal and IC air bags available; IC air bag deployed
Egress from vehicle:	Exited unassisted through a hole in windshield
Transport from scene:	None
Type of medical treatment:	None

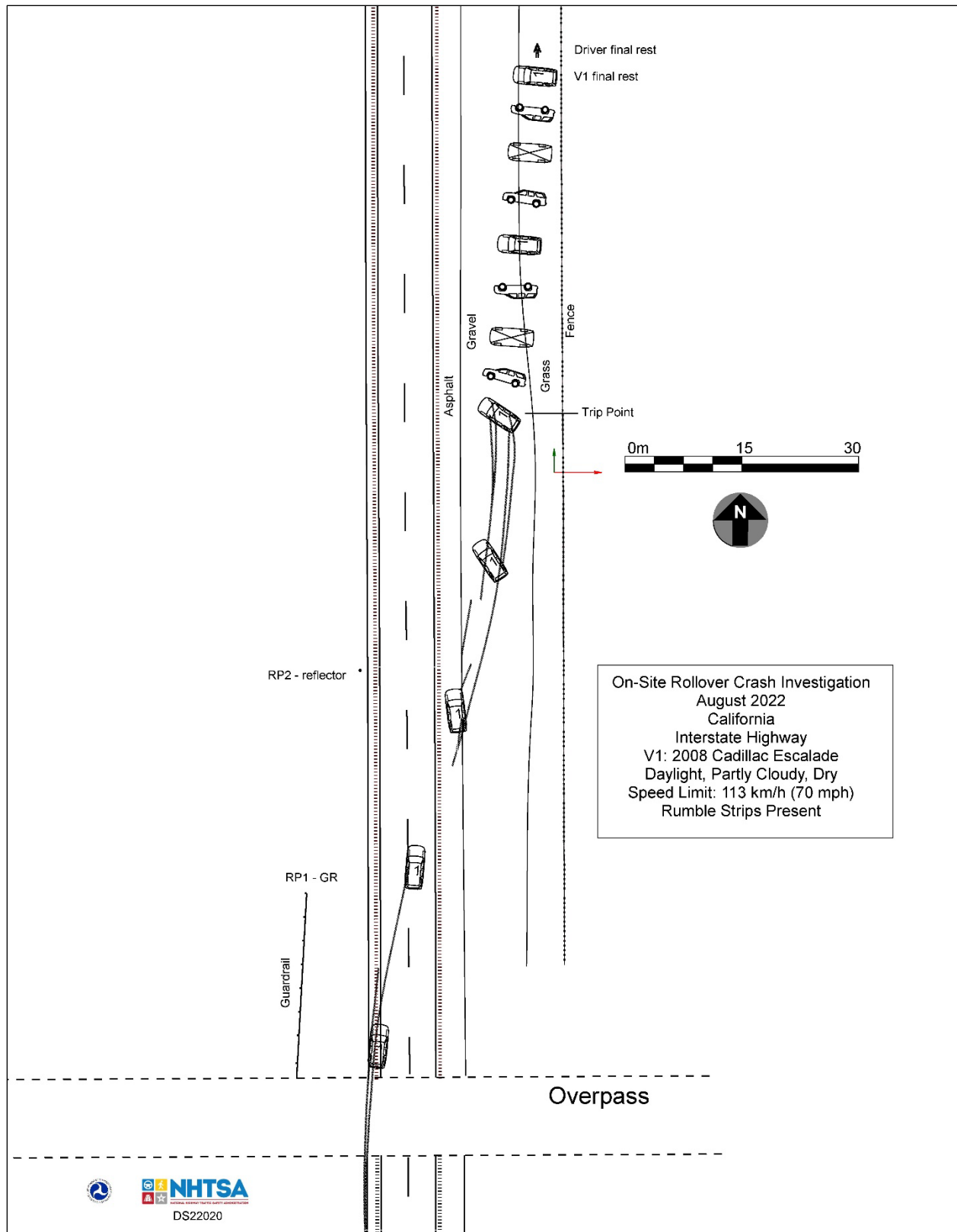
Front-Row Right Occupant Injuries

Following the crash, the occupant complained of pain to her right shoulder. The police report stated she had a possible injury. She refused treatment, indicating she would seek her own aid if necessary.

Front-Row Right Occupant Kinematics

The belted occupant was seated forward-facing. Following the right departure, the vehicle initiated a counterclockwise yaw, and the occupant was held in her seated position by the seat belt. The vehicle tripped and rolled right-side leading for eight quarter turns and the occupant was displaced in several directions while remaining in her seated position. The right IC air bag deployed, and she likely contacted it during the rollover. It was unknown if her seat belt pretensioner actuated. The EDR report indicated it was commanded to deploy but, at inspection, the belt was not locked by the retractor. The vehicle came to rest in an upright orientation. According to the police report, the occupant exited the vehicle unassisted through a hole in windshield.

Crash Diagram



Appendix A: Event Data Recorder Report — 2008 Cadillac Escalade¹⁰

¹⁰ The EDR Report contained in this report was imaged using the current version of the Bosch CDR software at the time of the vehicle inspection. The CDR report contained in the associated Crash Viewer application may differ relative to this 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	1GYFK63878R*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	DS22020_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 21.5.1
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 24.3.576
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	Deployment Deployment #2

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 for an event which but does not deploy the air bag(s). The minimum resultant SDM Recorded Vehicle Velocity Change, that is needed to record a Non-Deployment Event, which may not include Pretensioner Only Deployment, is five MPH. Additionally, a Non-Deployment Event Record can consist of a Pretensioner Only Deployment, with no indication of pretensioner deployment loop(s) being commanded in the record. 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 ³X' and ³Y' 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

-Pre-crash data associated with this event will always be for the first event even if it is not recorded.

-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-modifying 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.

-Once a firing loop has been commanded to be deployed, it will not be commanded to be deployed again during the same ignition cycle. Firing loop times for subsequent deployment type events, during the same ignition cycle, will record the deployment times as N/A.

-Number of ignition cycles SIR Warning Lamp was ON/OFF continuously counter can increment up to 99 cycles before resetting to zero. Thereafter, the counter represents the lamp on/off conditions for the ignition cycle in which a qualified crash event occurs.

-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.

