

**TRANSPORTATION SCIENCES
CRASH DATA RESEARCH CENTER**

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GENERAL DYNAMICS REMOTE CHILD SAFETY SEAT INVESTIGATION

NASS/SCI COMBO CASE NO. 03-45-065K

VEHICLE – 1999 CHEVROLET SILVERADO

LOCATION - STATE OF TENNESSEE

CRASH DATE – APRIL 2003

Contract No. DTNH22-01-C-17002

Prepared for:

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

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

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<i>16. Abstract</i> <p>This remote investigation focused on the performance of a Cosco Grand Explorer shield booster seat and injury mechanisms for a 16-month-old female seated in the shield booster seat in the front right of a 1999 Chevrolet Silverado. The Chevrolet was equipped with redesigned dual frontal air bags and a front right passenger air bag cut-off switch. The driver air bag deployed as a result of a severe head-on crash with a 1994 Mazda B2300 pickup truck. In addition, the vehicle was equipped with an Event Data Recorder (EDR) that was downloaded by the NASS researcher. The Chevrolet was occupied by a restrained 26-year-old male driver, a restrained 25-year-old female in the front center position, and a 16-month-old female in the front right seated in a shield booster seat that was installed using the lap belt portion of the vehicles lap and shoulder belt system. The driver of the Chevrolet sustained a contusion to the left forearm, bilateral knee abrasions, a left knee contusion and a minor lower leg laceration. He was transported by ambulance to a hospital where he was treated and released. The front center occupant sustained bilateral pulmonary contusions with right occult pneumothorax, a nasal fracture, left orbital fracture, and multiple soft tissue injuries. She was transported by ambulance to a hospital where she was admitted for four days. The front right occupant sustained a closed head injury, C1 and C2 dislocation with a spinal cord contusion (incomplete cord syndrome), bilateral lung contusions, and a Grade III spleen laceration. The child was transported by ambulance to a local hospital where she was admitted for 30 days and was then transferred to a rehabilitation center. It should be noted that the child occupant should have been restrained in a forward facing child safety seat since her weight was below the booster seat's manufacturer recommended specifications.</p>			
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GENERAL DYNAMICS REMOTE CHILD SAFETY SEAT INVESTIGATION
NASS/SCI COMBO CASE NO. 03-45-065K
SUBJECT VEHICLE – 1999 CHEVROLET SILVERADO
LOCATION - STATE OF TENNESSEE
CRASH DATE - April 2003

BACKGROUND

This remote investigation focused on the performance of a Cosco Grand Explorer shield booster seat and injury mechanisms for a 16-month-old female seated in the shield booster seat in the front right of a 1999 Chevrolet Silverado (**Figure 1**). The Chevrolet was equipped with redesigned dual frontal air bags and a front right passenger air bag cut-off switch. The driver air bag deployed as a result of a severe head-on crash with a 1994 Mazda B2300 pickup truck. In addition, the vehicle was equipped with an Event Data Recorder (EDR) that was downloaded by the NASS researcher. The



Figure 1. 1999 Chevrolet Silverado.

The Chevrolet was occupied by a restrained 26-year-old male driver, a restrained 25-year-old female in the front center position, and a 16-month-old female in the front right seated in a shield booster seat that was installed using the lap belt portion of the vehicles lap and shoulder belt system. The driver of the Chevrolet sustained a contusion to the left forearm, bilateral knee abrasions, a left knee contusion and a minor lower leg laceration. He was transported by ambulance to a hospital where he was treated and released. The front center occupant sustained bilateral pulmonary contusions with right occult pneumothorax, a nasal fracture, left orbital fracture, and multiple soft tissue injuries. She was transported by ambulance to a hospital where she was admitted for four days. The front right occupant sustained a closed head injury, C1 and C2 dislocation with a spinal cord contusion (incomplete cord syndrome), bilateral lung contusions, and a Grade III spleen laceration. The child was transported by ambulance to a local hospital where she was admitted for 30 days and was then transferred to a rehabilitation center. It should be noted that the child occupant should have been restrained in a forward facing child safety seat since her weight was below the booster seat's manufacturer recommended specifications.

This crash was identified by the National Automotive Sampling System (NASS) PSU 45 during the weekly review of Police Accident Reports (PAR's). This crash was selected and researched as CDS Case No. 03-45-065K. The NASS PSU performed the vehicle, scene, and booster seat inspections. Due to the presence of a booster seat and the injury severity sustained by the child occupant, NHTSA assigned the tasks of case review and report preparation to the SCI 1 team.

