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ON-SITE CHILD AIR BAG-RELATED FATALITY INVESTIGATION

CASE NUMBER - IN-06-025
LOCATION - ALABAMA
VEHICLE - 1994 FORD MUSTANG
CRASH DATE - May 2004

Submitted:

January 10, 2007
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National Highway Traffic Safety Administration
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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 be 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 Documentation Page

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16. *Abstract* This report covers an on-site child air bag-related fatality investigation that involved a 1994 Ford Mustang (case vehicle) and a 2002 Ford Windstar (other vehicle), which were involved in a rear-end crash on a five-lane city street. This crash is of special interest because the case vehicle was equipped with front air bags and one of the case vehicle's front right passengers [8-year-old, Black (non-Hispanic) male] sustained fatal injury due to contact with the front right passenger air bag module cover flaps and air bag. The case vehicle was traveling northwest in the inside northwestbound through lane and was stopped at a traffic signal at an intersection. The Windstar was stopped in traffic beyond the intersection, also in the inside northwestbound through lane. The case vehicle proceeded through the intersection and as it was traveling northwestbound, the driver began to swat at a bee that was inside the vehicle. The driver stated she then looked forward and saw the Windstar stopped in front of her and applied the brakes in an attempt to avoid the crash. The front of the case vehicle then impacted and underrode the back of the Windstar causing the case vehicle's driver and front right passenger air bags to deploy. Both vehicle's came to rest in the inside northwestbound through lane heading northwest. The case vehicle driver's 8-year-old son and 6-year-old step daughter were both seated in the front right seat. The male front right passenger was on the outboard side of the seat restrained only by the lap belt at the time of the crash sequence. The pre-crash braking and impact force caused the outboard front right passenger to jackknife over the lap belt, which positioned his face over the air bag module at the time of the deployment. His face was directly impacted by the air bag module cover flaps and the air bag causing his fatal injury.			
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TABLE OF CONTENTS IN-06-025

This investigation was brought to NHTSA's attention on or before August 16, 2006 by an attorney in Alabama. This crash involved a 1994 Ford Mustang (case vehicle) and a 2002 Ford Windstar (other vehicle). The crash occurred in May 2004 at 3:40 p.m., in Alabama and was investigated by the applicable city police department. This crash is of special interest because the case vehicle was equipped with front air bags and one of the case vehicle's front right passengers [8-year-old, Black (non-Hispanic) male] sustained fatal injury due to contact with the front right passenger air bag module cover flaps and air bag. This contractor inspected the case vehicle and scene and interviewed the case vehicle's driver on September 5 and 6, 2006. This report is based on the police crash report, scene and vehicle inspections, inspection of an exemplar Ford Mustang, measurements from a representative occupant, case vehicle driver interview, case file material provided by the Alabama attorney, occupant kinematic principles, medical records for the two front right passenger's and autopsy report for the 8-year-old front right passenger, and this contractor's evaluation of the evidence.

SUMMARY

The case vehicle was traveling northwest in the inside northwestbound through lane of a five-lane, undivided city street and was stopped for a traffic signal at an intersection. The Windstar was stopped in traffic beyond the intersection, also in the inside northwestbound through lane. The case vehicle's driver indicated that she proceeded through the intersection and was traveling northwestbound. A bee was inside the vehicle and flew into the front seat area. The driver began to swat at the bee. The driver stated that when she looked forward, the Windstar was stopped in front of her and she applied the brakes in an attempt to avoid the crash. The front of the case vehicle then impacted and underrode the back of the Windstar causing the case vehicle's driver and front right passenger air bags to deploy. As a result of the underride, the case vehicle's two air bag crash discriminating sensors, which were mounted on the upper radiator support, were directly contacted. Both vehicle's came to rest in the inside northwestbound through lane heading northwest.

The case vehicle's CDC was determined to be: **12-FDEW-1** (**0** degrees). The WinSMASH reconstruction program could not be used to reconstruct the case vehicle's Delta Vs because the case vehicle sustained no measurable crush to the front bumper and minor crush to the top radiator support. In addition, the Windstar had been repaired and was not inspected. The damage to the case vehicle and the photographs of the damage to the Windstar indicated that the crash severity was minor [2-13 km.p.h (1-8 m.p.h.)]. It is this contractor's opinion that the Delta V was most likely near or at the upper bound of the indicated range. The case vehicle was towed due to damage.

