TRANSPORTATION SCIENCES
CRASH RESEARCH SECTION

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CALSPAN ON-SITE AIR BAG/CHILD FATALITY INVESTIGATION
CALSPAN CASE NO. CA98-007
VEHICLE: 1996 FORD CONTOUR
LOCATION: GEORGIA
CRASH DATE: JANUARY, 1998

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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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16. *Abstract* This on-site investigation focused on a single vehicle air bag deployment crash that resulted in the death of a 4 month old female infant. The infant was positioned in a child safety seat that was held on the lap of the front right occupant. The involved vehicle was a 1996 Ford Contour that was equipped with frontal air bags for the driver and right passenger positions. The Contour impacted a barrier curb on an interstate bridge with the front left bumper and undercarriage components which resulted in deployment of the air bag system. The front right air bag expanded against the child safety seat which resulted in fatal head injuries to the infant.			
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TABLE OF CONTENTS

CALSPAN ON-SITE AIR BAG/CHILD FATALITY INVESTIGATION
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BACKGROUND

This on-site investigation focused on a single vehicle air bag deployment crash that resulted in the death of a 4 month old female infant. The infant was positioned in a child safety seat that was held on the lap of the front right occupant. The involved vehicle was a 1996 Ford Contour that was equipped with frontal air bags for the driver and right passenger positions. The Contour impacted a barrier curb on an interstate bridge with the front left bumper and undercarriage components which resulted in deployment of the air bag system. The front right air bag expanded against the child safety seat **(Figure 1)** which resulted in fatal head injuries to the infant.

Figure 1. Expansion of the front right air bag against the shell of the infant restraint.

The crash occurred in January 1998, and was identified by NHTSA's Atlanta Regional Office (Region IV). The notification was subsequently forwarded to the Veridian Special Crash Investigation Team on February 4, 1998, and an on-site investigation was initiated on February 5 due to the fatal outcome of the infant occupant.

SUMMARY

Crash Site

The crash occurred on a bridge for the eastbound lanes of a four lane divided interstate roadway. The bridge spanned a river with formed the eastern border of the Georgia/South Carolina state line. The bridge consisted of two concrete travel lanes that were 3.4 m (11.0') in width. Both lanes were bordered by 0.8 m (2.7') wide concrete shoulders. A continuous pour concrete bridge rail extended from the edge of the shoulder which consisted of a 33.0 cm (13.0") high barrier curb with a 0.6 m (2.0') integral walkway that was bordered by a vertical columned retaining wall. The dry concrete road surface was straight with a positive grade of 2 percent to the east. Viewing conditions were dark with no artificial illumination. The posted speed limit was 89 km/h (55 mph).

Vehicle Data

The involved vehicle was a 1996 Ford Contour GL, 4-door sedan. The vehicle was manufactured during April, 1996, and was identified by vehicle identification number 3FALP6532TM (production number deleted). The Contour was equipped with a 2.0 litre, I-4 transverse mounted engine coupled to a four-speed overdrive automatic transmission with a console mounted shifter. The vehicle was equipped with OEM aluminum alloy wheels and Firestone Firehawk GTA P205/60R15 90T M+S all-season radial tires.

Braking was achieved by power-assisted front disc/rear drum brakes without anti-lock (ABS). The vehicle's odometer recorded a total of 50,250 km (31,225 miles). The driver was listed on the Police Crash Report (PCR) as the owner of the vehicle. The tow yard operator noted that the vehicle was a previous rental car, therefore the history of the vehicle was unknown.
The interior of the vehicle was equipped with manually operated front bucket seats with reclining seat back supports and adjustable head restraints. The rear seat was a bench configuration with three designated seating positions. The four outboard seated positions were equipped with manual 3-point lap and shoulder belt systems while the center rear position was provided a lap belt. Automatic restraint was provided by a Supplemental Restraint System (SRS) that consisted of frontal air bags for the driver and front right passenger positions. The air bag system subsequently deployed as a result of the vehicle's front left undercarriage engagement with the integral barrier curb of the bridgerail.