SUMMARY

Crash Site

This two-vehicle crash occurred during the daylight hours of April 2003 in the State of Tennessee. At the time of the crash, there were no adverse weather conditions and the asphalt road surface was dry. The crash occurred on a two-lane local road that was divided by a double-yellow centerline. The roadway was bordered by white fog lines with grass roadsides extending beyond the fog lines. The road curved right with a positive grade for northbound traffic. The east roadside near the area of impact consisted of a gravel access road to railroad tracks and a chain link fence. The posted speed limit was 48 km/h (30 mph).

Vehicle Data – 1999 Chevrolet Silverado

The 1999 Chevrolet Silverado was identified by the Vehicle Identification Number (VIN): 1GCEC14W0X (production sequence omitted). The odometer reading was unknown at the time of the inspection as the vehicle was without power. The Silverado was a two-door, standard cab pickup truck that was equipped with a 4.3-liter V-6 engine, rear-wheel drive, four-speed automatic transmission, four-wheel power-assisted disc brakes with ABS, and daytime running lights. The front tires on the Chevrolet were Cooper Discoverer H/T radials, size P235/75R16. The rear tires were Winston Winner radials, size P235/75R16. The manufacture recommended front and rear tire pressure was 241 kpa (35 psi). The maximum pressure for both front and rear tires was 241 kpa (35 psi). The specific tire data is as follow:

Tire	Measured Pressure	Tread Depth	Restricted	Damage
LF	0 kpa	4 mm (5/32)	Yes	Cut/Torn
LR	207 kpa (30 psi)	6 mm (8/32)	No	None
RF	48 kpa (7 psi)	1 mm (1/32)	Yes	None
RR	228 kpa (33 psi)	6 mm (8/32)	No	None

The interior of the Chevrolet was configured with bucket seats and height adjustable head restraints for the front left and front right positions. The center seat was a fixed seat cushion with a forward folding backrest that could be used as a center armrest.

1994 Mazda B2300

The 1994 Mazda B2300 pick-up truck was identified by the Vehicle Identification Number (VIN): 4F4CR12AXR (production sequence omitted). The odometer reading at the time of the inspection was 237,295 km (147,452 miles). The vehicle was a two-door compact pickup truck that was equipped with a 2.3-liter, four-cylinder engine, front disc/rear drum brakes with anti-lock. The Mazda was configured with Yokohama AVID S/T tires, size P245/60R15. The manufacture recommended front and rear tire pressure was 241 kpa (35 psi). The maximum pressure for both front and rear tires was 241 kpa (35 psi). The specific tire data is as follow:

Tire	Measured Pressure	Tread Depth	Restricted	Damage
LF	228 kpa (33 psi)	2 mm (3/32)	Yes	None
LR	0 kpa	5 mm (6/32)	No	None
RF	0 kpa	5 mm (6/32)	Yes	Cut/Torn
RR	234 kpa (34 psi)	5 mm (6/32)	No	None

The interior of the Mazda was configured with front bucket seats with integral head restraints. The front safety belts were configured with sliding latch plates and Emergency Locking Retractors (ELR). The occupants of the vehicle did not utilize the safety belts.

Crash Sequence

Pre-Crash

The restrained 26-year-old male driver of the Chevrolet was operating the vehicle northbound (**Figure 2**) on the two-lane road negotiating the left curve. The unrestrained driver of the Mazda was operating the vehicle southbound on the same roadway negotiating the right curve. The driver of the Mazda relinquished control of the vehicle and entered the northbound lane. As the driver of the Chevrolet observed the Mazda enter his lane, he began to brake and steer right towards the east road edge. The driver of the Mazda applied the brakes and left approximately 33.9 meters (111.2') of pre-impact right front skid mark and approximately 12.4 meters (40.7') of a left front pre-impact skid mark (**Figure 3**). The equivalent velocity loss due to braking was calculated at 80 km/h (50 mph). The NASS scene schematic is included as **Figure 15** of this report.



Figure 2. Chevrolet's approach to the crash site.



Figure 3. Mazda's approach to crash site. Note pre-impact skid marks.

Crash

The full frontal aspect of the Mazda impacted the full frontal area of the Chevrolet in the northbound travel lane (**Figure 4**). At impact, the Chevrolet was straddling the east fog line. The impact speed for the Mazda was computed at approximately 105 km/h (65 mph). The resultant directions of force were within the 11 o'clock sector for the Chevrolet and 12 o'clock for the Mazda. The impact resulted in severe frontal damage to both vehicles. The impact resulted in the deployment of the Chevrolet's driver's frontal air bag. The front right air bag did not deploy due to the OEM on/off switch keyed to the off-position. The damage algorithm of the WINSMASH program was used to calculate a total delta-V for both vehicles. The total delta-V for the Chevrolet was 54 km/h (34 mph). The total delta-V for the Mazda was 67 km/h (42 mph). The longitudinal and lateral components for the Chevrolet were -51 km/h (32 mph) and 19 km/h (12 mph) respectively. The longitudinal and lateral components for the Mazda were -66 km/h (-41 mph) and -12 km/h (-8 mph) respectively.



