

**TRANSPORTATION SCIENCES
CRASH RESEARCH SECTION**

Veridian Engineering
Buffalo, New York

**VERIDIAN ON-SITE DRIVER AIR BAG FATALITY INVESTIGATION
VERIDIAN CASE NO. CA99-049
VEHICLE: 1991 FORD TAURUS STATION WAGON
LOCATION: NORTH CAROLINA
CRASH DATE: NOVEMBER, 1999**

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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. <i>Abstract</i> This on-site investigation focused on the type of injury and injury mechanisms for the driver of an air bag equipped 1991 Ford Taurus. The vehicle was found off-road against a tree with the driver deceased, slumped against the left door and the deployed front left air bag. Her 48 year old son was asleep in the rear seat of the vehicle. He provided sketchy details of the crash to the investigating police agency. The vehicle was involved in a low speed run-off-road crash with the tree which deployed the driver air bag system. The driver's thoracic injuries were consistent with air bag deployment for an out-of-position (forward) driver. Contact evidence within the vehicle supported the interaction between the driver and the deploying air bag. The correlation between the contact evidence and her injury patterns concluded that her death resulted from air bag deployment.			
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BACKGROUND

This on-site investigation focused on the type of injury and injury mechanisms for the driver of an air bag equipped 1991 Ford Taurus. The vehicle was found off-road against a tree (**Figure 1**) with the driver deceased, slumped against the left door and the deployed front left air bag. Her 48 year old son was asleep in the rear seat of the vehicle. He provided sketchy details of the crash to the investigating police agency. The vehicle was involved in a low speed run-off-road crash with the tree which deployed the driver air bag system. The driver's thoracic injuries were consistent with air bag deployment for an out-of-position (forward) driver. Contact evidence within the vehicle supported the interaction between the driver and the deploying air bag. The correlation between the contact evidence and her injury patterns concluded that her death resulted from air bag deployment.



Figure 1. On-scene view of the found position of the Ford Taurus.

The investigating police department notified NHTSA's Crash Investigation Division on November 30, 1999, of the November crash. Following initial discussions with the police, an on-site investigative effort was assigned. The NHTSA COTR and the Veridian SCI investigator initiated an on-site investigation on December 1st. Extensive interviews were conducted on December 2nd with all police and emergency personnel who were involved in the on-scene and follow-up investigations. The scene was inspected on the afternoon of the 2nd followed by the vehicle inspection and documentation on the 3rd. The medical examiner was interviewed on the afternoon of the 3rd at which time he provided the results of the autopsy.

SUMMARY

Crash Site

The crash occurred on a two lane county road in a remote rural area during nighttime hours. In the vicinity of the crash, the roadway transitioned from an asphalt surface to a gravel surface. The travel lanes of the asphalt surface were 5.9 m (19.4') in width with natural earth shoulders. The gravel segment was 6.3 m (20.7') in width and was bordered by natural vegetation of brush and trees. At the on-set of the gravel segment, the roadway curved to the right (for westbound traffic flow) with a radius of curvature of 125 m (409'). The posted speed limit was 89 km/h (55 mph).



Figure 2. Overall view of the crash site.

At the time of the crash, the conditions were dark with no artificial illumination and the environmental surfaces were dry. The struck tree was 33.0 cm (13.0") in diameter and was located 4.5 m (14.7') outboard of the south (left) road edge. There were no defects or environmental factors contributing to the crash. **Figure 2** is an overall view of the crash site.

Vehicle Data

The 1991 Ford Taurus station wagon was owned and operated by the 79 year old female driver. The previous history of the vehicle was unknown. The Taurus was equipped with a 3.0 liter V-6 engine linked to a 4-speed automatic overdrive transaxle, power-assisted front disc/rear drum brakes without anti-lock, and power-assisted rack-and-pinion steering. The interior was configured with a split bench (50/50) front seat with dual fold down center armrests, manual track and recline adjusters, and adjustable head restraints. Power equipment was limited to outside rear view mirrors as the door locks and windows were manually controlled. The second seat was a bench seat with a forward folding seat back. The Taurus was manufactured on 3/91 and was identified by vehicle identification number 1FACP55U1MG (production number deleted). The gross vehicle weight rating (GVWR) was 2,208 kg (4,870 lb). At the time of the crash, the odometer had recorded 145,132.6 km (90,183.7 miles).