Pre-Crash

The1996 Ford Contour GL, 4-door sedan, was occupied by a 17 year old male driver, a 21 year old female passenger seated in the front right position, and a 4 month old female infant. The infant was lying in a Cosco infant restraint that was held on the lap of the front right passenger. Although the PCR identified the adult occupants as restrained by the manual belt systems, there was no evidence within the vehicle to support belt usage. The integral harness of the Cosco child safety seat was removed from the restraint, therefore the infant was restrained solely by the shell of the restraint. The occupants of the Contour alleged that the infant was initially positioned in the rear seat of the vehicle with the child safety seat restrained by a manual belt system. The infant, however, was ill with a respiratory infection and the front right occupant (mother) noted the infant was experiencing breathing difficulties. She allegedly retrieved the child restraint from the rear seat of the vehicle and positioned the restraint on her lap in a rear-facing attitude.

The driver was traveling in an easterly direction on the interstate roadway. While traveling across the bridge, the driver alleged that the front left tire of the Ford Contour aired out as he was traveling on the inboard travel lane. The alleged air out resulted in a loss of control and the vehicle departed the inboard edge line at an estimated departure angle of 8-10 degrees.

Crash

The front left aspect of the bumper fascia impacted the barrier curb **(refer to Figure 2)**. The impact redirected the Contour slightly in a clockwise (CW) direction as the bumper overrode the barrier curb which allowed the front left frame rail and suspension components to engage against the curb **(refer to Figure 3)**. The left front tire and wheel contacted the face of the curb which resulted in abrasions to the aluminum alloy wheel and gouging to the sidewall of the tire. The inboard aspect left front alloy wheel was fractured by the contact with the barrier curb. The impact deformed the left front corner of the frame rail and displaced the lower control arm approximately 18.8 cm (7.0") rearward which resulted in separation of the lower ball joint from the

Figure 2. Front left three-quarter view documenting the curb impact damage.

steering spindle. In addition, minor sideswipe-type damage extended the full length of the lower left side of the Contour prior to separation from the curb. As a result of the undercarriage and suspension engagement, the Contour's frontal driver and passenger air bags deployed. The damage pattern to the Contour was continuous, therefore a Collision Deformation Classification (CDC) of 12-FLLE-9 applied for both the frontal and undercarriage contacts. The deceleration induced by the impact was estimated at 13-16 km/h (8-10 mph) since the damage profile was outside the scope of the WinSMASH reconstruction program.

The driver alleged that the left front tire aired out (blow-out) pre-crash which resulted in the loss of control, however, extensive tire damage occurred from the curb impact. There was no evidence at the crash site to support the air out of the tire. It should be noted that a gouge mark (possible wheel gouge) was present at the scene which preceded the impact point, however, there was no tire scuff marks adjacent to the gouge from an aired out tire. The left front tire and aluminum alloy wheel impacted the barrier curb which resulted in circumferential abrasions to the wheel bead and spokes. In addition, the sidewall of the tire was severely abraded and gouged. The contact fractured the inboard aspect of the wheel, however, the tire remained on the alloy as the vehicle continued in an easterly direction.

The contact evidence on the barrier curb was 9.1 m (30.0') in length and consisted of abrasions to the concrete surface with fragments of tire rubber and red paint transfers **(refer to Figure 3)**. The impact redirected the vehicle onto the inboard travel lane as it continued in an easterly direction The aired out left front tire was deflected rearward into the trailing edge of the left front wheel opening. The damage to the wheel and suspension components restricted the rotation of the tire, therefore the tire marked on the concrete road surface 1.8 m (6.0') east of the separation point from the curb. This tire print identified the post-crash trajectory of the vehicle.

Figure 3. Ford Contour's impact with the barrier curb.