Figure 4. Northbound view of area of impact.

Post-Crash

The Chevrolet was displaced rearward and rotated clockwise (CW) approximately 130 degrees to rest on the roadway, straddling the travel lanes. The Mazda was displaced rearward approximately 1.4 meters (4.6') and rotated counterclockwise (CCW) approximately 25 degrees. Police and EMS personnel responded to the crash site. The driver and front center occupants of the Chevrolet were injured and transported by ambulance to a local hospital. The 16-month-old female front right occupant and the shield booster seat had been removed by a bystander prior to the arrival of police and rescue personnel. The child occupant was found supine on the ground and was unresponsive and pulseless. The EMS report noted that the child did not have visible trauma. EMS personnel initiated CPR and restored the child's heartbeat, however; her blood pressure was initially low. She was placed in a C-collar and was transported by ambulance to a local hospital where she was admitted for treatment.

Vehicle Damage

Exterior – 1999 Chevrolet Silverado

The 1999 Chevrolet Silverado sustained severe frontal damage as a result of the head-on crash with the 1994 Mazda B2300 (**Figure 5**). The direct contact damage width was 162.0 cm (63.7") and extended from bumper corner-to-bumper corner. Maximum crush was located at C3 and was 78.0 cm (30.7"). The left side wheelbase was reduced 8.0 cm (3.1") and the right wheelbase was reduced 24.0 cm (9.5"). Six crush measurements were documented along the front bumper fascia using a combined direct and induced damage width of 179.0 cm (70.5") and were as follows: C1 = 56.0 cm (22.1"), C2 = 71.0 cm (28.0"), C3 = 78.0 cm (30.7"), C4 = 66.0 cm (26.0"), C5 = 55.0 cm (21.7"), C6 = 52.0

cm (20.5”). The Collision Deformation Classification (CDC) for this impact was 71-FDEW3 with incremented lateral shift to the right. Both doors remained closed and operational post crash. The windshield was cracked from impact forces and the rear backlight was disintegrated from the bed moving forward at impact and contacting the back wall of the cab.



Figure 5. Damage profile to the front of the Chevrolet.

Interior – 1999 Chevrolet Silverado

The 1999 Chevrolet Silverado sustained minor interior damage as a result of the crash. The damage consisted of intrusion and occupant contacts to the interior (**Figures 6**). The occupant contacts from the driver consisted of his left hand fracturing the left outside rearview mirror, the driver’s lower left arm fracturing the left A-pillar trim, a scuff from the driver’s left knee to the knee bolster, and a scuff mark from the driver’s face to the air bag. The contact points from the front center occupant consisted of fractured trim on the lower center instrument panel from her left knee, a fracture to the center instrument panel trim from the occupant’s lower left arm, deformed center instrument panel trim from the occupant’s face. Two scuffs were noted to the right door panel from possible contact with either the front right occupant or the shield booster seat. The intrusions are listed in the following table:



Figure 6. View of occupant contacts to the instrument panel.

Position	Component	Intrusion	Direction
Front left	Toe pan	15.0 cm (6.0”)	Longitudinal
Front left	Rear of cab	3.0 cm (1.2”)	Longitudinal
Front center	Toe pan	15.0 cm (6.0”)	Longitudinal
Front center	Rear of cab	7.0 cm (2.8”)	Longitudinal
Front right	Toe pan	20.0 cm (7.9”)	Longitudinal
Front right	Rear of cab	20.0 cm (7.9”)	Longitudinal

Exterior – 1994 Mazda B2300

The 1994 Mazda B2300 sustained severe frontal damage (**Figure 7**) as result of the impact with the Chevrolet. The direct contact damage width was 160.0 cm (62.9”) and extended from bumper corner-to-bumper corner. The left side wheelbase was reduced 6.0 cm (2.4”) and the right side was reduced 12.0 cm (4.7”). Maximum crush was located at C6 and was 61.0 cm (24.0”). Six crush measurements were documented along the bumper profile using a combined and direct damage width of 142.0 cm (55.9”) and were as follows: C1 = 38.0 cm (15.0”), C2 = 47.0 cm (18.5”), C3 = 44.0 cm (17.3”), C4 = 49.0 cm (19.3”), C5 = 57.0 cm (22.4”), C6 = 61.0 cm (24.0”). The left front door remained closed and operational post-crash and the front right door was jammed shut. The front left and front right glazings were not damaged. The windshield was cracked from deformation and occupant contact. The backlight was disintegrated from contact by an occupant who was riding in the cargo bed of the vehicle.



