

CRASH DATA RESEARCH CENTER

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**CALSPAN ON-SITE CHILD AIR BAG RELATED FATALITY
CRASH INVESTIGATION**

CASE NO: CA05-001

VEHICLE: 2000 CHEVROLET METRO LSi

LOCATION: GEORGIA

CRASH DATE: NOVEMBER 2004

Contract No. DTNH22-01-C-17002

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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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**CALSPAN ON-SITE CHILD AIR BAG RELATED FATALITY
CRASH INVESTIGATION
CASE NO.: CA05-001
VEHICLE: 2000 CHEVROLET METRO LSi
LOCATION: GEORGIA
CRASH DATE: NOVEMBER 2004**

BACKGROUND

This on-site investigation focused on the severity of the crash and the injury sources that contributed to the death of a 4-year old female passenger of a 2000 Chevrolet Metro LSi. The Chevrolet (**Figure 1**) was equipped with a redesigned frontal air bag system and the front right air bag deployed during a moderate-severity frontal crash with a 1996 Buick Century. The driver's frontal air bag did not deploy. The 4-year old child was seated on the lap of a 16-year old female passenger and was unrestrained in the front right position of the vehicle. The child was displaced forward by pre-crash braking and was struck by the front right air bag module cover flap and the deploying air bag. The leading edge of the cover flap opened against the chin of the child passenger resulting in abrasions to the right and midline areas of the chin and upper lip. This contact rotated the head upward, hyper-extending the neck and exposing the neck to the deploying air bag membrane. The expanding air bag engaged the anterior neck of the child resulting in a group of abrasions of the right lateral and posterior neck. The continued extension of the neck resulted in a dislocation of the cervical spine at the level of C1/C2.



Figure 1 - Damaged 2000 Chevrolet Metro.

Simultaneous to the child's trajectory, the 16-year old female front right passenger moved on a matching trajectory. The expanding air bag accelerated the 4-year old child passenger in an upward and rearward direction. This left side of the child's head was struck by the head of the 16-year old passenger resulting in occupant-to-occupant interaction and the 4 cm subgaleal contusion of her left scalp and the underlying subarachnoid hemorrhage and the subdural hematoma. The 16-year old responded to the 11 o'clock direction of force and compressed the 4-year old child passenger into the instrument panel resulting in the bilateral pulmonary contusions as the 4-year old child passenger. The continued loading and compression into the instrument panel by the 16-year old resulted in contusions of the 4-year old child's colon, duodenum, and spleen. The child's left arm was captured between the upper instrument panel and the front right passenger resulting in a distal fracture of the left humerus. Her right hand impacted the windshield resulting in contusions of the dorsal hand.

The impact redirected both vehicles in a northwest direction. The Buick's left side wheels impacted a curb and tripped the vehicle onto its left side where it came to rest on the northwest corner. Upon arrival at the scene, emergency personnel observed the driver

of the Chevrolet holding the 16-year old front right passenger as she drifted in and out of consciousness. They also observed the 4-year old female lying on the roadway next to the vehicle. The driver of the Chevrolet was unrestrained and not injured. Both front right passengers sustained police-reported incapacitating injuries and were transported to a regional trauma center by helicopter; however, there was no record of treatment at the medical facility for the 16-year old female. The 4-year old female was mechanically supported overnight, but following a diagnosis of her injuries, life support was withdrawn and she expired the next day. The 13-year old male driver of the Buick was unable to exit his vehicle due to its overturned state. Three witnesses pushed the vehicle back onto its wheels in an attempt to free the driver. After the vehicle was in an upright position, the driver exited the vehicle and fled from the scene. He was identified by the witnesses and later returned to the scene by the police. Both vehicles were towed from the scene due to damage.

This crash was identified by the National Highway Traffic Safety Administration (NHTSA) through an Internet news article. The article was forwarded to the Calspan Special Crash Investigation's (SCI) team on January 7, 2005 for follow-up. Cooperation was established with the investigating agency and an on-site investigation was performed on January 11, 2005. The Metro's Event Data Recorder (EDR) was retrieved from the vehicle and downloaded by the SCI investigator.

SUMMARY

Crash Site

This two-vehicle crash occurred in the state of Georgia in November 2004 at a four-leg intersection. It was raining at the time of the evening crash and the roadways were wet. The east/west roadway was configured with one lane in each direction that was separated by a broken yellow painted centerline. The north/south roadway had one lane in each direction that was delineated by double-yellow painted centerlines. Both roadways were straight and level and had posted speed limits of 48 km/h (30 mph). The crash occurred in an urban setting and the roadside environment consisted of multiple business and residential dwellings. Stop signs with no sight obstructions were located on the southeast and northwest corners controlling north/south traffic. The SCI scene schematic is included as **Figure 13** at the end of this narrative report.