Pre-Crash

The 79 year old female driver and her 48 year old son had departed their residence in South Carolina at an estimated time of 2130 hours. The purpose of the trip was unknown. The immediate family members stated to the police that the driver seldom drove at night. On the evening of the crash, the weather was cold with temperatures in the low single digits Celsius (upper 20s F).

The crash occurred at an unknown time, however, it was presumed to have occurred during the early morning (nighttime) hours. An on-duty police officer traveled past the scene of the crash while on routine patrol between the hours of 0000-0230. The Taurus was not present at the scene at this time. A witness, who was returning to her residence from work, observed the vehicle at 0610 hours. At this time, the windows were fogged over and the engine compartment appeared cool, therefore the police suspect the time of the crash to have occurred in the 0400-0430 hour time frame. The travel distance and route of the occupants during this seven (7) hour time frame was not known. The crash site was located approximately 96-112 km (60-70 miles) from their residence. They were traveling in a westerly direction on the two lane rural road and approached the crash site on the paved segment. According to his post-crash statement, the son was seated in the rear seat of the vehicle and was twisting the driver's right arm as she attempted to drive the vehicle while entering the right curve as surface transitioned to gravel. This action probably resulted in the driver's loss of ability to maintain directional control of the vehicle. As a result, the Ford Taurus traversed the travel lanes at a shallow angle and departed the left road edge. The investigating officers detected faint tire marks on the gravel surface. They concluded that the marks began as rotating tire prints for a distance of 6 m (20') then continued for an additional 4 m (13') as locked front skid marks. Due to the unstable nature of the gravel surface, these marks were obliterated by responders to the crash scene and were not visible during the SCI investigation.

Crash

As the vehicle departed the gravel road surface, the front left area of the Ford Taurus impacted a 33.0 cm (13.0") diameter tree. The damage and trajectory algorithm of the WinSMASH program computed an impact speed of 25.5 km/h (15.8 mph). The 12 o'clock direction of force impact resulted in a total velocity change of 20.4 km/h (12.7 mph) with a longitudinal component of -20.4 km/h (-12.7 mph). As a result of the impact induced deceleration, the frontal air bag for the driver's position deployed. The vehicle came to rest against the struck tree. The crash schematic is attached as **Figure 14**, Page 14.

Post-Crash Activities

The rear seat passenger of the vehicle provided police with several versions of his actions immediately following the crash. Based on blood evidence within the vehicle, blood evidence on the occupant's clothing, and observations of the first responding officer, the following are the probable actions of the passenger post-crash.

Following the crash, the passenger stated that he checked the driver for a pulse, found none and determined she had expired. Blood evidence on the back of the driver's blouse was consistent with this passenger touching the driver, however, these transfers could have resulted from actions against the driver pre-crash. He reached over the driver and turned the headlight and ignition switches to the off-position. This passenger allegedly exited the vehicle and walked 0.4 km (0.25 miles) in both directions along the desolate road in search of help.

A local resident to the area was returning home following the completion of her assigned night shift at a local manufacturing facility. As she traveled onto the unpaved segment of the county road, she observed the Ford Taurus on the left side of the roadway. This witness positioned her vehicle toward the Taurus and used her vehicle's headlights to illuminate the right side of the Taurus. She approached the vehicle, but had difficulty seeing inside the Taurus due to the dark conditions and fogged windows. She did note the deployed air bag and a dog positioned on the front right seat area. This witness drove to her residence and called the local county police dispatcher. The dispatcher notified a patrol vehicle and instructed the officer to the scene of the crash. The officer arrived 18 minutes after the initial call by the above witness. As the officer arrived on scene, he used his flashlight to illuminate the interior of the vehicle. He observed the driver slumped against the left door and over the top of the deployed front left air bag and the dog on the front right seat. This officer then proceeded to tap on the side window in an effort to wake the driver. The driver did not respond to the tapping, however, the noise awoke the rear passenger of the vehicle. He rose to a seated position and startled the investigating officer.