The case vehicle driver's 8-year-old son and 6-year-old step daughter were both seated in the front right seat. The 8-year-old male was seated on the outboard portion of the seat and the 6-year-old female was seated on the inboard portion of the seat. They both were most likely restrained by the manual, three-point, lap-and-shoulder safety belt just prior to the pre-crash activity related to the bee in the vehicle. However, the evidence indicated that the outboard front right passenger did not have the shoulder belt in the restrained position at the time of the pre-crash

braking and impact. It is this contractor's opinion that as a result of both front right passenger's movements related to the bee in the vehicle, the lap belt was most likely not snug across both passengers hips and the outboard front right passenger got out from under the shoulder belt and it was behind him at the time of the crash sequence. As a result of the pre-impact braking and impact force, the front right outboard passenger jackknifed over the lap belt, which positioned his face over the air bag module at the time of the deployment. The front right passenger's injuries, autopsy photographs and damage to the lower air bag module cover flap show that his face was directly impacted by the air bag module cover flaps and the air bag causing his fatal injury.

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which the case vehicle was traveling was a curved, five-lane, undivided city street traversing in a northwest and southeast direction. There were two northwestbound through lanes, two southeastbound through lanes and a center left turn lane for southeastbound traffic.. The outside northwestbound through lane was 3.5 meters (11.5 feet) in width while the inside northwestbound lane was 3 meters (9.8 feet) in width. The outside southeastbound through lane was 3.3 meters (10.8 feet) in width while the inside southeastbound through lane was 3.1 meters (10.2 feet) in width. The center left turn lane was 3.4 meters (11.2 feet) in width. There were fast food restaurants, service stations and other commercial businesses on each side of the street. The location of the crash was just north of a four-leg, signalized intersection. The speed limit was 72 km.p.h. (45 m.p.h.). At the time of the crash, the light condition was daylight, the atmospheric condition was clear and the roadway pavement was dry, level bituminous with an estimated coefficient of friction of 0.70. Traffic density was heavy and the site of the crash was commercial. See the Crash Diagram at the end of this report.

Pre-Crash: The case vehicle was traveling northwest in the inside northwestbound through lane and was stopped for the traffic signal at the intersection (**Figure 1**). The case vehicle driver's 8-year-old son and 6-year-old step daughter were both seated in the front right seat. The 8-year-old male was seated on the outboard portion of the seat and the 6-year-old female was seated on the inboard portion of the seat. Both passenger's were most likely restrained by the manual, three-point lap-and-shoulder belt at this time.

Figure 1: Approach of case vehicle northwestbound through intersection to area of impact (arrow)

The case vehicle was the lead vehicle at the intersection in the northwestbound through lane. Meanwhile, the Windstar was stopped in traffic beyond the intersection, also in the inside northwestbound through lane. The Windstar's driver indicated to police that several cars were stopped in front of him. The case vehicle's driver indicated that the traffic signal changed and she accelerated northwestbound through the intersection. She stated that as she was traveling northwestbound, a bee was inside the case vehicle and flew into the front seat area. The driver stated she looked away and swatted at the bee and when she looked back, she saw the Windstar

stopped in front of her. The driver stated she applied the brakes in an attempt to avoid the crash. The crash occurred in the northwestbound inside through lane (**Figure 2**).

Figure 2: Overview of area of impact (arrow) in northwestbound inside through lane

Figure 3: Damage to front of case vehicle from impact with back of Windstar

Figure 4: Attorney provided photo of overview of damage to back of Windstar from impact with case vehicle, tail lamp assemblies have been removed, arrows show damage to tailgate and bumper

