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SCI/NASS COMBINATION CASE REPORT

CASE NUMBER - NASS-1997-49-182E

LOCATION - Texas

VEHICLE - 1998 FORD ESCORT

CRASH DATE - October 1997

Submitted:

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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. <i>Abstract</i> This report covers a SCI/NASS combination investigation of an air bag deployment crash that involved a 1998 Ford Escort (case vehicle) and a 1997 Pontiac Grand AM (vehicle #1). This case is of interest because the case vehicle was equipped with redesigned air bags that deployed as a result of the collision events and neither the driver (29-year-old female) nor the front right passenger (25-year-old male) reportedly sustained any injuries in the crash. The case vehicle was southbound in the inside southbound through lane of an seven-lane, divided state trafficway, approaching a four-leg intersection and intending to continue straight. Vehicle #1 had been traveling northbound in a left-hand turn lane of the same trafficway and was making a left turn at the intersection. The crash occurred in the inside southbound through lane, within the intersection. The front of the case vehicle impacted the front of vehicle #1, causing the case vehicle's driver and front right passenger air bags to deploy. The driver and front right passenger air bags in vehicle #1 also deployed. The case vehicle's driver was seated with her seat track located between its middle and forward-most positions, and the tilt steering wheel was adjusted to its middle position. She was restrained by her lap and shoulder safety belt and sustained, according to her interview, only soreness as a result of this crash. The front right passenger was seated with his seat track located in its middle position, and was restrained by his lap and shoulder safety belt. He was completely uninjured, as indicated by the Police Crash Report and the driver's interview. The rear right passenger in the case vehicle (27-year-old male) was seated in a nonadjustable seat. He was wearing his lap and shoulder safety belt. He sustained, according to the interview with the case vehicle's driver, a small, minor scratch (i.e., laceration) to his upper lip but was otherwise uninjured. No ambulance came to the scene.					
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Additional photographs are available in NASS EDCS case 1997-49-182E

This combination SCI-NASS CDS case was brought to the NHTSA's attention on November 13, 1997, 1997 by NASS CDS sampling activities. This crash involved a 1998 Ford Escort SE (case vehicle, NASS vehicle #2) and a 1997 Pontiac Grand AM SE (NASS vehicle #1). The crash occurred in October, 1997 at 7:56 p.m. in Texas and was investigated by the applicable city police department. This case is of interest because the case vehicle was equipped with depowered (second generation) air bags and neither the driver (29-year-old female) nor the front right passenger (25-year-old male) reportedly sustained any injuries in the crash. The NASS CDS team inspected the scene and vehicles and interviewed the case vehicle's driver in late October, 1997. This report is based on the Police Crash Report, the case vehicle driver interview, NASS CDS data from the scene and vehicle inspections, occupant kinematic principles and this contractor's evaluation of the evidence. The case data and photographs are encoded in NASS EDCS case 1997-49-182E.

CRASH CIRCUMSTANCES

The case vehicle was southbound in the inside southbound through lane of an seven-lane, divided, state trafficway and intended to continue straight ahead through a four-leg intersection (i.e., the north leg of the intersection was divided with both the north and south roadways each having three through lanes, while the southbound roadway had a left-hand turn lane). Vehicle #1 had been traveling northbound in a left-hand turn lane of the same trafficway and was making a left turn, intending to travel west on the intersecting state trafficway (the south leg of the intersection was seven-lanes, undivided with three through lanes in both the north and south directions and a left-hand turn lane for northbound traffic). The case vehicle's driver was not able to perform any avoidance actions; it is not known if the driver of vehicle #1 performed any avoidance actions. The crash occurred in the inside southbound through lane, within the four-leg intersection of the two trafficways.

The front of the case vehicle impacted the front of vehicle #1, causing the case vehicle's driver and front right passenger supplemental restraints (air bags) to deploy. The driver and front right passenger supplemental restraints (air bags) in vehicle #1 also deployed. The crash severity to the case vehicle was low [14-23 km.p.h. (9-14 m.p.h.)]. The speed limit for both vehicles was 56 km.p.h [35 m.p.h]. Both vehicles were towed due to disabling damage.