The officer called in to his dispatcher and reported the personal injury crash. Additional officers were summoned to the scene. The driver did not yield a pulse and was determined to be deceased at the scene of the crash. A local tow facility was called to the scene to remove the vehicle from the wooded area to provide access to the left door area to remove the body from the vehicle. The passenger was observed as injured (multiple abrasions/avulsion of the hands and a contusion of the left face) at the scene, however, he refused medical treatment. His attorney refused to allow an interview with the SCI investigator.

VEHICLE DAMAGE

Exterior

The front left area of the Ford Taurus sustained moderate damage as a result of its impact sequence with the tree. Maximum crush was 26.4 cm (10.4") located on the bumper fascia, 54.6 cm (21.5") left of center. The direct contact damage on the bumper fascia began 34.3 cm (13.5") left of center and extended 33.7 cm (13.25") to the right (**Figure 3**). The narrow impact deformed the full frontal width of the front bumper resulting in a combined induced and direct contact damage length (Field L) of 154.3 cm (60.75"). The crush profile at bumper level was as follows: C1 = 19.1 cm (7.5"), C2 = 19.7 cm (7.75"), C3 = 10.2 cm (4.0"), C4 = 5.7 cm (2.25"), C5 = 3.8 cm (1.5"), C6 = 3.3 cm (1.3").

Figure 4 is a profile view of the left frontal area which documents the extent of frontal crush. The Collision Deformation Classification (CDC) for this tree impact was 12-FLEN-1. Components damaged by the tree impact included the front bumper fascia, bumper reinforcement bar, left headlight and turn signal assembly, and the hood.



Figure 3. Frontal damage to the Ford Taurus.



Figure 4. Profile view documenting the extent of frontal crush.

Secondary superficial damage from brush impacts at the scene involved the front right corner area of the vehicle and the left side surface. The front right corner of the vehicle had superficial sideswipe-type damage that extended 74.9 cm (29.5") rearward onto the right front fender. The left side had similar damage that began 64.8 cm (25.5") forward of the left front axle and extended 429.3 cm (169.0") rearward, ending at a point that was 95.3 cm (37.5") rearward of the left rear axle position. Both damage patterns consisted of superficial paint damage without residual crush. The respective CDCs for these impacts were 12-FRES-4 and 12-LDMS-1

Interior

The interior of the Ford Taurus had moderate damage that was associated with air bag deployment, driver loading of the steering assembly, and occupant contact to the interior surfaces. Numerous areas were stained by blood. There was no damage resulting from exterior deformation or intrusion of interior components.

The driver was out-of-position forward against the driver's air bag module at impact and deployment. Vertically oriented scuff marks were present on the upper cover flap from engagement against her clothing and torso. The scuff marks began 1.3 cm (0.5") left of the mid point of the flap and extended 7.0 cm (2.75") to the left. The marks originated at the horizontal tear seam and extended 9.9 cm (3.9") vertically onto the face of the flap.

The driver's forward position restricted the deployment of the cover flap and the air bag membrane. This, in combination with her forward trajectory in response to the frontal impact force, compressed the energy absorbing column. Column compression was evidenced by 5.4 cm (2.125") of left shear bracket separation and 4.8 cm (1.875") of right shear bracket separation (**Figure 5**). In addition, the hub of the steering wheel was canted to the left, resulting in approximately 2.5 cm (1.0") of wheel displacement.

