On Site Certified Advanced 208-Compliant Investigation / Vehicle to Object
Dynamic Science, Inc. / Case Number: DS03025
2003 GMC 1500 Yukon
Texas
May, 2003

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no responsibility for the contents or use thereof.

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the National Highway Traffic Safety Administration.

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

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

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient Catalog No.
DS03025		

4. Title and Subtitle	5. Report Date
Certified Advanced 208-Compliant Investigation	6. Performing Organization Report No.

7. Author(s)	8. Performing Organization Report No.
Dynamic Science, Inc.	

9. Performing Organization name and Address	10. Work Unit No. (TRAIS)
Dynamic Science, Inc. 530 College Parkway, Ste. K Annapolis, MD 21401	11. Contract or Grant no. DTNH22-01-C-27002

12. Sponsoring Agency Name and Address	13. Type of report and period Covered
U.S. Dept. of Transportation (NRD-32) National Highway Traffic Safety Administration 400 7th Street, SW Washington, DC 20590	14. Sponsoring Agency Code

15. Supplemental Notes

16. Abstract

This on-scene, in-depth investigation focused on the Certified Advanced 208-Complaint vehicle. This single vehicle crash took place during the night time hours in May 2003 at 2215 hours. The weather was clear and the bituminous/asphalt roadway surface was dry and level. It was dark at the time, but the roadway was lighted by overhead luminaires. The crash occurred on the roadside of a four-leg intersection located in a residential neighborhood. The case vehicle is a 2003 GMC 1500 Yukon 4x2 four-door sport utility vehicle and was being driven by a fully restrained 40 year old female. Close inspection of the driver's continuous loop three-point lap and shoulder belt indicated regular usage and evidence of occupant loading. The case vehicle was traveling northbound. The driver approached and then continued into the intersection with the intention of continuing northbound without adhering to the posted stop signs. The case vehicle impacted and then overrode the concrete curbing located at the northeast intersection quadrant. These impacts resulted in tire and rim deformation. The case vehicle continued in a northerly trajectory traveling approximately 9 m (30 ft.) across the lawn of a private residence. The front, center of the case vehicle impacted an oak tree coming to rest engaged with the impacted tree and facing north. The driver of the case vehicle sustained superficial injuries and attempted to leave the crash scene. She was treated at the scene by EMS and did not require transport to a hospital.

17. Key Words	18. Distribution Statement
Certified Advanced 208 Compliant Air bag, deployment	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No of pages	22. Price

Dynamic Science, Inc.
Crash Investigation
Case Number: DS03025

TABLE OF CONTENTS

BACKGROUND:

Description:	This Certified Advanced 208-Compliant case was identified by NHTSA during the review of submitted GES police reports. The police report was relayed to DSI on June 13 with the instructions to locate the case vehicle for the purpose of conducting an on-scene investigation. An on-site investigation was conducted and the data from the Sensing Diagnostic Module (SDM) was downloaded from the case vehicle. All field work was completed on July 7, 2003.
Investigation Type:	On-scene Certified Advanced 208-Compliant Investigation
Crash Location:	Texas
Crash Date:	May, 2003
Notification Date:	June 13, 2003
Field Work Completed:	July 7, 2003

SUMMARY

Crash Site

This on-scene, in-depth investigation focused on the Certified Advanced 208-Complaint (CAC) vehicle. This single vehicle crash took place during the night time hours in May, 2003 at 2215 hours. The weather was clear and the bituminous/asphalt roadway surface was dry and there was an uphill grade. It was dark at the time, but the roadway was lighted by overhead luminaires. The crash occurred on the roadside of a four-leg intersection located in a residential neighborhood. The intersection consists of a two-lane north/south roadway and an adjoining four-lane undivided roadway which extends east and west. The north leg of the intersection is offset from the south leg and requires a steering maneuver for traffic continuing northbound. There are stop signs present at each quadrant of the intersection which control the traffic flow. The roadways at the intersection are bordered by curbing and the posted speed limit for both roadways is 48 km/h (30 mph).