Post-Crash

The Contour subsequently traveled 33.5 m (109.9') following the initial point of impact on the inboard travel lane prior to exiting the east edge of the bridge structure (Georgia/South Carolina state line). The vehicle traveled an additional 33.4 m (109.7') in a tracking mode on the inboard travel lane prior to departing the inboard yellow edge line. The vehicle traversed the inboard shoulder and entered the depressed grass median. The Contour came to a controlled stop on the median approximately 115.8 m (379.9') east of the initial impact point with the barrier curb. The rotating left front tire print of the grass shoulder arced back toward the travel lanes which indicated that the driver steered in a clockwise direction prior to coming to rest. At rest, the vehicle was approximately parallel to the shoulder, facing in easterly direction. The crash schematic is attached to this summary report as **Figure 10**.

The Contour's fuel cut-off switch was tripped at impact which resulted in loss of fuel flow and a stall of the engine. As the vehicle continued in an easterly direction, the Contour was decelerated by the dragging

left front tire and normal engine braking. A separation velocity of 85.8 km/h (53.3 mph) was computed for the Contour assuming an average drag factor of .25 for the post-impact travel distance of 115.8 m (379.9') while ascending a positive grade of 2 percent.

VEHICLE DAMAGE

Exterior

The initial bumper fascia contact against the barrier curb did not result in residual crush to the bumper reinforcement bar. The direct contact damage on the fascia consisted of a heavy concrete abrasion pattern that began 34.9 cm (13.75") left of the vehicle's center line and extended 34.9 cm (13.75") to the front left bumper corner. The bumper overrode the 33.0 cm (13.0") barrier curb which allowed the front left undercarriage components to engage with the curb as the vehicle was redirected slightly in a clockwise direction. The outboard aspect of the leading edge of the front left frame crossmember was displaced 1.3 cm (0.5") rearward and was heavily abraded from the concrete curb impact. As the Contour continued forward, the lower aspect of the left lower control arm contacted the curb which resulted in 17.8 cm (7.0") of rearward displacement of the control arm and separation of the lower ball-joint form the steering spindle (refer to Figure 4). Ball-joint separation resulted from the straight machined shaft of the joint pulling out of the compression bore on the lower control arm unit. This compression union did not utilize a tapered shaft or the use of a castle nut/cotter key configuration.

Figure 4. Undercarriage damage and separation of the left lower ball-joint.

The lower ball-joint separation allowed displacement of the left front tire into the trailing aspect of the wheel opening. The tire/wheel contacted and dented the rear aspect of the left front fender and abraded the plastic inner fender liner. Rearward displacement of the left front axle resulted in complete separation of the left inboard constant velocity (CV) joint from the output shaft on the transaxle.

As the vehicle was redirected in a clockwise direction back toward the inboard travel lane, the trailing edge of the left front fender and leading edge of the left front door contacted the curb resulting in superficial sideswipe-type damage. The sideswipe damage continued on the lower aspect of the left C-pillar, trailing edge of the left rear door, left rear alloy wheel, and the left side surface of the rear bumper fascia. The vehicle disengaged from the barrier curb as its center of gravity continued in an easterly direction.

Figure 5. Sideswipe damage to the right side of the Contour.

The right side of the Ford Contour exhibited a similar superficial sideswipe-type damage pattern that was recent to the crash involving the left side of the vehicle. This damage pattern began at the right front bumper corner and extended 30.4 cm (12.0") rearward onto the side

surface of the fascia. Abrasions and shallow dents were noted to the right sill of the vehicle and to the right lower C-pillar/right rear door panel **(refer to Figure 5)**. There were no abrasions/contact evidence on the right front and/or right rear tires and wheels. This damage pattern was consistent with a barrier curb impact to the right side of the concrete bridgerail, however, there was no evidence over the entire length of the bridge to support this impact. Several "fresh" areas of abrasive contact were noted to the right barrier curb, however, these areas did not contain red paint transfers. In addition, the road debris along the base of the curb was not disturbed from recent contact.

Although the right side sideswipe damage (CDC of 12-FRLE-9) could not directly be linked to this crash, the damage was recent since the exposed sheet metal was free of surface rust, similar to the left side damage. This contact pattern would have resulted from a shallow angle departure from the outboard travel lane and subsequent contact with the barrier curb. The contact probably would have initiated an evasive counterclockwise steering input by the driver which could have resulted in the departure from the inboard travel lane. It should be noted that the body shop included this right side damage in the overall repair estimate for the crash related damage.