01005_SDMC-delphi_r006

Multiple Event Data

Associated Events Not Recorded	3
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)	Yes
The Event(s) Not Recorded was a Deployment Event(s)	No
The Event(s) Not Recorded was a Non-Deployment Event(s)	Yes

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

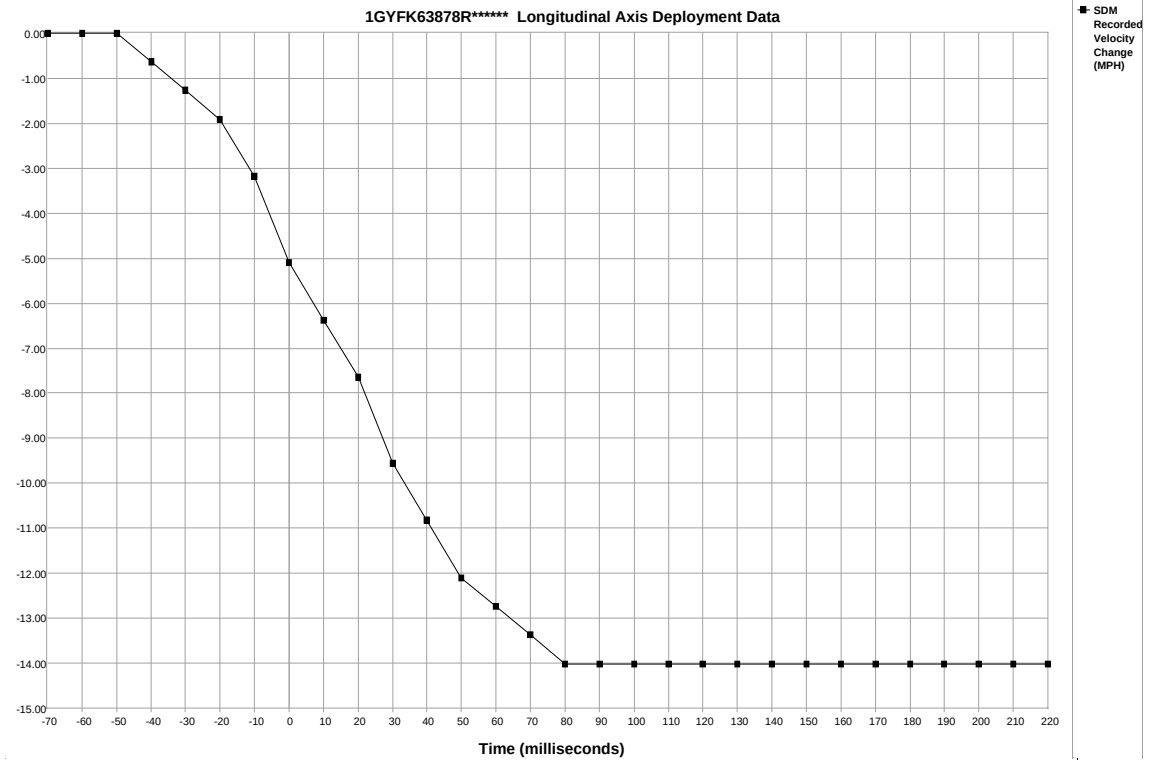
Parameter	-1.0 sec	-0.5 sec
Reduced Engine Power Mode	OFF	OFF
Cruise Control Active (If Equipped)	No	No
Cruise Control Resume Switch Active (If Equipped)	No	No
Cruise Control Set Switch Active (If Equipped)	No	No
Engine Torque (foot pounds)	-4.43	-4.06

Pre-Crash Data

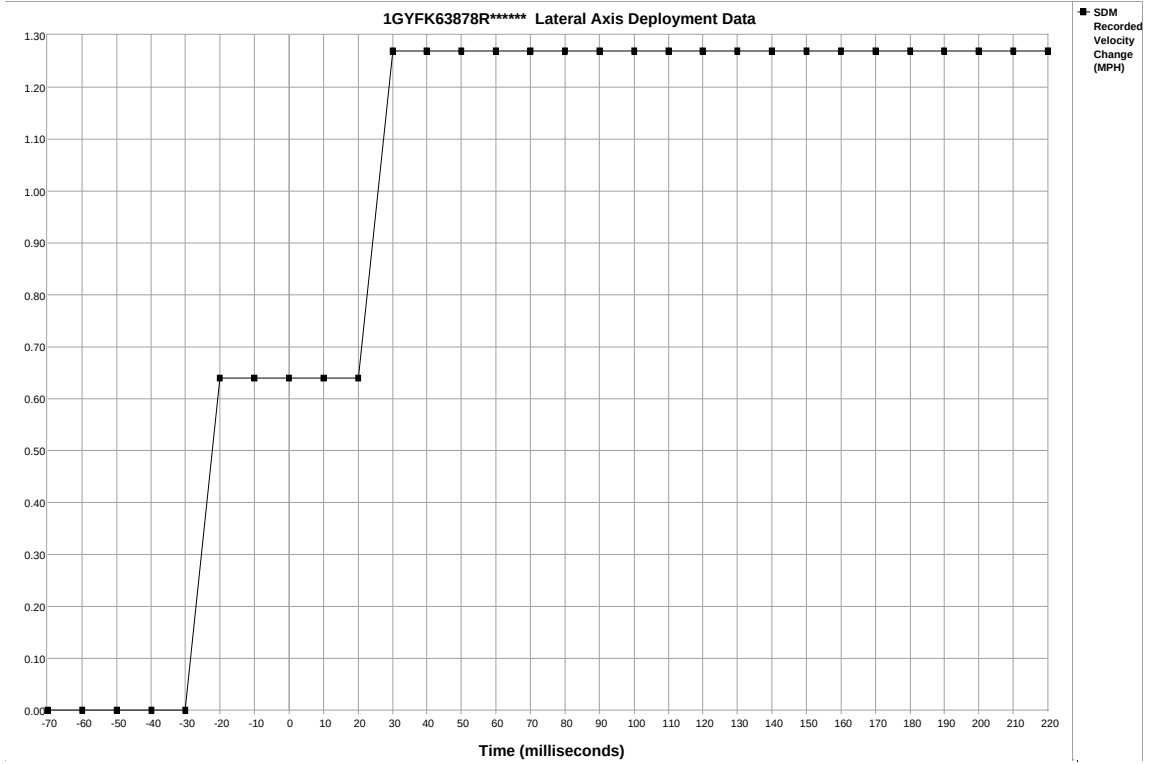
Parameter	-2.5 sec	-2.0 sec	-1.5 sec	-1.0 sec	-0.5 sec
Accelerator Pedal Position (percent)	0	0	0	0	0
Vehicle Speed (MPH)	28	28	28	28	28
Engine Speed (RPM)	768	768	768	768	768
Percent Throttle	18	18	18	18	18
Brake Switch Circuit State	OFF	OFF	OFF	OFF	OFF