Figure 1. View showing case vehicle's northbound pre-impact trajectory

Figure 2. Front, three-quarter view of 2003 GMC 1500 Yukon SUV

Pre-Crash

The case vehicle is a 2003 GMC 1500 Yukon 4x2 four-door sport utility vehicle and was being driven

by a fully restrained 40 year old female. Close inspection of the driver's continuous loop 3-point (seat integrated) lap and shoulder belt indicated regular usage and evidence of occupant loading. The data from the downloaded SDM indicated that the driver's belt switch status was "BUCKLED". The driver of the case vehicle occupied the leather covered bucket seat that was adjusted between the middle and forward most seat track position. The front left seatback support was adjusted rearward at a 17 degree angle. The case vehicle was traveling northbound. The downloaded SDM non-deployment data indicates that five seconds prior to algorithm enable (AE), the case vehicle was traveling at 87 km/h (54 mph) and the brake switch circuit status was in the "ON" position. The driver approached and then continued into the intersection with the intention of continuing northbound without adhering to the posted stop signs. The driver was familiar with the location and she resides only several blocks from the crash scene.

Figure 3. Close-up views showing curb impacts (Crash Events 1 and 2)

Figure 4. View showing impacted 33 cm (13 in) diameter oak tree and final rest position

Crash

The case vehicle impacted and then overrode the 15.2 cm (6.0 in) high concrete curbing located at the northeast intersection quadrant (refer to Figure 3). These impacts (Crash Events 1 and 2) resulted in tire and rim deformation (12FRWN3 and 12FLWN3). The case vehicle continued in a northerly trajectory traveling approximately 9 m (30 ft) across the lawn of a private residence. The front, center of the case vehicle impacted (12FCEN2) a 33.0 cm (13.0 in) diameter oak tree. The case vehicle came to rest engaged with the impacted tree and facing north (Refer to Figure 4). The maximum crush depth was 48.2 cm (19.0 in) and was located at the vehicle centerline or 10.0 cm (3.9 in) left of C_3.

Figure 5. View of case vehicle showing frontal deformation (maximum crush depth 48.2 cm)

The total change in velocity for the case vehicle was calculated at 32.0 km/h (19.9 mph) utilizing the Barrier algorithm of the WinSmash 2.41 program. The longitudinal delta V was -32.0 km/h

(-19.9 mph) which was well within the threshold necessary for air bag deployment. It should be noted that there is a brush guard affixed to the front of the case vehicle and could enhance the stiffness parameters established for the vehicle. The WinSmash results do appear reasonable and the SDM recorded a deployment velocity change of -30.38 km/h (-18.88 mph) at the 127.5 millisecond mark.

Post-Crash

The driver of the case vehicle sustained superficial injuries as a result of the crash and reportedly had unsuccessfully attempted to change the two front flat tires. After her failed attempt to change the damaged tires, she attempted to leave the crash scene and walk home. Presumably police and EMS personnel had arrived on scene and she was subsequently treated by the EMS personnel and did not require transport to a hospital. The investigating police indicated that there was alcohol involvement, however, did not issue an alcohol analysis test.

VEHICLE DATA - 2003 GMC 1500 Yukon

VIN:	1GKEC13Z13RXXXXXX
Odometer:	8,938 km (5,554 miles)
Engine:	5.3 L / V8
Reported Defects:	None Reported
Cargo:	None

The 2003 GMC 1500 Yukon was equipped with Firestone P265/70R16 Wilderness LE brand tires. The specific tire data is as follows:

Tire	Tread	Measured Pressure	Manufacturer's Recommended Maximum Tire Pressure
LF	8 mm (10/32 in)	0 kPA (0 psi) - flat	303 kPa (44 psi)
LR	9 mm (11/32 in)	221 kPa (32 psi)	303 kPa (44 psi)
RR	9 mm (11/32 in)	228 kPa (33 psi)	303 kPa (44 psi)
RF	9 mm (11/32 in)	0 kPA (0 psi) - flat	303 kPa (44 psi)

The front seating positions in the 2003 GMC 1500 Yukon consisted of leather covered forward facing bucket seats. The front, left seat was adjusted between the middle and forward most seat track position. The seatback was reclined at a 17 degree angle. The front, right seat was adjusted at the middle seat track position and the seatback angle was reclined at a 21 degree angle. The front right seat was unoccupied.

