**CRASH DATA RESEARCH CENTER**

Calspan Corporation
Buffalo, NY 14225

# CALSPAN ON-SITE CHILD SAFETY SEAT CRASH INVESTIGATION

**CASE NO: CA08005**

**VEHICLE: 2002 SATURN VUE**

**LOCATION: NORTH CAROLINA**

**CRASH DATE: JANUARY 2008**

Contract No. DTNH22-07-C-00043

Prepared for:

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

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

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

# TECHNICAL REPORT STANDARD TITLE PAGE

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## BACKGROUND

This on-site investigation focused on the crash dynamics and occupant kinematics of a 3-year old male child seated within a forward facing Evenflo Big Kid Booster Safety Seat (BSS). The BSS was designed as a belt positioning booster seat and was in the rear center seat of a 2002 Saturn Vue Sport Utility Vehicle (SUV). A manual lap and shoulder belt restrained the child within the booster. The Saturn **(Figure 1)** was involved in a single vehicle four-quarter turn rollover crash. The vehicle was operated by a 22-year old female driver who lost directional control of the vehicle and drifted off the right roadside. She overcorrected to the left and overturned onto the roadway and then off the left roadside. The unrestrained driver was ejected during the rollover and sustained bilateral rib fractures (right 1-8; left 1-7), flail chest, bilateral pulmonary contusions, three skull fractures, facial fractures, spinal fractures, extremity fractures, and multiple soft-tissue injuries. She was transported to a regional trauma center by ambulance and was admitted for 20 days. The male child remained in position during the crash and was uninjured. He was transported to the same trauma center for a precautionary evaluation and released.

**Figure 1 - Damaged 2002 Saturn Vue.**

This January 2007 crash was identified by the Crash Investigation Division (CID) of the National Highway Traffic Safety Administration (NHTSA) through an Internet news search. Due to the presence of the BSS, the notification was forwarded to the Calspan Special Crash Investigations (SCI) team for follow-up. The vehicle and BSS were located and cooperation was established with the salvage facility to inspect the vehicle, and with a family member to inspect the BSS. The vehicle, scene, and BSS were inspected and a detailed interview was conducted on February 4-5, 2008. The Electronic Data Recorder (EDR) was also downloaded and is included as **Attachment A** to this report. This narrative report has been linked to the Electronic Data System (EDS).

## SUMMARY

### *Crash Site*

The crash occurred during the morning hours of January 2008. The rural roadway was wet and a light rain fell at the time of the crash. The two-lane east/west roadway was configured with one lane in each direction and was delineated by double-yellow painted centerlines. The travel lanes were 3.7 m (12 ft) in width and were bordered by 0.5 m (1.5 ft) wide paved shoulders with white painted fog lines. The worn-asphalt surfaced roadway was arched in configuration and experienced a 125 m (412 ft) radius of

curvature to the left at its apex from the eastbound direction. The roadside environment consisted of agricultural fields with drainage ditches, located 3 m (10 ft) outboard of the road edge on the south side and 2 m (6.5 ft) on the north. The posted speed limit for the roadway was 89 km/h (55 mph). On the south roadside, two narrow furrow marks that widened into left-curved yaw marks were present. They were attributed to the front right and rear left tires. The front right tire mark was 17 m (56 ft) in length and the rear left tire mark was 17.5 m (57.5 ft) in length. Both marks dissipated as the soft soil transitioned back to the asphalt roadway. Four gouge marks and glass and plastic debris were identified further east from the tire marks on the asphalt roadway. The physical evidence was documented and is illustrated to scale on the SCI Crash Schematic **(Figure 11)** at the end of this narrative report.