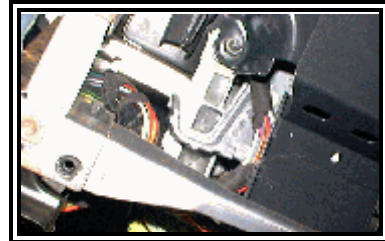


Figure 5. Shear bracket separation.

A probable left arm/shoulder scuff mark was visible on the left door panel, located 31.8-33.0 cm (12.5-13.0") rearward of the leading edge and 14.0-17.1 cm (5.5-6.75") below the beltline. The driver was displaced in an upward and rearward direction by the expanding air bag. This trajectory resulted in head contact to the headliner adjacent to the left B-pillar. The contact point compressed the padded material to a depth of 1.3 cm (0.5") and tore the fabric. A scuff mark with dandruff-like deposits surrounded the contact point which was located 49.5-56.7 cm (19.5-23.5") rearward of the windshield header and 7.6-21.6 cm (3.0-8.5") inboard of the left roof side rail.

The rear seated passenger loaded the front left seat back as he responded to the 12 o'clock impact force. His loading of the seat back support deflected the hinge point of the seat back forward approximately 2.5 cm (1.0"). The investigating officers cut numerous areas of blood stained fabric from the vehicle to submit to their crime lab for typing analysis. These deposits were believed to be related to the rear seat passenger.

MANUAL RESTRAINT SYSTEMS

The Ford Taurus was equipped with manual 3-point lap and shoulder belt systems for the four outboard seated positions and center lap belts for both front and rear seats. The front outboard systems consisted of continuous loop webbings with sliding latchplates and emergency locking retractors. The upper anchorages (D-rings) were fixed. The driver's belt system did yield evidence of routine usage as indicated by faint wear marks on the latchplate. The wear pattern was not consistent with full-time usage for the mileage recorded on the odometer, therefore it was determined that the driver was an occasional belt user. There was no loading evidence or blood stains on the belt system. Furthermore, the driver was observed in the vehicle at final rest unrestrained. The front right belt system had similar wear patterns to the driver's belt system.

The rear outboard belt systems were configured similar to the front systems with the addition of a 20.3 cm

(8.0") tethered D-ring affixed to the roof side rails. All three rear belt systems yielded faint routine wear marks which indicated infrequent usage over the life of the vehicle. The rear seat passenger was out-of-position and was not restrained by a belt system.

AUTOMATIC RESTRAINT SYSTEM

The 1991 Taurus was equipped with a Supplemental Restraint System (SRS) that consisted of a frontal air bag for the driver’s position. The driver air bag deployed as a result of the front left impact sequence with the tree. The system consisted of three front crash sensors mounted to the radiator support panel, a safing sensor, an interior mounted diagnostic control module, a steering wheel mounted air bag module, and an instrument panel mounted air bag indicator lamp. Prior to the SCI investigation, the investigating police department cut the deployed driver air bag membrane from the module assembly. All other components remained intact.

The front outboard electro-mechanical crash sensors were mounted to the lower aspect of the radiator support panel. The left sensor was rotated approximately 15 degrees in a clockwise direction by the impact deflection of the radiator support panel. There was no damage or direct contact to the sensor. The right sensor was not damaged. The center sensor was mounted to the top mid aspect of the support panel under a plastic trim panel. Although the label was rotated on the housing, there was no damage or displacement of the unit.

The following identifies the Ford OEM Part Nos. and the individual identification number for each sensor:

	Left Sensor	Center Sensor	Right Sensor
Ford Part Number	F0DB-14B005-RF	F1DB-14B006-AA	F0DB-14B004-RE
Identification Number	3HQ4614020	4B04613298	3GD4413806

The driver air bag was housed in an H-configuration module cover assembly with asymmetrical cover flaps (**Figure 6**). The upper flap was 20.3 cm (8.0") in width at the horizontal tear seam and 12.7 cm (5.0") in height to the top hinge point. The lower cover flap maintained the same width with a height of 3.8 cm (1.5"). The upper cover flap was scuffed left of center from expansion against the driver’s right chest area. The vertically oriented scuff marks (**Figure 7**) were located 1.3-7.0 cm (0.5-2.75") left of the center line on the cover flap and 0-9.9 cm (0-3.9") vertically, originating at the horizontal tear seam.



