CRASH DATA RESEARCH CENTER

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CALSPAN ON-SITE CERTIFIED ADVANCED 208-COMPLIANT VEHICLE CRASH INVESTIGATION

CASE NO: CA05-008

VEHICLE: 2004 CHEVROLET AVALANCHE

LOCATION: MARYLAND

CRASH DATE: DECEMBER 2003

Contract No. DTNH22-01-C-17002

Prepared for:

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

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points are coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

TECHNICAL REPORT STANDARD TITLE PAGE

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16. Abstract This on-site investigation focused on the performance of the Certified Advanced 208-Compliant (CAC) frontal air bag system of a 2004 Chevrolet Avalanche 4x4 sport utility pickup truck. The CAC safety system consisted of dual-stage frontal air bags for the driver and front right passenger positions, seat track positioning sensors, safety belt buckle switches, and a front right occupant presence sensor. In addition, the Avalanche was equipped with an Event Data Recorder that was downloaded during this on-site investigation. The manufacturer of this vehicle has certified that the Avalanche meets the advanced air bag requirements for Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The 42-year old male driver of the Avalanche was intoxicated by alcohol and was attempting to negotiate a left curve with a downgrade. He relinquished control of the vehicle as it drifted to the right and departed the right road edge. The front right corner area of the Avalanche impacted a large diameter tree which resulted in a Stage 1 deployment of the driver's frontal air bag. The belted driver loaded the safety belt system and the deployed air bag which protected him from potentially serious injuries. The vehicle was towed from the scene and considered a total loss by the insurance company.			
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BACKGROUND

This on-site investigation focused on the performance of the Certified Advanced 208-Compliant (CAC) frontal air bag system of a 2004 Chevrolet Avalanche 4x4 sport utility pickup truck. The CAC safety system consisted of dual-stage frontal air bags for the driver and front right passenger positions, seat track positioning sensors, safety belt buckle switches, and a front right occupant presence sensor. In addition, the Avalanche was equipped with an Event Data Recorder that was downloaded during this on-site investigation. The manufacturer of this vehicle has certified that the Avalanche meets the advanced air bag requirements for Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The 42-year old male driver of the Avalanche was police reported to be intoxicated from alcohol and was attempting to negotiate a left curve with a downgrade. He relinquished control of the vehicle as it drifted to the right and departed the right road edge. The front right corner area of the Avalanche **(Figure 1)** impacted a large diameter tree which resulted in a Stage 1 deployment of the driver's frontal air bag. The belted driver loaded the safety belt system and the deployed air bag which protected him from potentially serious injuries. The vehicle was towed from the scene and considered a total loss by the insurance company.

Figure 1. Front right corner damage to the 2004 Chevrolet Avalanche.

The crash was identified from a list of claims of CAC vehicles that was provided to NHTSA by a major insurance company. The vehicle for this case was located at a local insurance salvage yard and was available for SCI inspection. The insurance company granted approval to the SCI team to download the vehicle's Event Data Recorder (EDR). The vehicle was inspected on February 2, 2005. The EDR output is included as **Attachment A** of this report.

SUMMARY

Crash Site

The crash occurred on a three-lane road during nighttime hours under overcast skies with a light rainfall. The asphalt road surface was wet. There were no streetlights in the area of the crash. The driver noted that due to the rain and the lack of overhead lighting, the roadway and surrounding area was extremely dark. The roadway curved to the left for southbound traffic. Prior to the impact site, the grade transitioned from a hillcrest to a two percent negative grade. The roadway also widened from two lanes to three which

included a designated left turn lane for southbound traffic. There was no stabilized shoulder supporting the southbound travel lane. The northbound lane was bordered by a 4.6 m (5.1') wide asphalt shoulder. The total width of the roadway at the impact site was 9.7 m (31.8'). **Figure 2** is an overall view of the crash site. The Scene Schematic is included as **Figure 11** of this narrative report.

Figure 2. Southbound approach to the crash site.