System Status At Deployment

Ignition Cycles At Investigation	31504
SIR Warning Lamp Status this Ignition Cycle	OFF
SIR Warning Lamp ON/OFF Time Continuously (seconds) this Ignition Cycle	655350
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously this Ignition Cycle	1564
Ignition Cycles At Event	26530
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
Passenger's Belt Switch Circuit Status	UNBUCKLED
Driver Seat Position Switch Circuit Status	Rearward
Passenger Classification Status at Event Enable	Passenger Seat Empty
Passenger Air Bag Indicator Status at Event Enable	OFF
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)	45
Driver 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	Disposal
Passenger 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	Suppressed
Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	Suppressed
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
Rollover Occupant Containment Enable Status	Enabled
Side Air Bag Deployment Status	No Side Air Bags Were Deployed
Rollover Sensor Status	No Rollover
Time From Rollover Event Enable to Deployment (ms)	0
Crash Record Locked	Yes
Vehicle Event Data (Pre-Crash) Associated With This Event	Yes
SDM Synchronization Counter	26530
Time Between Events (sec)	0.0
Event Recording Complete	Yes
Driver First Stage Deployment Loop Commanded	Yes
Passenger First Stage Deployment Loop Commanded	No
Driver Second Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded for Disposal	Yes
Passenger Second Stage Deployment Loop Commanded	No
Passenger 2nd Stage Deployment Loop Commanded for Disposal	No
Driver Pretensioner Deployment Loop Commanded	Yes
Passenger Pretensioner Deployment Loop Commanded	Yes
Driver Side Deployment Loop Commanded	No
Passenger Side Deployment Loop Commanded	No
Second Row Left Side Deployment Loop Commanded	No
Second Row Right Side Deployment Loop Commanded	No
Driver (Initiator 1) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 1) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 3) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 3) Roof Rail/Head Curtain Loop Commanded	No
Driver Knee Deployment Loop Commanded	No
Passenger Knee Deployment Loop Commanded	No
Second Row Left Pretensioner Deployment Loop Commanded	No
Second Row Right Pretensioner Deployment Loop Commanded	No
Second Row Center Pretensioner Deployment Loop Commanded	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	-0.64	-1.27	-1.91	-3.18	-5.09	-6.37	-7.64	-9.55	-10.82	-12.10	-12.73	-13.37
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Longitudinal Axis Recorded Velocity Change (MPH)	-14.01	-14.01	-14.01	-14.01	-14.01	-14.01	-14.01	-14.01	-14.01	-14.01	-14.01	-14.01	-14.01	-14.01	-14.01

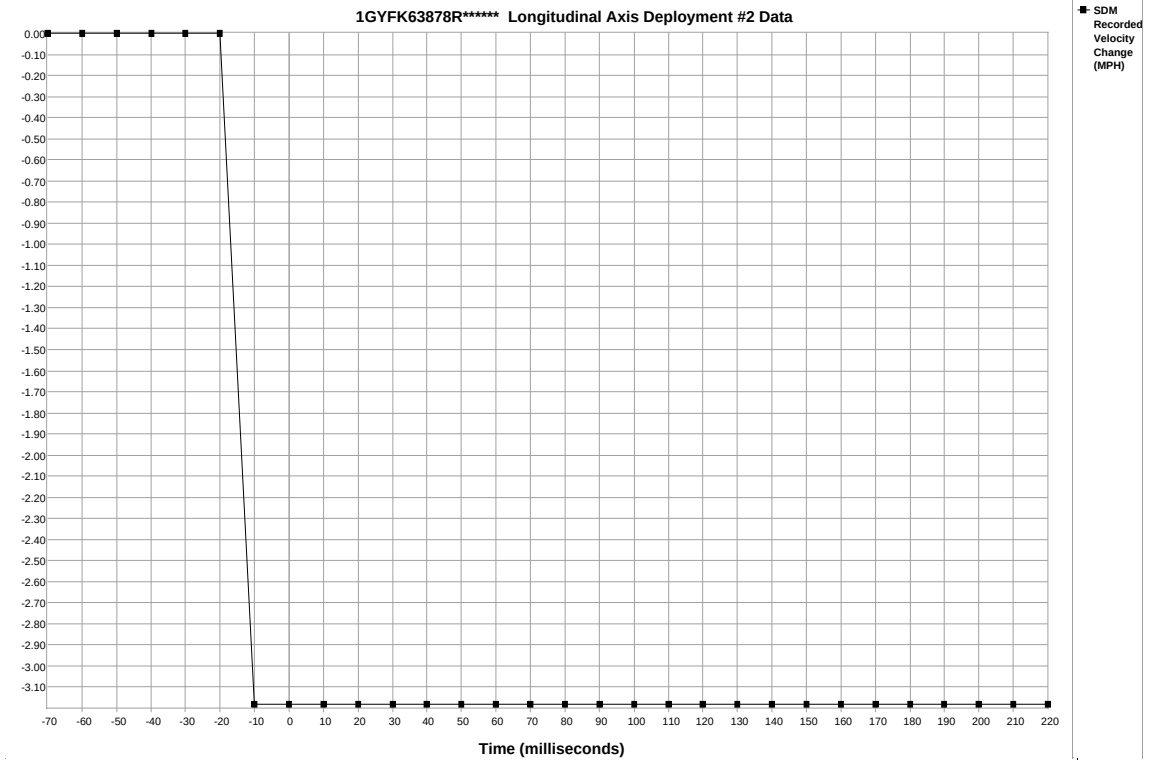


Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Lateral Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.64	0.64	0.64	0.64	0.64	1.27	1.27	1.27	1.27	1.27
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Lateral Axis Recorded Velocity Change (MPH)	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27