Figure 6. Overall view of the deployed front left air bag.

The forward position of the driver against the cover flap at deployment restricted the upward rotation of the flap. Therefore, the subsequent expansion of the air bag membrane against the inner aspect of the restricted flap resulted in an incomplete separation of the flap at the top hinge

point (**Figure 8**). The hinge was 16.2 cm (6.375") in width and was completely separated with the exception of the left 1.3 cm (0.5").



Figure 7. Vertically oriented scuff marks on the upper cover flap.



Figure 8. Near separation of the upper hinge point.

The air bag membrane was constructed of two panels sewn with an internal peripheral seam. The bag measured 69.9 cm (27.5") in diameter in its deflated and removed state. The bag was vented by two 2.2 cm (0.875") diameter vent ports located at the 11 and 1 o'clock sectors, centered 8.9 cm (3.5") inboard of the peripheral seam. Internally, the bag was tethered by four straps sewn to the face of the bag with a 17.8 cm (7.0") octagonal reinforcement at the 12/6 and 3/9 o'clock sectors.

Numerous blood stains were noted to the bag from post-crash loss by the driver and/or the rear seat passenger. The rear seat passenger was not in contact with the bag during the deployment phase.

A fabric transfer that was consistent with the color of the blouse worn by the driver was noted to the lower aspect of the air bag at the 5:30 o'clock sector (**Figure 9**). The light blue fabric transfer began 3.8 cm (1.5") forward of the peripheral seam and extended 11.4 cm (4.5") toward the inflator. Based on the known fold pattern for this air bag, the 6 o'clock sector of the bag is the last aspect folded into the module assembly and therefore, is the first to deploy.

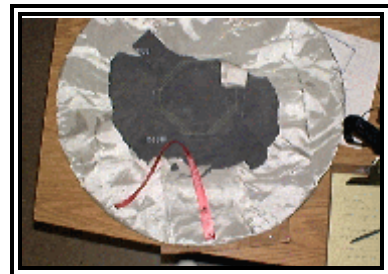


Figure 9. Fabric transfer at the 5:30 o'clock position of the bag.

OCCUPANT DEMOGRAPHICS/DATA

Driver

Age/Sex: 79 year old female
Height: 149.9 cm (59.0")
Weight: 53.1 kg (117.0 lb)
Manual Restraint
Usage: None, 3-point lap and shoulder belt was available
Usage Source: Observations of the first arriving officer, vehicle inspection
Eyewear: Prescription eyeglasses (bifocals)
Type of Medical
Treatment: N/A, fatal at scene

Crash Related Driver Injuries

Injury	Injury Severity (AIS 90)	Injury Mechanism
Multiple bilateral rib fractures, left 1-6 and right 1-7 (anterio-lateral fractures) with upper right pulmonary contusion	Critical (450266.5,3)	Front left air bag cover flap and expanding air bag membrane
Small focus of interstitial hemorrhage and perivascular hemorrhage of the brainstem	Critical (1402110.5,8)	Rebound trajectory into the headliner
Left subarachnoid hemorrhage	Serious (140466.3,2)	Rebound trajectory into the headliner
Sternum fracture at the junction of the 2 nd and 3 rd ribs with hemorrhage	Moderate (450804.2,4)	Front left air bag cover flap and expanding air bag membrane
3.8 cm contusion of the right anterior chest above and medial to the right nipple	Minor (490402.1,1)	Front left air bag cover flap
10.2x3.8 cm contusion of the right lateral chest at the level of the breast	Minor (490402.1,1)	Front left air bag cover flap
Multiple irregular abrasions and contusions of the right anterior shoulder	Minor (790202.1,1; 790402.1,1)	Front left air bag cover flap