Figure 7. Frontal damage to the 1994 Mazda B2300.

Child Safety Seat - Cosco Grand Explorer

The 16-month old front right child occupant was seated in a Cosco Grand Explorer shield booster seat. The seat was identified by Model No. 02-424 TCD GEIC (**Figure 8**) and was manufactured on 08/01/02. The shield booster seat was installed in the front right seat the vehicle’s lap portion of the 3-point lap and shoulder belt system. Manufacturer recommends use of the restraint with the shield for children 13.6-18.1 kgs (30-40 lbs); without the shield for 18.1-36.3 kgs (40-80 lbs). The subject occupant was not within the manufacturers’ guidelines.



Figure 8. Frontal view of the Cosco shield booster.

At impact, the child responded to the 11 o’clock impact force and initiated a forward and left trajectory. The abdominal and lower torso area of the 16-month-old female loaded the shield of the booster seat resulting in a Grade III spleen laceration and bilateral lung contusions. Her head flexed over the shield resulting in the C1/C2 dislocation with spinal cord injury and a closed head injury. The researcher documented loading marks on the bottom aspect of the seat at the left and right sides of the seat’s integrated frame (**Figures 9 and 10**).



Figure 9. Bottom left side view depicting the loading marks.



Figure 10. Bottom right side view depicting the loading marks.

Manual Restraint Systems – 1999 Chevrolet Silverado

The 1999 Chevrolet Silverado was equipped with integrated manual 3-point lap and shoulder belts for the outboard seating positions and a lap belt for the front center position. The driver's safety belt was configured with a sliding latch plate and a belt-sensitive Emergency Locking Retractor (ELR). The driver's safety belt was restricted in the used position indicating that he utilized the safety belt in the crash. The front center safety belt was configured with a locking latch plate and no retractor. The front right safety belt was an integrated 3-point lap and shoulder belt with a sliding latch plate and a switchable ELR/Automatic Locking Retractor (ALR). The driver and front center passenger utilized their safety belts. The lap portion of the 3-point lap and shoulder belt of the front right safety belt was used to install the shield booster seat that was occupied by the 16-month-old female. It was unknown if the safety belt retractor was engaged in the ALR position at the time of the crash.

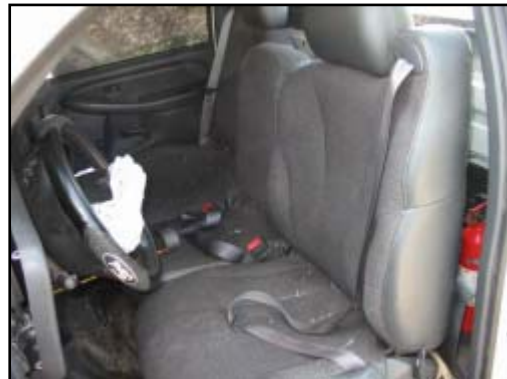


Figure 11. Driver's safety belt restricted in the used position.

Frontal Air bag System - 1999 Chevrolet Silverado

The 1999 Chevrolet Silverado was equipped with a redesigned frontal air bags system for the driver and front right passenger positions. The force of the impact with the Mazda resulted in the deployment of the driver's frontal air bag. The front left air bag deployed from the center of the steering wheel hub. The front left air bag module was designed with "T" configuration symmetrical cover flaps. The cover flaps were



Figure 12. Deployed driver's air bag.

measured as 6.5 cm (2.6”) in width and 10.0 cm (3.9”) in height. The front left air bag contained two vent ports on the rear aspect of the air bag at the 11 and 1 o’clock positions. The air bag was measured by the NASS researcher at 50.0 cm (19.7”) in diameter (**Figure 12**). A scuff was noted to the bottom left quadrant of the air bag from possible contact with the driver’s face.

The mid mounted front right air bag was equipped with an OEM on/off switch was located at the lower right corner of the mid instrument panel. The switch was in the off-position at the time of the crash and the front right air bag did not deploy (**Figures 13 and 14**).



Figure 13. Non-deployed front right air bag.



Figure 14. OEM on/off switch in off position.

Event Data Recorder (EDR) 1999 Chevrolet Silverado

The 1999 Chevrolet Silverado was equipped with an Event Data Recorder (EDR). The NASS researcher was able to successfully download the data from the EDR. The output is included in this report as **Attachment A**. The EDR data indicated that the driver’s safety belt was unbuckled at the time of the crash. However, the driver’s safety belt was restricted in the used position, which supported belt use in this crash. The EDR data also indicated that the right front air bag was not suppressed at the time of the crash. This was inconsistent with the manual on/off switch that was in the off-position. The right front air bag did not deploy in this crash. The EDR data reported the ignition cycle count at deployment was Zero. An ignition cycle count of zero was an indicator of a probable power interruption that may have occurred during the recording. This recorded data was probably faulty based the physical evidence of the NASS inspection.