VEHICLE DAMAGE

Exterior Damage - 2003 GMC 1500 Yukon

Damage Description:	Moderate/ Primary Frontal Impact (Highest Delta V): Longitudinal displacement deformation to the front bumper, brush guard, grille and hood. In addition the front, right headlight was broken and deformation was noted to the left fender. Minor/ Secondary Front Wheel/Tire Impacts (Second Highest Delta V): Both the front right and front left tires were deflated due to the initial curb impact. Additionally, the rims on both front wheel assemblies sustained residual damage.	
CDC:	Impact 1 (Third Highest Delta V): 12FRWN3 Impact 2 (Second Highest Delta V): 12FLWN3 Impact 3 (Highest Delta V): 12FCEN2	
Delta V (Highest Delta V):	Total	32.0 km/h (19.9 mph)
	Longitudinal	-32.0 km/h (-19.9 mph)
	Latitudinal	0.0 km/h (0.0 mph)
	Energy	93,563 joules (69,009 ft-lbs)

During impact 3 (highest delta v), the case vehicle sustained 128.0 cm (50.4 in) of direct and induced contact damage that extended across the entire frontal end width of the vehicle. The impact energy was managed by the forward structures of the vehicle. The damaged components included the front bumper fascia and reinforcement bar, brush guard, upper and lower radiator supports, grille area and the hood. In addition the front, right headlight was broken and deformation was noted to the left fender. Six crush measurements were documented at the bumper level: Cl= 0.0 cm (0.0 in), C2= 1.0 cm (0.4 in), C3= 44.0 cm (17.3 in), C4= 41.2 cm (16.2 in), C5= 1.0 cm (0.4 in), C6= 0.0 cm (0.0 in). A Collision Deformation Classification (CDC) of 12FCEN2 was assigned to the damage. The principal direction of force was within the 12 o'clock sector and was an estimated 0 degrees. There was a reduction of approximately 4.0 cm (1.6 in) to both wheelbases. All doors remained closed and operational, and the windshield glazing was cracked from contact with the hood.

Interior Damage - 2003 GMC 1500 Yukon

The interior greenhouse area of the case vehicle was void of any intruding components and the case vehicle's integrity was not compromised (no avenues for ejection through damaged glazing or opened doors). There was a permanent yellow scuff transfer noted to the knee bolster/lower instrument panel located at the front, left drivers position. This scuff mark was due to direct contact from the driver's left leg. The drivers face made contact with the deploying driver's air bag as evidenced by a probable lip stick /facial cosmetic transfer.

MANUAL RESTRAINT SYSTEMS - 2003 GMC 1500 Yukon

The driver's manual restraint system consisted of a seat integrated continuous loop 3-point manual lap and shoulder belt equipped with a sliding latch plate. The emergency locking retractor (ELR) was integrated into the front, left seat back support. The driver's manual 3-point lap and shoulder belt exhibited evidence of historical usage as scratching and striations were noted to the latch plate component. There was evidence of occupant loading as faint melted fabric fibers were noted on the plastic edge of the sliding latch plate loop. The deployment event recorded by SDM reports that the driver's belt switch circuit was "BUCKLED".

The front, right bucket seat, the two 2nd row bucket seats, and the two 3rd row split bench outboard seat positions were equipped with continuous loop three-point manual lap and shoulder belts were equipped with sliding latch plates and switchable/ELR to ALR retractors. The 3rd row middle seat position was equipped with a manual lap belt with a locking latch plate. The two 2nd row bucket seat positions were equipped with lower anchors and top tethers for child safety seats, and original manufacturer belt positioning devices.

FRONTAL AIR BAG SYSTEM - 2003 GMC 1500 Yukon

This vehicle was equipped with an advanced occupant protection system. The system consists of the SDM, dual-level (dual stage) driver and front right passenger air bags, a front right passenger sensing system, seatback mounted side air bags at both front seat positions, and a driver's seat belt latch usage detector. The case vehicle was also equipped with OnStar. The OnStar system can be activated by a button on the rear view mirror. It is not known if the driver of the case vehicle communicated with the OnStar service center after the crash.

Figure 6. Close-up view showing passenger air bag sensing system and OnStar

The driver's air bag deployed at impact with the tree. The driver's air bag module was located in the center hub of the steering wheel rim and had two module cover flaps. The flaps opened in a designed I-configuration. Both module cover flaps measured 8.0 cm (3.1 in) by 12.0 cm (4.7 in). There was no contact evidence on the cover

flaps. The diameter of the driver's air bag measured 61.0 cm (24.0 in) in its deflated state. The driver's air bag had a maximum excursion of 22.0 cm (8.7 in). It had vent ports at the 11 and 1 o'clock positions and two tethers. On the back and top of the air bag membrane was what appeared to be dried blood. On the face of the lower right quadrant of the air bag was what appeared to be smeared lipstick.