The Chevrolet Avalanche impacted a 36 cm (14") diameter sycamore tree that was located 2.1 m (6.9') outboard of the painted white edge line of the southbound travel lane. This tree leaned toward the roadway and displayed evidence of the impact as it was debarked in the area of the Avalanche's path of travel. This crash abraded the edges of the remaining bark. The posted speed limit for this area was 64 km/h (40 mph).

Vehicle Data

The involved vehicle in this crash was a 2004 Chevrolet Avalanche 4x4, four-door sport utility pickup truck. The vehicle was manufactured in Mexico on 9/03 and was identified by Vehicle Identification Number (VIN): 3GNEK12T84G (production number deleted). The Avalanche was powered by a conventionally mounted 5.3 liter, V-8 gasoline engine linked to a four-speed automatic transmission with overdrive. The transmission selector lever was column mounted. The service brakes were power-assisted four-wheel disc with an anti-lock braking system (ABS). The vehicle was equipped with OEM five-spoke alloy wheels and Firestone Wilderness LE tires; size P265/70R16 with an S speed rating. The manufacturers recommended tire pressure was 241 kPa (35 PSI). The specific tire data at the time of the SCI inspection was as follows:

Position	Measured Pressure	Measured Tread Depth	Damage
Left Front	217 kPa (31.5 PSI)	8 mm (10/32")	None
Left Rear	217 kPa (31.5 PSI)	6 mm (8/32")	None
Right Front	0 kPa	7 mm (9/32")	Inner bead of alloy wheel fracture, 18 cm cut of inner tire side wall
Right Rear	141 kPa (20.5 PSI)	6 mm (8/32")	None

The interior of the Avalanche was equipped with a cloth covered split bench seat with separated seat backs and a center fold down seat back that converted to a center seat position. Both outboard positions were equipped with adjustable head restraints that were adjusted to the full-down positions. The driver's seat was power-adjustable. The steering wheel was tilt-adjustable.

The second row seat was a 60/40 split bench with forward folding seat backs. The rear outboard positions were equipped with adjustable head restraints while the center rear position incorporated a low profile integrated head restraint. The two outboard seated positions were equipped with Lower Anchors and Tethers for CHildren (LATCH).

Crash Sequence

Pre-Crash

The 42-year old male driver of the 2004 Chevrolet Avalanche pickup truck was traveling in a southerly direction on the two lane roadway at an EDR recorded speed of 51 km/h (32 mph) at -5 seconds prior to Algorithm Enable (AE). He ascended a positive grade and a hillcrest and attempted to negotiate a left curve as the roadway transitioned to a negative grade. The driver allowed the vehicle to drift wide right as it departed the southbound travel lane onto the grassy roadside. A tire mark, probably the right front tire of the Avalanche, was present on the roadside. This mark, which gouged the soft soil, began 21.7 m (71.2') north of the struck tree and faded at 10 m (32.9') north of the tree **(Figure 3)**. A subtle rolling tire mark continued to the base of the tree. The driver, although intoxicated, claimed to have braked in an attempt to avoid the crash. The EDR recorded a brake input at -1 second prior to AE.

Figure 3. Right front tire mark and the struck tree.

Crash

The front right corner area of the Avalanche impacted the 35 cm (14") diameter tree resulting in a direction of force of 12 o'clock. The initial contact involved the front corner of the bumper fascia and the leading edge of the right front fender. There was minor structural involvement at the corner of the vehicle. As these components crushed, the vehicle continued forward engaging the right corner of the upper radiator support and the right front tire and wheel. The leading edge of the front fender was crushed 101 cm (39.9") rearward. At this point, the fender concealed the right A-pillar; however, the impact crushed the pillar rearward resulting in approximately 33 cm (13") of rearward displacement of the lower A-pillar.

The corner impact involved two planes of damage; therefore this crash was outside the scope of the WINSMASH reconstruction program. Results based on the frontal crush alone would be under representative of the damage. The EDR recorded a longitudinal delta V of – 22.8 km/h (-14.18 mph), which based on SCI experience, appears to be low for this crash. This maximum delta V was recorded at 210 ms of AE. A Stage 1 deployment command was triggered at 52.5 ms of AE for the driver's CAC air bag. The front right air bag was suppressed by the unoccupied seat.