Injury	Injury Severity (AIS 90)	Injury Mechanism
Subgaleal hemorrhage over the scalp	Minor (290402.1,9)	Headliner/roof
0.9 cm avulsion of the right lower leg, proximal to the ankle	Minor (890802.1,1)	Foot pedals

<i>Non-Crash Related Injuries</i>	<i>Injury Severity (AIS 90)</i>	<i>Mechanism</i>
2.5x0.3 cm linear abrasion of the right upper chin	Minor (290602.1,8)	Inflicted by passenger pre-crash
Minor abrasion on the surface of the lips	Minor (290202.1,8)	Inflicted by passenger pre-crash
0.6 cm laceration on the undersurface of the lower lip, left of midline	Minor (290602.1,8)	Inflicted by passenger pre-crash
1.9 cm laceration at the margin of the lip and the base of the gum	Minor (290602.1,8)	Inflicted by passenger pre-crash
Slight tear laceration of the upper frenulum	Minor (290602.1,8)	Inflicted by passenger pre-crash
Fracture of the alveolar bone at teeth Nos. 8 and 9	Minor (250200.2,8)	Inflicted by passenger pre-crash
Contusion of gum at the margin of the inner lip above tooth No. 6	Minor (243202.1,8)	Inflicted by passenger pre-crash
Tear laceration at the skin at teeth Nos. 8 and 9	Minor (243204.1,8)	Inflicted by passenger pre-crash
Tooth No. 9 fractured at the base of the gum	Minor (251404.1,8)	Inflicted by passenger pre-crash
Teeth Nos. 7 and 8 were loosened	Minor (251402.1,8)	Inflicted by passenger pre-crash

<i>Non-Crash Related Injuries</i>	<i>Injury Severity (AIS 90)</i>	<i>Mechanism</i>
Severe dislocation of the right shoulder	Moderate (750630.1,1)	Inflicted by passenger pre-crash
Severe dislocation of the right elbow	Moderate (751030.2,1)	Inflicted by passenger pre-crash
Multiple abrasions of the right arm	Minor (790202.1,1)	Inflicted by passenger pre-crash

** All injuries were documented by the medical examiner during the autopsy.*

Driver Kinematics

The driver of the Ford Taurus was a 79 year old female. She had a history (per family members) of seldom driving during nighttime hours. The following was reconstructed from contact evidence within the vehicle, injury data obtained from the medical examiner, and on-scene photographs of the driver's final rest position within the vehicle.

The driver was driving the vehicle under duress due to violent actions against her by her son who was positioned in the rear seat of the Taurus. On the approach to the crash scene, the passenger was probably positioned between the center and left rear seated positions, reaching between the front seat back supports, twisting the right arm of the driver. This action would have displaced the driver in a forward and left direction. She was therefore, steering the vehicle with her left arm.



Figure 10. Profile view of the driver's seated position.

The driver was seated in an upright posture with the manual seat track adjusted to forward position, 7.4 cm (2.9") rearward of the full forward, or 15.0 cm (5.9") forward of the full rear position. The seat back angle was reclined to approximately 20 degrees with the tilt steering wheel set to the mid adjustment position (**Figure 10**). In this position, the horizontal distance between the seat back support and the mid point of the air bag module cover was 47.0 cm (18.5"). She was not wearing the manual belt system.

The driver was unable to maintain control of the vehicle as she entered the right curve. The vehicle drifted to the left and departed the right left road edge and impacted the tree resulting in air bag deployment.

At impact, the driver was out-of-position forward and left with her right upper chest area against the left side of the air bag module cover and her right arm extended rearward. The upward rotational trajectory of the asymmetrical upper cover flap was restricted due to the driver's forward position. As the pressure of the expanding air bag membrane began to build behind the flap, the top hinge of the upper flap separated (**Figure 11**). The flap subsequently gathered the blouse of the driver and torn the polyester fabric over the

right upper chest and shoulder area. A cover flap transfer was noted to the blouse over the shoulder area at the tear site (**Figure 12**). Vertically oriented scuff marks were visible on the left aspect of the upper flap.