The EDR recorded a maximum delta-V of 48.7 km/h (-30.28 mph) at 150 ms of Algorithm Enable (AE). The EDR data also indicates that the deployment of the driver’s air bag was commanded at 3.75 ms from AE.

Occupant Demographics – 1999 Chevrolet Silverado

Driver

Age/Sex: 26-year-old/Male
Height: 175.0 cm (69.0")
Weight: 70.0 kgs (154.0 lbs)
Seat Track Position: Between middle and full rear
Manual Restraint Use: Manual 3-point lap and shoulder belt
Usage Source: Vehicle inspection
Eyewear: None
Type of Medical Treatment: Transported by ambulance to a local hospital where he was treated and released.

Driver Injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Mechanism
Bilateral knee abrasions	Minor (890202.1, 3)	Knee bolster
Left knee contusion	Minor (890402.1, 2)	Knee bolster
Lower leg laceration over the distal left tibia 1.5 cm (0.6")	Minor (890602.1,2)	Lower left instrument panel
Lower left arm contusion	Minor (790402.1, 2)	Left A-pillar trim cover

Injury source: Emergency room records

Driver Kinematics

The 26-year old male driver of the 1999 Chevrolet Silverado was seated in a presumed upright driving posture and was restrained by the manual 3-point lap and shoulder belt. The seat track was adjusted between the middle and full rear track position. At impact, the driver's frontal air bag deployed. The restrained driver initiated a forward and left trajectory and loaded the safety belt. His knees and lower left leg contacted the knee bolster and lower left instrument panel, which resulted in the bilateral knee contusions and a left distal tibia laceration. The driver's lower left arm was deflected by the deploying air bag, which resulted in a lower left arm contusion from contact with the left A-pillar trim. The driver was transported by ambulance to a local hospital where he was treated for his injuries and released.

Front Center Passenger

Age/Sex: 25-year-old/Female
Height: 170.0 cm (67.0")
Weight: 59.0 kgs (130.0 lbs)
Seat Track Position: Fixed seat track
Manual Restraint Use: Manual 2-point lap belt
Usage Source: Vehicle Inspection
Eyewear: None
Type of Medical Treatment: Transported by ambulance to a local hospital where she was admitted for treatment of her injuries

Front Center Passenger Injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Mechanism
Bilateral pulmonary contusions with right occult pneumothorax	Severe (441410.4,3)	Seat back
Left orbit fracture	Serious (251204.3, 2)	Center instrument panel
Central nasal fracture	Moderate (251004.2,4)	Center instrument panel
Lower left lip laceration, NFS	Minor (290600.1,9)	Center instrument panel
Left facial contusion	Minor (290402.1,2)	Center instrument panel
Right hip abrasion	Minor (890202.1,1)	Safety belt
Left elbow abrasion	Minor (790202.1,2)	Center instrument panel
Bilateral tibial abrasions	Minor (890202.1,3)	Center instrument panel

Injury source: Emergency room records and post emergency room records

Front Center Passenger Kinematics

The 25-year-old female front center passenger was seated in a presumed upright posture and restrained by the 2-point manual lap belt. At impact, the restrained passenger initiated a forward and left trajectory and loaded the safety belt, which resulted in a right hip abrasion. Her head and upper torso and head jackknifed over the lap belt. As she continued forward, her face contacted the center instrument panel resulting in the left orbit fracture, nasal fracture, lower left lip laceration, left facial contusion, left elbow abrasion, and bilateral tibial abrasions. The passenger rebounded into the seatback as she came to rest. This contact resulted in the bilateral pulmonary contusions with right occult pneumothorax. The front center passenger was transported by ambulance to a hospital where she was admitted for four days for treatment of her injuries.