Vehicle Data – 2000 Chevrolet Metro LSi

The 2000 Chevrolet Metro LSi was a four-door sedan and was identified by the Vehicle Identification Number (VIN): 2C1MR5222Y6 (production number omitted). The vehicle was equipped with a 4-cylinder, 1.3-liter engine linked to an automatic transmission. The Metro was a rental vehicle and had 159,313 km (98,995 miles) at the time of SCI inspection. The total GVWR was 1,250 kg (2,756 lbs), which distributed 650 kg (1,433 lbs) to the front and 620 kg (1,367 lbs) to the rear. The vehicle manufacturer recommended tire size was P155/80R13 and the recommended tire pressure was 220 kPa (32 PSI). The vehicle was configured with 33 cm (13") steel wheels and Hercules HP400 Radial GT P205/60R13 tires. The specific tire information at the time of the SCI vehicle inspection was as follows:

Position	Measured Pressure	Measured Tread Depth	Damage
LF	179 kPa (26 PSI)	1 mm (1/32")	None
LR	228 kPa (33 PSI)	2 mm (3/32")	None
RF	Flat	2 mm (3/32")	None
RR	Flat	2 mm (3/32")	None

The 2000 Chevrolet Metro was configured with front bucket seats with integral head restraints and a fixed two-passenger rear bench seat with a full length forward-folding seatback. The driver's seat ran along a 19 cm (7.5") track and was adjusted to 2 cm (0.75") forward of the full rear position. The angle of the driver's seatback was adjusted 28-degrees from upright. The front right seat had a 21 cm (8.5") long track and was adjusted to a near mid-track position, 12 cm (4.75") aft of full forward. The angle of the front right seat was 15-degrees from upright.

Vehicle Data – 1996 Buick Century

The 1996 Buick Century was a four door sedan and was identified by the VIN: 1G4AG55M0T6 (production number omitted). The vehicle was manufactured in 8/95 and was equipped with a 6-cylinder, 3.1-liter engine linked to an automatic transmission. The vehicle's mileage was 123,183 km (76,545 miles) and had a total GVWR of 1,903 kg (4,196 lb). The Buick was configured with 36 cm (14") steel wheels and BF Goodrich Control T/A P185/75R14 tires. The specific tire information at the time of the inspection was as follows:

Position	Measured Pressure	Measured Tread Depth	Damage
LF	145 kPa (21 PSI)	6 mm (8/32")	Rim dented
LR	Flat	6 mm (8/32")	Tire cut and wheel angled under vehicle ~ 30 degrees
RF	76 kPa (11 PSI)	7 mm (9/32")	None
RR	110 kPa (16 PSI)	7 mm (9/32")	None

Crash Sequence

Pre-Crash

The adult female driver of the Chevrolet was operating the vehicle in a westbound direction (**Figure 2**) and was approaching the four-leg intersection. The 13-year old male was operating the Buick in the northbound direction (**Figure 3**) and approaching the same intersection controlled by a stop sign for north/south traffic. The driver of the Buick disregarded the unobstructed stop sign on the southeast corner of the intersection. Occupant contact patterns suggest that a pre-crash braking action was taken by the Chevrolet prior to impact; however, no physical evidence was found at the scene for corroboration.



Figure 2 - Westbound approach of the 2000 Chevrolet Metro.



Figure 3 - Northbound approach of the 1996 Buick Century.

Crash

As both vehicles entered the intersection, the full frontal plane of the Chevrolet impacted the right side of the Buick in a right angle configuration. The direction of force was in the 11 o'clock sector for the Chevrolet and the 2 o'clock sector for the Buick. The impact resulted in moderate damage to both vehicles and was sufficient to deploy the front right passenger air bag in the Chevrolet. The EDR recorded a deployment time of 35 milliseconds after Algorithm Enable (AE) and a longitudinal velocity change of 24 km/h (14.9 mph) for the Chevrolet at 150 ms of AE. The damage algorithm of the WinSMASH program computed a total delta V of 29 km/h (18 mph) for the Chevrolet and 21 km/h (13 mph) for the Buick. The specific longitudinal and lateral components were -25 km/h (-15.5 mph) and 15 km/h (9.3 mph) for the Chevrolet and -11 km/h (-6.8 mph) and -18 km/h (-11.2 mph) for the Buick, respectively. The Chevrolet rotated approximately 180 degrees and came to final rest 8 m (26') west of the point of impact facing eastbound. The Buick was redirected in a northwest direction while rotating clockwise and impacted a concrete curb with its left side wheels. The vehicle subsequently tripped over the curb and overturned one-quarter turn onto its left side.