Figure 11. Separation of the upper hinge of the air bag cover flap.



Figure 12. Contact and damage to the right upper chest area of the driver's blouse.

The direct contact by the cover flap produced contusions of the right anterior chest and multiple irregular abrasions and contusions of the right anterior shoulder. The cover flap and the expanding air bag compressed the chest of the driver which resulted in multiple bilateral antero-lateral rib fractures with an upper right pulmonary contusion and a sternal fracture at the junction of the 2nd and 3rd ribs.

The driver subsequently loaded the expanding air bag as she responded to the 12 o'clock impact force. The combination of air bag expansion against the driver and driver loading of the bag and steering wheel combination, resulted in compression of the energy absorbing steering column. The left shear bracket was compressed 5.3 cm (2.1") while the right bracket compressed 4.8 cm (1.9"). Her continued forward motion was evidenced by a 0.9 cm avulsion of the right lower leg which resulted from contact against the brake pedal.

The continued expansion of the frontal air bag against the chest of the driver propelled her in an upward and rearward direction (**Figure 13**). The posterior and superior aspects of the driver's head impacted the roof headliner inboard of the left upper B-pillar. The contact compressed the padded backing and tore the fabric headliner. In addition to the 1.3 cm (0.5") residual depth compression, a scuff mark with dandruff-like deposits evidenced the contact area. The driver sustained subgaleal hemorrhage over the scalp with subarachnoid hemorrhage, and interstitial hemorrhage and perivascular hemorrhage of the brainstem from contact with the headliner.



Figure 13. Overall trajectory of the driver with head strike to the headliner.

During the driver's latter trajectory that was influenced by the expanding air bag, the rear seat passenger responded to the frontal impact force and initiated a forward trajectory over the front left seat back support. His left facial area impacted the posterior scalp of the driver as she was accelerated rearward or during her contact with the headliner. Although no specific driver injury was attributed to the occupant-to-occupant interaction, the passenger sustained a large contusion of the left cheek and an abrasion over the bridge of the nose.

The driver subsequently rebounded from the roof contact into the driver's seat where she came to rest slumped forward of the seat back support with her head resting on the upper aspect of the left door panel. In this position, her right arm was extended rearward with the anterior aspect facing upward. It was possible that the rear seat passenger moved the driver's body to access the headlamp switch and the ignition. Blood stains were noted on the posterior aspect of her blouse which probably resulted from interaction by the passenger following the crash.

The driver was found in the above position by the investigating officer and was pronounced dead at the scene. The body was transported to the state medical examiner's office where a full autopsy was performed. All injuries were documented and coded in the Driver Injury section of this report.

Rear Seat Passenger

Age/Sex: 48 year old male
 Seated Position: Center rear (probable)
 Height: 167.6 cm (66.0")
 Weight: 40-45 kg (90-100 lbs), police estimate
 Manual Restraint Use: None
 Usage Source: Vehicle inspection, pre-crash activities
 Eyewear: None
 Type of Medical Treatment: Refused treatment

Rear Seat Passenger Injuries

Injury	Injury Severity (AIS 90)	Injury Mechanism
Contusion of the left face	Minor (290402.1,2)	Occupant-to occupant interaction
Small abrasion over the bridge of the nose	Minor (290202.1,4)	Occupant-to occupant interaction (possible)

Rear Seat Passenger Kinematics

The adult male passenger of the Ford Taurus provided the police with numerous versions of his involvement in this crash. These included he as a passenger in the front seat of the vehicle, he as a rear seated

passenger asleep at the time of the crash, and he as a rear seat passenger fighting with the driver at the prior to the crash. The passenger was seated in the center rear area of the vehicle engaged in a harmful act against the driver.