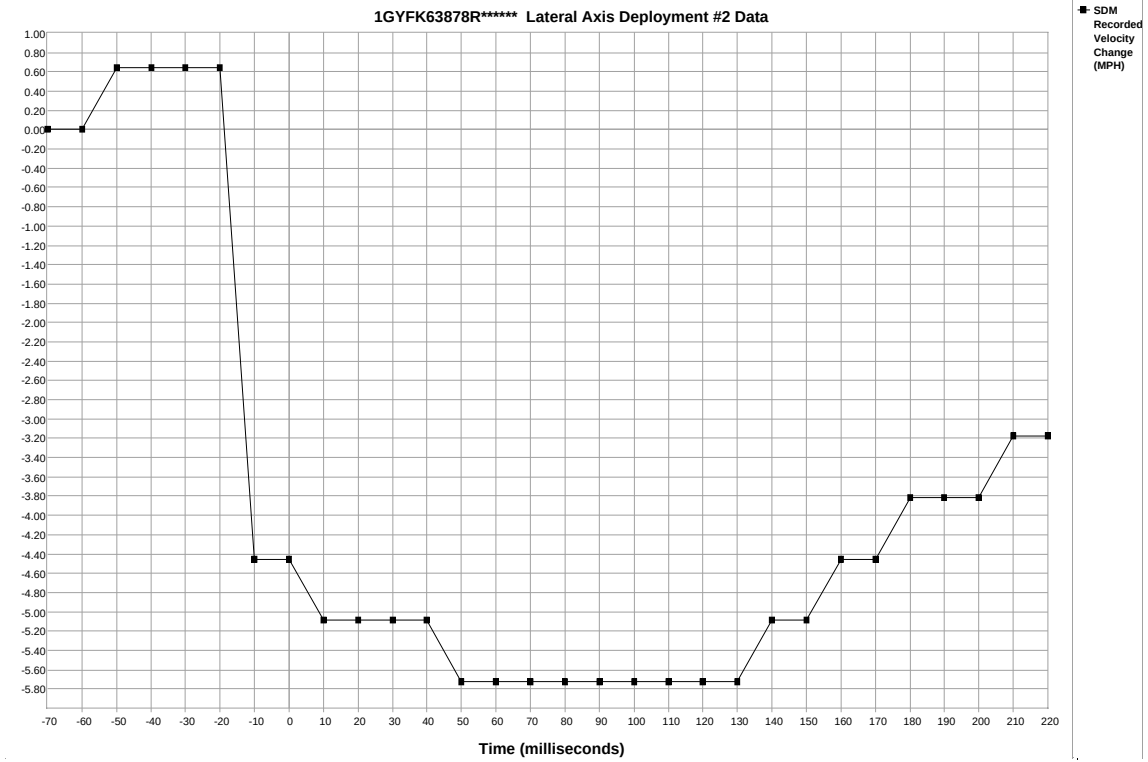
System Status At Deployment #2

Ignition Cycles At Investigation	31504
SIR Warning Lamp Status this Ignition Cycle	ON
SIR Warning Lamp ON/OFF Time Continuously (seconds) this Ignition Cycle	24250
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously this Ignition Cycle	31
Ignition Cycles At Event	31503
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	UNBUCKLED
Passenger's Belt Switch Circuit Status	BUCKLED
Driver Seat Position Switch Circuit Status	Rearward
Passenger Classification Status at Event Enable	Large Occupant Classification Type #1
Passenger Air Bag Indicator Status at Event Enable	ON
Diagnostic Trouble Codes at Event, fault number: 1	B0012-0E
Diagnostic Trouble Codes at Event, fault number: 2	B0015-04
Diagnostic Trouble Codes at Event, fault number: 3	B0022-04
Diagnostic Trouble Codes at Event, fault number: 4	B0052-00
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)	637.5
Passenger Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec)	637.5
Rollover Occupant Containment Enable Status	Enabled
Side Air Bag Deployment Status	Side Air Bag(s) Were First Commanded to Deploy Due to Rollover Event
Rollover Sensor Status	Rollover Event
Time From Rollover Event Enable to Deployment (ms)	4360
Crash Record Locked	Yes
Deployment Event Recorded in the Non-Deployment Record	Yes
Vehicle Event Data (Pre-Crash) Associated With This Event	No
SDM Synchronization Counter	31503
Time Between Events (sec)	0.0
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	Yes
Passenger Pretensioner Deployment Loop Commanded	Yes
Driver Side Deployment Loop Commanded	No
Passenger Side Deployment Loop Commanded	No
Second Row Left Side Deployment Loop Commanded	No
Second Row Right Side Deployment Loop Commanded	No
Driver (Initiator 1) Roof Rail/Head Curtain Loop Commanded	Yes
Passenger (Initiator 1) Roof Rail/Head Curtain Loop Commanded	Yes
Driver (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 3) Roof Rail/Head Curtain Loop Commanded	Yes
Passenger (Initiator 3) Roof Rail/Head Curtain Loop Commanded	Yes
Driver Knee Deployment Loop Commanded	No

Passenger Knee Deployment Loop Commanded	No
Second Row Left Pretensioner Deployment Loop Commanded	No
Second Row Right Pretensioner Deployment Loop Commanded	No
Second Row Center Pretensioner Deployment Loop Commanded	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	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Longitudinal Axis Recorded Velocity Change (MPH)	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18	-3.18



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	0.64	0.64	0.64	0.64	-4.46	-4.46	-5.09	-5.09	-5.09	-5.09	-5.73	-5.73	-5.73
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Lateral Axis Recorded Velocity Change (MPH)	-5.73	-5.73	-5.73	-5.73	-5.73	-5.73	-5.09	-5.09	-4.46	-4.46	-3.82	-3.82	-3.82	-3.18	-3.18