Post-Crash

The driver of the Chevrolet remained inside her vehicle and was found by emergency personnel holding the 16-year old female passenger as she was in a reportedly semi-conscious state. The 4-year old female passenger was on the ground outside of the Chevrolet and was unresponsive to stimulus. The 4-year old was removed from the vehicle by an unknown person at the crash scene. The two front right passengers were transported to a regional trauma center. There was no record of treatment for the 16-year old female at the medical facility. The 4-year old child was placed on mechanical life support as a result of her injuries. After a grave prognosis was made, the child was removed from artificial life support and expired the following day.

Multiple witnesses at the scene checked the status of the driver of the Buick and then pushed the vehicle back onto its wheels. The 13-year old male driver exited the vehicle and ran from the scene and was later apprehended at his home. Both vehicles sustained disabling damage and were towed from the scene.

Vehicle Damage

Exterior Damage – 2000 Chevrolet Metro LSi

The 2000 Chevrolet Metro (**Figure 4**) sustained moderate damage as a result of the right angle crash with the 1996 Buick Century. The direct contact damage was distributed across the full width of the frontal plane and measured 124 cm (49"). The combined direct and induced damage also encompassed the full front end of the vehicle. The maximum crush was located at the left aspect of the bumper and was 17 cm (7") in depth. Six equidistant crush measurements were documented across the front bumper and were as follows: C1 = 17 cm (7"), C2 = 16 cm (6.3"), C3 = 17 cm (7"), C4 = 16 cm (6.3"), C5 = 15 cm (6"), C6 = 17 cm (7"). The Collision Deformation Classification (CDC) was 11-FDEW-1. The bumper shifted 14 cm (5.5") to the right during the impact; however, the structural components remained in place and end shift was not incremented.



Figure 4 - Damaged 2000 Chevrolet Metro.

Interior Damage – 2000 Chevrolet Metro LSi

The 2000 Chevrolet Metro sustained moderate interior damage as a result of occupant loading of interior components and air bag contact. A scuff was present on the left knee bolster, located 35 – 36 cm (13.75 – 14.24") below the brow at the top aspect of the instrument panel and 43 – 48 cm (17 – 19") left of the vehicle's centerline. This contact had an associative orange fabric transfer present that was attributed to the driver's left knee (**Figure 5**). Blood spatter was present on the center console and transmission selector. Additional blood transfers were found on the front right seat cushion. The glove compartment cover was found in an open position and would not re-latch.



Figure 5 - Driver's knee contact location.

A distinct air bag abrasion was present at the top aspect of the center instrument panel. The rearview mirror also exhibited air bag associated contact evidence as its internal glass was cracked and its left side was displaced into the windshield where it fractured the same. In addition to the rearview mirror, the windshield was also contacted at multiple locations by both the expanding air bag and the 4-year old passenger during the crash sequence. A 2 cm (0.6") diagonally oriented scuff with a



Figure 6 - Windshield area occupant contact points.

distinguishable crosshatching transfer pattern from the air bag membrane was located slightly inboard of the right A-pillar. Additionally, four vertically oriented transfers extended from the top aspect of the windshield at the header to the midpoint of the glazing. Clear body fluid transfers were identified 12 – 21 cm (30 – 53”) slightly inboard of the right A-pillar and head and hair oil transfers were located 42 – 51 cm (16.5 – 20”) right of the glazing’s centerline and 10 – 25 cm (3.75 – 10”) below the header. Associative dark and coarse textured hairs were affixed to the windshield glazing along with 10 – 12 blood spatter marks on the header and left side of the sun visor. An overall view of the contact points on or near the windshield is exhibited in **Figure 6**.

Exterior Damage - 1996 Buick Century

The 1996 Buick Century sustained moderate right side damage (**Figures 7 and 8**) as a result of the impact with the 2000 Chevrolet Metro. The direct contact damage began 50 cm (20”) aft of the right front axle along the leading edge of the front right door and extended 156 cm (61.5”) rearward. The combined direct and induced damage began 48 cm (19”) aft of the right front axle and extended rearward 190 cm (75”). The maximum crush was located 124 cm (49”) aft of the right front axle at the B-pillar and was 32 cm (12.5”) in depth. Both right side doors were jammed closed due to this impact. Six equidistant measurements were taken along the mid-door level of the vehicle and were as follows: C1 = 2 cm (0.75”), C2 = 17 cm (6.75”), C3 = 32 cm (12.5”), C4 = 29 cm (11.5”), C5 = 19 cm (7.5”), C6 = 5 cm (2”). The CDC for this impact was 02-RPEW-3.



Figure 7 - Right side damage to the 1996 Buick Century.



Figure 8 - Longitudinal view of the depth of crush on the right side of the 1996 Buick Century.