Front Right Passenger

Age/Sex: 16-month-old/Female
Height: 91.0 cm (36.0”), estimate from interview sources
Weight: 11.0 kgs (24.0 lbs)
Seat Track Position: Mid to rear
Manual Restraint Use: Shield booster installed by lap belt portion of the manual 3-point lap and shoulder belt
Usage Source: Vehicle Inspection
Eyewear: None
Type of Medical Treatment: Transported by ambulance to a local hospital where she was admitted for treatment

Front Right Passenger Injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Mechanism
Closed head injury, unconscious post-resuscitation on admission or initial observation at scene	Critical (160824.5,0)	Head motion/flexion
Bilateral lung contusions	Severe (441410.4, 3)	Booster seat shield
C1/C2 dislocation of approximately 1.0 cm (0.6”) with cervical cord contusion, incomplete cord syndrome	Severe (640216.4,6)	Head motion/flexion
Spleen laceration moderate (OIS Grade III)	Moderate (544224.3,2)	Booster seat shield

Injury source: Post emergency room records

Front Right Passenger Kinematics

The 16-month old female front right passenger was seated in the Cosco shield booster in an unknown posture. The lap portion of the manual 3-point lap and shoulder belt was used to install the booster seat to the vehicle. It was unknown if the safety belt retractor was engaged in the ALR position at the time of the crash. The seat track was adjusted to a mid-to-rear track position. At impact, the child initiated a forward and left trajectory and loaded the shield of the booster seat. This loading resulted in the bilateral lung contusions and a Grade III spleen laceration. As she loaded the shield, her head flexed forward over the shield. This flexion resulted in the C1/C2 dislocation of approximately 1.0 cm (0.6”) with cervical spine cord contusion with incomplete cord syndrome.