***Vehicle Data – 2002 Saturn Vue***

The 2002 Saturn Vue was designed as a four-door SUV with a lift gate and was identified by the Vehicle Identification Number (VIN): 5GZCZ23D12S (production number omitted). The front wheel drive vehicle was powered by a 4-cylinder, 2.3-liter engine linked to a 5-speed manual transmission. The service brakes consisted of front disc/rear drum without anti-lock (ABS). The Saturn was equipped with OEM alloy wheels and mixed P215/70R16 tires. None of the tires sustained damage during the crash. The Gross Vehicle Weight Rating (GVWR) was 2,058 kg (4,538 lb) and the manufacturer's recommended tire pressure was 210 kPa (30 PSI). The specific tire data at the time of the SCI inspection was as follows:

| Position | Tire Type | Tire I.D. Number | Measured Pressure | Measured Tread Depth |
|---|---|---|---|---|
| LF | Kumho Solus KR21 | C0JH YP6V 0107 | 97 kPa (14 PSI) | 4 mm (5/32") |
| LR | General Ameri GS60 | A309 3T2 1607 | 276 kPa (40 PSI) | 8 mm (10/32") |
| RF | Kumho Solus KR21 | C0JH YP6V 0107 | 248 kPa (36 PSI) | 3 mm (4/32") |
| RR | Bridgestone Deuler H/T | 0849Z | 159 kPa (23 PSI) | 2 mm (3/32") |

The interior of the Saturn Vue was configured with bucket seats with adjustable head restraints for the front row seating positions and a 60/40 left side wide split bench rear seat with adjustable head restraints for the outboard positions. All four head restraints were adjusted to the full-down position. The front seats ran along a 25 cm (10") adjustable seat track and was in a mid-track position at the time of the crash.

***Crash Sequence***

***Pre-Crash***

The 2002 Saturn Vue was occupied by an unrestrained 22-year old female driver and by a 3-year old male restrained by the lap and shoulder belt within a booster seat in the center rear position. The Saturn was traveling eastbound approaching a T-intersection **(Figure 2)**. The driver leaned to the right and down towards the front right floor in an attempt to

pick up an unspecified object. In doing so, she allowed the vehicle to drift off the right side of the roadway **(Figure 3)**. The driver responded by steering the vehicle to the left in an attempt to regain directional control of the Saturn.

**Figure 2 - Eastbound approach of Saturn.**

**Figure 3 - Area of roadside departure.**

The vehicle began to rotate counterclockwise (CCW), reentered the roadway, and traveled in a northeast direction. The weight of the vehicle was transferred onto the right side tires. A yaw mark, attributed to the front right tire, was located in the eastbound travel lane, 4 m (13 ft) beyond the end of the roadside furrow **(Figure 4)**. It was the probable trip point of the vehicle as evidenced by four gouges on the roadway further east.

**Figure 4 - Location of trip-over.**

***Crash***

The Saturn tripped into a right side leading rollover event. During the course of the rollover, the vehicle crossed the roadway's centerline and departed the left side of the road, approximately 28 m (92 ft) east of the trip point. Four scuffmarks from the vehicle as it overturned were present on the roadway. The first gouge was located 6 m (20 ft) east and 0.2 m (0.5 ft) south of the trip point. The second was 9.5 m (31 ft) and 0.7 (2.3 ft) south from the trip point. The third gouge was located 15 - 16 m (49 – 52 ft) east and 1 m (3 ft) south of the trip point. The final gouge was located 21 – 23 m (69 – 75 ft) east and 1.6 m (5.2 ft) south of the trip point. The vehicle overturned four-quarter turns and came to rest on its wheels.

The Saturn straddled a shallow ditch on the south roadside at final rest. It had rotated CCW 180-degrees from its original heading during the rollover.

***Post-Crash***

The female driver was ejected from the vehicle through the sunroof during the crash and was found partially underneath the left side of the vehicle at final rest. She was not restricted under the vehicle as it was on its wheels. Emergency personnel arrived on

scene and rendered aid to the ejected driver. They also removed the male child from the second row and evaluated his condition. Both the ejected driver and the child were transported to a regional trauma center by ambulance. The driver was admitted for incapacitating injuries and hospitalized for 20 days. The child was uninjured and released after a precautionary evaluation. The vehicle sustained disabling damage and was towed from the scene.

***Vehicle Damage – 2002 Saturn Vue***

The top of the Saturn sustained moderate damage to its top plane consistent with a rollover crash type. The direct contact and induced damage to the roof began 112 cm (44") aft of the front left axle and extended rearward 117 cm (46"). The maximum vertical and lateral crush was at the left A-pillar area and measured 20 cm (8") and 18 cm (7"), respectively **(Figure 5)**. The left A-pillar was crushed downward and the driver's window shattered.