After the initial impact, the Buick rotated clockwise and was redirected left-side-leading into a 13 cm (5”) concrete curb at the road edge. The left front rim was dented from the curb impact and the left rear wheel was deformed and folded underneath the vehicle approximately 30 degrees. The left rear tire was also deflated. The CDC’s for the left side wheel impacts were 09-LFWN-1 and 09-LBWN-1, respectively.

After striking the curb, the vehicle tripped and overturned left-side-leading one-quarter turn. The rollover damage began 72 cm (28.5”) forward of the left front axle on the fender and extended 348 cm (137”) rearward. Associative grass was imbedded within the fender and rear fascia joints and an isolated dent was present on the left roof side rail. The CDC for the rollover event was 00-LDAO-1.

Manual Restraints – 2000 Chevrolet Metro LSi

The 2000 Chevrolet Metro was equipped with 3-point manual lap and shoulder belts for all four seating positions. The driver and front right belts were configured with sliding latch plates, fixed D-rings, and an Emergency Locking Retractor (ELR) for the driver's position and a switchable ELR/Automatic Locking Retractor (ALR) for the front right passenger. The belt systems were unremarkable and absent of indicative loading evidence consistent with usage. The D-ring's were without transfer evidence, the webbing was free of rippling, and the latch plates displayed no usage indicators.

The second row seats were configured with continuous loop belts, sliding latch plates, and switchable ELR/ALR's. The second row was unoccupied during the crash.

Redesigned Frontal Air Bag System – 2000 Chevrolet Metro LSi

The 2000 Chevrolet Metro was equipped with redesigned air bags for the driver and front right passenger positions. The air bag deployment was asymmetrical with only the front right air bag deploying (**Figure 9**). The driver's air bag was housed in the steering wheel hub with horizontally oriented H-configuration cover flaps.

The front right passenger air bag was housed in the right instrument panel area with a single cover flap design hinged at the top aspect. The flap was 36 cm (14") in width and 16 cm (6.2") in height and rectangular in shape. A tissue transfer was identified on the leading edge of the cover flap (**Figure 10**). The transfer was 6 cm (2.4") in width and 4 cm (1.75") in height and began 37 cm (15") right of the vehicle's centerline, 5 cm inboard of the lower left corner of the cover flap. A lone hair was present on the cover flap slightly below the top aspect.

The air bag membrane measured 46 cm (18") in width and 50 cm (25") in height. A large tissue transfer was present on the air bag that began at the top horizontal seam approximately 8 cm (3") inboard of the right vertical seam and extended rearward 6 cm (2.25"). The transfer continued below the horizontal seam and the width of transfer increased to 22 cm (8.5") at its widest point. The vertically oriented transfer transitioned to a lateral orientation at 25 cm (10") below the horizontal seam on the face of the air bag and extended downward an additional 29 cm (11.5"). The air bag contained no tether straps or external vent ports. **Figures 11** and **12** are overall views of the transfer evidence on the front right air bag.



Figure 9 - Asymmetrical air bag deployment.



Figure 10 - Transfer evidence on the leading edge of cover flap.



Figure 11 - Overall view of the transfer evidence on the front right air bag.



Figure 12 - Overall view of transfer evidence on the front right air bag.

Event Data Recorder – 2000 Chevrolet Metro

The Chevrolet's Event Data Recorder (EDR) was removed from the vehicle and downloaded by the SCI investigator. The EDR summary report is included as **Attachment A** at the end of this narrative report. The system recorded a Deployment event as a result of the frontal impact with the 1996 Buick Century. The SCI investigation concluded that the driver was not restrained by the manual safety belt system. This was supported by the EDR that recorded the driver's belt switch circuit status as unbuckled. The EDR commanded a deployment of the redesigned air bag system at 35 milliseconds from AE. The EDR module recorded the air bag warning lamp status and being in the 'ON' position during this single event crash, which indicates that a problem existed within the air bag system. The driver's air bag failed to deploy during the crash.

Occupant Demographics

Driver

Age/Sex:	Not PAR reported/Female
Height:	Unknown
Weight:	Unknown
Seat Track Position:	Rear-track, 2 cm (0.75") forward of the full rear position
Manual Restraint Use:	None used
Usage Source:	Vehicle inspection
Eyewear:	Unknown
Type of Medical Treatment:	Not injured

Driver Kinematics

The adult female driver of the 2000 Chevrolet Metro was unrestrained and seated in a presumed upright attitude in the front left position. At impact with the Buick Century, the driver initiated a forward and slightly left trajectory in response to the 11 o'clock direction of force. The driver's left knee contacted the knee bolster as evidenced by a scuff mark and a fabric transfer on the component. The driver was reportedly not injured; however, she accompanied the other passengers to a trauma center.