Figure 7. View showing deployed front, left (drivers) air bag

Figure 8. Close-up view of the driver's air bag showing lipstick/cosmetic transfer

The front right passenger air bag was a mid-mount design located in the right aspect of the instrument panel. The front right passenger air bag did not deploy due to case vehicle being equipped with a Passenger Sensing System, and the absence of a front right occupant. The Passenger Sensing System is designed to automatically switch the air bag on or off based on a passenger's weight. The system also uses a sensor in the passenger-side seat belt to measure how much tension is exerted by the seat belt when it is being cinched down, another means of determining what may be on the seat. There is an indicator on the rear-view mirror that alerts vehicle occupants to the status of the system at all times. If the light reads "Passenger Air Bag ON," the air bag is programmed to deploy in a frontal crash of sufficient severity. If it reads "Passenger Air Bag OFF," the system has turned off the air bag because it determined either that there is no occupant on the front passenger seat, or that a rear-facing infant seat, a forward-facing child restraint, a booster seat or a smaller person, such as a child who has outgrown child restraints, is present.

The case vehicle is also equipped with seat mounted side air bags at both front bucket seat positions. Neither of the side air bags deployed in this crash.

The air bag system is controlled by the SDM. The primary function of the SDM is to control the deployment of the occupant protection systems. The system records the vehicle's forward velocity change. The SDM will record 100 milliseconds of data after the deployment criteria is met and up to 50 milliseconds of data before deployment criteria is met. The SDM will also record 150 milliseconds of data after non-deployment criteria is met.

Two events were recorded by the SDM, a deployment event at 1666 ignition cycles and a non-deployment event at the same ignition cycles. The non-deployment event probably occurred when the case vehicle overran the concrete curb and "woke" up the system. The Vetronix report indicates the time between non-deployment and deployment event was 1.1 seconds.

Figure 9. Front right Passenger Sensing System

The Vetronix system status at DEPLOYMENT report indicates that:

1. SIR warning lamp status was OFF.
2. The driver's belt switch status was BUCKLED.
3. Ignition cycles at deployment 1666.
4. Ignition cycles at investigation 1679.
5. Maximum SDM recorded velocity change -30.38 km/h (-18.88 mph).
6. Algorithm enable (AE) to maximum SDM recorded velocity change was 127.5 milliseconds.
7. Driver first stage time algorithm enabled to deployment command criteria met 17.5 milliseconds.
8. Driver second stage time algorithm enabled to deployment command criteria met N/A.
9. Passenger first stage time algorithm enabled to deployment command criteria met N/A.
10. Passenger second stage time algorithm enabled to deployment command criteria met N/A.
11. Time between non-deployment and deployment events was 1.1 seconds.
12. Frontal deployment level event counter 1.
13. Event recording complete YES.
14. Multiple events associated with this record YES.
15. One or more associated events not recorded YES.
16. The vehicle speed was 80 km/h (50 mph) 5 seconds before AE, decelerated to 77 km/h (48 mph) 4 seconds before AE, to 68 km/h (42 mph) 3 seconds before AE,

to 38 km/h (30 mph) 2 seconds before AE, and to 35 km/h (22 mph) 1 second before AE.

17. The brake switch status was ON from 5 through 2 seconds before AE, and was OFF 1 second before AE.

The Vetronix system status at NON-DEPLOYMENT report indicates that:

18. SIR warning lamp status was OFF.
19. The driver's belt switch status was BUCKLED.
20. Ignition cycles at deployment 1666.
21. Ignition cycles at investigation 1679.
22. Maximum SDM recorded velocity change -4.81 km/h (-2.99 mph).
23. Algorithm enable (AE) to maximum SDM recorded velocity change was 157.5 milliseconds.
24. Event recording complete YES.
25. Multiple events associated with this record YES.
26. One or more associated events not recorded YES.
27. The vehicle speed was 87 km/h (54 mph) 5 seconds before AE, decelerated to 80 km/h (50 mph) 4 seconds before AE, to 77 km/h (48 mph) 3 seconds before AE, to 68 km/h (42 mph) 2 seconds before AE, to 38 km/h (30 mph) 1 seconds before AE.
28. The brake switch status was ON from 5 through 1 seconds before AE.

