

**TRANSPORTATION SCIENCES
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**VERIDIAN ON-SITE ADVANCED OCCUPANT PROTECTION
SYSTEM INVESTIGATION
VERIDIAN CASE NO. CA00-020
VEHICLE: 2000 FORD TAURUS SE
LOCATION: ALABAMA
CRASH DATE: APRIL 2000**

Contract No.
DTNH22-94-D-07058

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

<p>1. <i>Report No.</i> CA00-020</p>	<p>2. <i>Government Accession No.</i></p>	<p>3. <i>Recipient's Catalog No.</i></p>	
<p>4. <i>Title and Subtitle</i> Veridian On-Site Advanced Occupant Protection System Investigation Vehicle: 2000 Ford Taurus SE Location: Alabama</p>		<p>5. <i>Report Date:</i> May 2002</p>	
		<p>6. <i>Performing Organization Code</i></p>	
<p>7. <i>Author(s)</i> Crash Data Research Center</p>		<p>8. <i>Performing Organization Report No.</i></p>	
<p>9. <i>Performing Organization Name and Address</i> Transportation Sciences Crash Data Research Center Veridian Engineering P.O. Box 400 Buffalo, New York 14225</p>		<p>10. <i>Work Unit No.</i> C01115.0289.(0000-0009)</p>	
		<p>11. <i>Contract or Grant No.</i> DTNH22-94-D-07058</p>	
<p>12. <i>Sponsoring Agency Name and Address</i> U.S. Department of Transportation National Highway Traffic Safety Administration Washington, D.C. 20590</p>		<p>13. <i>Type of Report and Period Covered</i> Technical Report Crash Date: April 2000</p>	
		<p>14. <i>Sponsoring Agency Code</i></p>	
<p>15. <i>Supplementary Notes</i> On-site investigation of a 2000 Ford Taurus crash that was equipped with an Advanced Occupant Protection System.</p>			
<p>16. <i>Abstract</i> This on-site investigation focused on the non-deployment issues of the frontal air bag system in a 2000 Ford Taurus. The Taurus was equipped with an Advance Occupant Protection System (AOPS) that consisted of dual stage frontal air bags for the driver and right passenger positions, a driver's seat track positioning sensor, front seat belt buckle pretensioners, load limiting retractors, a Restraints Control Module (RCM) with event data recording (EDR) capabilities, and a center front radiator support mounted electronic crash sensor. The Taurus was a rental car that was occupied by a 76 year old male driver and a 76 year old female front right passenger. Both occupants were properly restrained by the available 3-point lap and shoulder belt systems. The driver relinquished control of the Taurus as he was traveling in a southerly direction on a rural two lane parkway. The vehicle crossed the centerline and departed the left road edge onto a grassy area with a downslope. The center frontal area of the Taurus impacted a blunt flared end of a concrete bridge rail. The impact resulted in a velocity change of 68.9 km/h (42.8 mph) which fired the front seat belt pretensioners. The above threshold crash did not deploy the frontal air bag system. The belted driver impacted his face on the center hub/air bag module cover and sustained fatal head injuries. The belted front right passenger sustained multiple lower extremity and pelvic fractures, a fractured nasal bone, and a facial contusion. She was transported by ambulance to a local hospital and transferred by helicopter to a regional trauma center where she was admitted for 20 days. She was subsequently transferred to a rehabilitation facility for 30 days and released.</p>			
<p>17. <i>Key Words</i> Advanced Occupant Protection System, Center frontal impact Belt pretensioners, No air bag deployment</p>		<p>18. <i>Distribution Statement</i> General Public</p>	
<p>19. <i>Security Classif. (of this report)</i> Unclassified</p>	<p>20. <i>Security Classif. (of this page)</i> Unclassified</p>	<p>21. <i>No. of Pages</i> 12</p>	<p>22. <i>Price</i></p>

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PROTECTION SYSTEM INVESTIGATION
VERIDIAN CASE NO. CA00-020
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BACKGROUND