Interior

The interior of the Ford Contour sustained minor severity damage that was associated with air bag deployment and occupant contact. The cover flap for the front right passenger air bag contacted and cracked the laminated windshield. There were three distinct points of contact to the windshield. The first point was located 19.1-19.7 cm (7.5-7.75") right of center and 16.5-18.4 cm (6.5-7.25") above the top surface of the instrument panel. This contact consisted of a vinyl transfer from the left edge of the cover flap. The mid aspect of the flap contacted the windshield 35.6 cm (14.0") right of center while the right edge of the flap contacted the glazing 53.3-55.9 cm (21.0-22.0") right of center. A large impact crack was noted to the right side of the windshield located 25.7 cm (10.1") right of center and 33.0 cm (13.0") above the upper instrument panel. A white air bag membrane fabric transfer was located above this star-like crack, 22.9-28.6 cm (9.0-11.25") right of center and 34.9-39.4 cm (13.75-15.5") above the instrument panel. In addition to the windshield contact evidence, a heavy white plastic transfer from the child safety seat was located 34.3-48.3 cm (13.5-19.0") right of center and 38.1-50.8 cm (15.0-20.0") above the upper instrument panel.

The driver's right hand or the displaced CSS contacted and fractured the wiper stalk from the right side of the steering column. A yellow scuff mark was noted to the base of the steering column, located 40.6-43.2 cm (16.0-17.0") left of center and 27.9-29.2 cm (11.0-11.5") below the upper instrument panel.

Figure 6. Deployed front left air bag.

AUTOMATIC RESTRAINT SYSTEM

As previously noted, the 1996 Ford Contour was equipped with a Supplemental Restraint System (SRS) that consisted of frontal air bags for the driver and front right passenger positions. The SRS deployed as a result of the vehicles's front left impact sequence with the integral

barrier curb of the left side bridgerail. The front left air bag deployed from the four-spoke steering wheel rim mounted module assembly **(refer to Figure 6)**. The module cover consisted of symmetrical cover flaps with overall dimensions of 19.1 cm (7.5") at the horizontal tear seam and 7.6 cm (3.0") vertically. At the time of vehicle inspection, the steering wheel was rotated approximately 180 degrees CW. The air bag membrane was 58.4 cm (23.0") in diameter and was constructed of two different fabrics sewn with an internal peripheral seam. The forward panel was a light color fabric with a close weave pattern while the outer panel (panel exposed to the driver) was a typical coarser woven fabric. The outer panel was lined internally with a neoprene-type liner. The bag was vented by two 1.9 cm (0.75") diameter vent ports that were located at the 11 and 1 o'clock sectors of the bag, centered 7.4 cm (2.9") inboard of the peripheral seam. The front left air bag was tethered by two 12.7 cm (5.0") wide tethers sewn to the face of the bag at the 3 and 9 o'clock positions. The 17.8 cm (7.0") diameter reinforcement was sewn to the face of the bag with two rows of stitching.

There was no direct contact evidence on the bag from occupant involvement. Superficial transfers were noted to the inner panel of the bag circumferentially 360 degrees from the bags expansion against the cover flaps. There was no compression of the energy absorbing steering column.

The front right passenger air bag was mounted in the upper aspect of the right instrument panel. The air bag deployed from a single top (forward) hinged cover flap. The profile of the Contour's instrument panel resulted in a 12.1 cm (4.75") setback of the leading edge of the cover flap from the protruding mid instrument panel. The cover flap was contoured to the profile of the upper instrument panel with a radius of approximately 1.9 cm (0.75"). The overall dimensions of the frontal passenger air bag module cover flap were 36.2 cm (14.25") horizontally at the leading edge and 15.9 cm (6.25") in depth toward the windshield. The cover flap consisted of a soft-edged vinyl skin over a sheet metal inner liner which acted as the hinge point for the upward and forward opening flap. A label affixed to the sheet metal liner identified the manufacture date at 03/22/96 with a Production Shift #3 and a Mold #1. This sheet metal liner was scattered with a superficial film of rust.