Front Right Passenger

Age/Sex: 16-year old/Female
Height: Unknown
Weight: Unknown
Seat Track Position: Mid-track, 12 cm (4.75”) aft of full forward
Manual Restraint Use: None used
Usage Source: Vehicle inspection
Eyewear: Unknown
Type of Medical Treatment: Transported to a regional trauma center; no record of treatment at medical facility

Front Right Passenger Injuries

Injury	Injury Severity (AIS90/Update 98)	Injury Source
Loss of consciousness, NFS	Moderate (160406.2,0)	Occupant-to-occupant contact (probable)

**Source: Police report.*

Front Right Passenger Kinematics

The 16-year old female passenger was unrestrained and seated in a presumed upright posture in the front right position of the vehicle. She had a 4-year old child seated on her lap. The driver of the Chevrolet applied the brakes in an attempt to avoid the Buick and thereby displaced these occupants forward.

At impact with the 1996 Buick Century, the redesigned front right air bag deployed and both front right seat passengers initiated a forward and slightly left trajectory in response to the 11 o’clock direction of force. Evidence on the air bag and cover flap indicated that the 4-year old passenger was in close proximity to the air bag prior to deployment. The 16-year old female followed the trajectory of the 4-year old female, and as the 4-year old was redirected by the expanding air bag, the occupant’s heads impacted resulting in the closed head injury to the 16-year old. The 16-year old female was redirected to the right into the right aspect of the windshield. This was supported by a large skin/hair oil transfer on the windshield.

The 16-year old female passenger was assisted by the driver following the crash, who held her until the arrival of emergency personnel. She was transported to a regional trauma center; however, there was no record of treatment for this passenger at the medical facility.

Child on Lap of Front Right Passenger

Age/Sex: 4-year old/Female
Height: 107 cm (48”)
Weight: 17 km (38.4 lbs)
Seat Track Position: Mid track, 12 cm (4.75”) aft of full forward
Manual Restraint Use: None used
Usage Source: Vehicle inspection

Eyewear:

Unknown

Type of Medical Treatment:

Transported to a regional trauma center; mechanically supported overnight and expired the following day.

Child on Lap of Front Right Passenger Injuries

Injury	Injury Severity (AIS90/Update 98)	Injury Source
Bilateral pulmonary contusions [4 cm (1.5") area on right upper lobe / 4 cm (1.5") area on right subpleural middle lobe / 5 cm (2") area on right subpleural lower lobe / 1 cm (0.5") area on left upper lobe apex]	Severe (441410.4,3)	Upper instrument panel with subsequent loading by the 16-year old front right passenger
Subdural hematoma to left cerebral hemisphere	Severe (140652.4,2)	Occupant-to-occupant interaction with the front right passenger
1 cm (0.5") subarachnoid hemorrhage to anterior left brain	Serious (140684.3,2)	Occupant-to-occupant interaction with the front right passenger
Cervical spine separation at C1/C2 level	Moderate (650204.2,6)	Front right air bag module cover flap
4 cm (1.5") contusion to distal colon and 5 cm (2") secum contusion	Moderate (540810.2,8)	Upper instrument panel with subsequent loading by the 16-year old front right passenger
1 cm (0.3") contusion to proximal duodenum muscoca	Moderate (541010.2,8)	Upper instrument panel with subsequent loading by the 16-year old front right passenger
2 cm (1.75") postero-superior sub capsular spleen contusion	Moderate (544212.2,2)	Upper instrument panel with subsequent loading by the 16-year old front right passenger
Transverse fracture to distal left humerus	Moderate (752602.,2)	Upper instrument panel
10 cm (3.75") group of abrasions beginning on right lateral neck and extending across the right posterior neck vertically 4 cm (1.6") to the right chest	Minor (390202.1,1)	Expanding air bag

Abrasion and faint contusion on right lateral face beginning on right ear and extending to right cheek	Minor (290202.1,1) (290402.1,1)	Expanding air bag
Abrasion to the right and midline area of the chin and upper lip	Minor (290202.1,8)	Front right air bag module cover flap
4 cm (1.5") contusion to the medial and lateral left eye and eyebrow extending to the bridge of the nose	Minor (297402.1,2)	Occupant-to-occupant interaction with the front right passenger
6 cm (2.25") group of contusions with abrasions to the dorsolateral right hand extending to the wrist	Minor (790202.1,1) (790402.1,1)	Windshield
10 cm (4") subgaleal left scalp contusion	Minor (190402.1,2)	Occupant-to-occupant interaction with the front right passenger

**Source: Autopsy report.*

Child on Lap of Front Right Passenger Kinematics

The 4-year old female passenger was unrestrained and seated on the lap of the 16-year old female passenger in the front right position of the vehicle. Her seated position on the lap was determined from the location and elevation of tissue contact evidence on the front right air bag module cover in relation to her height and police interview data. There was no loading evidence of the safety belt system to support usage. Additionally, the child passenger's kinematics and range of motion clearly supported the lack of safety belt use. The front right seat was adjusted to a mid track position, 12 cm (4.75") aft of full forward. As the driver of the Chevrolet detected the Buick entering the intersection, she braked in an attempt to avoid the crash. This braking action displaced the 4-year old child passenger forward in close proximity to the front right air bag module assembly.