This on-site investigation focused on the non-deployment issues of the frontal air bag system in a 2000 Ford Taurus. The Taurus was equipped with an Advanced Occupant Protection System (AOPS) that consisted of dual stage frontal air bags for the driver and right passenger positions, a driver's seat track positioning sensor, front seat belt buckle pretensioners, load limiting retractors, a Restraints Control Module (RCM) with event data recording (EDR) capabilities, and a center front radiator support mounted electronic crash sensor. The Taurus was a rental car that was occupied by a 76 year old male driver and a 76 year old female front right passenger. Both occupants were properly restrained by the available 3-point lap and shoulder belt systems. The driver relinquished control of the Taurus as he was traveling in a southerly direction on a rural two lane parkway. The vehicle crossed the centerline and departed the left road edge onto a grassy area with a downslope. The center frontal area of the Taurus impacted a blunt flared end of a concrete bridge rail (**Figure 1**). The impact resulted in a velocity change of 68.9 km/h (42.8 mph) which fired the front seat belt pretensioners. The above threshold crash did not deploy the frontal air bag system. The belted driver impacted his face on the center hub/air bag module cover and sustained fatal head injuries. The belted front right passenger sustained multiple lower extremity and pelvic fractures, a fractured nasal bone, and a facial contusion. She was transported by ambulance to a local hospital and transferred by helicopter to a regional trauma center where she was admitted for 20 days. She was subsequently transferred to a rehabilitation facility for 30 days and released.



Figure 1. Frontal view of the impact damage to the 2000 Ford Taurus.

NHTSA received notification of the crash in June 2000 and immediately assigned the on-site investigative effort to the Veridian SCI team. The on-site investigation was scheduled in cooperation with the attorney who represented the occupants of the Taurus, the attorney's consultant, representatives of Ford, and the rental car agency who retained possession of the vehicle at a regional depot.

SUMMARY

Crash Site

The crash occurred on a Parkway in Alabama during daylight hours. The Parkway consisted of a two lane asphalt road that was 6.4 m (21.0') in width and delineated by a dashed yellow centerline and bordered by solid white edge lines. In the vicinity of the crash site, the parkway was straight and level with a posted speed limit of 80 km/h (50 mph). Both edges of the parkway were bordered by grass shoulders that

sloped away from the travel lanes at approximately 15 degrees. At the time of the crash, the conditions were clear and the environmental surfaces were dry.

At the crash site, a concrete bridge railing system paralleled both edges of the parkway. The struck bridge rail (**Figure 2**) was formed with an integral 20.3 cm (8.0") barrier curb that was located 1.0 m (3.3') outboard of the edge line. The curb transitioned to a horizontal surface of 35.6 cm (14.0") in width. The vertical aspect of the railing was 66 cm (26") in height, 30.5 cm (12.0") in width at the top surface and 50.8 cm (20.0") wide at the base. The struck face of the rail flared outboard of the travel lanes and was located 2.1 m (6.9') east of the edge line. There were no barriers protecting the flared end of the bridge rail from southbound traffic.



Figure 2. Struck concrete bridge railing.

Vehicle Data

The involved 2000 Ford Taurus SE was a four-door sedan, powered by a 3.0 liter transverse mounted V-6 engine that was linked to a four-speed automatic overdrive transmission with a column mounted transmission selector lever. The Taurus was a rental car that was obtained by the driver on the morning of the crash. The vehicle was equipped with power-assisted front disc/rear drum brakes (no ABS), 5-spoke alloy wheels with P215/60R16 Continental Touring Contact AS tires, and front wheel drive. The interior was configured with front bucket seat and a flip and fold center armrest that converted to a center seating position, and a three passenger rear bench seat with split, forward folding seat backs. The cloth trimmed front bucket seats had adjustable head restraints that were adjusted to the full down positions. The fore and aft seat adjustments for the driver's seat were power while the right seat and recline features were manually controlled. Power equipment included power-assisted rack-and-pinion steering, power windows door locks, and outside rear view mirrors. The Taurus was manufactured on January 2000 and was identified by vehicle identification number 1FAFP5520YG (production number deleted). The odometer reading at the time of the crash was 14, 556 km (9,045 miles).

Crash Sequence

Pre-Crash

The driver and his wife had rented the Ford Taurus on the morning of the crash. They had driven the vehicle for approximately two hours and stopped for lunch. Following the lunch break, the husband drove the vehicle and was traveling in a southerly direction on the two lane Parkway for approximately one hour. On the approach to the crash site, he apparently fell asleep and relinquished directional control of the Taurus. The vehicle drifted across the centerline and the northbound travel lane prior to departing the east road edge at a shallow departure angle in a tracking mode. Although most of the physical evidence had eroded from the crash scene prior to the SCI investigation, the roadside departure points were identified. The left side tires departed 39.2 m (128.6') north of the blunt end of the struck bridge rail while the right side tires departed the pavement 14.8 m (48.6') north of the referenced point.