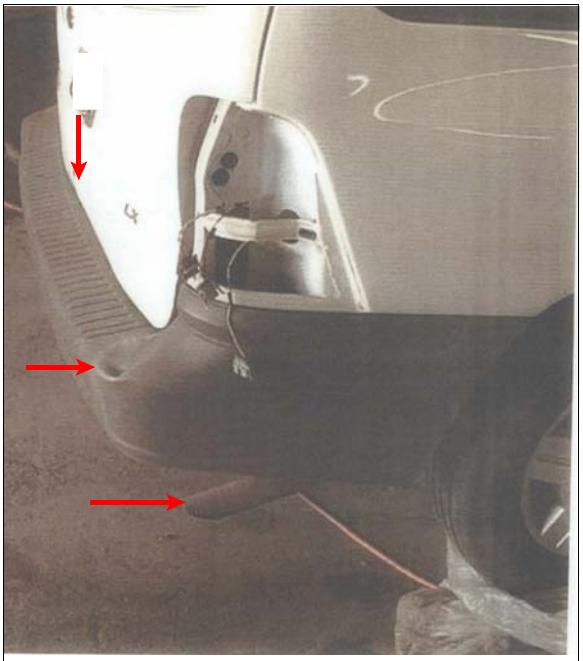

Figure 5: Attorney provided photo of right side view of damage to back of Windstar (arrows) from impact with case vehicle, right tail lamp assembly has been removed

Crash: The front of the case vehicle (**Figure 3**) impacted the back of the Windstar (**Figure 4** and **Figure 5**) causing the case vehicle's driver and front right passenger air bags to deploy. The impact damage to both vehicle's indicated that the case vehicle was offset to the right of the Windstar's centerline at impact. The damage indicated that approximately 80% of the case vehicle's front bumper engaged the back bumper of the Windstar. The case vehicle driver's pre-crash braking caused the case vehicle's front suspension to load, and the front of the case vehicle dipped down and underrode the back of the Windstar. The damage to the vinyl skirt (**Figure 6** below), which covered the case vehicle's front bumper and front of the hood, indicated that the top portion of the case vehicle's front bumper engaged

the bottom portion of the Windstar's back bumper as the underride occurred. During the underride, the case vehicle's two air bag crash discriminating sensors, which were attached to the upper radiator support (**Figure 7**), were directly contacted and displaced rearward into the radiator. The left sensor sustained a more severe impact than the right sensor as indicated by the deformation to the radiator condenser (**Figure 8**).

Figure 6: Front of case vehicle with vinyl skirt in place, green arrow shows cut from contact with Windstar's tail pipe, red arrow shows tear in vinyl from contact with bottom portion of Windstars back bumper

Figure 7: Arrows show location of air bag discriminating sensors

Figure 8: Close view of case vehicle's left discriminating sensor, crushed rearward into radiator condenser

Figure 9: Attorney provided photo of frame capture from on-scene video showing final rest position of case vehicle and Windstar, view from drive-through exit of fast food restaurant

Post-Crash: Both vehicle's came to rest in the inside northwestbound through lane heading northwest. An on-scene video provided by the Alabama attorney indicated that the distance between the two vehicles at final rest was approximately two-thirds of a full size car-length (**Figure 9**). It is not known if the driver of the Windstar pulled his vehicle forward any distance following the impact. However, the debris pattern on the roadway (which appeared to be mostly fragments of the case vehicle's left front headlamp assembly) was distributed across most of the distance between the two vehicles, indicating that the Windstar was pushed forward most of this distance due to the impact.

The 1994 Ford Mustang was a rear wheel drive, two-door coupe (VIN: 1FALP4040RF------) equipped with a 3.8L, V6 engine and four-speed automatic transmission. The front seating row was equipped with bucket seats with folding backs and adjustable head restraints, driver and front right passenger air bags and manual, three-point, lap-and-shoulder safety belts. Four wheel, anti-lock brakes were an option on the case vehicle, but it is unknown if it was so equipped. The case vehicle's wheelbase was 257 centimeters . The odometer reading at the time of the vehicle inspection was 279,203 kilometers (173,494 miles).