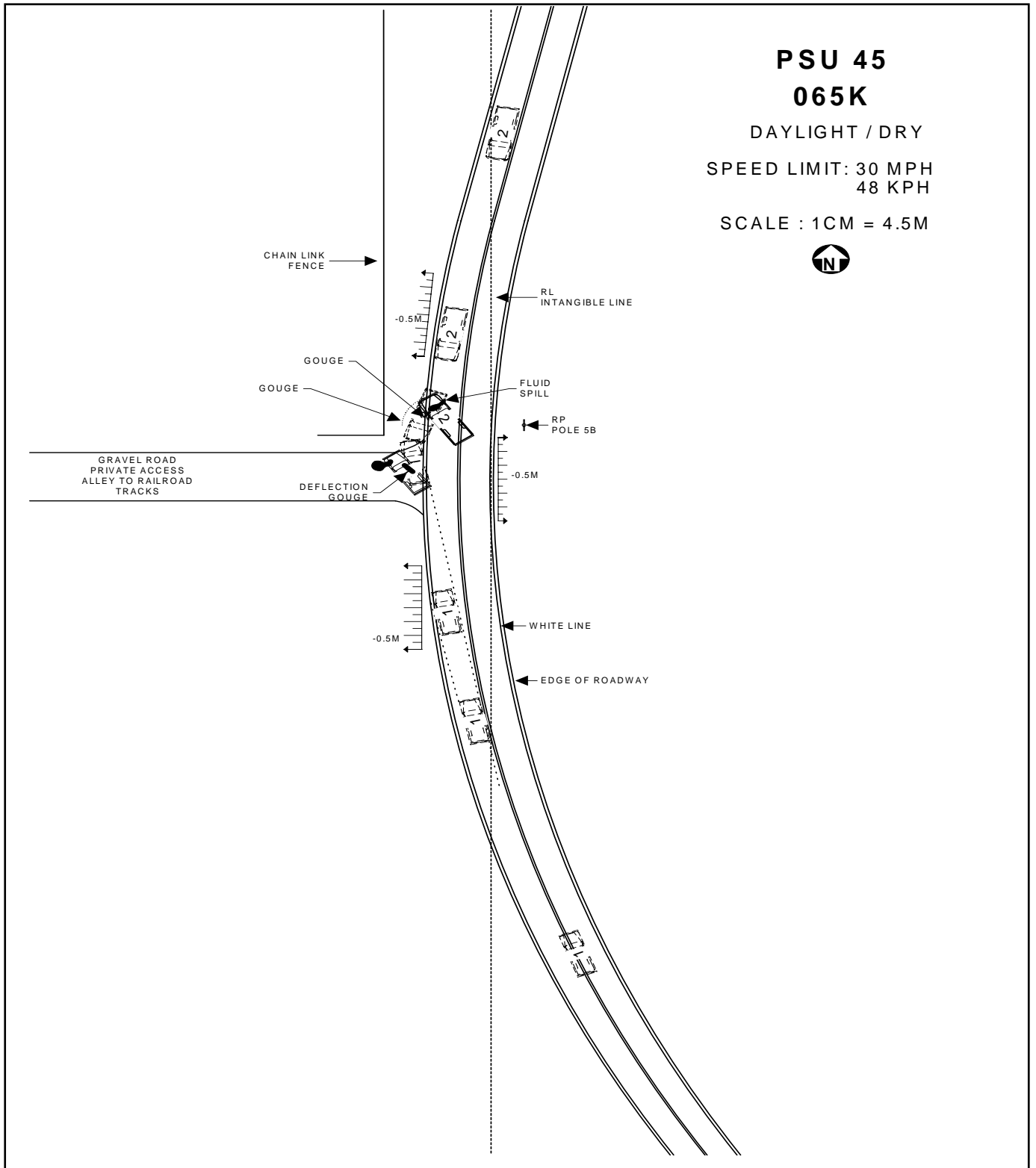
Medical Treatment

The EMS record stated that bystanders removed the child from the vehicle and placed her on the ground in a supine position. EMS personnel noted that she was unresponsive and pulseless. A C-collar was applied and CPR activities were initiated which restored the child’s heartbeat; low blood pressure was initially noted. The child was transported by ambulance to a local hospital. Upon arrival to the hospital, her Glasgow Coma Score was

reported as 4 with a Trauma Score of 6. The child was hospitalized for a period of 30 days for treatment that included spinal fusion surgery of C1/C2.

The 16-month-old female was discharged from the hospital after 30 days and was transferred to a rehabilitation center. The medical report states that she was transferred with a trachea tube and a “J” tube (feeding tube).

Figure 15. NASS Scene Schematic



Attachment A: EDR output

CDR File Information

Vehicle Identification Number	1GCEC14W0X
Investigator	
Case Number	
Investigation Date	
Crash Date	
Filename	
Saved on	
Data check information	
Collected with CDR version	Crash Data Retrieval Tool 2.00
Collecting program verification number	A31D1C76
Reported with CDR version	Crash Data Retrieval Tool 2.00
Reporting program verification number	A31D1C76
Interface information	Block number: 00 Interface version: 35 Date: 01-02-03 Checksum: 6200
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). The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded 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. The SDM can store up to two different Deployment Events, if they occur within five seconds of one another. Deployment events can not 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 file will be locked after a deployment, if the non-deployment occurred within 5 seconds before the deployment or a deployment level event occurs within 5 seconds after the deployment.

SDM Data Limitations:

-SDM Recorded Vehicle Forward Velocity Change is one of the measures used to make air bag deployment decisions. SDM Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced during the recorded portion of the event. 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. The SDM records the first 300 milliseconds of Vehicle Forward Velocity Change after Algorithm Enable. The maximum value that can be recorded for Vehicle Forward Velocity Change is 56 MPH.

-Driver's Belt Switch Circuit Status indicates the status of the driver's seat belt switch circuit.

-The Time between Non-Deployment and 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 power to the SDM is lost during a crash event, all or part of the crash record may not be recorded. An indication of a loss of power would be if the ignition cycles at Deployment or Non-Deployment is recorded as zero. Data recorded after that may not be reliable, such as Time Between Non-Deployment and Deployment Events, Driver Belt Switch Circuit Status, and Passenger Air Suppression Switch Circuit Status.

SDM Data Source:

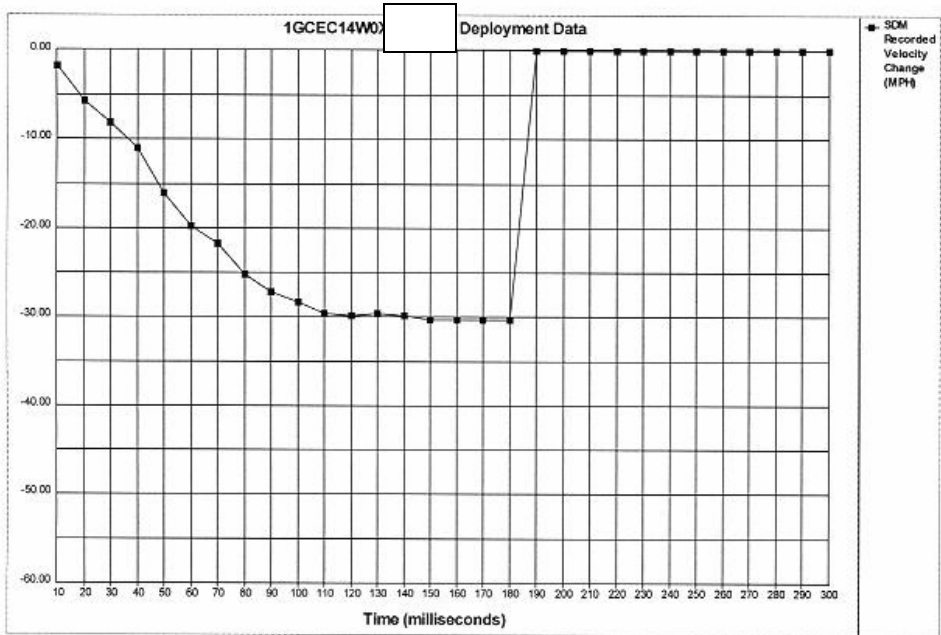
All SDM recorded data is measured, calculated, and stored internally, except for the following:

-The Driver's Belt Switch Circuit is wired directly to the SDM.