**Figure 5 - Crush to A-pillar area of the Saturn.**

After an 11 cm (4.3") separation of direct contact damage along the left side rail, direct damage resumed and extended rearward another 142 cm (56"). This area of damage consisted only of abrasions and scratches and ended 36 cm (14") forward of the left rear axle.

Another area of direct contact damage was to the left fender and left aspect of the hood. This damage pattern was linear and consisted of heavy abrasions that began 28 cm (11") forward of the base of the A-pillar and extended forward a distance of 94 cm (37"). Additional faint abrasions were located on the left rear door, left wheel well, and left quarter panel.

Several additional areas on the right side of the vehicle revealed surface scratching consistent with interaction with the asphalt roadway. Feint abrasions were present on the back aspect of the vehicle's right side that began at the right rear bumper corner and extended forward 66 cm (26"). The direct contact damage dissipated for a length of 16 cm (6.3") and then resumed for a distance of 23 cm (9") to the right rear door. The right rear door handle was fractured from the vehicle. The right roof side rail also sustained minor damage from the rollover. The direct contact damage began at the C-pillar and extended forward to the A-pillar. The right front, right rear, and second right rear windows shattered.

The windshield header also sustained minor damage that encompassed the full length of the component, a distance of 122 cm (48"). The windshield was cracked at several locations and experienced a 100 percent bond separation from the header. The bond separation consisted of a minimal gap leading to a 30 x 23 cm (12 x 9") split of the laminate 30 – 60 cm (12 - 24") inboard of the right A-pillar. The roof glass also shattered

during this rollover crash. The Collision Deformation Classification for the rollover event was 00-TDDO-3.

***Interior Damage – 2002 Saturn Vue***

The 2002 Saturn Vue sustained moderate damage due to passenger compartment intrusion. The largest intrusion was to the front left roof side rail, which intruded vertically 20 cm (8”). There was no occupant contact evidence identified during the SCI inspection. **Figure 6** is a view of the intrusion into the driver’s area of the vehicle.

**Figure 6 - Intrusion of the left A-pillar and roof side rail.**

The full profile of intrusions is detailed within the following table:

| Position | Component | Magnitude | Direction |
|---|---|---|---|
| Front left | Roof side rail | 21 cm (8”) | Vertical |
| Front center | Windshield header | 21 cm (8”) | Vertical |
| Front left | A-pillar | 20 cm (8”) | Vertical |
| Front right | A-pillar | 9 cm (3.5”) | Vertical |
| Front left | Windshield header | 19 cm (7.5”) | Vertical |
| Rear right | Roof | 18 cm (7”) | Vertical |
| Front center | Roof | 16 cm (6.5”) | Vertical |
| Front left | Roof | 19 cm (7.5”) | Vertical |
| Rear right | Roof side rail | 13 cm (5”) | Vertical |
| Rear center | Roof | 11 cm (4”) | Vertical |
| Rear left | Roof | 9 cm (3.5”) | Vertical |
| Front right | Windshield header | 7 cm (2.8”) | Vertical |
| Front right | Roof | 6 cm (2.4”) | Vertical |
| Front left | A-pillar | 4 cm (1.5”) | Lateral |

***Manual Restraint System – 2002 Saturn Vue***

The manual restraint system consisted of 3-point lap and shoulder belts in the five seating positions. The driver’s restraint was configured with continuous loop webbing, a sliding latch plate and an Emergency Locking Retractor (ELR). The remaining restraints were configured with continuous loop webbing, sliding latch plates, and switchable ELR/Automatic Locking Retractors (ALR).

The driver’s restraint was stowed within the retractor at inspection. The adjustable D-ring was in the full-down position. There was no crash related evidence on the D-ring surface. Examination of the driver’s restraint revealed minor evidence of historical use consistent with the age of the vehicle. However, considering the severity of the crash and that the driver was ejected, it was determined that the restraint was not used.