Crash

The center frontal area of the Ford Taurus impacted the blunt end of the concrete bridge rail at a WinSMASH computed speed of 65.6 km/h (40.8 mph). The front bumper crushed to a maximum residual depth of 94.2 cm (37.1") (**Figure 3**). No damage occurred to the concrete bridge rail. The Taurus rebounded from the barrier impact and rotated approximately 45 degrees in a CW direction prior to coming to rest on the grassy area east of the bridge. The damage algorithm of the WinSMASH program computed velocity change of 68.9 km/h (42.8 mph) with a longitudinal component of -68.9 (-42.8 mph). As a result of the impact, the front seat belt buckle pretensioners fired, however, the frontal air bags did not deploy.



Figure 3. Rearward crush to the front bumper.

Post-Crash

The Ford Taurus rebounded approximately 2 m (6.6') rearward and rotated approximately 45 degrees in a clockwise (CW) direction coming to rest with its center of gravity located 4.9 m (16.1') east of its at-crash position. The driver was slumped forward against the steering assembly and expired at the scene of the crash. The front right adult passenger was removed from the vehicle by rescue personnel and transported by ambulance to a local hospital where she was evaluated and transferred by helicopter to a regional trauma center where she was admitted for treatment of her injuries.

Vehicle Damage

Exterior

The 2000 Ford Taurus sustained severe center frontal damage that resulted from its impact sequence with the blunt end of the concrete bridge rail. Maximum crush was 94.2 cm (37.1") located on the centerline of the bumper reinforcement beam. The direct contact damage width was 32.4 cm (12.75") and was centered on the frontal plane. The severe impact deformed the full frontal width of the Taurus resulting in a combined induced and direct damage length of 77.7 cm (30.6") that extended from bumper corner-to-bumper corner. The crush profile at the level of the bumper beam was as follows: C1 = 46.0 cm (18.1"), C2 = 68.6 cm (27.0"), C3 = 93.7 cm (36.9"), C4 = 94.2 cm (37.1"), C5 = 75.4 cm (29.7"), C6 = 41.9 cm (16.5"). The wheelbases was reduced in length by 20.5 cm (8.1") on the right and 23.1 cm (9.1") on the right side. The Collision Deformation Classification (CDC) for the bridge rail impact was 12-FCEN-4.

Both front doors remained closed and were jammed by damage. Rescue personnel pried the left front door open and used hydraulic equipment to open and remove the right front door from the vehicle. Both rear doors remained closed and operational post-crash. The windshield was fractured due to exterior deformation. Rescue personnel cut the lower aspect of the right upper A-pillar and tore the plastic laminate adjacent to the pillar and base of the windshield. The left door glazing was opened approximately 12.7 cm (5.0") at the time of the crash and remained intact. The right front and both rear door glazing were fully closed. The right front door glazing was shattered, while the rear door and back light glazing remained intact.

Interior

The interior of the Ford Taurus sustained moderate damage that resulted from intrusion associated with exterior deformation, occupant contact damage, firing of the seat belt pretensioners, and occupant loading of the manual belt systems. The intrusions are documented in the table below.

Occupant Position	Intruding Component	Direction of Intrusion	Magnitude of Intrusion
Left front	Left aspect of mid instrument panel	Longitudinal	5.7 cm (2.25")
Left front	Steering wheel hub	Longitudinal	7.4 cm (2.9")
Center front	Center mid instrument panel	Longitudinal	15.3 cm (6.0")
Left front	Brake pedal	Longitudinal	39.4 cm (15.5")
Left front	Toe pan	Longitudinal	36.2 cm (14.25")
Right front	Right aspect of mid instrument panel	Longitudinal	1.9 cm (0.75")
Right front	Mid instrument panel under front right air bag module	Longitudinal	4.4 cm (1.75")
Right front	Lower right A-pillar	Longitudinal	5.1 cm (2.0")
Right front	Toe pan	Longitudinal	44.2 cm (17.4")

The driver loaded the manual belt system as he responded to the 12 o'clock impact force. His loading of the belt system abraded D-ring which was adjusted to the full-up position. The belt webbing was cut by rescue personnel while the latch plate remained buckled. Blood stained the webbing in the area that cover his torso and pelvic region. Fabric transfers were noted to the webbing and the plastic covering on the outboard aspect of the seat cushion was abraded from belt interaction.