The cover flap opened at the designated tear points along the leading edge and the side surfaces of the flap. Contact evidence was present on the leading edge of the cover flap. An abrasion with a whitish transfer was noted to the leading edge which began at the left corner and extended 21.0 cm (8.25") to the right. This transfer resulted from cover flap contact against the posterior aspect of the shell of the child safety seat. The contact probably momentarily impeded the opening of the cover flap. The expanding passenger side air bag loaded against the cover flap, bowing the flap in an outward direction. The rust film was transferred on the lower aspect of the deploying air bag at the outboard edges of the flap. A gray vinyl transfer was noted to the top surface of the right frontal air bag from bag expansion against the interior surface of the flap. This horizontally oriented transfer was located 1.3-11.4 cm (0.5-4.5") left of the bag center and was 1.9 cm (0.75") in height.

Figure 7. Cover flap and air bag contact to the windshield.

The leading edge of the cover flap impacted and fractured the laminated windshield at three distinct points **(refer to Figure 7)**. The left corner of the flap impacted and fractured the windshield glazing 19.1-19.7 cm (7.5-7.75") right of center and 16.5-18.4 cm (6.5-7.25") above the top surface of the upper instrument panel. A vertically oriented scuff mark surrounded the mid point of the fracture. The bowing of the upper flap resulted in contact by the mid aspect of the leading edge of the flap. This point was located 35.6 cm (14.0") right of center and 15.2 cm (6.0") above the instrument panel. The right corner of the flap impacted and fractured the windshield 53.3-55.9 cm (21.0-22.0") right of center and 15.2 cm (6.0") above the panel.

The subsequent expansion of the frontal passenger air bag against the forward positioned child safety seat altered the deployment path of the bag. The bag was deflected in a forward direction against the windshield. Bag contact to the windshield was evidenced by a patterned white air bag membrane transfer that was located 22.9-28.6 cm (9.0-11.25") right of center and extended (34.9-39.4 cm 13.75-15.5") above the referenced instrument panel. The contact fractured the windshield in a star-like pattern that was centered 26.7 cm (10.5") right of center and 33.0 cm (13.0") above the upper panel.

The front passenger air bag was tethered by two wide band internal tether straps that were 7.6 cm (3.0") in width. The tethers were sewn to the face of the passenger bag at a point that was approximately 22.9 cm (9.0") below the top horizontal edge of the bag. The maximum rearward excursion of the bag at the tether point was 45.1 cm (17.75"), measured from the leading edge of the cover flap, or 33.0 cm (13.0") from the protruding mid panel. Venting of the bag was achieved by a 7.6 cm (3.0") diameter vent port that was located on the inboard aspect of the bag at 9 o'clock. The vent port was centered 50.8 cm (20.0") outboard of the module assembly. There was no additional damage or contact evidence to the front passenger air bag assembly.

MANUAL RESTRAINT SYSTEMS

The 1996 Ford Contour was equipped with 3-point lap and shoulder belts in the four outboard seated positions and a center rear lap belt. The front belt systems consisted of continuous loop webbings with a sliding latchplate. The B-pillar mounted retractors were inertia activated with the addition of webbing grabbers. The D-rings were adjustable with 8.3 cm (3.25") of vertical travel. The lower anchorages for the front belt systems were affixed to the outboard aspect of the seat frames. The buckle assemblies contained an energy management system that were concealed within the vinyl sleeves. Both frontal units were not deployed.

The driver's belt system yielded faint superficial wear indicators on the latchplate that were not consistent with frequent usage for the recorded mileage on the vehicle. The lap belt webbing was partially folded in the sliding latchplate. The lap belt webbing also contained four gouge marks that resulted from the belt system being caught between the striker and door latch mechanism. There was no loading evidence of the belt system that was related to this crash.