CASE VEHICLE

The case vehicle was a front wheel drive 1998 Ford Escort SE, five-passenger, four-door sedan (VIN: 1FAFP13P9WW-----) equipped with a 2.0L, EFI-SPI, I-4 engine and a four-speed automatic transmission. Four wheel anti-lock brakes are an option for this model, but it is unknown if the case vehicle was so equipped. The case vehicle's wheel base was 250 centimeters (98.4 inches), and the odometer reading at inspection was 1,370 kilometers (851 miles). The case vehicle was towed due to

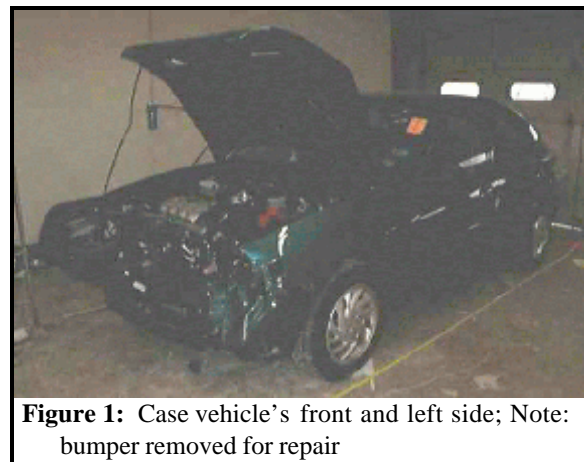


Figure 1: Case vehicle's front and left side; Note: bumper removed for repair

disabling damage. Damage to the case vehicle (**Figure 1**) consisted of direct contact across the left half of the front, including the bumper, grille, the front edge of the left fender and the leading edge of the hood, with induced damage across the entire front. In addition, there was an area of spider web cracking on the right side of the windshield immediately above the front right air bag module. The CDC for the case vehicle is: **11-FYEW-2**, with principal direction of force 340 [-20] degrees. The WinSMASH reconstruction program, damage only algorithm, was used on the case vehicle's highest severity impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 19 km.p.h. (12 m.p.h.), -19 km.p.h. (-12 m.p.h) and +3 km.p.h. (+2 m.p.h.).

The case vehicle was fitted with two bucket seats in the front row and a bench seat in the second row, with manual three-point lap-and-shoulder safety belts in the four outboard seating positions and a manual two-point lap-only safety belt in the middle position of the back seat. The driver and front right seat backs were both slightly reclined and showed no signs of having moved as a result of the collision forces. The driver's seat track was adjusted between the middle and forward-most positions, with the adjustment mechanism jammed such that the seat track could not be moved either forward or backward. The tilt steering wheel was adjusted in the center position. The front right seat track was adjusted at the middle position and was fully operational.

The case vehicle's driver air bag was located in the steering wheel hub. An inspection of the air bag module's cover flaps revealed that the flaps opened along the perforations, with no evidence of damage to the flaps. The driver air bag was round, with a diameter of approximately 54 centimeters [21.3 inches]. Vent ports were located at the 10 and 2 o'clock positions, and the air bag had no tethers. A smudge of pink makeup, probably lipstick, was found near the center of the air bag (**Figure 2**). The driver air bag was otherwise unremarkable. The interior inspection also revealed that the steering wheel rim was bent forward, approximately 1 centimeter (0.4 inches), in the upper quadrant. There was no evidence of steering column movement.



Figure 2: Case vehicle's driver air bag

The front right passenger air bag module was located in the middle instrument panel and had a single cover flap. The vehicle inspection indicates that the air bag module's cover flap opened along the perforations with no evidence of damage to the cover flap or the surrounding areas of the instrument panel. The windshield, however, had an area of spider web cracking directly above the air bag module's cover flap. The front right passenger air bag was a vertical rectangle approximately 53 centimeters [21 inches] wide and 82 centimeters [32 inches] tall. There were two vent ports in the air bag's side panels, located approximately at the 10 and 2 o'clock positions, and no tether straps. There was no contact evidence on the air bag and no evidence of damage to the air bag (**Figure 3**).