A pocketing effect occurred as the vehicle crushed to maximum engagement. As a result, the Avalanche rotated in a clockwise direction as it separated from the tree. The vehicle

rotated onto the grassy area adjacent to the west roadside. The frontal area of the Avalanche impacted and fractured a sign post that was located 1.3 m (4.3') outboard of the road edge. The vehicle came to rest 8.5 m (27.9') south of the struck tree. At rest, the Chevrolet was facing in a southwesterly direction and had rotated approximately 37 degrees CW from impact to rest.

Post-Crash

As the vehicle came to rest, the driver unbuckled the integrated safety belt system and opened the left front door and exited the vehicle unassisted. Military police and emergency medical personnel arrived on-scene. The driver complained of a sore knee and a knuckle laceration (aspects unknown) and refused medical treatment. He was transported from the scene by the military police and subsequently arrested for driving while intoxicated. His reported BAC was .17.

Vehicle Damage

Exterior

The front right corner area of the Avalanche impacted the tree resulting in moderate damage to the frontal and right side planes. The bumper fascia, grille, and right headlamp assembly were removed from the vehicle prior to the SCI inspection. Maximum crush was located at the leading edge of the right front fender and measured 101 cm (39.9"). The direct contact damage along the frontal plane could not be determined from the remaining bumper fascia; therefore, the damage width was measured at the hood face. The contact began 62 cm (24.25") right of the vehicle's centerline and extended 33 cm (13") to the right corner. The direct and induced damage width extended across the full frontal width of the bumper beam and measured 168 cm (66"). The bumper beam and upper radiator support were deformed by the front right corner impact and required independent crush profiles **(Figure 4)**. The bumper beam crush was as follows: C1 = 0 cm, C2 = 0 cm, C3 = 0 cm, C4 = 3 cm (1.1"), C4 = 11 cm (4.5"), C5 = 31 cm (12.1"). The profile at the level of the upper radiator was as follows: C1 = 0 cm, C2 = 1 cm (0.3"), C3 = 5 cm (2"), C4 = 10 cm (4.1"), C5 = 19 cm (7.6"), C6 = 39 cm (15.4").

Figure 4. Overhead view of the frontal crush profiles.

Figure 5. Lateral view of the extent of crush to the right A-pillar.

The direct contact damage continued past the corner area of the frontal plane. The tree engaged the right front tire and wheel and extended into the right A-pillar **(Figure 5)**.

The right side wheelbase was reduced in length by 17 cm (6.7”). Additionally, the inner bead of the right front alloy wheel was fractured and the inner sidewall of the tire was cut from tree engagement. The Collision Deformation Classification (CDC) for this impact event was 12-FREE-6.

The driver opened the left front door post-crash; however, due to body distortion, the door would not re-latch. The right front door was jammed closed. The left rear door and the tailgate remained closed during the crash and remained operational post-crash. The right rear door was restricted at the right B-pillar and would open approximately 3 cm (1”) and re-latch.

The windshield was cracked full width and height due to the rearward displacement of the right A-pillar. There was no bond separation. The right front door glazing was shattered by deformation. All remaining side and backlight glass was intact. The vehicle was not equipped with a sunroof.

Interior

The interior of the Chevrolet Avalanche sustained moderate damage as a result of the frontal impact with the tree and driver contact with interior components. The interior space was reduced in size by intrusion of numerous components. Maximum intrusion involved 33 cm (13”) of rearward displacement of the right instrument panel and the lower right A-pillar. The intruding components **(Figure 6)** are identified in the following table:

Figure 6. Passenger compartment intrusion.