At impact with the 1996 Buick Century, the front right air bag deployed from the top mounted module assembly. The leading edge of the cover flap opened against the chin of the child passenger resulting in abrasions to the right and midline areas of the chin and upper lip. This contact rotated the head upward, hyper-extending the neck and exposing the neck to the deploying air bag membrane. Based on the right bias of the abrasion pattern, the child's head was probably turned slightly to her left.

The expanding air bag engaged the anterior neck of the child resulting in a group of abrasions of the right lateral and posterior neck. The continued extension of the neck resulted in a dislocation of the cervical spine at the level of C1/C2. No cord damage was noted in the autopsy report.

As the front right air bag began to deploy, the child passenger responded to the 11 o'clock direction of force by initiating a forward and slightly lateral trajectory to her left. Simultaneous to the child's trajectory, the 16-year old female front right passenger moved on a matching trajectory. The expanding air bag accelerated the 4-year old child passenger in an upward and rearward direction. This left side of the child's head was

probably struck by the head of the 16-year old passenger resulting in occupant-to-occupant interaction and the 4 cm subgaleal contusion of her left scalp and the underlying subarachnoid hemorrhage and the subdural hematoma.

The combination of both occupants loading the air bag deflected the air bag up and to the left. The air bag fabric subsequently transferred onto the windshield and the center mid instrument panel. Simultaneously, the 16-year old compressed the 4-year old child passenger into the instrument panel resulting in the bilateral pulmonary contusions. The continued loading and compression into the instrument panel by the 16-year old resulted in contusions of the 4-year old child's colon, duodenum, and spleen.

The child's left arm was captured between the upper instrument panel and the front right passenger resulting in a distal fracture of the left humerus. The expanding front right air bag was redirected by the occupant loading. The left upper quadrant of the air bag expanded against the rear view mirror which fractured the mirror and displaced the mirror to the left, contacting and fracturing the windshield. The mirror was subsequently separated from its windshield mount. (The mirror was repositioned during this SCI inspection.) Her right hand impacted the windshield resulting in contusions of the dorsal hand.

Medical Treatment

Upon arrival at the scene, emergency personnel observed the 4-year old child lying unresponsive on the roadway adjacent to the vehicle. The child was removed by an unknown person at the scene of the crash. She was airlifted to a regional trauma center where she was evaluated and placed on life support. After a comprehensive medical evaluation, the family conceded to her removal from life support and she expired the following day.