The booster seat was positioned in a forward facing orientation in the second row center seat. Inspection of the vehicle belt system revealed usage evidence in the form of rippling, creasing, and a subtle discoloration of the webbing, as well as historical usage evidence on the latch plate. The crease and discoloration were located 20 – 25 cm (8 – 10") and 36 – 43 cm (14 – 17") above the belt's anchor point, respectively. At these locations, this area of the webbing would have engaged the child and BSS during the crash sequence. The historical usage on the rear center latch plate was more pronounced than on the remaining latch plates, which was indicative of regular usage of the belt system. The seatback contained a shoulder belt plastic belt-webbing guide that routed the webbing through the seatback. At impact, the belt webbing loaded the plastic guide and partially tore the component from the seatback and shifted it slightly to the left **(Figure 7)**. After examining the restraint system and associated parts of the seatback, it was determined that the belt was engaged during the impact.

**Figure 7 - Damaged guide path for second row center shoulder restraint.**

***Child Safety Seat***

The 3-year old male child was seated in the center position of the Saturn's second row within an Evenflo Big Kid belt positioning booster. The seat was manufactured on December 18, 2006 and had the model number 3371689A. The labels indicated that the seat was for use by children between 13.6 – 45.3 kg (30 – 100 lb) and 97 – 145 cm (38 – 57"). These usage requirements were denoted for when the BSS was utilized with the detachable seatback. Without the back support, the BSS was recommended for use by children between 18 – 45 kg (40 – 100 lb) and 102 – 145 cm (40 – 57") in height. **Figure 8** is a frontal view of the BSS used in this crash. Following the crash, the BSS was removed from the vehicle and taken to the driver's home. It was inspected at that location during the on-site SCI investigation.

**Figure 8 - Frontal view of Evenflo Big Kid CSS.**

During the in-person interview, a relative estimated the 3-year old male child's physical dimensions as 76 cm (30") in height and 15 kg (33 lb) in weight. It was noted at the time that the relative seemed confident about the child's estimated height, but was unsure about the child's weight. Subsequent attempts to speak with the child's mother were unsuccessful. It was probable that the child was restrained within the BSS with the belt routed through the positioning slots; however, no discernable physical evidence was found on the BSS or within the belt paths during the SCI inspection. **Figures 9** and **10** are left and right side views of the BSS.

**Figure 9 - Left side of the BSS.**

**Figure 10 - Right side of the BSS.**

***Frontal Air Bag System – 2002 Saturn Vue***

The frontal air bag system in the Saturn Vue consisted of redesigned frontal air bags for the driver and front right passenger positions. The driver air bag was located within the steering wheel hub and the front right air bag was located within the right aspect of the instrument panel. The frontal air bags were not commanded to deploy in the rollover impact.

***Electronic Data Recorder***

The 2002 Saturn Vue was equipped with an Electronic Data Recorder (EDR) that was downloaded during the SCI inspection. The EDR had one stored non-deployment event that was not related to this crash. It occurred 198 ignition cycles prior to this crash. A copy of the EDR output is included as **Attachment A** at the end of this narrative report.

***Occupant Demographics***

***Driver***

| | |
|---|---|
| Age/Sex: | 22-year old/Female |
| Height: | 163 cm (64”) |
| Weight: | 61 kg (135 lb) |
| Seat Track Position: | Mid-track position |
| Restraint Use: | None |
| Usage Source: | Vehicle inspection, ejection |
| Medical Treatment: | Transported by ambulance to regional trauma center and admitted for 20 days. |