Position	Component	Direction	Magnitude
Front left	Face of instrument cluster	Rearward	3 cm (1”)
Front left	Knee bolster	Rearward	2 cm (0.75”)
Front center	Mid instrument panel	Rearward	14 cm (5.5”)
Front right	Mid instrument panel	Rearward	25 cm (10”)
Front right	Right A-pillar/IP	Rearward	33 cm (13”)
Front right	Windshield header	Rearward	10 cm (4”)
Front right	Toe pan	Rearward	Unknown

The driver’s knees and lower legs contacted and scuffed the knee bolster **(Figure 7)** and the parking brake release lever. These contacts did not produce residual damage. He loaded the manual safety belt system and loaded through the deployed air bag. This loading force was absorbed by the steering wheel flange which deformed, identified by a change in the gap between the steering wheel and the column **(Figure 8)**. The left side

was closed while the right side of this gap was opened to 5 mm (0.4”). There was no compression of the energy absorbing steering column.

Figure 7. Driver knee scuffs to bolster.

Figure 8. Bending of steering wheel flange.

Manual Safety Belt Systems

The Avalanche was configured as a six-passenger vehicle. The front outboard safety belt systems were integrated into the front seat backs. Both systems utilized continuous loop webbing with sliding latch plates. The driver’s side retractor was an Emergency Locking Retractor (ELR) while the right side was a switchable ELR/Automatic Locking Retractor (ALR). There was no loading evidence on the belt associated with the crash. The center front position was equipped with a lap belt and a locking latch plate.

The three rear seat belt systems utilized ELR/ALR retractors with sliding latch plates and continuous loop webbing. The outboard systems were incorporated into the B-pillars while the center rear was integrated in the seat back.

Certified Advanced 208-Compliant Frontal Air Bag System

Figure 9. Deployed Stage 1 driver’s air bag.

The 2004 Avalanche was equipped with a Certified Advanced 208-Complaint (CAC) frontal air bag system for the driver and front right passenger positions. The system consisted of dual-stage air bags, seat track positioning sensors, safety belt buckle switches, and a front right occupant presence sensor. The front right seat was not occupied; therefore the front right air bag was suppressed. The status of the front right air bag was displayed in the rear view mirror. The manufacturer of this vehicle has certified that the Avalanche meets the advanced air bag requirements for FMVSS No. 208. The driver’s air bag deployed from an I-configuration module cover that was incorporated within the 4-spoke steering wheel rim **(Figure 9)**. The flaps measured 11 cm (4.5”) in height, 7 cm (2.75”) in width at the top and 5 cm (2”) in width at the bottom aspect. The air bag membrane was 62 cm (24.5”) in diameter and was tethered by two wide band straps at the 3 and 9 o’clock positions. The bag was vented by two 3 cm (1.25”) diameter

ports located at the 12 o'clock sector of the air bag, 10 cm (4") forward of the peripheral seam. There was no driver contact evidence or damage to the deployed air bag membrane.

Event Data Recorder

The Event Data Recorder (EDR) in the 2004 Avalanche was downloaded through the J1962 connector that was located under the knee bolster. Power was applied to the vehicle by reconnecting the cut battery cables **(Figure 10)**. The EDR was downloaded using the Vetronix Crash Data Retrieval tool and software version 2.5.

Figure 10. Reconnected battery cables and engine compartment fuse box.

The EDR recorded a single Deployment File at ignition cycle 2113. This download occurred at cycle 2122. The Pre-Crash data indicated the driver was traveling at 51-55 km/h (32-34 mph) -5 to -2 seconds prior to Algorithm Enable (AE). He applied a brake input at approximately -1 second prior to AE. The recorded vehicle speed at this time was reduced to 42 km/h (26 mph). The crash data yielded a recorded maximum longitudinal velocity change of -23 km/h (-14.18 mph) at 210 ms of AE. The system commanded a Stage 1 deployment of the driver's air bag at 52.5 ms of AE. There was no front right passenger; therefore the air bag for this position was suppressed. The driver's belt status was reported as Buckled.

