



INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER

School of Public and Environmental Affairs
222 West Second Street
Bloomington, Indiana 47403-1501
(812) 855-3908 Fax: (812) 855-3537

REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN99-070
LOCATION - Louisiana
VEHICLE - 1996 FORD TAURUS
CRASH DATE - January 1997

Submitted:

April 17, 2002

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National Center for Statistics and Analysis
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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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15. <i>Supplementary Notes</i> Remote air bag deployment investigation concerning a 1996 Ford Taurus four-door sedan, with manual three-point safety belts and dual front air bags, and a 1993 Ford Escort four-door station wagon					
16. <i>Abstract</i> This report covers a remote investigation of an air bag deployment crash that involved a 1996 Ford Taurus GL (case vehicle) and a 1993 Ford Escort LX (other vehicle). This crash is of special interest because the case vehicle's unrestrained front right passenger (3-year-old female) sustained fatal brain injuries as a result of contacting the front right air bag. The case vehicle was traveling north in the northbound lane of a two-lane undivided roadway approaching a controlled four-leg intersection. The other vehicle was traveling south in the southbound lane of the same roadway and was attempting to turn left across the case vehicle's path of travel. The front of the case vehicle impacted the right side of the other vehicle, causing the case vehicle's driver and front right passenger air bags to deploy. Both vehicles were towed from the scene due to damage. The case vehicle's front right passenger's seat back was fully reclined and she was sleeping, with her seat track located in its middle position, and was not wearing her available, active, three-point, lap-and-shoulder safety belt. Her injuries included: severe cerebral edema, subarachnoid hemorrhage, subdural hemorrhage, bilateral pulmonary contusions, and abrasions and contusions on her face. She was pronounced dead approximately 22 hours post-crash. The case vehicle's driver (26-year-old female) was seated with her seat track located in its middle position, and the tilt steering wheel located between its middle and upmost positions. She was not wearing her available, active, three-point, lap-and-shoulder safety belt and sustained contusions to her left hand, left elbow, and left breast.					
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TABLE OF CONTENTS

IN99-070

	<u>Page No.</u>
BACKGROUND	1
CRASH CIRCUMSTANCES	1
CASE VEHICLE: 1996 FORD TAURUS	1
CASE VEHICLE FRONT RIGHT PASSENGER	3
FRONT RIGHT PASSENGER'S INJURIES	3
CASE VEHICLE DRIVER	4
DRIVER'S INJURIES	4
OTHER VEHICLE: 1993 FORD ESCORT	5
 SELECTED PHOTOGRAPHS	
Figure 1: Front of case vehicle	1
Figure 2: Front right corner and right side of case vehicle	2
Figure 3: Front right passenger's air bag cover flap	2
Figure 4: Right side of windshield, cracked by contact with air bag cover flap	2
Figure 5: Right side of the other vehicle	5

This remote report was brought to the NHTSA's attention on April 21, 1999 by an attorney representing the family of the deceased front right passenger. This crash involved a 1996 Ford Taurus GL (case vehicle) and a 1993 Ford Escort LX (other vehicle). The crash occurred in January 1997, at 5:48 p.m., in Louisiana and was investigated by the applicable city police department. This crash is of special interest because the case vehicle's front right passenger (3-year-old female) sustained fatal brain injuries from her deploying front right passenger air bag. This contractor interviewed the case vehicle's driver on October 13, 1999. This summary is based on the Police Crash Report, an interview with the case vehicle's driver, police on-scene photographs, occupant kinematic principles, occupant medical records, and this contractor's evaluation of the available evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling north in the northbound bound of two-lane, undivided state highway, approaching a four-leg intersection and intending to pass through and continue north. The other vehicle had been traveling south in the southbound lane of the same roadway and attempted to turn left at the intersection, intending to travel east. According to the Police Crash Report, the roadway was straight, dry, level and the bituminous surface was without defects. The speed limit for both vehicles was 56 km.p.h. [35 m.p.h.] and it was dark with street lights illuminating the roadways. The intersection was controlled by an overhead caution signal flashing amber for north/south traffic. The crash occurred in the northbound lane, within the intersection.