The front passenger belt system had few routine usage indicators and lacked evidence of crash related

loading. There were no air bag fabric transfers on the webbing or transfers from the child safety seat.

Although not occupied during the crash, the rear seat belt systems did not yield evidence of routine usage. There was no damage to the manual restraint systems.

CHILD SAFETY SEAT

The involved child safety seat (CSS) was manufactured by Cosco on 06/16/97 and was identified by Model No. 02 733 PJE **(refer to Figure 8).** The CSS was improperly used at the time of the crash. It was designed to be used as a rear-facing infant restraint. The restraint consisted of an ABS-type plastic one-piece shell with a pivoting carrying handle affixed to the mid point of the shell. A foam pad with a fabric liner provided a soft surface for the infant. The CSS was manufactured with a 3-point harness, however, the harness straps were removed from the shell of the restraint. The belts were not present in the vehicle, therefore it was suspected that the harness was removed prior to this crash. A locking clip was taped to the base of the shell.

Figure 8. Overall view of the Cosco infant restarint.

A warning label was affixed to the right side (outboard side when used in a rearward-facing position) of the shell which advised against the placement of the restraint in the right front of a vehicle that was equipped with a front right passenger air bag. The red label further advised that the infant could suffer severe head and/or neck injuries.

A second warning label was printed on the left side of the fabric liner of the restraint. The label was printed in black and yellow and measured 11.4x5.3 cm (4.5 x 2.1"). The label provided the following:

W Do not place rear-facing
A child seat on front seat
R with air bag.
N Death or serious injury can
I occur.
N The back seat is the safest place
G for children 12 and under.

The child restraint was positioned on the lap of the right front passenger in a rear-facing position. The manual 3-point lap and shoulder belt webbing was not in use by the passenger, therefore the infant restraint was secured only by the arms of the passenger.

Figure 9. Cover flap abrasion and fracture to the shell of the child safety seat.

At impact, the leading edge of the front passenger air bag module cover

flap opened against the upper rear aspect of the shell of the restraint. This contact sequence was evidenced by an abrasion with a whitish transfer embedded into the leading edge of the flap and a horizontally oriented abrasion with gray vinyl embedded into the shell of the restraint. This abrasion pattern was located across the manufacture date clocks that were embossed into the shell of the restraint **(refer to Figure 9)**. The abrasion was 14.2 cm (5.6") horizontally and 1.9 cm (0.75") in height. This contact fractured the shell in both a horizontal and vertical direction across the back of the shell above and to the left of the harness adjustment slots. This would have been the approximate location of the infant's head.

The cover flap contact and subsequent expansion of the bag membrane accelerated the restraint in an upward and rearward direction. The carrying handle impacted the upper right quadrant of the windshield. A large white plastic transfer was noted to the glazing 34.3-48.3 cm (13.5-19.0") right of center and 38.1-50.8 cm (15.0-20.0") above the upper instrument panel. Several abrasions were noted to the posterior aspect of the carrying handle. Two additional rust transfers were noted to the handle that resulted from bag contact. The rust was transferred onto the bag from expansion against the sheet metal liner of the cover flap. The left side pivot of the carrying handle was fractured by the deployment sequence which resulted in partial separation of the handle. There was no evidence or pre-existing damage to the restraint.

DRIVER DEMOGRAPHICS

Age/Sex:	17 year old male
Height:	177.8 cm (70.0")
Weight:	65.8 kg (145.0 lb)
Manual Restraint Usage:	None
Usage Source:	Vehicle inspection
Mode of Transport From Scene:	Ambulance
Type of Medical Treatment:	None

DRIVER INJURIES

Injury	*Injury Severity (AIS 90)*	*Injury Mechanism*
Not reported as injured	N/A	N/A