CASE VEHICLE DAMAGE

Exterior Damage: The case vehicle's impact with the back of the Windstar involved the front of the vehicle. The vinyl front skirt, which fit over the front bumper and front of the hood, was torn in several places at the bumper level due to contact with the Windstar. The left headlamp/turn signal assembly and grille were broken out and the lower left corner of the right headlamp was broken. There was a semi-circular impression with scratches on the bumper fascia with corresponding hole in the vinyl skit just below the lower left corner of the right headlamp due to contact to the Windstar's tail pipe. The fiber glass on the bottom side the hood was cracked in several places. In addition, the on-scene video provided by the case vehicle driver's attorney showed that the hood was bent in the left middle portion of the hood more so than was apparent at the time of the inspection. The middle portion of the upper radiator support was displaced rearward and the two air bag crash discriminating sensors were directly contacted and displaced rearward into the radiator. The direct damage began at the front left corner and extended approximately 115 centimeters (45.3 inches) across the front of the vehicle. There was no residual crush at the bumper level. Inspection of the energy absorbing styrofoam under the bumper fascia showed no residual compression of the material, and no damage was visible to any of the front unibody components. The only visible crush to the front of the case vehicle occurred to the upper radiator support. Based on measurements from an exemplar Mustang, the maximum residual crush to the upper radiator support was determined to be approximately 4 centimeters (1.6 inches) occurring at C_3 (**Figure 10**). The table below shows the crush to the upper radiator support. Again, there was no residual crush at the bumper level.

Figure 10: Top view of crush to top radiator support

Units	Event	Direct Damage		Field L	C_1	C_2	C_3	C_4	C_5	C_6	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	1	115	4	148	0	2	4	2	0	0	-17	0
in		45.3	1.6	58.3	0.0	0.8	1.6	0.8	0.0	0.0	-6.7	0.0

There was no change in the case vehicle's wheelbase. Induced damage involved the hood and radiator support. Damage unrelated to this crash was observed on the left quarter panel, right side, front right bumper corner and the back left bumper corner.

The case vehicle's recommended tire size was P205/65R15. The case vehicle was equipped with tires of this size on the rear and tires size P205/60R15 on the front. The case vehicle's tire data are shown in the table below. The measured air pressure was considered unknown because the tires had been periodically re-inflated while the case vehicle was in storage.

Tire	*Measured Pressure*		*Recommend Pressure*		*Tread Depth*		*Damage*	*Restricted*	*Deflated*
	kpa	psi	kpa	psi	milli-meters	32nd of an inch			
LF	Unknown	Unknown	241	35	4	5	None	No	No
RF	Unknown	Unknown	241	35	4	5	None	No	No
LR	Unknown	Unknown	241	35	1	1	None	No	No
RR	Unknown	Unknown	241	35	4	5	None	No	No

Vehicle Interior: Inspection of the case vehicle's interior (**Figure 11**) revealed deformation of the front right passenger's lower air bag module cover flap (**Figure 12** below). The louvers of the air vent directly below the lower cover flap's right corner were also broken out (**Figure 12** below). In addition, a possible scuff mark was found on the right "A"-pillar. Lastly blood stains were observed on the center console and the lower left side of the front right passenger's air bag. This likely occurred as the outboard front right passenger was taken out the case vehicle by the driver. No other occupant contact evidence was found and no intrusion of the passenger

Figure 11: Overview of steering wheel, windshield, instrument panel and air bags

compartment was observed. In addition, there was no compression of the energy absorbing steering column and no deformation of the steering wheel.

Figure 12: Case vehicle's front right passenger's air bag module cover flaps, arrow shows deformation of lower cover flap

Damage Classification: Based on the vehicle inspection, the CDC was determined to be: **12-FDEW-1** (**0** degrees). The WinSMASH reconstruction program could not be used to reconstruct the case vehicle's Delta Vs because the case vehicle sustained no measurable crush to the front bumper and only minor crush to the top radiator support. In addition, the Windstar had been repaired and was not inspected. Based on the damage to the case vehicle and the photographs of the damage to the Windstar, the crash severity was determined to be minor [2-13 km.p.h (1-8 m.p.h.)]. This contractor's opinion is that the Delta V was most likely near or at the upper bound of the indicated range. The case vehicle was towed due to damage.

AUTOMATIC RESTRAINT SYSTEM

The case vehicle was equipped with front air bags at the driver and front right positions. Both air bags deployed as a result of the front impact with the back of the Windstar.