The driver's head flexed forward as his torso loaded the shoulder belt webbing. His face impacted the top aspect of the steering wheel hub/air bag module cover. This contact was evidenced by a tissue transfer that was 7.6 cm (3.0) laterally and 5.1 cm (2.0") longitudinally at the apex of the cover. A large tissue transfer was embedded into the midpoint of the overall contact pattern. There was no displacement of the steering wheel rim, however, the alloy shear capsule bracket that was affixed to the column fractured inboard of

the shear assemblies. The shear coupling at the lower end of the steering column separated due to toe pan intrusion. The deformable bracket of the steering column was bent due to the intrusion of the toe pan.

The driver's left arm probably contacted the upper A-pillar as evidenced by a 17.8 cm (7.0") blue fabric transfer. The plastic cover was partially separated from the pillar. His left knee impacted the left lower aspect of the intruding lower instrument panel, outboard of the bolster panel. The 13x28 cm (5x11") knee contact fractured the plastic panel and penetrated 20.3 cm (8.0") into the sub-panel at the top aspect and 5.1 cm (2.0") at the lower aspect of the contact point. The contact was centered 55.9 cm (22.0") left of center and 25 cm (10") below the upper instrument panel. The driver's right knee contacted and scuffed the right aspect of the knee bolster 18-25 cm (7-10") left of the vehicle's centerline. The right edge of the bolster panel was gouged with hair embedded into contact point. The edge of the bolster panel was displaced 2.5 cm (1.0") forward by the right knee contact.

Although there was no evidence of pre-crash braking by the driver, the brake pedal was rotated to the left and the rubber pad was scuffed from probable right foot contact. The rear view mirror was separated from the windshield mounting point. The left aspect of the mirror was fractured with blood stains noted to the right side.

The left floor separated from the sill in the area of the driver's position. The spot weld separation began at the base of the left A-pillar and extended (14.0") rearward.

The front right passenger, although restrained by the manual belt system, loaded the intruding glove box door with her left knee. A large 10x10 cm (4x4") scuff mark with deformation was noted to the separated glove box door, located 7.6 cm (3.0") left of center and 7.6 cm (3.0") below the top edge of the glove box door. She loaded the belt webbing which produced abrasions to the D-ring with transfers on the webbing and an abrasion on the outboard aspect of the seat trim from the lap belt. There were no other visible contact points within the Taurus from the passenger.

Manual Restraint Systems

The front outboard seat belt systems in the Ford Taurus consisted of continuous loop webbings with sliding latch plates that retracted onto emergency locking retractors with load limiters. The load limiters consisted of a torsion bar axle within the retractor. The latch plates buckled into the center mounted buckle assemblies. The buckles were equipped with pyrotechnic pretensioners and switches that required buckling of the belt system to fire the pretensioner. The D-rings were adjustable on the upper B-pillars. The driver side D-ring was adjusted to the full-up position while the passenger D-ring was adjusted 4.8 cm (1.875") below the full-up position.

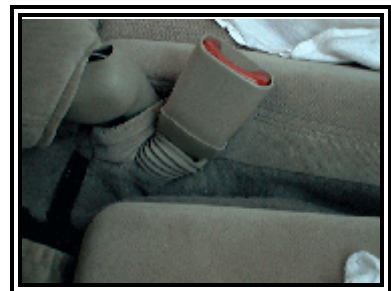


Figure 4. Driver side fired pretensioner.

The driver's side pretensioner fired at impact (**Figure 4**). Based on a post-crash measurement, the pretensioner piston traveled 60.0 mm (2.375"), resulting in 47.6 mm (1.875") of clearance between the end of the piston and the end of the barrel. The driver loaded the belt webbing which produced an abrasion to the plastic surface of the D-ring. Rescue personnel cut the shoulder belt webbing which retracted into the B-pillar. Approximately 162.6 cm (64.0") of belt length remained which extended from the lower anchorage to the cut point. The majority of the belt webbing was blood stained. The area of the belt webbing that extended over the driver's chest contained fragments of tissue and fabric transfers. This evidence pattern was located 86-102 cm (34-40") above the lower anchor point. An additional area of transfer was located 112-120.0 cm (44-47.25") on the outboard aspect of the webbing, the side away from the driver's chest.