***Driver Injuries***

| Injury | Injury Severity (AIS 90/Update 98) | Injury Source |
|---|---|---|
| Bilateral rib fractures (right 1-8; left 1-7) with flail chest (left lung), and bilateral lung contusions | Critical (450266.5,3) | Ground |
| Subdural hematoma along left greater sphenoid wing | Severe (140650.4,2) | Ground |
| Comminuted fracture of the lateral wall of the left orbit, left zygomatic arch fracture, and small fracture along the posterior aspect of the left orbital floor | Serious (251204.3,2) | Ground |
| Basilar skull fracture along the left petrous tip to the left orbital roof involving the left sphenoid sinus adjacent to the left optic foramen, and fractures of the medial and lateral left pterygoid plates | Serious (150202.3,8) | Ground |
| Fracture of lateral tip of right transverse process (C-7) | Moderate (650220.2,6) | Ground |
| Fracture of T-3 right transverse process | Moderate (650420.2,7) | Ground |
| Mid anterior skull fracture | Moderate (150402.2,5) | Ground |
| Right temporal skull fracture | Moderate (150402.2,1) | Ground |
| Left clavicle fracture | Moderate (752200.2,2) | Ground |
| Right scapula (caracoid) fracture | Moderate (753000.2,1) | Ground |
| Major avulsion to the facial region along the lateral margin of the left orbit | Moderate (290804.2,2) | Ground |
| Major avulsion of the scalp region along the lateral wall of the left frontal scalp | Moderate (190804.2,2) | Ground |
| Neck contusion | Minor (390402.1,6) | Ground |
| Nose fracture | Minor (251002.1,4) | Ground |
| Fracture of multiple teeth | Minor (251404.1,8) | Ground |

**Source: Medical records and in-person interview.*

***Driver Kinematics***

The 22-year old female driver was initially seated in an upright posture and was unrestrained. As she traveled eastbound on the two-lane rural roadway, she leaned

downward and to the right to retrieve an object that had fallen onto the front right floor. The vehicle began to drift off the south roadside and the driver overcorrected by steering rapidly to the left to regain directional control. The vehicle began to rotate CCW and the driver responded to the rotational forces by moving slightly toward the right side of the vehicle.

As the Saturn began to overturn, the driver responded by moving upward toward the roof of the vehicle. The sunroof shattered during the rollover and the driver was ejected through the opening. The opening from the shattered sunroof was 66 cm (26") laterally and 46 cm (18") longitudinally. As she was ejected from the Saturn, she sustained bilateral rib fractures (right 1-8; left 1-7), flail chest, bilateral pulmonary contusions, three skull fractures, facial fractures, spinal fractures, extremity fractures, and multiple soft-tissue injuries. It is probable that these injuries were the result of ground contact as she was ejected from the vehicle. The SCI vehicle inspection revealed no occupant contact evidence within the vehicle.

The emergency personnel who arrived on the scene found the driver outside and partially underneath her vehicle. She was oriented with her head facing to the south and her body near the left B-pillar. She was not pinned underneath the vehicle as it was on its wheels at final rest. The driver was transported by ambulance to a regional trauma center and admitted for 20 days.

***Second Row Center Passenger***

| | |
|---|---|
| Age/Sex: | 3-year old/Male |
| Height: | 76 cm (30") |
| Weight: | 15 kg (33 lb) |
| Seat Track Position: | Not adjustable |
| Restraint Use: | Seated within booster seat with 3-point lap and shoulder restraint |
| Usage Source: | Vehicle inspection |
| Medical Treatment: | Transported by ambulance to a regional trauma center for evaluation and released. |

***Second Row Center Passenger Injuries***

The second row center child passenger was not injured.

***Second Row Center Passenger Kinematics***

The 3-year old male child was seated in an upright posture within the booster BSS in the second row seating position. He was restrained within the BSS by the 3-point manual lap and shoulder belt. As the Saturn began to overturn, the child responded to the crash forces by loading the 3-point lap and shoulder restraint and rode down the crash forces. Loading evidence was identified on the belt webbing during the SCI inspection and is discussed in the Manual Restraint Systems section of this report. The child was removed from the vehicle by emergency personnel and transported by ambulance to a regional trauma center as a precaution. After an evaluation, he was released to family members.