This passenger was probably straddling the center and left rear seated positions, in a forward attitude against the front left seat back. At impact, the passenger initiated a forward trajectory and loaded the front left seat back support with his torso area as his head extended over the top of the seat back/head restraint. The driver was accelerated in an upward and rearward direction by the inflating front left air bag. Her rearward trajectory, in combination with his forward motion, resulted in contact between the heads of the occupants. This occupant-to-occupant interaction produced a large contusion over the left facial area (cheek) of the passenger that radiated to the lower eye area. In addition, he sustained a small superficial abrasion to the bridge of the nose which could have occurred from this contact sequence.

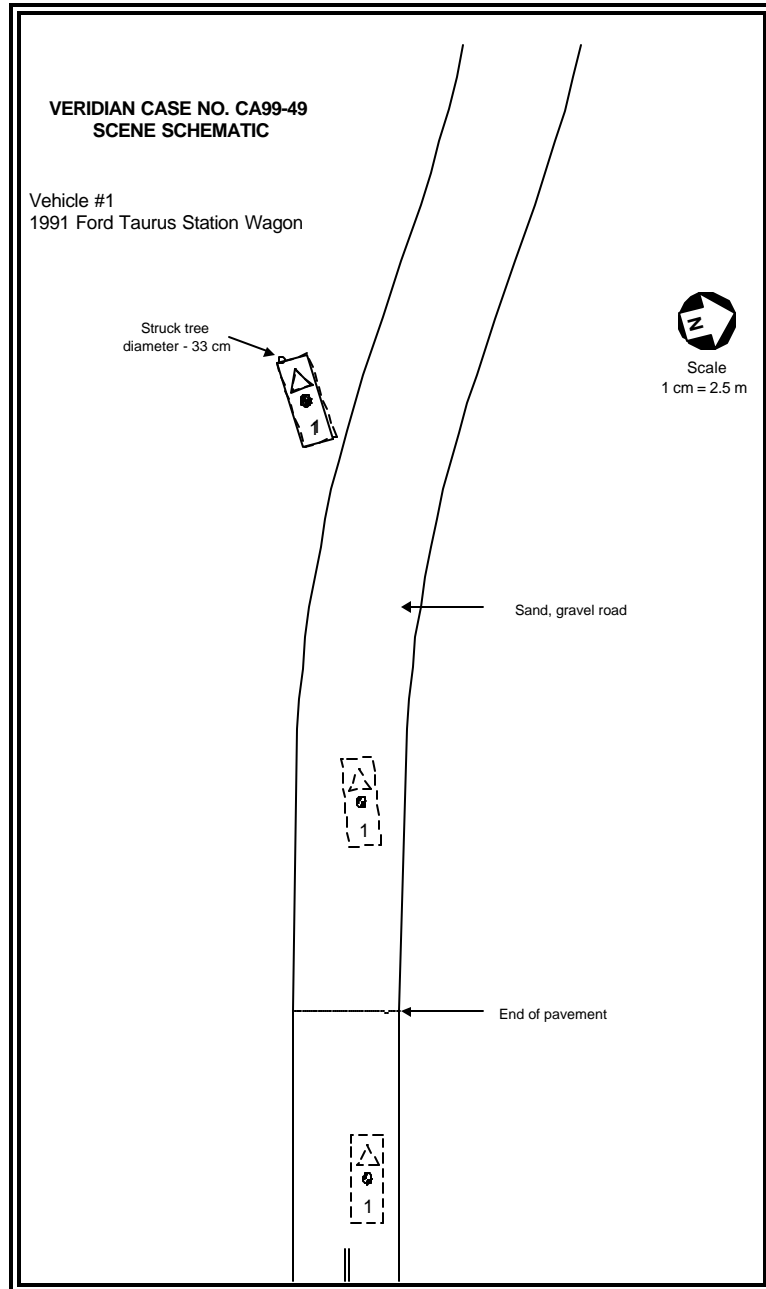


Figure 14. Crash Schematic