The front right passenger was properly restrained by the manual belt system. At impact, the pretensioner fired (**Figure 5**). The post-crash measurement of the pretensioner was 44.5 mm (1.75") which equated to 63.5 mm (2.5") of travel of the piston within the barrel. Her loading against the belt webbing resulted in witness marks (abrasions) to the seat trim, D-ring, and the belt webbing.



Figure 5. Passenger side fired pretensioner.

Additionally, rescue personnel cut the webbing at the level of the D-ring and the lower outboard anchor point. The shoulder belt webbing was captured (gathered) in the forward aspect of the D-ring and was cut 5.7 cm (2.25") forward of the D-ring. The lap belt webbing was cut 12.7 cm (5.0") above the vinyl sleeve at the sill anchor point.

The center front seat position was equipped with a fixed length adjustable lap belt. This belt was stowed at the time of the crash within the flip and fold center armrest/seat cushion. The rear seat of the Taurus was equipped with 3-point lap and shoulder belts for the three designated positions. All three rear seat belt systems consisted of continuous loop webbings with sliding latch plates and dual mode emergency and automatic locking retractors. There were no rear seat passengers in the vehicle.

Advanced Occupant Protection System

The 2000 Ford Taurus was equipped with an Advanced Occupant Protection System (AOPS) for the driver and front right passenger positions. The system consisted of dual stage frontal air bags, a driver's seat track positioning sensor, seat belt buckle pretensioners, seat belt retractor load limiters, and a Restraints Control Module (RCM) with event data recording capabilities (**Figure 6**). The RCM measures the severity of the crash and deploys the appropriate safety system (pretensioner and/or air bag) and level of air bag deployment. In addition to the RCM, the Taurus was equipped with a center front crash sensor that was mounted to the top aspect of the upper radiator support panel. Although this crash was an above threshold crash for air bag deployment, the frontal air bags did not deploy (**Figures 7 and 8**).

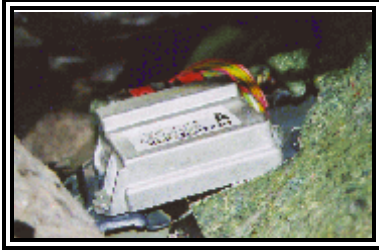


Figure 6. Restraints Control Module (RCM).



Figure 7. Non-deployment of driver air bag.



Figure 8. Non-deployment of front right air bag.

The center front crash sensor was mounted within the crush zone of the vehicle and was destroyed by the severe frontal damage (**Figure 9**). The RCM was mounted on the top aspect of the center tunnel, directly under the mid instrument panel. Although the floor was damaged surrounding the RCM location, the RCM was not damaged. The RCM was identified by Serial No. 212025280019 and was manufactured on 01/15/2000. The Model No. of the RCM was YF1A014B321-AC. During the on-site investigation, the RCM was removed from the vehicle by a Ford engineer. The three mounting bolts were properly installed with measured torque values of 108 in/lbs.

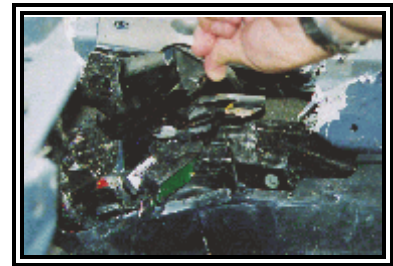


Figure 9. Damaged center front crash sensor.

The driver's air bag module was mounted in a typical mode within the four-spoke steering wheel rim. The driver's face impacted the top of the module, however, there was no damage to the module. The front right passenger's air bag module was a top mount configuration within the upper right instrument panel. A single cover flap concealed the module and air bag assembly. There was no damage to the passenger air bag module.

Both occupant's of the Ford Taurus were properly restrained by the manual belt systems. The use of the manual belts was detected by the RCM which fired the buckle pretensioners during the crash. The driver's side pretensioner traveled 63.5 mm (2.5") as determined from a post-crash measurement of the unit's barrel. The front right passenger's unit stroked a distance of 60.0 mm (2.375") based on a post-crash barrel measurement resulting in 47.6 mm (1.875") of clearance between the end of the piston and the end of the barrel.