The case vehicle's front right passenger air bag was located in the middle of the right instrument panel (**Figure 12**). The air bag module cover consisted of two cover flaps. The upper cover flap was semi-circular in shape while the lower cover flap was trapezoidal-shaped. The upper cover flap was approximately 41 centimeters (16.1 inches) in length and 7.5 centimeters (3 inches) in height at the center. The lower cover flap was approximately 44 centimeters (17.3 inches) in length and 7.5 centimeters (3 inches) in height. An inspection of both module cover flaps and the air bag fabric revealed that the cover flaps opened at the designated tear points. However, the right corner of the lower cover flap was observed to be deformed. It was bent and displaced into the air bag module compartment (**Figure 12**). The distance between the front edge of the instrument panel and the leading edge of the module cover flaps was approximately 5.5 centimeters (2.2 inches). The distance between the mid-center of the front right passenger's seat back, as positioned at the time of the vehicle inspection, (seat at approximate full rear position, seat back slightly reclined) and the front surface

Figure 13: Overview of case vehicle's deployed front right passenger air bag

of the air bag's fabric at approximate full excursion was approximately 40 centimeters (15.7 inches). There was no evidence of damage to the air bag due to the deployment. The deployed front right passenger air bag (**Figure 13** above) was square with a height and width of approximately 65 centimeters (25.6 inches). The air bag was designed without tethers and had one vent port located on the left side of the air bag at the approximate 10:30 o'clock position (**Figure 14**). The vent port was 5.5 centimeters (2.2 inches) in diameter. Inspection of the air bag fabric revealed a few stains, which appeared to be moisture stains, on the side of the air bag and what appeared to be three small blood stains on the lower left quadrant of the air bag. No evidence of cloth or skin transfer was observed on the air bag.

Figure 14: Case vehicle's front right passenger air bag vent port (arrow)

The case vehicle's driver air bag was located in the steering wheel hub. An inspection of the air bag module cover flaps and the air bag fabric revealed that the cover flaps opened at the designated tear points. There was no evidence of damage during the deployment to the air bag module cover flaps or the air bag fabric. The deployed driver's air bag was round with a diameter of approximately 62 centimeters (24.4 inches). The air bag was designed with four tethers, each approximately 7.5 centimeters (3 inches) in width and had two vent ports, each approximately 2.5 centimeters (1 inch) in diameter, located at the approximate 12 o'clock position. Inspection of the air bag fabric revealed what appeared to be diffuse dirt stains on the front of the air bag. Otherwise the air bag was unremarkable.

CASE VEHICLE OUTBOARD FRONT RIGHT PASSENGER KINEMATICS

Immediately prior to the crash the case vehicle's outboard front right passenger [8-year-old, Black (non-Hispanic) male; 127 centimeters and 31 kilograms (50 inches, 68 pounds)] was seated on the outboard portion of the front right seat. He was sharing the front right seat with his 6-year-old stepsister. He was most likely seated upright. However, due to the reported bee in the case vehicle just prior to the crash, he was most likely moving around in the seat. The front right passenger's seat track was reportedly adjusted to between its middle and rear position and the seat back was slightly reclined. The precise track position of the front right seat at the time of the crash is not known. The passenger was not wearing glasses or contact lenses at the time of the crash.

The case vehicle's outboard front right passenger was most likely restrained by the manual, three-point, lap and shoulder safety belt system just prior to the pre-crash activity related to the bee in the vehicle. However, the evidence indicated that this passenger did not have the shoulder belt in the restrained position at the time of the pre-crash braking and impact. The passenger's facial injuries, autopsy photographs and damage to the lower air bag module cover flap indicated

that the right side of his face was directly contacted by the air bag module cover flaps. His head could not have reached the air bag module if his upper torso had been restrained by the shoulder belt. Based on measurements from a representative occupant [130 centimeters and 26 kilograms, (51 inches, 57 pounds)] and an exemplar vehicle inspection, it was determined that with the seat in the position indicated by the driver, it was most likely possible for the passenger's head to reach the air bag module while restrained by only the lap belt. It's this contractor's opinion that as a result of both front right passenger's movements related to the bee in the vehicle, the lap belt was most likely not snug across both passenger's hips, the outboard front right passenger got out from under the shoulder belt (which due to his height would have been positioned high on him in any case) and it was behind him at the time of the pre-crash braking and impact. Lastly, two children sharing the same seat and same safety belt system was unsafe and improper usage of the safety belt system.