Hexadecimal Data

\$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	2B	FF	FF	88	87	00	00
\$12	FF	F0	FC	F0	C0	00	00
\$13	FF	30	FC	B0	C0	00	00
\$14	FF	30	FC	B0	C0	00	00
\$15	01	02	03	04	0B	0C	05
\$16	06	00	00	0F	10	00	00
\$17	00	00	00	00	00	00	00
\$18	01	03	04	05	06	07	00
\$19	07	07	07	07	07	07	07
\$1A	07	00	00	07	07	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
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\$28	00	71	88	E9	56	45	04
\$29	02	49	00	00	00	00	00
\$2A	00	91	00	00	00	00	00
\$2B	28	25	50	00	00	00	00
\$2C	7F	7F	7E	7F	7F	7F	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
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\$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	08	00	00	00
\$36	00	00	00	00	00	00	00
\$37	00	00	00	00	00	00	00
\$38	00	00	00	04	00	00	00
\$39	00	00	00	00	00	00	00
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\$3B	80	09	79	00	20	00	00
\$3C	00	FF	7B	10	00	7B	10
\$3D	82	C0	00	00	00	00	00
\$40	00	00	00	00	00	00	00
\$41	00	00	00	00	00	00	90

\$42 0C 0C 0C 0C 0C 00 00
\$43 06 95 06 94 00 00 00
\$44 2D 2D 2D 2D 2E 00 00
\$45 2D 2D 2D 2D 2D 00 00
\$46 2B 82 C0 00 00 00 00
\$50 C0 A5 00 00 00 00 00
\$51 03 0C C0 00 00 00 00
\$52 80 09 79 00 1F 00 00
\$53 FF 7B 0F 7B 0F 00 00
\$54 80 12 0E 80 15 04 00
\$55 80 22 04 80 52 00 00
\$56 00 00 00 00 00 00 00
\$57 00 00 00 00 00 00 00
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\$5C 05 F8 05 F8 05 F8 00
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\$5F 05 F7 05 F7 05 F7 00
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\$64 C9 00 A6 00 00 00 00
\$65 DA A4 01 A0 02 00 00
\$66 00 00 00 00 FF FF 00
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\$91 93 00 00 00 00 00 00
\$92 00 FF FF 06 1C 00 00
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\$9C 0C 01 0F 02 11 02 00
\$9D 13 02 14 02 15 02 00
\$9E 16 02 16 02 16 02 00
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\$A2 16 02 16 02 16 02 00
\$A3 8F FF FF 10 00 00 00
\$A4 00 80 01 20 01 00 00
\$A5 12 42 00 00 00 00 00

\$01 41 48 00 00 00 00 00 00 00 00 00 00 00 00 00
\$02 00 00 00 9C
\$03 41 4A 00 00 00 00 00 00 00 00 00 00 00 00 00
\$04 00 00 00 9C
\$05 41 55 00 00 00 00 00 00 00 00 00 00 00 00 00
\$06 00 00 00 65
\$07 41 54 00 00 00 00 00 00 00 00 00 00 00 00 00
\$08 00 00 00 65
\$09 44 41 00 00 00 00 00 00 00 00 00 00 00 00 00
\$0A 00 00 00 98
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\$0D 30 30 00 00 00 00 00 00 00 00 00 00 00 00 00
\$0E 00 00 00 00

```
$0F 21 64 90 29
$22 64 05
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$25 47 FA FA 4B FA FA FA 4B
$26 47 FA FA 4B FA FA FA 4B
$40 00 00
$42 D6 10 14
$43 00 00 DC 80
$44 F6 28 80 C0 FF 1C
$45 01 01 11 11 60 60 60 60
$46 04 64 04 04 64 04 64 04 04 64 00 00
$47 17 07 08
$B4 41 53 32 35 33 30 4B 4E 38 30 31 36 55 47 53 41
$C1 01 89 91 AC
$C2 01 8B 25 D5
$CB 00 F2 80 32
$CC 00 F2 80 32
$DB 41 41
$DC 41 41
```

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Appendix B: Rollover Sensor Report — 2008 Cadillac Escalade

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	1GYFK63878R*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	DS22020_V1_ROS.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 21.5.1
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 24.3.576
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Roll-over Sensor
Event(s) recovered	Event Record "A"

Comments

No comments entered.

Data Limitations

Recorded Crash Events:

There are two types of recorded crash events. The first is the Non-Rollover Event. A Non-Deployment Event records data but does not deploy the air bag(s). The ROS can store one Non-Rollover Event. This event will be overwritten by the next Non-Rollover Event or by a second Rollover Event.

The second type of ROS recorded crash event is the Rollover Event. The ROS can store up to two different Rollover Events. Rollover Events cannot be overwritten or cleared from the ROS. Once the ROS records two Rollover Events, the ROS must be replaced.

Data:

-The ROS Records Lateral Acceleration, Vertical Acceleration, and Roll Rate data. This data reflects what the sensing system experienced during the recorded portion of the event. For Rollover Events, the ROS will record 750 milliseconds of data before the Deployment criteria is met. For Non-Rollover Events, the ROS will record 750 milliseconds of data before Event Conclusion. Acceleration and Roll Rate data are displayed in SAE sign convention.

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

-ROS 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

-Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if:

- The ROS 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

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

-Event Recorded Last in the Ignition Cycle is used to determine the order of recorded ROS events, if they occur in the same ignition cycle.

-Ignition Cycles Since DTCs Were Last Cleared can record a maximum value of 255 cycles and can only be reset by a scan tool.

-Rollover Occupant Containment Enable Status

Enabled: Indicates that the ROS system enabled after the ROS internal system check

Disabled: Indicates that the ROS system disabled after the ROS internal system check

-Rollover Occupant Containment Enable Override Status

Normal: Indicates that the ROS system enabled after receipt of expected messages from the SDM

Override: Indicates that the ROS system enabled without receipt of expected messages from the SDM (This

- does not inhibit ROS performance)
- Vertical (Z) axis acceleration data is displayed with a positive 1g offset.
 - When reviewing ROS crash data, associated SDM crash data should also be reviewed.
 - All data should be examined in conjunction with other available physical evidence from the vehicle and scene.

Data Source:

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

- Vehicle Status Data (Pre-Crash) is transmitted to the ROS, by various vehicle control modules, via the vehicle's communication network.

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.