Event Data Recorder Download

The RCM Event Data Recorder (EDR) was downloaded by a Ford engineer during the on-site SCI investigation. The frontal area of the Taurus sustained severe damage that resulted in damage to the vehicle's battery and the engine compartment fuse box. Due to this damage, 12 volt battery power could not be supplied to the vehicle for EDR download. An alternative method was utilized in which 12 volt

power was applied directly to the passenger compartment fuse box for the EDR reading. This method failed to provide an output from the EDR. It was determined that the EDR did not record crash data during this event. It was possible that due to the exterior damage and resultant damage to the vehicle's battery and associated electrical system, that power was lost during the crash prior to the EDR writing data to its memory.

A second attempt to inspect the Ford Taurus to download the EDR data and to determine the root cause of the frontal air bag non-deployment was scheduled with the plaintiff's attorney, Ford representatives, and the Veridian SCI team. The plaintiff's attorney expressed concerns regarding the destruction of evidence and refused to allow a disassembly of the vehicle, therefore the root cause of the non-deployment and the lack of EDR data remains unknown.

Driver Demographics

Age/Sex: 76 year old male
 Height: 180.3 cm (71.0")
 Weight: 77.1 cm (170.0 lb)
 Manual Restraint
 Usage: 3-point lap and shoulder belt system
 Usage Source: Vehicle inspection, buckle pretensioner firing
 Mode of Transport
 From Scene: Pronounced deceased at the scene of the crash

Driver Injuries

Injury	Injury Severity (AIS90/Update 98)	Injury Source
Blunt force trauma to the head (NFS)	Unspecified (115099.7,0)	Steering wheel hub cover/air bag module cover
Blunt force trauma to the face (NFS)	Unspecified (215099.7,0)	Steering wheel hub cover/air bag module cover
Fractured right leg (NFS)	Moderate (852002.2,1)	Knee bolster
Abrasion with contusion over the left anterior shoulder	Minor (790202.1,2; 790402.1,2)	Shoulder belt webbing
Abrasion and contusion over the left anterior chest	Minor (490202.1,2; 490402.1,2)	Shoulder belt webbing

Driver Kinematics

The 76 year old male driver of the Ford Taurus was seated in a presumed upright driving posture, although his head may have slumped forward prior to impact. The manually operated front right seat track was adjusted to a rear track position, set 7.0 cm (2.75") forward of the full rear position. The seat back was reclined to a measured angle of approximately 20 degrees aft of vertical. The driver was properly restrained by the manual 3-point lap and shoulder belt system as evidenced by loading transfers to the webbing and associated hardware, and the firing of the buckle pretensioner. The driver was dressed in a long sleeved blue plaid-type shirt and long pants.

At impact, the AOPS detected an above threshold crash and deployed the front seat belt pretensioners. The frontal air bags did not deploy. The driver responded to the 12 o'clock frontal impact force by initiating a forward trajectory. He loaded the manual 3-point lap and shoulder belt system which restrained his abdominal and torso regions. His loading force against the belt system resulted in a frictional abrasion to the left D-ring, latchplate, and plastic trim panel located at the outboard aspect of the front left seat cushion. In addition, the belt webbing was covered with body fluids, fragments of tissue, and fabric transfers which evidenced belt usage. His loading force against the belt webbing resulted in an abrasion and contusion over the left anterior shoulder and chest, with unspecified blunt force trauma of the chest.

Although the manual belt system restrained the driver's torso and prevented contact with the steering assembly, his head continued forward in flexion mode, jack-knifing over the belt system. His facial and forehead area impacted the top aspect of the steering wheel hub/air bag module cover (**Figure 10**). This contact was evidenced by tissue transfers. As a result of this facial impact, the driver sustained unspecified blunt force trauma of the head and face. In addition to the tissue transfers, his head impact fractured the alloy shear capsule brackets as the load was transmitted vertically to the steering assembly. There was no deformation of the steering wheel rim.



Figure 10. Driver contact evidence on steering wheel hub/air bag module cover.

His left knee impacted the intruding left lower instrument panel, adjacent to the edge of the knee bolster. The contact fractured the vinyl component over an area that measured 12.7 cm (5.0") horizontally and 20.3 cm (8.0") vertically. The depth of the contact ranged from 20.3 cm (8.0") at the top aspect to 5.1 cm (2.0") at the lower aspect at the parking brake release lever. No injury was documented from this contact point. The driver's right knee contacted the right aspect of the knee bolster 18-25 cm (7-10") left of center. A scuff mark and a gouge mark (with hair embedded into the gouge) evidenced the contact area. The right side of the bolster panel was displaced forward approximately 2.5 cm (1.0") and was "floating", supported at the lower edge. Body fluid was present at the right knee contact point.