As a result of the case vehicle driver's pre-crash braking, the outboard front right passenger jackknifed forward as the case vehicle decelerated. His mother reported that he put out his left arm as if to hold his stepsister back. The soft tissue injuries to his face and right arm also indicated he most likely extended his right arm forward to brace against the instrument panel, most likely adjacent to the right side of the air bag module, and turned his head to the left. As the impact occurred, he was most likely very close to the instrument panel. The impact then caused the passenger to continue to jackknife over the lap belt and continue forward along a path opposite the case vehicle's 0 degree of principal force as the case vehicle decelerated. The underride nature of the impact most likely resulted in a delayed deployment of the air bags allowing the passenger's head to continue forward and position his face over the air bag module. The soft tissue injuries to the right side of the passenger's face, the autopsy photographs of his facial injuries and the deformation of the right portion of the lower air bag module cover flap (**Figure 12** above) indicated that the passenger's face was over the right portion of the air bag module when the deployment occurred. The air bag deployment caused the right portion of the upper air bag module cover flap to impact the upper right side of the passenger's face and forehead causing a laceration near his right eye, which penetrated to the bone, and a contusion over his right forehead. The laceration was likely due to contact with the edge of the upper cover flap. The right portion of the lower air bag module cover flap impacted the passenger's right cheek causing a contusion and abrasion to the right mid-cheek in the approximate shape of the cover flap. As the deploying air bag unfolded, it contacted the right side of the passenger's neck, right shoulder and right forearm causing an abrasion to his neck, shoulder and forearm. The contact with the air bag module cover flaps and the air bag also caused a nonanatomic brain injury, subarachnoid hemorrhage and cerebral and intracerebellar contusions. The passenger was then projected back and to the right by the deployment and the back of his head most likely impacted the right front door window frame causing bilateral cerebral contusions. The outboard front right passenger then most likely came to rest in the front right seat. He was removed from the vehicle through the driver's door by the case vehicle's driver.

The police crash report indicated the outboard front right passenger sustained a "K" (fatal)injury and was transported by ambulance to a hospital. The table below shows the outboard front right passenger's injuries and injury mechanisms.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Nonanatomic brain injury; unresponsive, GCS =3, pupils fixed and dilated, asystole[1], with cardiopulmonary arrest and pulseless electrical activity[1]	critical 160824.5,0	Front right module's upper cover flap	Probable	Emergency room records
2	Contusions bilateral cerebellar hemispheres, not further specified	serious 140402.3,6	Right front window sill	Probable	Autopsy
3	Contusions, cerebral, involving inferior gyri[1] of bilateral temporal lobes and right frontal lobe, not further specified	serious 140620.3,3	Air bag, front right passenger's	Possible	Autopsy
4	Contusion, intracerebral, of white matter of right frontal lobe	severe 140638.4,1	Front right module's upper cover flap	Probable	Autopsy
5	Hemorrhage, intraventricular, large, not further specified as to location	severe 140678.4,9	Air bag, front right passenger's	Probable	Autopsy
6	Hemorrhage, subarachnoid, diffuse, not further specified	serious 140684.3,9	Air bag, front right passenger's	Probable	Autopsy
7	Contusion, subgaleal, up to 7.6 cm (3 in) over right frontal region of scalp	minor 190402.1,1	Air bag, front right passenger's	Probable	Autopsy
8	Contusion, subgaleal, up to 7.6 cm (3 in) over occipital regions of scalp	minor 190402.1,6	Right front window sill	Probable	Autopsy

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[1] The following terms are defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:

asystole (a-sis′to-le): cardiac standstill or arrest; absence of a heartbeat.

asystolic (a"sis-tol′ik): asystole.

gyrus (ji′ras) pl. ***gyri (ji′ri)***: one of the convolutions of the surface of the brain caused by infolding of the cortex; see ***gyri cerebri***.

g. cerebra′les: cerebral gyri; the tortuous convolutions of the surface of the cerebral hemisphere, caused by infolding of the cortex and separated by the fissures or sulci. Many are constant enough that they have been given special names. Called also *gyri cerebri* and *gyri of cerebrum*.

g. ce′rebri, gyri of cerebrum: gyri cerebrales.