Driver Demographics/Data

Age/Sex:	42 year old/Male
Height:	175 cm (69")
Weight:	77 kg (170 lb)
Eyewear:	Prescription eyeglasses
Manual Safety Belt Usage:	Integrated 3-point lap and shoulder belt
Usage Source:	Vehicle inspection, EDR output
Egress from Vehicle:	Exited unassisted through left front door
Mode of Transport:	Police vehicle
Type of Medical Treatment:	None, refused treatment

Driver Injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Source
Minor laceration over a knuckle (NFS)	Minor (790602.1,9)	Instrument panel (probable)
Sore knee	Not code able under AIS	Knee bolster

Source – Police report

Driver Kinematics

The 42-year old male driver of the 2004 Chevrolet Avalanche was seated in a mid track position with the seat back reclined to a measured angle of 14 degrees. In this adjusted position, the horizontal distance between the center of the driver air bag module and the seat back support was 45 cm (17.75"). The driver was wearing a windbreaker, denim jeans and eyeglasses. He was restrained by the manual integrated 3-point lap and shoulder belt system. Belt usage was determined by the minimal contact evidence within the vehicle and supported by the EDR output. There was no distinct loading evidence on the belt system. Although the driver was legally intoxicated with a police reported BAC of .17, he stated that he had both hands positioned on the steering wheel rim and was seated in an upright posture.

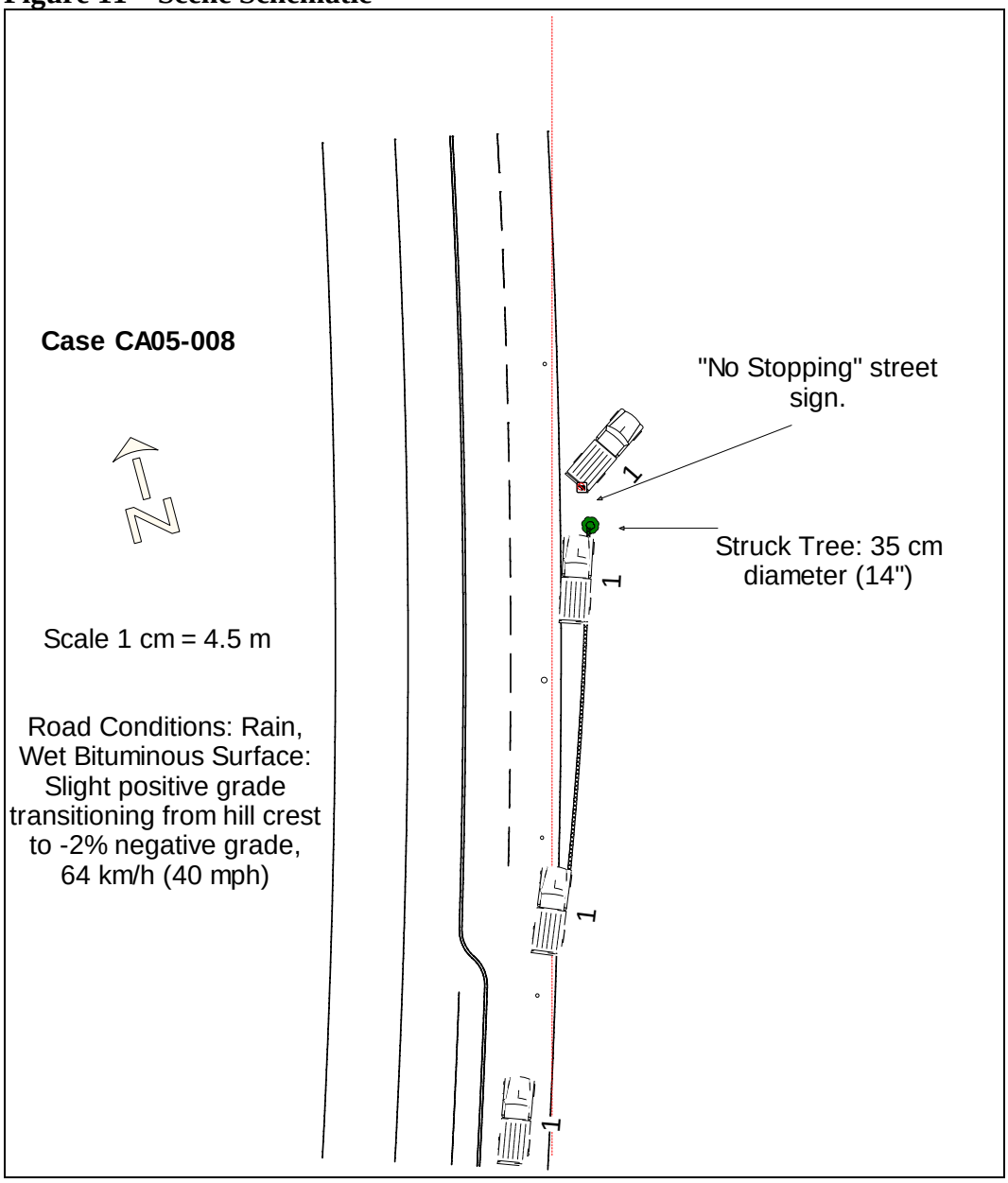
At impact with the tree, the frontal air bag deployed. The EDR output identified a Stage 1 deployment at 52.5 ms of AE. The driver responded to the frontal crash forces by initiating a forward trajectory and loading the integrated safety belt system and the deployed driver's air bag. His loading force was transmitted through the safety systems and into the steering wheel rim. The steering wheel flange was deformed which resulted in a change of the gap between the steering wheel and the column. This gap was narrower on the left side than on the right. There was no compression of the steering column shear brackets. The combination of safety systems prevented the driver from contact with the steering assembly and from possible serious injury.