The other vehicle turned left across the path of the case vehicle. The case vehicle driver braked, attempting to avoid the crash, but the front of the case vehicle impacted with right side of the other vehicle, causing the case vehicle's driver and front right passenger air bags to deploy. Based on the police diagram, the case vehicle came to rest with its front end off the northeast corner of the intersection heading northeast. The other vehicle came to rest completely off the roadway, at the northeast corner of the intersection heading southwest.

CASE VEHICLE

The case vehicle was a front wheel drive 1996 Ford Taurus GL six-passenger, four-door sedan (VIN: 1FALP52U9TA-----), equipped with a 3.0 liter V6 engine. Four wheel anti-lock brakes were an option for this model, but it is not known if the case vehicle was so equipped. Its wheelbase was 277 centimeters [108.5 inches]. The odometer reading is unknown. The case vehicle was towed due to disabling damage.

Direct contact extended approximately half way across the case vehicle's front bumper (Figure 1), from the front right bumper corner

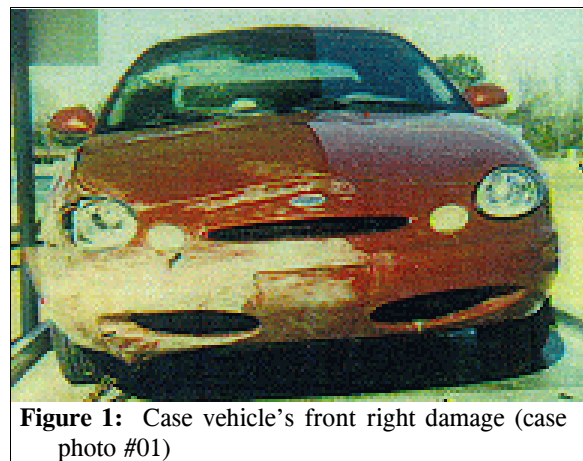


Figure 1: Case vehicle's front right damage (case photo #01)

toward the middle. There was also direct damage on the right side with scratches extending to the right front door (**Figure 2**). The right half of the case vehicle's plastic front bumper fascia showed extensive abrading and it was probably compressed and rebounded. The leading edge of the hood and the right headlight assembly show direct contact but only slight deformation. Neither of the front tires appear to be physically restricted from the front end damage.

The front of the case vehicle overrode the sill on the other vehicle, engaging the relatively soft side structures on the other vehicle's right side (**Figure 5**), and the case vehicle's air bags probably did not deploy until the case vehicle had reached maximum engagement (i.e., the force pulse from the impact was gradual rather than sudden, sometimes called the "ramp versus spike" phenomenon).

Based on the available photographs, the case vehicle's CDC was estimated as: **12-FZEW-1 (350)**. The WinSMASH reconstruction program, CDC-only algorithm based on the estimated CDCs for both vehicles, was used. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 20.0 km.p.h. [12.4 m.p.h.], -19.7 km.p.h. [-12.3 m.p.h.], and +4.5 km.p.h. [+2.8 m.p.h.]. This should be regarded as a borderline reconstruction, but the results appear reasonable.

The case vehicle's driver air bag was located in the steering wheel hub. The single available photograph does not show any obvious damage to the driver air bag or its cover flaps.

The front right passenger's air bag was located in the top of the instrument panel. The single cover flap appears to have opened at the designated tear points and there was no obvious evidence of damage to the air bag (**Figure 3**). The air bag module's cover flap was bent from contacting and cracking the windshield during deployment (**Figure 4**). The front right passenger had no injuries that could be associated with coming in contact with the cover flap. There was no contact evidence readily visible in the photographs for either the driver or front right passenger air bag.