OCCUPANT DEMOGRAPHICS - 2003 GMC 1500 Yukon

	Occupant 1
Age/Sex:	40/Female
Seated Position:	Front, Left
Seat Type:	Bucket, leather covered
Height:	Unknown
Weight:	Unknown
Occupation:	Unknown
Pre-existing Medical Condition:	Unknown
Alcohol/Drug Involvement:	Alcohol involvement/ No BAC performed
Driving Experience:	Unknown
Body Posture:	Upright, Facing forward, specifics unknown
Hand Position:	Presumably both hands on steering wheel rim/ specifics unknown
Foot Position:	Right foot depressing the brake pedal
Restraint Usage:	3-point, manual lap and shoulder restraint used, lap and shoulder position of webbing not known
Air bag:	Steering wheel mounted air bag available. Drivers air bag deployed due to the third crash event or highest delta V impact with the 33 cm (13 in.) tree.

OCCUPANT INJURIES -2003 GMC 1500 Yukon

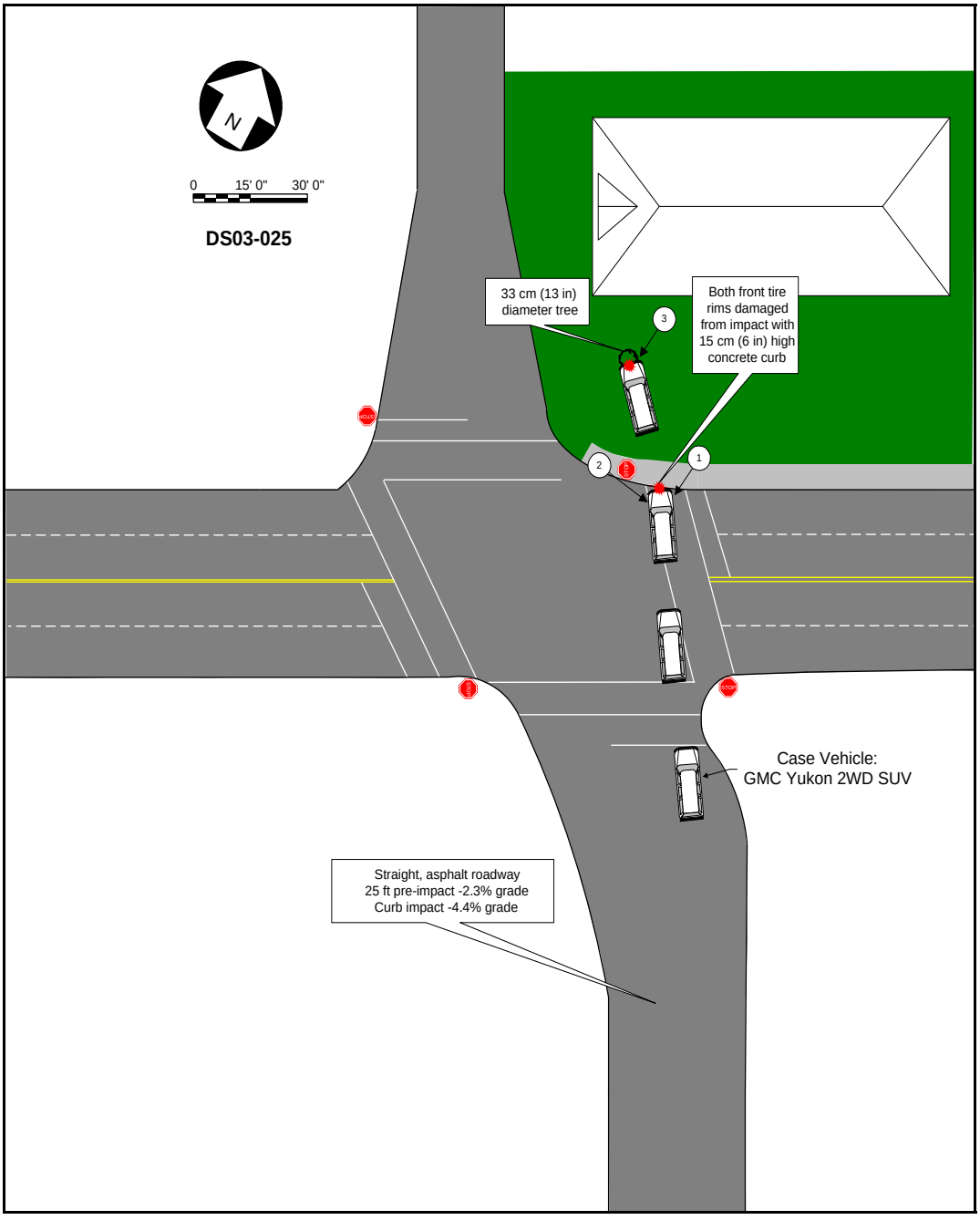
	Injury	OIC Code	Injury Mechanism	Confidence Level
Driver:	Police indicated that the driver sustained “B” type (non-capacitating) injuries.	Unknown	Unknown	Unknown