Due to his mid track seat position, the driver's knees contacted the knee bolster. His left knee scuffed the bolster as his lower leg scuffed the parking brake release lever. The driver's right knee scuffed the bolster at the base of the steering column. An additional leg scuff was noted to the lower right aspect of the bolster panel. Although the driver denied injury during the SCI interview, the Police Accident Report (PAR) noted that the driver complained of a sore knee. This was probably related to the bolster contact.

His hand(s) probably separated from the steering wheel rim. The investigating officer noted in his report that the driver sustained a lacerated knuckle to an unspecified hand. This probably resulted from contact with the instrument panel. There was no contact evidence to support this injury source.

Following the crash, the driver exited the vehicle unassisted and waited for police to arrive on scene. He refused medical treatment as he complained of the knuckle laceration and the sore knee.

Figure 11 – Scene Schematic



Attachment A – 2004 Chevrolet Avalanche EDR Report

CDR File Information

Vehicle Identification Number	3GNEK12T84G******
Investigator	TS
Case Number	CA05-008
Investigation Date	Wednesday, February 2 2005
Crash Date	Thursday, December 23 2004
Filename	CA05-008EDR.CDR
Saved on	Wednesday, February 2 2005 at 11:41:45 AM
Collected with CDR version	Crash Data Retrieval Tool 2.50
Reported with CDR version	Crash Data Retrieval Tool 2.900
Event(s) recovered	Deployment

SDM Data Limitations

SDM Recorded Crash Events:
There are two types of SDM recorded crash events. The first is the Non-Deployment Event. A Non-Deployment Event is an event severe enough to "wake up" the sensing algorithm but not severe enough to deploy the air bag(s). It contains Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded vehicle forward velocity change. This event will be cleared by the SDM after the ignition has been cycled 250 times.
The second type of SDM recorded crash event is the Deployment Event. It also contains Pre-Crash and Crash data. The SDM can store up to two different Deployment Events, if they occur within 25.4 seconds of one another. Deployment Events cannot be overwritten or cleared from the SDM. Once the SDM has deployed the air bag, the SDM must be replaced.
The data in the Non-Deployment Event file will be locked after a Deployment Event, if the Non-Deployment Event occurred within 5 seconds before the Deployment Event. If multiple Non-Deployment Events occur within 5 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 multiple Non-Deployment Events occur within 5 seconds of each other (but not necessarily all within 5 seconds of the Deployment Event), and subsequent Non-Deployment Events are less severe than prior Non-Deployment Events, and the last of the multiple Non-Deployment Events occurs within 5 seconds of a Deployment Event, then the most severe of the Non-Deployment Events (which may have occurred more than 5 seconds prior to the Deployment Event) will be recorded and locked.