Figure 2: Minor deformation to case vehicle's front right bumper and right fender (case photo #02)

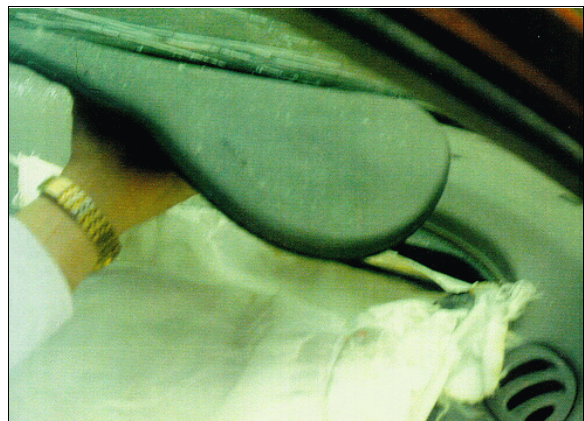


Figure 3: Close-up of the case vehicle's front right air bag module cover flap (case photo #06)

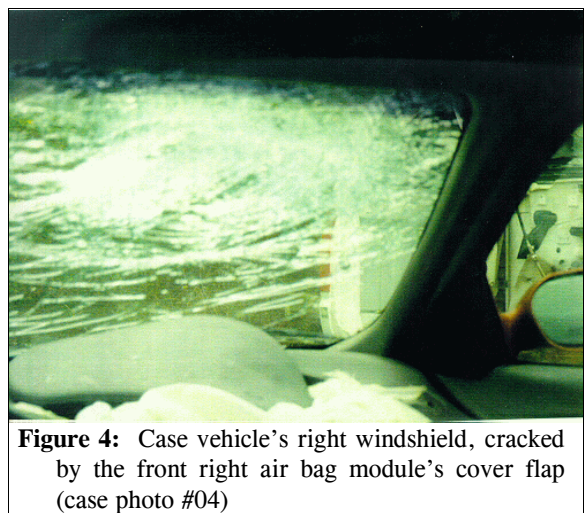


Figure 4: Case vehicle's right windshield, cracked by the front right air bag module's cover flap (case photo #04)

The case vehicle's front right passenger (3-year-old female, white, non-Hispanic, 102 centimeters, 15 kilograms [40 inches, 33 pounds]) was not restrained by the available, manual, three-point, lap-and-shoulder safety belt system. She was unconscious at the scene, was transported via ambulance to a local hospital and subsequently transferred, via helicopter, to a trauma center. She was pronounced dead approximately 22 hours after the crash.

According to the case vehicle driver, the front right passenger’s seat back was completely reclined and the child was laying back, sleeping. The exact position of her legs and arms is not known. The driver indicated that the seat track was in the middle position. The case vehicle's driver braked at the last second, attempting to avoid the crash. As a result of the braking and the non-use of her available safety belts, the front right passenger moved forward and upward just prior to impact. The case vehicle's impact with the other vehicle caused the front right passenger to move further forward and upward, toward the 350 degree direction of force. The case vehicle’s impact with the relatively soft side structures of the other vehicle resulted in the air bags not deploying immediately. When the case vehicle achieved maximum engagement, the air bag deployed, contacting the right side of the passenger’s face and upper torso, causing abrasions and contusions on the right side of her face and bilateral pulmonary contusions. This impact delivered a blow to her head that resulted in severe cerebral edema. As the air bag expanded, the front right passenger was lifted upward and thrown rearward as the case vehicle rotated clockwise. The back of her head probably contacted the right B-pillar, causing subdural and subarachnoid hemorrhage over the right side of her brain. The passenger rebounded forward and, at final rest, she was on the floor with her back and head leaning back against the seat cushion and her legs extended out in front of her.

FRONT RIGHT PASSENGER’S INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Nonanatomic brain injury, pupils fixed & dilated, no reflexes (corneal, gag or cough), no response to deep pain or noxious stimuli; GCS = 3	160824.5 critical	Air bag, front right passenger’s	Certain	Hospitalization records
2	Edema, severe ¹ (massive), cerebral, no visible sulci, gyri or cisterns, closed lateral ventricles, positive mass effect (Aspect = Unknown)	140674.5 critical	Air bag, front right passenger’s	Certain	Autopsy

¹ This patient failed two apnea tests and had no response to cold water calorics. After the second apnea test, she was declared brain dead