PEA: pulseless electrical activity

pulseless electrical activity: continued electrical rhythmicity of the heart in the absence of effective mechanical function; it may be due to uncoupling of ventricular muscle contraction from electrical activity or may be secondary to cardiac damage with respiratory failure and cessation of cardiac venous return. Called also *electromechanical dissociation*.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
9	Contusion, 10.2 x 3.8 cm (4 x 1.5 in) over right forehead	minor 290402.1,7	Front right module's upper cover flap	Probable	Autopsy
10	Abrasion, large, right mid-cheek, not further specified	minor 290202.1,1	Front right module's lower cover flap	Probable	Autopsy
11	Contusion, 10.2 x 5.1 cm (4 x 2 in), superimposed over abrasion in right mid-cheek	minor 290402.1,1	Front right module's lower cover flap	Probable	Autopsy
12	Laceration, 2.5 x 0.6 cm (1 x 0.25 in), to bone, right upper side of face at corner of right eye	minor 290602.1,1	Front right module's upper cover flap	Certain	Autopsy
13	Contusion over frenulum of nasal area, extending onto left cheek	minor 290402.1,4	Front right module's lower cover flap	Probable	Autopsy
14	Contusion lips, upper and lower, at mid-line	minor 290402.1,8	Front right module's lower cover flap	Probable	Autopsy
15	Contusion, 3.8 cm (1.5 in), linear, right upper neck	minor 390402.1,1	Air bag, front right passenger's	Probable	Autopsy
16	Contusion x 2, overlying left upper anterior chest	minor 490402.1,2	Air bag, front right passenger's	Probable	Autopsy
17	Abrasion, large, overlying right anterior shoulder	minor 790202.1,1	Air bag, front right passenger's	Probable	Autopsy
18	Contusion, 7.6 x 5.1 cm (3 x 2 in) superimposed within abrasion above right anterior shoulder	minor 790402.1,1	Air bag, front right passenger's	Probable	Autopsy
19	Contusion, 10.2 x 5.1 cm (4 x 2 in), on right forearm, not further specified	minor 790402.1,1	Air bag, front right passenger's	Probable	Autopsy
20	Abrasion dorsum {back} left hand	minor 790202.1,2	Air bag, front right passenger's	Possible	Autopsy

CASE VEHICLE INBOARD FRONT RIGHT PASSENGER KINEMATICS

Immediately prior to the crash, the case vehicle's inboard front right passenger [6-year-old, Black (non-Hispanic) female; unknown height, 15.4 kilograms (34 pounds)] was seated on the inboard portion of the front right seat. She was sharing the front right seat with her 8-year-old

step brother. She was most likely seated upright. However, due to the reported bee in the case vehicle just prior to the crash, she was most likely moving around in the seat. The front right passenger's seat track was reportedly adjusted to between its middle and rear position and the seat back was slightly reclined. The precise track position of the front right seat at the time of the crash is not known. The passenger was not wearing glasses or contact lenses at the time of the crash.

The case vehicle's inboard front right passenger was most likely restrained by the manual, three-point, lap-and-shoulder belt. It's this contractor's opinion that as a result of both front right passenger's movements related to the bee in the vehicle, the lap belt was most likely not snug across both passengers hips, and the outboard front right passenger got out from under his shoulder belt and it passed behind him, but remained across the chest of the inboard front right passenger.

As a result of the case vehicle driver's pre-crash braking, the inboard front right passenger continued forward as the case vehicle decelerated. The driver reported that the outboard front right passenger put out his left arm as if to hold the inboard front right passenger back as the case vehicle decelerated. The case vehicle's impact with the back of the Windstar caused the inboard front right passenger to continue forward along a path opposite the case vehicle's 0 degree direction of principal force as the case vehicle decelerated. She most likely contacted the left side of the deployed front right passenger air bag, which was partially deflected due to contact to the outboard front right passenger. The air bag contact most likely deflected her upper torso to the left and downward and she impacted the left side of the head on the floor-mounted transmission lever causing a contusion to the left side of her head. In addition, she sustained a contusion to her right shoulder, possibly due to contact with the shoulder belt. The position of the inboard front right passenger following the crash is not known. The passenger exited the vehicle through the driver's door with some help of the driver.