SDM Data Limitations:
-SDM Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Forward Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle forward velocity change. For Deployment Events and Deployment Level Events, the SDM will record 100 milliseconds of data after deployment criteria is met and up to 50 milliseconds before deployment criteria is met. For Non-Deployment Events, the SDM will record the first 150 milliseconds of data after algorithm enable.
-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has been interrupted and not fully written.
-SDM Recorded Vehicle Speed accuracy can be affected if the vehicle has had the tire size or the final drive axle ratio changed from the factory build specifications.
-Brake Switch Circuit Status indicates the status of the brake switch circuit.
-Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if the SDM receive an invalid message from the module sending the pre-crash data.
-Driver's and Passenger's Belt Switch Circuit Status indicates the status of the seat belt switch circuit. If the vehicle's electrical system is compromised during a crash, the state of the Belt Switch Circuit may be reported other than the actual state.
-The Time Between Non-Deployment and 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 Associated with this Record: This parameter will indicate whether one or more associated events preceded the recorded event.
-One or More Associated Events Not Recorded: If a single event is recorded, this parameter will indicate whether one or more associated events, prior to the recorded event, was not recorded.
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.
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.

SDM 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 once a second by the Powertrain Control Module (PCM), via the vehicle's communication network, to the SDM.
-Brake Switch Circuit Status data is transmitted once a second by either the ABS module or the PCM, via the vehicle's

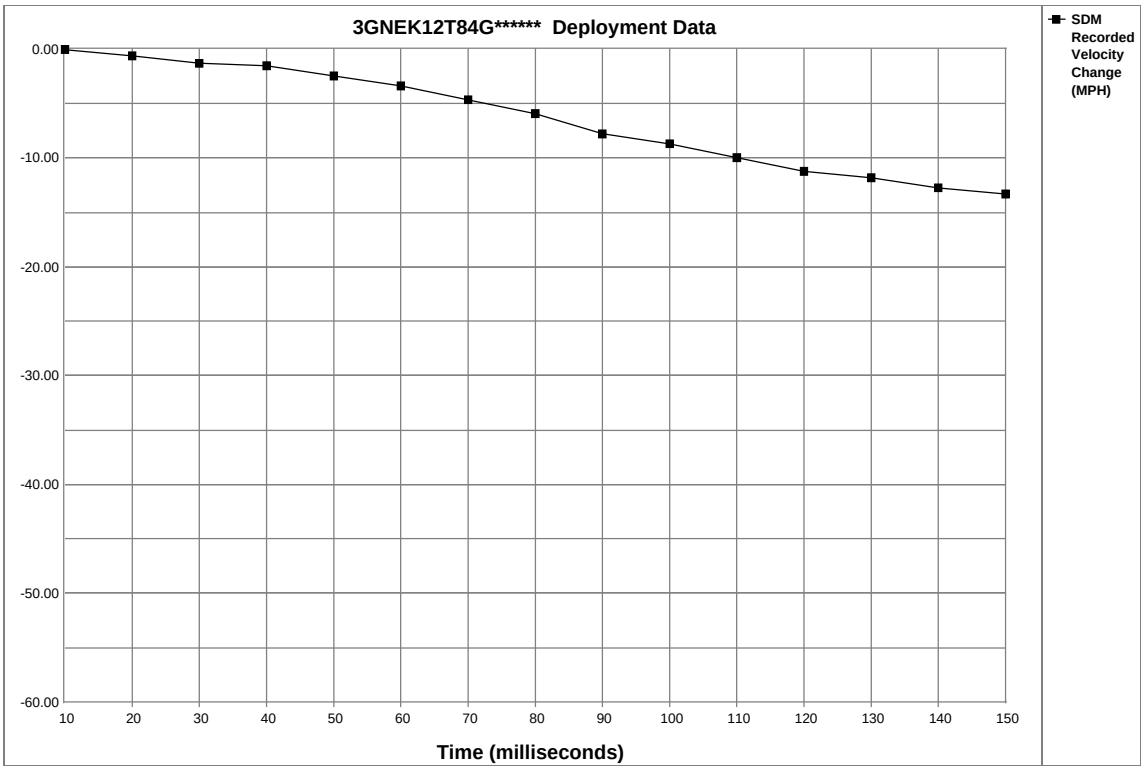
communication network, to the SDM.
-The SDM may obtain Belt Switch Circuit Status data a number of different ways, depending on the vehicle architecture. Some switches are wired directly to the SDM, while others may obtain the data from various vehicle control modules, via the vehicle's communication network.