01036_ROSB_r005.rft

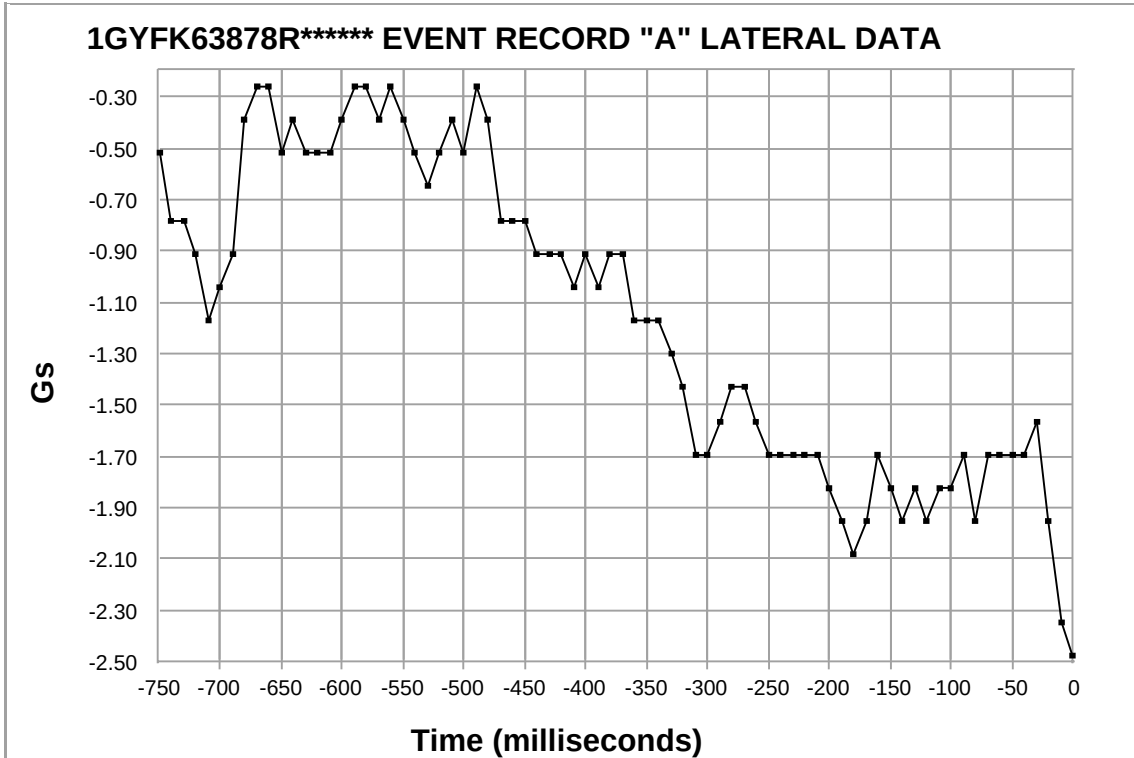
Event Record "A" Data

Crash Record Locked	Yes
Event Recording Complete	Yes
Event Record Type	Rollover
Event Recorded Last in the Ignition Cycle	Yes
SDM Event Synchronization Counter at Event Enable	31503
Ignition Cycles Since DTCs Were Last Cleared	255
Non-Rollover Data Overwritten	No
Vehicle Speed at Event Enable (MPH)	77
Vehicle Power Mode Status at Event Enable	Run
Remote Start Status at Event Enable (If Equipped)	Inactive
Diagnostic Trouble Code at Event Enable, fault number: 1	N/A
Diagnostic Trouble Code at Event Enable, fault number: 2	N/A
Diagnostic Trouble Code at Event Enable, fault number: 3	N/A
Diagnostic Trouble Code at Event Enable, fault number: 4	N/A
Diagnostic Trouble Code at Event Enable, fault number: 5	N/A
Diagnostic Trouble Code at Event Enable, fault number: 6	N/A
Time from Event Enable to Deployment Command Criteria Met (msec)	4360
Rollover Occupant Containment Enable Status	Enabled
Rollover Occupant Containment Enable Override Status	Normal
Energy Source Rollover System Used	Battery
Number of Non-Rollover Events During this Ignition Cycle	0
Deployment Mode	REC

Event Record "A" ROS Recorded Vehicle Lateral Acceleration

Time (ms)	Acceleration (G)
-750	-0.52
-740	-0.78
-730	-0.78
-720	-0.91
-710	-1.17
-700	-1.04
-690	-0.91
-680	-0.39
-670	-0.26
-660	-0.26
-650	-0.52
-640	-0.39
-630	-0.52
-620	-0.52
-610	-0.52
-600	-0.39
-590	-0.26
-580	-0.26
-570	-0.39
-560	-0.26
-550	-0.39
-540	-0.52
-530	-0.65
-520	-0.52
-510	-0.39
-500	-0.52
-490	-0.26
-480	-0.39
-470	-0.78
-460	-0.78
-450	-0.78
-440	-0.91
-430	-0.91
-420	-0.91
-410	-1.04
-400	-0.91
-390	-1.04
-380	-0.91

Time (ms)	Acceleration (G)
-370	-0.91
-360	-1.17
-350	-1.17
-340	-1.17
-330	-1.30
-320	-1.43
-310	-1.69
-300	-1.69
-290	-1.56
-280	-1.43
-270	-1.43
-260	-1.56
-250	-1.69
-240	-1.69
-230	-1.69
-220	-1.69
-210	-1.69
-200	-1.82
-190	-1.95
-180	-2.08
-170	-1.95
-160	-1.69
-150	-1.82
-140	-1.95
-130	-1.82
-120	-1.95
-110	-1.82
-100	-1.82
-90	-1.69
-80	-1.95
-70	-1.69
-60	-1.69
-50	-1.69
-40	-1.69
-30	-1.56
-20	-1.95
-10	-2.35
0	-2.48