Immediately prior to impact, the driver may have attempted to brake the vehicle. The brake pedal was deformed, rotated in a CCW direction and the rubber pad was scuffed and partially separated from the

pedal. Although unspecified, the driver sustained a right leg fracture that resulted from the above referenced contacts.

The driver's left arm impacted the upper aspect of the left A-pillar. Although no injury was identified, the contact was evidenced by a 17.8 cm (7.0") vertically oriented blue fabric transfer to the plastic cover of the pillar. The cover was partially separated from the A-pillar.

The driver came to rest within the vehicle in a slumped position. Emergency police and ambulance personnel arrived on-scene within 11 minutes of the crash. The paramedics did not detect a pulse from the driver and noted that he was not breathing. He was removed from the vehicle and pronounced dead at the scene of the crash by the Coroner approximately 2 hours following the crash. No autopsy was performed on the body.

Front Right Passenger Demographics

Age/Sex: 76 year old female
 Height: 170.2 cm (67.0")
 Weight: 72.1 kg (159.0 lb)
 Eyewear: Sunglasses, fractured during crash
 Manual Restraint
 Usage: 3-point lap and shoulder belt system
 Usage Source: Vehicle inspection, buckle pretensioner firing
 Mode of Transport
 From Scene: Transported by ambulance to a local hospital
 Type of Medical
 Treatment: Stabilized at the local hospital and transferred by helicopter to a regional trauma center where she was admitted for 30 days (20 days intensive care) then released for rehabilitation

Front Right Passenger Injuries

Injury	Injury Severity (AIS90/Update 98)	Injury Source
Mid shaft left tibia/fibula fracture (NFS)	Moderate (853404.2,2; 851605.2,2)	Glove box door/lower instrument panel sub structure
Fractures of the left 2 nd and 3 rd toes	Minor (853602.1,2; 853602.1,2)	Intruding right toe pan
Right thumb fracture	Minor (750499.1,1)	Upper right instrument panel
Nasal fracture	Minor (251000.1,4)	Right door panel (possible)

Injury	Injury Severity (AIS90/Update 98)	Injury Source
Facial contusion of the right cheek	Minor (290202.1,1)	Right door panel (possible)
Aspiration of the right lung	N/A, not codeable under AIS	Shoulder belt

Source of injury Data - Front right passenger interview with attorney present

Front Right Passenger Kinematics

The front right passenger of the Ford Taurus was seated in a normal upright posture with the seat track adjusted 5.4 cm (2.125") forward of the full rear position. She was properly restrained by the manual 3-point lap and shoulder belt system. Belt usage was supported by observations of the first responders, loading evidence on the webbing and hardware components, cutting of the webbing during extrication of the passenger, firing of the buckle pretensioner, and statements from the passenger during the interview.

At impact, the seat belt buckle pretensioner fired which tensioned the belt webbing across the pelvic and thoracic regions of the passenger. She initiated a forward trajectory in response to the frontal impact force and loaded the belt webbing. Her loading force against the belt system compressed her chest resulting in aspiration of the right lung with no overlying rib fractures. Her left leg impacted the intruding glove box door and the lower aspect of the right instrument panel substructure. A 10x10 cm (4x4") area of scuffing and deformation to the glove box door evidenced the contact which resulted in a mid shaft left tibia and fibula fracture.