OCCUPANT KINEMATICS - 2003 GMC 1500 Yukon

The 40 year-old female driver was wearing the continuous loop 3-point manual lap and shoulder restraint in a normal and correct fashion based on loading evidence, occupant contacts and her kinematic pattern. She likely was minimally displaced due to the two front tire/wheel impacts (Crash Events 1 and 2). It is unknown whether the emergency locking retractor engaged due to the tire impacts, however, it is likely that the impacts were of sufficient force for her upper torso to pitch forward.

As the front, center of the case vehicle impacted the 33.0 cm (13.0 in) oak tree (Crash Event 3/ Highest Delta V), the driver responded to the 12 o’clock impact force by moving directly forward. The applied lap belt webbing restricted her lower torso from continued forward movement, however, her left leg contacted the knee bolster shroud as evidenced by a yellow scuff transfer. As her upper torso/chest region was held by the locked shoulder belt, her head and face pitched downward impacting the deployed driver’s air bag. This contact was evidenced by a lip stick/cosmetic transfer (refer to Figures 7 and 8). She rebounded into her respective seatback support and did not lose consciousness as a result of her involvement with the deployed driver’s air bag. The driver unbuckled the lap and shoulder restraint and exited the vehicle unassisted. Her injuries did not require transport to a hospital and the case vehicle was subsequently towed from the crash scene.

ATTACHMENT 1 - SCENE DIAGRAM



ATTACHMENT 2 - Vetronix Report Deployment Event

CDR File Information

Vehicle Identification Number	1GKEC13Z13Rxxxxxx
Investigator	
Case Number	
Investigation Date	
Crash Date	
Filename	DS03-025.CDR
Saved on	Monday, July 7 2003 at 09:29:47 AM
Collected with CDR version	Crash Data Retrieval Tool 2.10
Reported with CDR version	Crash Data Retrieval Tool 2.900
Event(s) recovered	Deployment Non-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