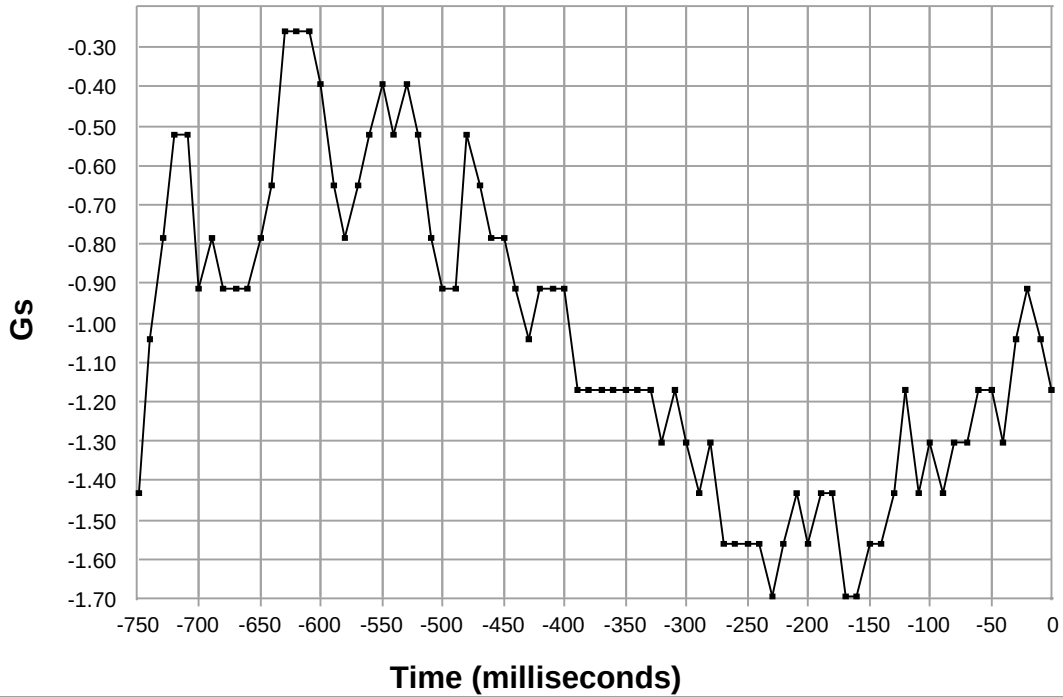


Event Record "A" ROS Recorded Vehicle Vertical Acceleration

Time (ms)	Acceleration (G)
-750	-1.43
-740	-1.04
-730	-0.78
-720	-0.52
-710	-0.52
-700	-0.91
-690	-0.78
-680	-0.91
-670	-0.91
-660	-0.91
-650	-0.78
-640	-0.65
-630	-0.26
-620	-0.26
-610	-0.26
-600	-0.39
-590	-0.65
-580	-0.78
-570	-0.65
-560	-0.52
-550	-0.39
-540	-0.52
-530	-0.39
-520	-0.52
-510	-0.78
-500	-0.91
-490	-0.91
-480	-0.52
-470	-0.65
-460	-0.78
-450	-0.78
-440	-0.91
-430	-1.04
-420	-0.91
-410	-0.91
-400	-0.91
-390	-1.17
-380	-1.17

Time (ms)	Acceleration (G)
-370	-1.17
-360	-1.17
-350	-1.17
-340	-1.17
-330	-1.17
-320	-1.30
-310	-1.17
-300	-1.30
-290	-1.43
-280	-1.30
-270	-1.56
-260	-1.56
-250	-1.56
-240	-1.56
-230	-1.69
-220	-1.56
-210	-1.43
-200	-1.56
-190	-1.43
-180	-1.43
-170	-1.69
-160	-1.69
-150	-1.56
-140	-1.56
-130	-1.43
-120	-1.17
-110	-1.43
-100	-1.30
-90	-1.43
-80	-1.30
-70	-1.30
-60	-1.17
-50	-1.17
-40	-1.30
-30	-1.04
-20	-0.91
-10	-1.04
0	-1.17

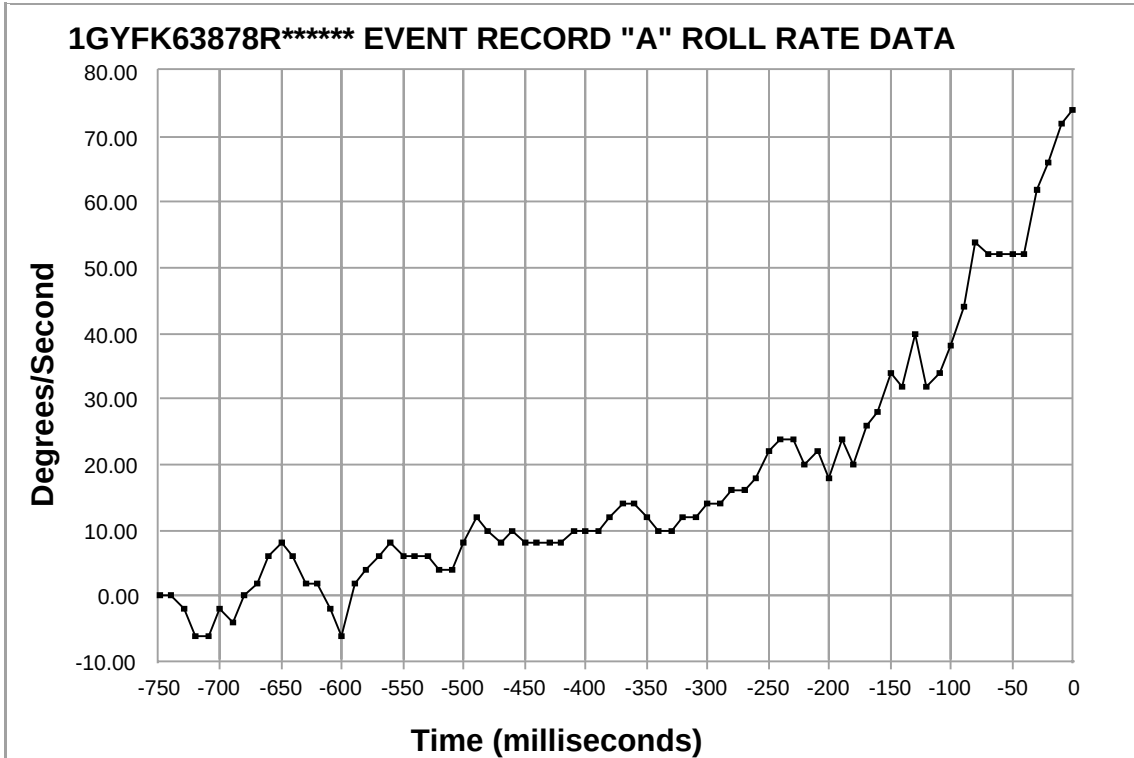
1GYFK63878R*** EVENT RECORD "A" VERTICAL DATA**