CASE VEHICLE INBOARD FRONT RIGHT PASSENGER INJURIES

The police crash report indicated that the case vehicle's inboard front right passenger sustained a "B" (non-incapacitating-evident) injury and was transported by ambulance to a hospital and treated and released The passenger's injuries and injury mechanisms are shown in the table below.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Contusion {knot} on left side of head, not further specified	minor 190402.1,1	Floor-mounted transmission selector lever {air bag-related}	Possible	Emergency room records
2	Contusion {ecchymosis} right shoulder with swelling, not further specified	minor 790402.1,1	Torso portion of safety belt system	Possible	Emergency room records

Immediately prior to the crash, the case vehicle's driver [27-year-old, Black (non-Hispanic) female; 150 centimeters and 93 kilograms (59 inches, 205 pounds)] was seated in an upright position and leaning to the left. She had her left hand on the steering wheel and was attempting to swat a bee with her right hand. She subsequently put her right foot on the brake pedal. The driver's seat track was reportedly adjusted to between its middle and rear position and the seat back was slightly reclined. The driver was not wearing glasses or contact lenses at the time of the crash

Based on the police crash report and driver interview, the driver was most likely restrained by her manual, three-point, lap-and-shoulder safety belt. The driver's restraint usage could not be independently confirmed. Inspection of the safety belt assembly showed no evidence of loading, which is not unusual for this minor severity crash.

As a result of the case vehicle driver's pre-crash braking, the driver's safety belt retractor most likely locked and she most likely moved slightly forward into her safety belt as the case vehicle decelerated. It is also likely that the driver braced against the steering wheel. The case vehicle's impact with the back of the Windstar caused the driver to continue forward along a path opposite the case vehicle's 0 degree direction of principal force as the case vehicle decelerated. She moved forward into her deployed air bag contacting her left forearm on the air bag causing a small abrasion to her forearm. She remained in her seat as the case vehicle came to final rest. She was able to exit the case vehicle under her own power. She assisted the inboard front right passenger out of the vehicle through the driver's door. She then took the outboard front right passenger out of the vehicle through the driver's door.

CASE VEHICLE DRIVER INJURIES

The police crash report indicated the case vehicle's driver sustained no injury as result of the crash. She was not transported to a medical facility. The table below shows the case vehicle driver's reported injury and injury mechanism.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Abrasion left forearm, not further specified	minor 790202.1,2	Air bag, driver's	Probable	Interviewee (same person)

OTHER VEHICLE

The 2002 Ford Windstar was a front wheel drive, four-door minivan (VIN: 2FMZA50482B------). The Windstar was equipped with a 3.8L, V6 engine; four-speed automatic transmission, four wheel anti-lock brakes and dual stage driver and front right passenger air bags.

Exterior Damage: The Windstar's impact with the case vehicle involved the back of the vehicle. The Windstar's back bumper and tailgate were directly damaged. Based on the Windstar collision repair records provided by the case vehicle driver's attorney, the repair work involved replacing the back bumper cover and the energy absorbing styrofoam located under the back bumper cover. In addition, the tailgate, tail pipe and muffler were replaced and the rear floor pan was repaired. There was no indication in the repair records of any repair to the Windstar's unibody structure.

Damage Classification: Based on photographs of the damage to the Windstar, the CDC was estimated to be: **06-BDEW-1** (180 degrees).The WinSMASH reconstruction program could not be used to reconstruct the Windstar's Delta Vs because the Windstar had been repaired and was not inspected. In addition, the case vehicle sustained no measurable crush to the front bumper and only minor crush to the top radiator support, which precluded using the WinSMASH program as a basis for a reconstruction. Based on the photographs of the damage to the Windstar and the damage to the case vehicle, the Windstar's crash severity was determined to minor [2-13 km.p.h (1-8 m.p.h.)]. The Windstar was towed due to damage.

Windstar's Occupants: According to the police crash report, the driver of the Windstar [31-year-old, White (unknown if Hispanic) male] was restrained by his manual, three-point, lap-and-shoulder safety belt system. The police crash report indicated the driver sustained an "A" (incapacitating) injury and was transported by ambulance to a hospital.


Superelevation +2.4%
V2 Stopped for Traffic
N
IN-06-025
Clear, Daylight
Dry, Level Asphalt
Estimated Coefficient of Friction: 0.70
Approximate Impact Position
CV = 1994 Ford Mustang
V2 = 2002 Ford Windstar
0m 5m 10m
Scale