The case vehicle's driver [29-year-old female, not pregnant, 170 centimeters and 54 kilograms (67 inches, 120 pounds)] was restrained by her available manual three-point lap-and-shoulder safety belt system. There was no evidence of belt pattern bruising and/or abrasions to the driver's body. The case vehicle's driver was seated in a reclined posture with her back against the seat back, her left foot on the floor, her right foot on the accelerator, and both hands on the steering wheel. Her seat track was located between its middle and forward-most positions, the seat back was slightly reclined, and the tilt steering wheel was adjusted to its middle position.

The case vehicle driver did not make any avoidance maneuvers prior to the crash. Based on the use of her available safety belts, she most likely remained in her pre-crash seating position. The impact with vehicle #1 caused the driver air bag to deploy and caused the driver to move forward and slightly to the left, towards the 350 [-10] degree direction of principal force. Because she was restrained by her safety belt system, she encountered the deployed air bag in an upright posture, leaving a lipstick smudge slightly above the center of the air bag. Because her forward motion was cushioned by the air bag, she did not load the safety belt webbing with sufficient force to cause any bruising. The upper quadrant of the steering wheel rim was bent slightly forward by the back of the air bag as a result of the air bag being compressed by the driver's head and torso. The case vehicle's driver stated that she was uninjured except that her jaw felt sore, but with no swelling or discoloration, and she did not seek any medical treatment. No ambulance came to the scene.



Figure 3: Case vehicle's front right passenger air bag

FRONT RIGHT PASSENGER

The front right passenger [25-year-old male, 185 centimeters, 88 kilograms (73 inches, 195 pounds)] was restrained by his available manual three-point lap-and-shoulder safety belt system. There was no evidence of belt pattern bruising and/or abrasions to the front right passenger's body. He was seated in a reclined posture with his back against the seat back, his feet on the floor, and his hands at an unknown location. His seat track was located in its middle position, and the seat back was slightly reclined.

The impact with vehicle #2 caused the front right passenger air bag to deploy and caused the front right passenger to move forward and slightly to the left, toward the 350 [-10] degree direction of principal force. Because he was restrained by his safety belt system, he encountered the deployed air bag in an upright posture. Because the air bag cushioned his forward motion, he did not load the safety belt webbing with sufficient force to cause any bruising.

Front Right Passenger (continued)

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The front right passenger was completely uninjured, as indicated by the Police Crash Report and the driver's interview, and he did not seek any medical attention.

REAR RIGHT PASSENGER

The rear right passenger in the case vehicle [27-year-old male, 180 centimeters and 84 kilograms (71 inches, 185 pounds)] was seated in an upright posture with his back against the seat back and his feet on the floor, but the location of his hands is unknown. His seat track and seat back were not adjustable. The rear right passenger was wearing his available, active, three-point, lap and shoulder belt.

He sustained a scratch/small laceration to his upper lip, probably as a result of contacting the front right seat back, and was otherwise uninjured. The Police Crash Report indicated that he would seek medical treatment from a private physician. The case vehicle's driver did not know if he actually did see a physician.

VEHICLE NUMBER 1

The other vehicle that was involved with the case vehicle in this crash is referred to as vehicle #1 because the NASS CDS version of this crash follows the vehicle numbering from the Police Crash Report, which designates the case vehicle as vehicle #2.

Vehicle #1 is a front wheel drive 1997 Pontiac Grand AM SE, five-passenger, four-door sedan (VIN: 1G2NE52T0VC-----) equipped with a 2.4L, MFI, L-4 engine, and the standard transmission is a five-speed manual. Four wheel anti-lock brakes are standard for vehicle #1. Vehicle #1's wheel base was 267 centimeters (103.4 inches). Vehicle #1 was towed due to disabling damage. Vehicle #1 sustained direct contact damage across the right three-quarters of the front, including the bumper, grille, right headlight and the leading edge of the hood. The CDC was determined to be: **01-FDEW-01**, with principal direction of force 20 degrees. The WinSMASH reconstruction program, damage only algorithm, was used on vehicle #1's highest severity impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 18 km.p.h. (11 m.p.h.) -17 km.p.h. (-11 m.p.h.) and -6 km.p.h. (-4 m.p.h.).

Vehicle #1's driver, and sole occupant, was not injured, and no ambulance came to the scene.