-The Passenger Front Air Bag Suppression Switch Circuit is wired directly to the SDM.

System Status At Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	UNBUCKLED
Passenger Front Air Bag Suppression Switch Circuit Status	Air Bag Not Suppressed
Ignition Cycles At Deployment	0
Ignition Cycles At Investigation	10451
Time From Algorithm Enable To Deployment Command (msec)	3.75
Time Between Non-Deployment And Deployment Events (sec)	N/A



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	-1.76	-5.70	-8.12	-10.97	-16.02	-19.75	-21.72	-25.23	-27.21	-28.30	-29.62	-29.84	-29.82	-29.84	-30.28
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
Recorded Velocity Change (MPH)	-30.28	-30.28	-30.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Hexadecimal Data

This page displays all the data retrieved from the air bag module.
It contains data that is not converted by this program.

```
B600: 20 50 58 00 00 00 00 AA
B608: AA 00 00 00 00 00 00 AA
B610: AA 00 00 00 00 29 F9 C9
B618: F9 F9 F9 F9 F9 F9 FF 00
B620: AA AA AA 00 00 00 00 7D
B628: 00 00 48 03 08 1A 25 32
B630: 49 5A 63 73 7C 81 87 88
B638: 87 88 8A 8A 8A 8A 00 00
B640: 00 00 00 00 00 00 00 00
B648: 00 00 00 00 00 00 00 00
B650: 00 00 00 00 00 00 00 00
B658: 00 00 00 00 00 00 00 00
B660: 00 00 00 00 00 00 00 00
B668: 00 00 00 00 00 00 00 00
B670: 00 00 00 00 00 00 00 00
B678: 00 00 00 00 00 00 00 00
B680: 00 00 00 00 00 00 00 00
B688: 00 00 00 00 7D FA 00 00
B690: 7D FA 00 00 00 00 00 00
B698: 00 00 00 00 7D FA 00 00
B6A0: 7D FA 00 00 7D FA 00 00
B6A8: 7D FA 29 C9 00 00 81 00
B6B0: 00 00 00 00 00 00 00 00
B6B8: 00 00 00 00 00 9E 60 C4
B6C0: 3B 19 0E 00 00 64 02 00
B6C8: 00 AA 00 00 00 00 FF FF
B6D0: BE C8 BC AC B9 B5 BE AC
B6D8: DD 6A B4 E6 EE F0 00 00
B6E0: AA C8 12 FF AA 00 03 4B
B6E8: 27 AA 00 00 00 00 00 00
B6F0: FF 08 F0 05 50 06 12 11
B6F8: 58 A4 A4 A4 A4 A4 A4 A4
B700: A4 A4 A4 A4 B3 C9 D8 E7
B708: F4 41 44 48 4B FF FF FF
B710: FF FF FF FF FF FF FF FF
B718: FF FF FF FF FF FF FF FF
B720: FF FF FF FF FF FF FF FF
B728: FF FF FF FF FF FF FF FF
B730: FF FF FF FF FF FF FF FF
B738: FF FF FF FF FF FF FF FF
B740: FF FF FF FF FF FF FF FF
B748: FF FF FF FF FF FF FF FF
B750: FF FF FF FF FF FF FF FF
B758: FF FF FF FF FF FF FF FF
B760: FF 00 00 00 18 0A 10 00
B768: 00 AA 02 00 00 FF FF FF
B770: FF FF FF FF FF FF FF FF
B778: FF FF FF FF FF FF FF FF
B780: FF FF FF FF FF FF FF FF
B788: FF FF FF FF FF FF FF FF
B790: FF FF FF FF FF FF FF FF
B798: FF FF FF FF FF FF FF FF
B7A0: FF FF FF FF FF FF FF FF
B7A8: FF FF FF FF FF FF FF FF
B7B0: FF FF FF FF FF FF FF FF
B7B8: FF FF FF FF FF 00 00 AA
B7C0: 00 C2 0E 67 00 00 00 00
B7C8: 00 00 00 00 00 00 00 00
B7D0: 00 00 00 00 00 00 00 00
B7D8: 00 00 00 00 00 00 00 00
B7E0: 00 00 00 00 00 00 00 00
B7E8: 00 00 00 00 00 00 00 00
```

1GCEC14W0X

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B7F0: 00 00 00 00 00 00 00 00  
B7F8: 00 00 A5 A5 A5 A5 75 FD
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