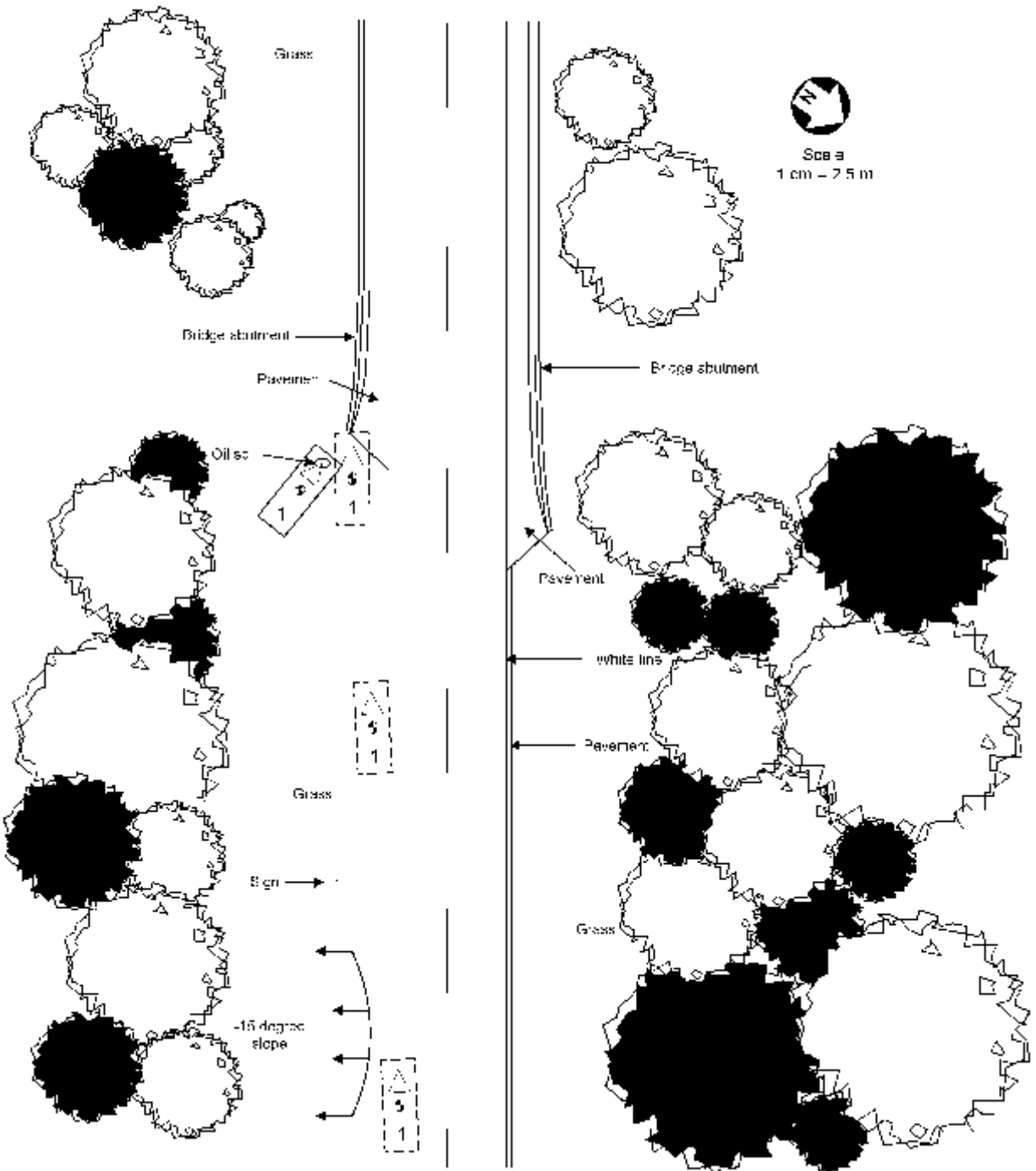
The front right passenger's feet loaded against the intruding toe and floor pan. As a result, she sustained fractures of the left 2nd and 3rd toes. Her right hand probably contacted the right upper instrument panel as she attempted to brace for the impending impact. Although there was no contact evidence to support this action, the passenger sustained a fracture of the right thumb.

The front right passenger's head moved forward as her body loaded the manual belt system. The rear seat track position prevented the passenger's head and face from contacting interior components forward of her seated position. She did, however, sustain a fractured nose and a contusion of her right cheek which possibly resulted from a rebound contact into the right door. Again, there was no contact evidence to support this contact sequence.

Medical Treatment

The front right passenger was removed from the vehicle by paramedics. The manual belt webbing was cut and the passenger was placed on a back board. Following on-scene monitoring and stabilization, she was transported to a local hospital where she was evaluated and prepared for helicopter transfer to a regional trauma center. She was admitted to the intensive care unit for a period of 20 days and released to a rehabilitation facility following 30 days of total hospitalization.

VERIDIAN CASE NO. CA00-020
SCENE SCHEMATIC



Scene Diagram