Event Record "A" ROS Recorded Vehicle Roll Rate Data

Time (ms)	Roll Rate (degrees/second)
-750	0.00
-740	0.00
-730	-2.00
-720	-6.00
-710	-6.00
-700	-2.00
-690	-4.00
-680	0.00
-670	2.00
-660	6.00
-650	8.00
-640	6.00
-630	2.00
-620	2.00
-610	-2.00
-600	-6.00
-590	2.00
-580	4.00
-570	6.00
-560	8.00
-550	6.00
-540	6.00
-530	6.00
-520	4.00
-510	4.00
-500	8.00
-490	12.00
-480	10.00
-470	8.00
-460	10.00
-450	8.00
-440	8.00
-430	8.00
-420	8.00
-410	10.00
-400	10.00
-390	10.00
-380	12.00

Time (ms)	Roll Rate (degrees/second)
-370	14.00
-360	14.00
-350	12.00
-340	10.00
-330	10.00
-320	12.00
-310	12.00
-300	14.00
-290	14.00
-280	16.00
-270	16.00
-260	18.00
-250	22.00
-240	24.00
-230	24.00
-220	20.00
-210	22.00
-200	18.00
-190	24.00
-180	20.00
-170	26.00
-160	28.00
-150	34.00
-140	32.00
-130	40.00
-120	32.00
-110	34.00
-100	38.00
-90	44.00
-80	54.00
-70	52.00
-60	52.00
-50	52.00
-40	52.00
-30	62.00
-20	66.00
-10	72.00
0	74.00



Hexadecimal Data

\$01	00	00	00	00	00	00	00
\$04	00	00	00	00	00	00	00
\$05	00	00	00	00	00	00	00
\$06	01	00	00	00	00	00	00
\$07	00	80	00	00	7F	80	7F
\$08	82	82	6A	78	79	60	00
\$09	00	00	00	07	00	00	00
\$0A	00	01	01	01	00	00	00
\$10	00	FF	7D	ED	00	7B	0F
\$11	80	A5	E0	7B	0F	FF	00
\$12	7C	00	80	40	00	00	00
\$13	00	00	00	00	00	00	00
\$14	00	00	00	00	00	00	00
\$15	00	00	00	00	00	00	00
\$16	84	75	80	86	78	80	00
\$17	86	7A	81	87	7C	83	00
\$18	89	7C	83	88	79	81	00
\$19	87	7A	82	83	79	80	00
\$1A	82	79	7F	82	79	7D	00
\$1B	84	7A	7C	83	7B	7D	00
\$1C	84	7E	7F	84	7E	7F	00
\$1D	84	7E	81	83	7D	83	00
\$1E	82	7B	7F	82	7A	7E	00
\$1F	83	7B	7D	82	7C	7C	00
\$20	83	7D	7D	84	7C	7D	00
\$21	85	7D	7D	84	7C	7E	00
\$22	83	7A	7E	84	79	7C	00
\$23	82	79	7A	83	7C	7B	00
\$24	86	7B	7C	86	7A	7B	00
\$25	86	7A	7C	87	79	7C	00
\$26	87	78	7C	87	79	7C	00
\$27	88	79	7B	87	79	7B	00
\$28	88	77	7B	87	77	7A	00
\$29	87	77	79	89	77	79	00
\$2A	89	77	7A	89	77	7B	00
\$2B	8A	77	7B	8B	76	7A	00
\$2C	8D	77	7A	8D	76	79	00
\$2D	8C	75	79	8B	76	78	00
\$2E	8B	74	78	8C	74	77	00
\$2F	8D	74	75	8D	74	74	00
\$30	8D	73	74	8D	74	76	00
\$31	8D	75	75	8E	74	77	00
\$32	8F	75	74	90	75	76	00
\$33	8F	73	73	8D	73	72	00
\$34	8E	74	6F	8F	74	70	00
\$35	8E	75	6C	8F	77	70	00
\$36	8E	75	6F	8E	76	6D	00
\$37	8D	75	6A	8F	76	65	00
\$38	8D	76	66	8D	77	66	00
\$39	8D	77	66	8D	76	66	00
\$3A	8C	78	61	8F	79	5F	00
\$3B	92	78	5C	93	77	5B	00
\$3C	DA	D0	80	01	40	00	5D
\$3D	40	00	00	00	00	00	00
\$3E	00	00	00	00	00	00	00
\$3F	00	00	00	00	00	00	00
\$40	00	00	00	00	00	00	00
\$41	00	00	00	00	00	00	00
\$42	00	00	00	00	00	00	00
\$43	00	00	00	00	00	00	00

```
$44 00 00 00 00 00 00 00
$45 00 00 00 00 00 00 00
$46 00 00 00 00 00 00 00
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$5C FF FF 7F FF FF 7F 00
$5D FF FF 7F FF FF 7F 00
$5E FF FF 7F FF FF 7F 00
$5F FF FF 7F FF FF 7F 00
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$6B FF FF 7F FF FF 7F 00
$6C FF FF 7F FF FF 7F 00
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$7B FF FF FF 00 FF FF FF
$7C 00 00 00 00 00 00 00
$7D 00 00 00 00 00 00 00
$7E 00 00 00 00 00 00 00
$7F 00 00 00 00 00 00 00
$90 00 00 00 00 00 00 00
$91 00 00 00 00 00 00 00
$92 00 00 00 00 00 00 00
$93 00 00 00 00 00 00 00
$94 00 00 00 00 00 00 00

$22 90 29
$40 00 40
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$42 19 FF
$45 71 88 E9 56 45 04 02 49
$A1 00 00 00 00
$A2 01 20 84 00 01 20 95 40
$B0 5A
```

```
$B1  00 FE FF
$B2  FF FF FF FF FF
$B4  44 45 35 33 38 32 45 37 31 38 38 30 34 32 34 39
$B7  50 AA FF 01 56
$B8  FF FF FF FF FF
$C1  00 9E 86 20
$C2  00 9E 86 1C
$C3  00 9E 86 25
$CB  01 89 E9 56
$CC  01 89 E9 56
$D1  48 45
$D2  48 46
$D3  4B 45
$DB  41 41
$DC  41 41
```

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DOT HS 813 696
March 2025



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**



16601-022125-v1a