DRIVER KINEMATICS

At the initial impact with the barrier curb, the Contour's supplemental frontal air bag system deployed. The 17 year old male driver was presumably seated in a normal driving posture with the seat track adjusted to a rear track position. At the time of vehicle inspection, the left front seat track was adjusted to a position that was 3.2 cm (1.25") forward of the full rearward position. The driver was probably not restrained by the manual 3-point lap and shoulder belt system. There was no direct evidence of loading on the system

or separation of the buckle webbing energy management system.
The driver responded to the frontal impact force by moving slightly forward into the path of the deployed front left air bag. There was no direct evidence of driver contact on the bag or compression of the energy absorbing steering column. His left knee probably contacted the knee bolster at the base of the steering column. A yellowish-type scuff mark was noted to the plastic panel 40.6-43.2 cm (16.0-17.0") left of center. The wiper stalk that was mounted on the right side of the steering column was fractured at the mounting point with the column. This fracture probably resulted from driver hand contact or as a result of displacement of the CSS.

The driver was not reported as injured, however, following his initial transport to a local hospital, (regarding the treatment of his infant daughter), the driver was arrested and jailed on numerous charges which included DWI, vehicular homicide 1st degree, failure to maintain lane, and a child restraint violation. In addition, the driver was suspected to be under the influence of a controlled substance (marijuana) following the police detection of its odor within the vehicle.

FRONT RIGHT PASSENGER DEMOGRAPHICS

Age/Sex:	21 year old female
Height:	162.6 cm (64.0")
Weight:	54.4 kg (120.0 lb)
Manual Restraint Usage:	None
Usage Source:	Vehicle inspection
Mode of Transport From Scene:	Ambulance
Type of Medical Treatment:	Treated and released

FRONT RIGHT PASSENGER INJURIES

Injury	*Injury Severity (AIS 90)*	*Injury Mechanism*
Unknown if injured	Unknown	Unknown

FRONT RIGHT PASSENGER KINEMATICS

The front right passenger of the Ford Contour was seated in a presumably upright posture with the seat track adjusted to the full rearward position and the seat back reclined to 23 degrees. There was no loading evidence on the manual belt system from the low severity crash and minimal routine usage indicators, therefore the passenger was probably unrestrained by the manual belt system. She was holding her infant daughter on her lap who was positioned in a Cosco infant CSS. Based on contact evidence and subsequent damage to the child safety seat, the child restraint was held in a rear-facing attitude on the mother's lap with the upper aspect of the shell positioned within a close proximity to the top mount frontal passenger air bag. The integral harness belts were removed from the restraint, therefore the infant was not

restrained within the CSS.

At impact with the barrier curb which deployed the air bag system, the leading edge of the right frontal air bag module cover flap contacted the upper rear aspect of the shell of the CSS. The initial contact with the leading edge of the module cover flap and subsequent expansion of the air bag membrane against the shell of the restraint displaced the restraint in an upward and rearward direction. The subsequent rearward displacement of the infant restraint resulted in probably contact between the infant and/or restraint and the anterior aspect of the front right passenger. It was unknown of the front right passenger sustained injury from the crash events.

INFANT PASSENGER DEMOGRAPHICS

Age:	4 months
Length:	Unknown
Weight:	Unknown
Restraint Usage:	Improperly restrained and positioned on the lap of the passenger in the front right of the Ford Contour
Mode of Transport From Scene:	Ambulance
Type of Medical Treatment:	Expired within 22 minutes of arrival to a local trauma center

INFANT PASSENGER INJURIES

Injury	***Injury Severity (AIS 90)***	***Injury Mechanism***
Closed head injury *(Cause of death was listed on the Death Certificate as Massive Central Nervous System Injury)*	Unknown (115099.7,0)	Front right air bag module cover flap contact and bag expansion against the shell of the CSS
Skull fractures, not further specified	Moderate (150000.2,9)	Front right air bag module cover flap contact and bag expansion against the shell of the CSS
Superficial abrasions of forehead and left face	Minor (290202.1,7; 290202.1,2)	Probable contact against the body of the front right passenger
Possible nasal fracture	Not codeable	Probable contact against the body of the front right passenger

The above injuries were obtained from the Coroner who consulted with the attending physician and observed the infant's body. No autopsy was performed.