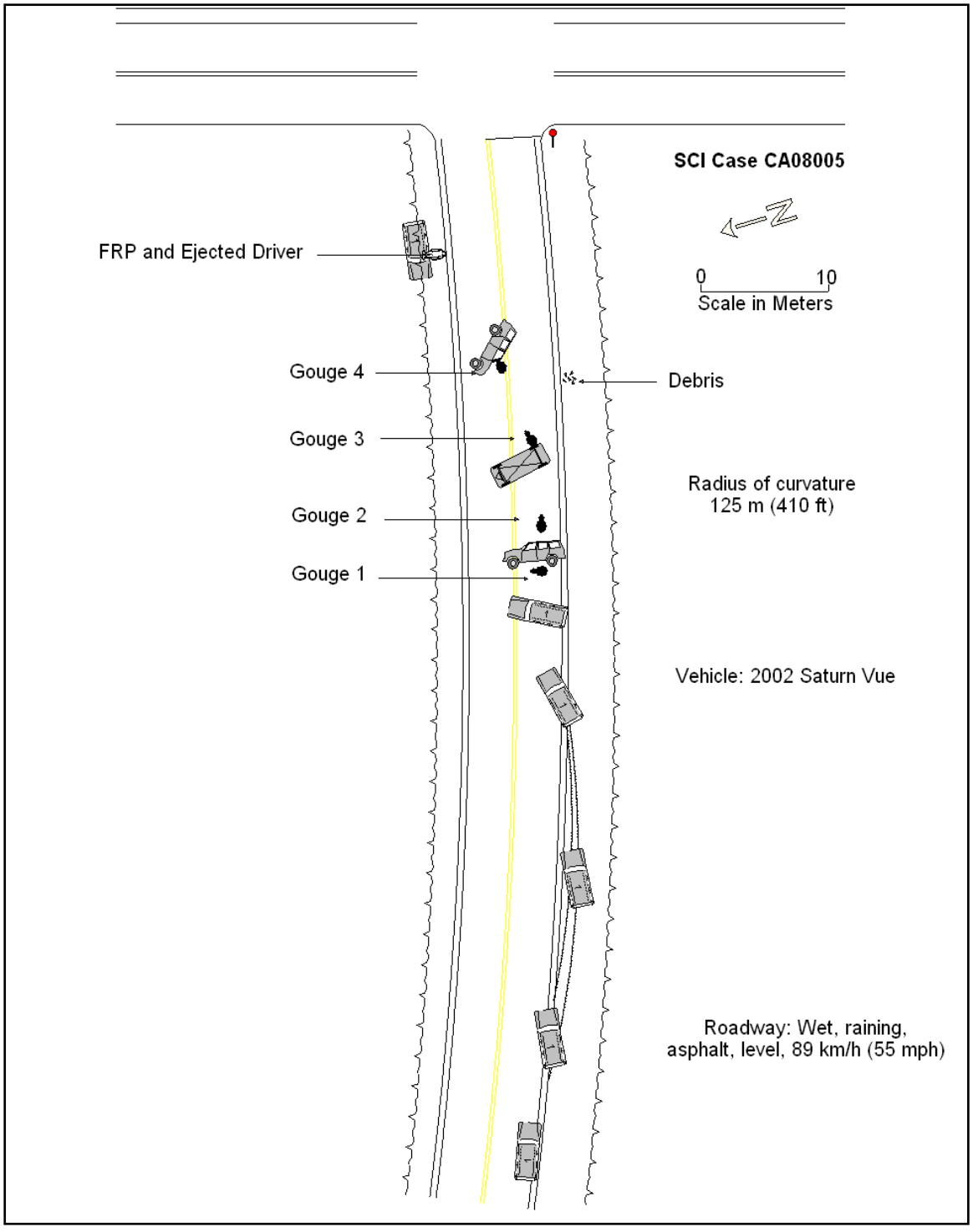


**Figure 11 – SCI Crash Schematic**

**Attachment A – EDR Report**

## CDR File Information

| | |
|---|---|
| Vehicle Identification Number | 5GZCZ23D12S****** |
| Investigator | |
| Case Number | |
| Investigation Date | |
| Crash Date | |
| Filename | |
| Saved on | |
| Collected with CDR version | Crash Data Retrieval Tool 2.800 |
| Reported with CDR version | Crash Data Retrieval Tool 2.900 |
| Event(s) recovered | 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 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 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, and then the Deployment Level Event will overwrite the Non-Deployment Event file.