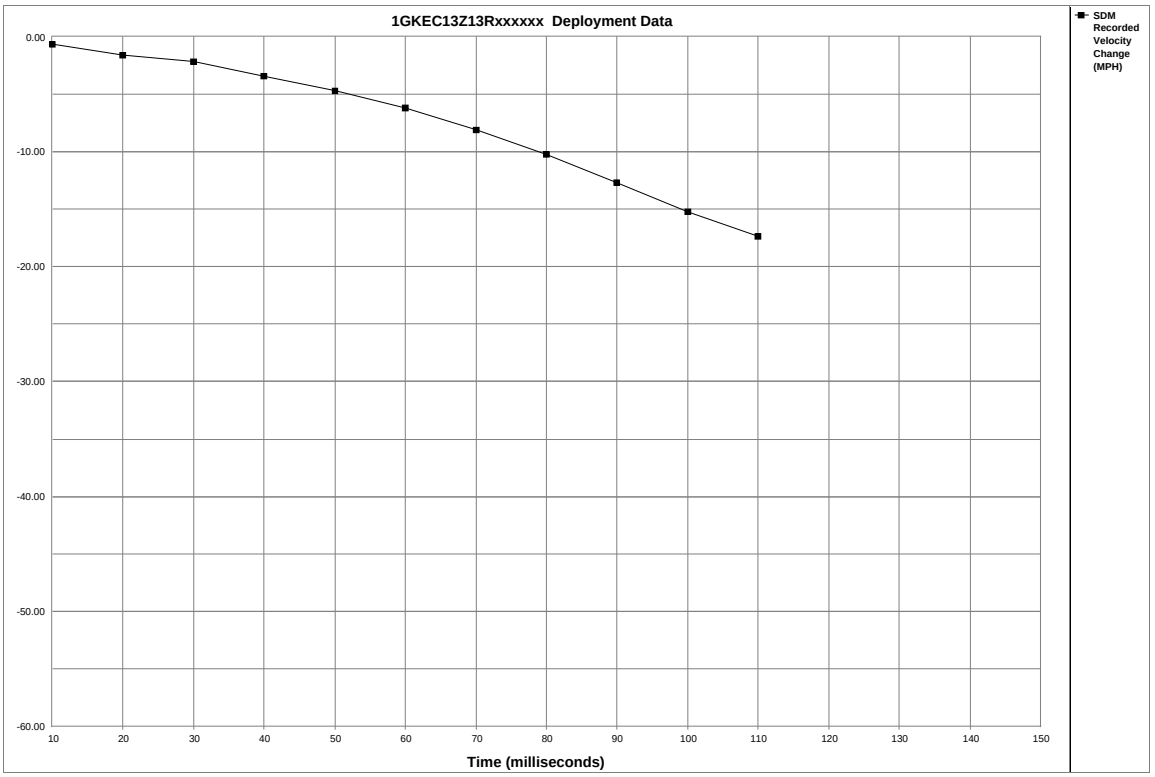
communication network, to the SDM.
-The SDM may obtain Belt Switch Circuit Status data a number of different ways, depending on the vehicle architecture. Some switches are wired directly to the SDM, while others may obtain the data from various vehicle control modules, via the vehicle's communication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

System Status At Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Passenger Seat Position Switch Circuit Status	Rearward
Ignition Cycles At Deployment	1666
Ignition Cycles At Investigation	1679
Maximum SDM Recorded Velocity Change (MPH)	-18.88
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	127.5
Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	17.5
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)	1.1
Frontal Deployment Level Event Counter	1
Event Recording Complete	Yes
Multiple Events Associated With This Record	Yes
One Or More Associated Events Not Recorded	Yes

Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle
-5	50	1280	0
-4	48	1152	0
-3	42	1152	0
-2	30	896	0
-1	22	1152	0

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



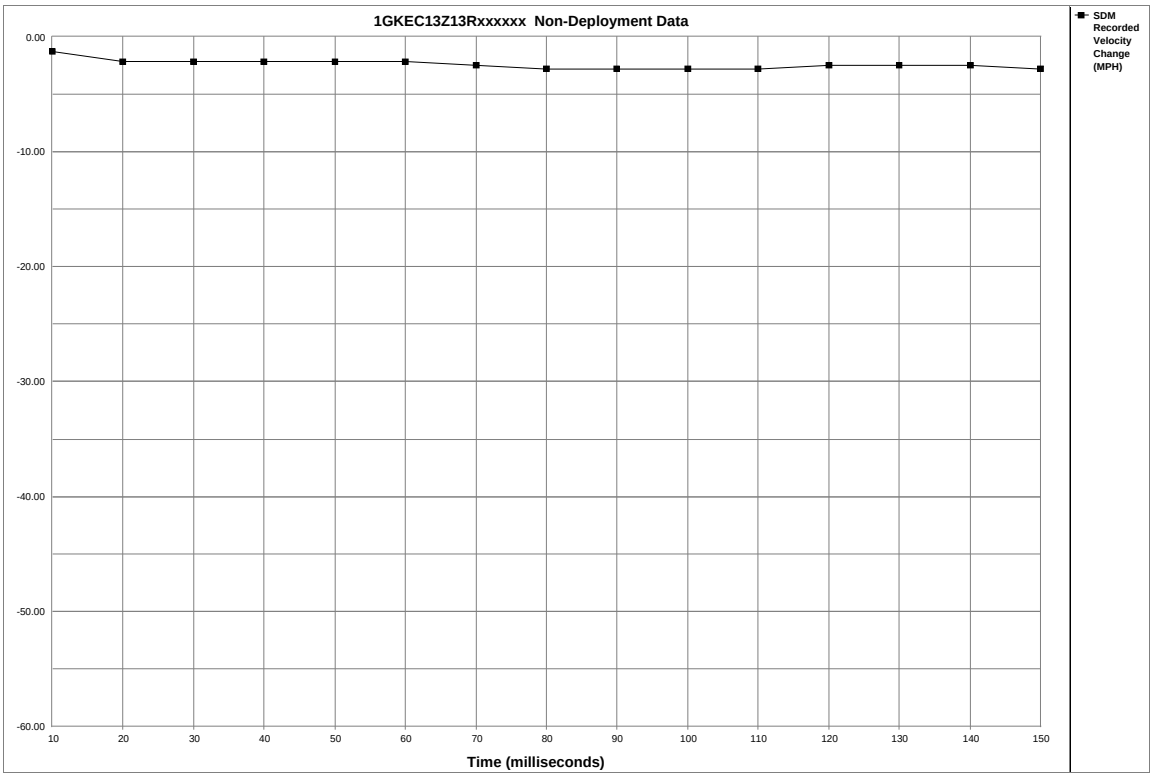
Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	-0.62	-1.55	-2.17	-3.41	-4.65	-6.20	-8.06	-10.23	-12.71	-15.19	-17.36	N/A	N/A	N/A	N/A