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
3	Hemorrhage, subdural, small, overlying tentorium of right occipital lobe	140650.4 severe	Right B-pillar	Possible	Autopsy
4	Hemorrhage, subarachnoid, mild, posterior tip of right occipital lobe	140684.3 serious	Right B-pillar	Possible	Autopsy
5	Contusions, pulmonary, bilateral, not further specified	441410.4 severe	Right B-pillar Air bag, front right passenger's	Probable	Hospitalization records
6	Abrasion, large, right side of face and neck, 6 centimeters [2.4 inches] at widest point	290202.1 minor	Air bag, front right passenger's	Certain	Autopsy
7	Abrasion over left mandible, 2x1 centimeters [0.8x0.4 inches]	290202.1 minor	Air bag, front right passenger's	Certain	Autopsy
8	Contusion, large, over right temple, right zygoma and right cheek	290402.1 minor	Air bag, front right passenger's	Certain	Hospitalization records

CASE VEHICLE DRIVER

The case vehicle's driver (26-year-old female, white, non-Hispanic, 165 centimeters, 57 kilograms [65 inches and 125 pounds]) was not restrained by the available manual, three-point, lap-and-shoulder safety belt system. She sustained minor injuries, was transported via ambulance to a local hospital where she was treated and released.

Immediately prior to the crash, the driver was seated in an upright posture with her back against the seat back, her left foot on the floor, her right foot on the brake, and both hands on the steering wheel. She indicated that her seat track was located between its middle and forward-most positions, the seat back was upright, and the tilt steering wheel was located between its middle and upmost positions. The case vehicle's driver braked at the last second, attempting to avoid the crash. As a result of the braking and the non-use of her available safety belts, she most likely moved forward just prior to impact. The case vehicle's impact with the other vehicle caused her to move further forward and slightly leftward, toward the 350 degree direction of force. The case vehicle's impact with the relatively soft side structures of the other vehicle resulted in the air bags not deploying immediately. When the case vehicle achieved maximum engagement, the air bag deployed, causing a contusion to her left breast and the third finger on her left hand. Her arms flailed and her left elbow contacted the left side interior surface, causing a contusion. At final rest, she remained seated with her back against the seat back, close to her original seating position.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Contusion, left 3rd finger	790402.1 minor	Driver's air bag	Probable	Emergency room records
2	Contusion, left breast	490402.1 minor	Driver's air bag	Probable	Interview
3	Contusion, left elbow	790402.1 minor	Left side interior surface	Probable	Interview

OTHER VEHICLE

The other vehicle was a front wheel drive 1993 Ford Escort LX, four-door, six-passenger station wagon (VIN: 1FAPP15J7PW-----),. equipped with a 1.9 liter I4 engine. The Escort was not equipped with anti-lock brakes. Its wheelbase was 250 centimeters [98.4 inches]. The vehicle's odometer reading is not known.

The case vehicle impacted the Escort's right side, with direct damage extending from the right A-pillar to the right C-pillar. The front of the case vehicle overrode the Escort's right sill, resulting in substantial penetration and intrusions into the right side of the Escort's passenger compartment, centered on the right B-pillar. The Escort was towed from the scene due to damage.

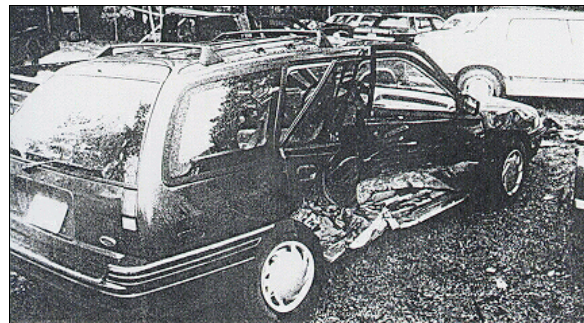


Figure 5: Other vehicle's right side damage (case photo #07)

Based on the one available photograph, the CDC was estimated as **02-RPEW-3 (60)** for the Escort. The WinSMASH reconstruction program, CDC-only algorithm based on the estimated CDCs for the two vehicles, was used. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 25.0 km.p.h. [15.5 m.p.h.], -12.5 km.p.h. [-7.8 m.p.h.], and -21.7 km.p.h. [-13.5 m.p.h.]. This should be regarded as a borderline reconstruction, but the results appear reasonable.