SDM Data Limitations:
-SDM Adjusted Algorithm Forward Velocity Change:
Once the crash data is downloaded, the CDR tool mathematically adjusts the recorded algorithm forward velocity data to generate an adjusted algorithm forward velocity change that may more closely approximate the forward velocity change the sensing system experienced during the recorded portion of the event. The adjustment takes place within the downloading tool and does not affect the crash data, which remains stored in the SDM. The SDM Adjusted Algorithm Forward Velocity Change may not closely approximate what the sensing system experienced in all types of events. For example, if a crash is preceded by other common events, such as rough road, struck objects, or off-road travel, the SDM Adjusted Algorithm Forward Velocity Change may be less than and some times significantly less than the actual forward velocity change the sensing system experienced. 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. The maximum value that can be recorded for SDM Adjusted Algorithm Forward Velocity Change is about 112 MPH.
-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.
-Some of the Pre-Crash data may be recorded after Algorithm Enable (AE). This may happen in situations involving relatively "soft" crash pulses or those that take place over a relatively longer period of time. If this occurs, it may affect the reported pre-crash data values, but does not affect other data such as SDM Adjusted Algorithm Forward Velocity Change.
-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 Belt Switch Circuit Status indicates the status of the driver’s seat belt switch circuit. If the vehicle’s electrical system is compromised during a crash, the state of the Driver’s Belt Switch Circuit may be reported other than the actual state.
-The Time Between 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.
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. Depending on vehicle option content, the Brake Switch Circuit Status data may not be available.
-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 Non-Deployment

| | |
|---|---|
| SIR Warning Lamp Status | OFF |
| Driver's Belt Switch Circuit Status | UNBUCKLED |
| Passenger Belt Switch Circuit Status (If Equipped) | UNBUCKLED |
| Ignition Cycles At Non-Deployment | 10354 |
| Ignition Cycles At Investigation | 10552 |
| Maximum SDM Algorithm Forward Velocity Change (MPH) | -1.82 |

| Seconds Before AE | Vehicle Speed (MPH) | Engine Speed (RPM) | Percent Throttle |
|---|---|---|---|
| -5 | 15 | 768 | 5 |
| -4 | 12 | 768 | 5 |
| -3 | 6 | 768 | 5 |
| -2 | 2 | 768 | 5 |
| -1 | 1 | 768 | 5 |

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

## Hexadecimal Data

```
$01  0C 04 00 00 00 00
$02  B8 8E 00 00 00 00
$03  41 53 32 30 37 31
$04  4B 30 39 56 32 31
$05  02 41 00 00 00 00
$06  22 68 71 96 00 00
$10  FA D8 FF 00 00 00
$11  93 00 86 00 00 83
$12  00 00 00 00 00 00
$13  01 00 00 00 00 00
$14  03 04 EB 00 00 00
$18  83 83 83 40 FF 00
$1C  5A FA FA FA FA FA
$1D  FA 5A FA FA FA FA
$1E  FA FA 00 00 00 00
$1F  FF 02 00 00 00 00
$20  00 00 00 7D 80 00
$21  FF FF FF FF FF FF
$22  FF FF FF FF 00 00
$23  03 04 00 00 00 00
$24  00 01 01 02 02 02
$25  03 03 03 02 00 00
$26  01 03 09 14 18 FF
$27  0C 0C 0C 0C 0C 00
$28  0C 0C 0C 0C 0C 00
$29  FA F1 FC 00 00 00
$2A  00 00 00 00 00 00
$2B  00 00 00 00 00 00
$2C  00 00 FF 00 00 85
$2D  00 00 00 00 00 00
$2E  00 00 00 00 00 00
$30  FF FF FF FF FF 00
$31  FF FF FF FF FF FF
$32  FF FF FF FF 00 00
$33  FF FF FF FF FF FF
$34  FF FF FF FF FF FF
$35  FF FF FF FF FF FF
$36  FF FF FF FF FF FF
$37  FF FF FF FF FF FF
$38  FF FF FF FF FF 00
$39  FF FF FF FF FF FF
$3A  FF FF FF FF FF 00
$3B  FF FF FF FF 00 00
$3C  FF FF FF FF FF FF
$3D  FF FF FF FF 00 00
$3E  FF FF FF 00 00 00
$40  FF FF FF FF FF 00
$41  FF FF FF FF FF FF
$42  FF FF FF FF 00 00
$43  FF FF FF 00 00 00
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