INFANT PASSENGER KINEMATICS

The front right female passenger was seated in a presumed normal upright posture with the seat track adjusted to the full rearward position. The seat back was reclined to a measured angle of 23 degrees. She was not wearing the manual 3-point lap and shoulder belt system. Prior to impact, the passenger was holding the child safety seat on her lap in a rear-facing position with the upper aspect of the shell positioned in a close proximity to the top mount front passenger air bag cover flap.

At impact with the barrier curb, the frontal air bag system deployed. The leading edge of the module cover flap initially opened against the upper rear aspect of the plastic shell of the restraint. The expanding air bag membrane subsequently contacted the shell of the restraint which accelerated the restraint in an upward and rearward direction. This contact was evidenced by an abrasion with a whitish-type transfer to the leading edge of the module cover flap and horizontally oriented abrasions with gray vinyl transfers embedded into the abrasion located on the rear aspect of the child restraint shell directly above the harness slots. As a result of the contact, the shell was fractured in a horizontal and vertical pattern adjacent to the reinforcement at the left rear aspect of the shell.

The initial deployment of the frontal passenger air bag against the child safety seat resulted in severe closed head injuries to the infant. The infant was not restrained by the integral harness of the child safety seat and was accelerated in a rearward direction as the right front passenger initiated a forward trajectory in response to the 12 o'clock impact force. The facial area of the infant probably impacted the head and/or body of the right front passenger. Data from the coroner's office indicated the infant sustained a possible nasal fracture and superficial abrasions of the left face and forehead from the suspected occupant-to-occupant interaction.

MEDICAL TREATMENT

A South Carolina emergency medical service received notification of the crash and responded to the scene, arriving within four (4) minutes of the call. All three occupants were immediately placed in the ambulance due to the grave condition of the infant and transported to a local trauma center in Georgia. The time off arrival at the trauma center was 14 minutes following the EMS arrival on-scene. The infant subsequently expired within 12 minutes of her arrival to the medical facility. The attending physician ordered a series of X-rays which revealed the closed head injuries and skull fractures. He consulted with the coroner and signed the death certificate confirming accidental death due to a motor vehicle accident without the need of an autopsy. The cause of death was listed as massive central nervous system injury.

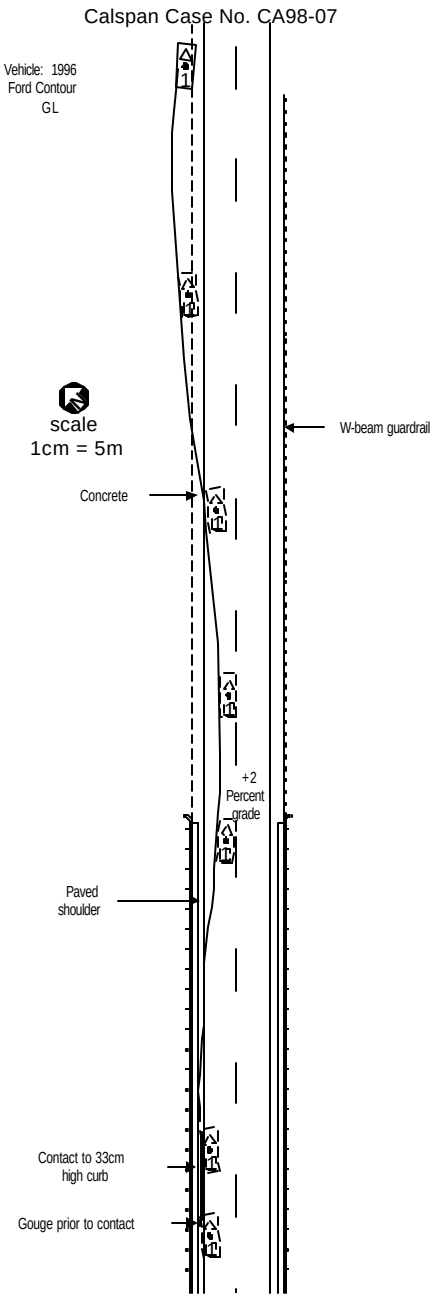

Figure 10. Crash Schematic