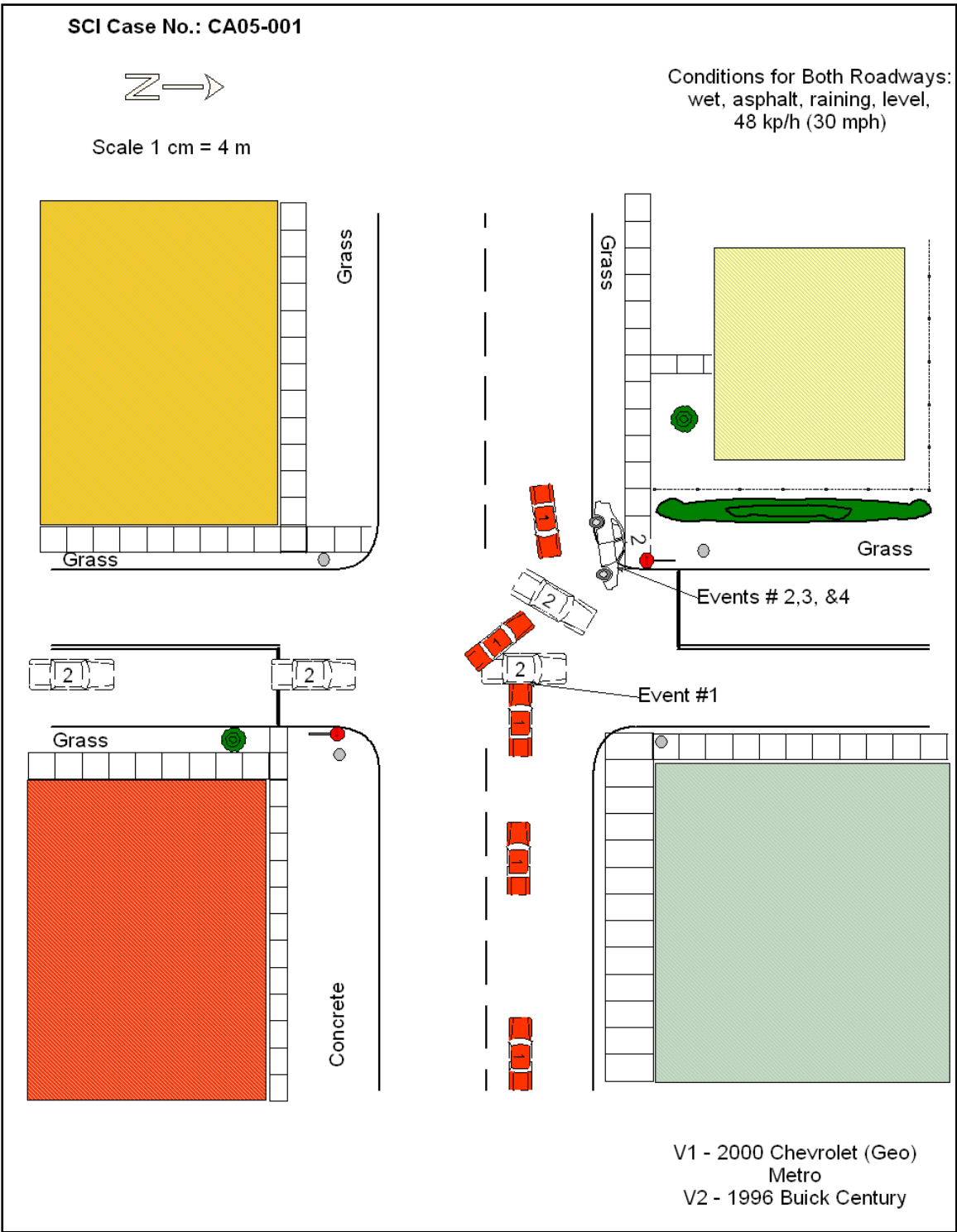


Figure 13 – SCI Scene Schematic.

Attachment A – EDR Report

CDR File Information

Vehicle Identification Number	2C1MR5222Y6*****
Investigator	
Case Number	ca05051
Investigation Date	Thursday, April 20 2006
Crash Date	
Filename	CA05-001.CDR
Saved on	Friday, April 20 2007 at 03:22:03 PM
Collected with CDR version	Crash Data Retrieval Tool 2.800
Collecting program verification number	9238B95E
Reported with CDR version	Crash Data Retrieval Tool 2.800
Reporting program verification number	9238B95E
Interface used to collected data	Block number: 00 Interface version: 4A Date: 11-08-05 Checksum: 7500
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 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, unless a Deployment Level Event occurs within 5 seconds after the Deployment Event, then the Deployment Level Event will overwrite the Non-Deployment Event file.

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. 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 the event is recorded as zero. Data recorded after that may not be reliable, such as Time Between Non-Deployment and Deployment Events, and Driver Belt Switch Circuit Status.

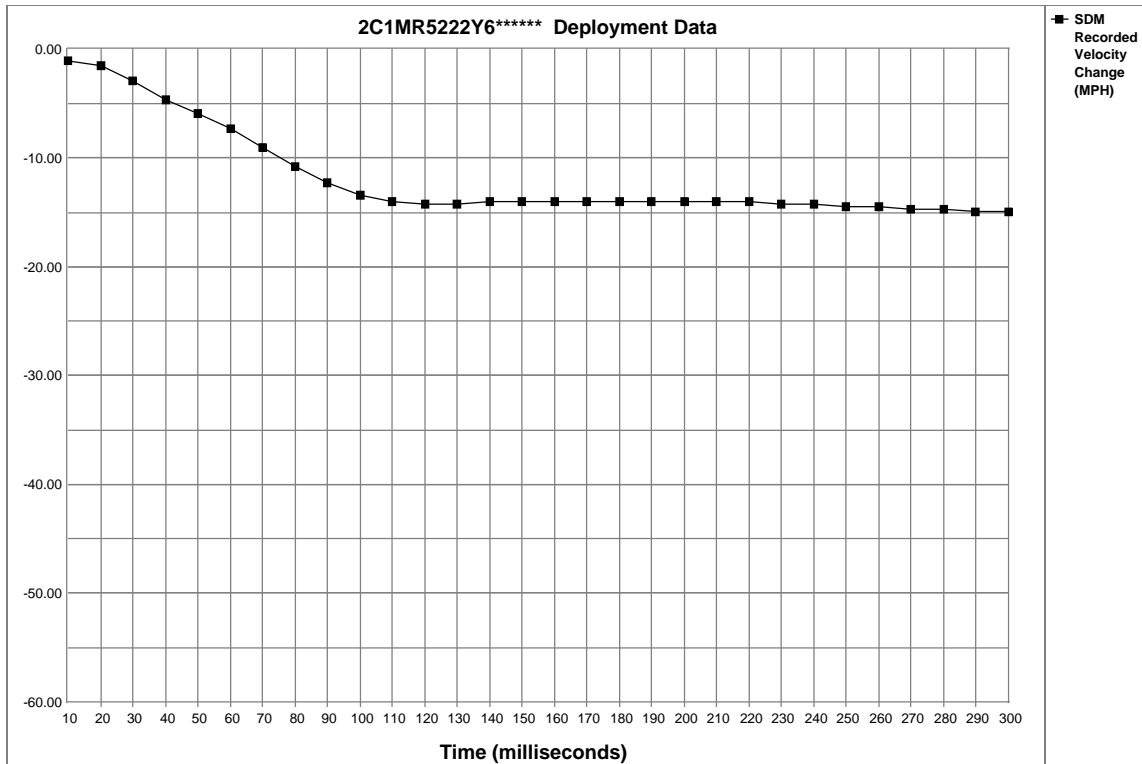
SDM Data Source:

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.

System Status At Deployment

SIR Warning Lamp Status	ON
Driver's Belt Switch Circuit Status	UNBUCKLED
Ignition Cycles At Deployment	16965
Ignition Cycles At Investigation	16976
Time From Algorithm Enable To Deployment Command (msec)	35
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)	-1.10	-1.54	-2.85	-4.61	-5.92	-7.24	-9.00	-10.75	-12.29	-13.38	-14.04	-14.26	-14.26	-14.04	-14.04
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
Recorded Velocity Change (MPH)	-14.04	-14.04	-14.04	-14.04	-14.04	-14.04	-14.04	-14.26	-14.26	-14.48	-14.48	-14.70	-14.70	-14.92	-14.92

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: 33 40 A0 00 00 55 00 00
B608: 00 00 00 00 00 55 00 00
B610: 00 00 00 00 00 00 00 64
B618: 02 30 FF 00 00 00 00 00
B620: 43 F9 F9 F9 E2 F9 F9 F9
B628: F9 AA AA 00 00 AA 06 0C
B630: 9F 02 00 00 1C 05 07 0D
B638: 15 1B 21 29 31 38 3D 40
B640: 41 41 40 40 40 40 40 40
B648: 40 40 40 41 41 42 42 43
B650: 43 44 44 42 45 20 00 00
B658: FF 00 55 AA AA AA 55 02
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 00 00 00 00
B690: 00 00 00 00 00 00 00 00
B698: 00 00 00 00 00 00 00 00
B6A0: 00 00 00 00 00 00 00 00
B6A8: 00 00 00 00 00 00 00 00
B6B0: 00 00 00 00 00 00 00 00
B6B8: 00 06 78 A3 06 7B A4 06
B6C0: 7E A5 06 80 A6 06 82 A7
B6C8: 06 84 A8 06 88 A9 00 00
B6D0: 00 00 00 CC CB B7 B2 B1
B6D8: BE AC 77 6A B4 E6 DC 60
B6E0: 00 00 00 00 00 24 50 AA
B6E8: 00 02 49 47 04 55 00 55
B6F0: 00 00 00 00 00 00 00 18
B6F8: 08 F0 05 50 05 0B 24 64
B700: 12 12 36 44 51 5D 62 6C
B708: 7B 8C 99 9D 9D A1 AF AF
B710: AF AF AF B3 C1 C5 C5 D3
B718: D3 D3 D6 D6 D6 D8 DD E6
B720: ED F4 FD 42 44 46 49 4B
B728: 4D 4F 52 54 56 58 5A 5C
B730: 5E 60 62 64 66 68 69 6B
B738: 6C 6C 6D 6E 6F 71 74 76
B740: 78 79 7C 7E 80 82 84 87
B748: 89 8A 8C 8E 90 91 92 93
B750: 94 95 95 96 97 98 99 99
B758: 9A 9A 9B 9C 9D 9E 9F 9F
B760: 9F A0 A0 A0 00 C8 01 18
B768: 04 16 34 30 14 14 02 08
B770: AA 00 34 35 12 12 36 40
B778: 51 5D 5D 61 75 81 8A 8D
B780: 98 98 9E 9E 9E 9E 9E 9E
B788: B1 BD BD C4 C4 C4 C4 C4
B790: C4 C8 CB CB CB CB CB CB
B798: CB CC CE CE CE CE CE CE
B7A0: CE CE CE CE CE CE CE CE
B7A8: FF FF FF FF FF FF FF FF
B7B0: FF FF FF FF FF FF FF FF
B7B8: FF FF FF FF FF FF FF FF
B7C0: FF FF FF FF 00 55 D0 4A
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
```

B7F0: 00 00 00 00 A5 A5 A5 A5
B7F8: 01 01 75 FD 01 0B 00 00