System Status At Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Passenger's Belt Switch Circuit Status	UNBUCKLED
Passenger Seat Position Switch Circuit Status	Rearward
Ignition Cycles At Deployment	2113
Ignition Cycles At Investigation	2122
Maximum SDM Recorded Velocity Change (MPH)	-14.18
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	210
Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	52.5
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)	Suppressed
Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
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	32	960	0
-4	33	1792	0
-3	34	1024	0
-2	34	1024	0
-1	26	768	0

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



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	0.00	-0.62	-1.24	-1.55	-2.48	-3.41	-4.65	-5.89	-7.75	-8.68	-9.92	-11.16	-11.78	-12.71	-13.33

Hexadecimal Data

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$02	F1	F1	00	00	A8	00
$03	41	53	33	32	35	33
$04	4B	42	51	57	43	31
$05	30	33	36	4A	33	35
$06	15	18	22	71	00	00
$07	32	03	31	56	00	00
$08	41	44	75	06	56	32
$09	67	31	34	37	5A	32
$0A	41	44	75	06	56	32
$0B	67	31	34	38	34	50
$0C	00	00	00	00	00	00
$0D	00	00	00	00	00	00
$0E	00	00	00	00	00	00
$0F	00	00	00	00	00	00
$10	FE	F6	FC	00	00	00
$11	80	80	80	79	79	79
$12	96	01	00	3C	3C	00
$13	FF	02	00	00	00	00
$14	1D	1D	00	00	64	40
$15	FA	FA	FA	FA	FA	FA
$16	FA	FA	FA	FA	FA	FA
$17	FA	FA	00	00	00	00
$18	00	0F	05	EC	F5	00
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$1D	00	00	00	00	00	00
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$26	FF	FF	FF	FF	FF	FF
$27	FF	FF	FF	FF	FF	FF
$28	FF	FF	FF	FF	FF	FF
$29	FF	FF	FF	FF	FF	FF
$2A	FF	FF	FF	FF	FF	FF
$2B	FF	FF	FF	FF	FF	FF
$2C	FF	FF	FF	FF	FF	FF
$2D	FF	FF	00	00	00	00
$30	B2	FE	00	00	FF	FF
$31	FF	FF	FF	FF	FF	FF
$32	FF	FF	FF	FF	FF	FF
$33	FF	FF	FF	FF	FF	FF
$34	00	00	33	20	15	05
$35	00	00	00	00	00	00
$36	00	00	00	00	00	00
$37	00	00	00	02	DB	40
$38	54	17	6C	3B	00	00
$39	01	00	00	03	FF	FF
$3A	00	02	04	05	08	0B
$3B	0F	13	19	1C	20	24
$3C	26	29	2B	00	FE	F7
$3D	FE	A5	00	00	00	00
$40	2A	37	36	35	34	00
$41	80	00	00	00	00	00
$42	00	00	0C	10	10	1C
$43	0F	00	7D	80	00	00
$44	FF	FF	FF	FF	FF	FF

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$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
```