System Status At Non-Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Passenger Seat Position Switch Circuit Status	Rearward
Ignition Cycles At Non-Deployment	1666
Ignition Cycles At Investigation	1679
Maximum SDM Recorded Velocity Change (MPH)	-2.99
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	157.5
Crash Record Locked	Yes
Event Recording Complete	Yes
Multiple Events Associated With This Record	Yes
One Or More Associated Events Not Recorded	Yes

Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle
-5	54	1408	0
-4	50	1280	0
-3	48	1152	0
-2	42	1152	0
-1	30	896	0

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



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	-1.24	-2.17	-2.17	-2.17	-2.17	-2.17	-2.48	-2.79	-2.79	-2.79	-2.79	-2.48	-2.48	-2.48	-2.79

Hexadecimal Data

$01	F1	26	C4	F8	B0	F8
$02	F1	F1	3C	3C	A8	00
$03	41	53	32	32	38	30
$04	4B	33	47	36	54	31
$05	30	35	51	59	36	37
$06	15	19	24	44	00	00
$07	32	02	31	56	00	00
$08	41	44	75	06	56	22
$09	81	48	41	41	5A	48
$0A	00	00	00	00	00	00
$0B	00	00	00	00	00	00
$0C	41	55	75	08	58	22
$0D	60	4A	35	38	39	34
$0E	41	55	75	08	58	22
$0F	60	4A	35	42	47	48
$10	FF	2E	80	00	00	00
$11	7F	7F	80	7F	7F	80
$12	9F	00	00	3D	3E	00
$13	FF	02	00	00	00	00
$14	1D	03	05	05	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	3F	55	AC	F1	00
$19	09	00	0A	00	00	64
$1A	00	00	00	00	00	00
$1B	00	00	00	00	00	00
$1C	00	0C	00	00	00	00
$1D	00	00	00	00	00	00
$1F	FE	00	00	00	00	00
$20	9E	FD	00	00	FF	FF
$21	FF	FF	FF	FF	FF	FF
$22	FF	FF	FF	FF	FF	FF
$23	FF	FF	FF	FF	FF	FF
$24	00	00	9A	00	3F	0E
$25	07	00	00	03	FF	FF
$26	04	07	07	07	07	07
$27	08	09	09	09	09	08
$28	08	08	09	00	FF	2F
$29	FC	A5	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	BE	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	30	0F	07	03
$35	00	00	00	00	00	00
$36	00	00	00	00	00	00
$37	00	00	00	03	CD	5B
$38	33	07	61	30	F4	00
$39	01	00	00	03	FF	FF
$3A	02	05	07	0B	0F	14
$3B	1A	21	29	31	38	00
$3C	00	00	00	0B	FF	2F
$3D	FC	A5	00	00	00	00
$40	24	30	43	4D	51	00
$41	7F	00	00	00	00	00
$42	00	00	12	0E	12	12
$43	14	00	7D	80	00	00
$44	30	43	4D	51	57	00

```
$45  FF 00 00 00 00 00
$46  00 00 0E 12 12 14
$47  16 00 7D 80 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
```