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REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN99-105
LOCATION - MISSOURI
VEHICLE - 1998 FORD ESCORT ZX2
CRASH DATE - August 1998

Submitted:

February 11, 2000

Revised:
June 5, 2001

Contract Number: DTNH22-94-D-17058

Prepared for:

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National Highway Traffic Safety Administration
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. *Supplementary Notes*
Remote redesigned air bag report involving a 1998 Ford Escort ZX2 (case vehicle, vehicle #2), equipped with manual safety belts and dual redesigned front air bags, and a 1997 Honda Accord LX (vehicle #1)

16. *Abstract*

This report covers a remote investigation of an air bag deployment crash that involved a 1998 Ford Escort ZX2 (case vehicle, vehicle #2) and a 1997 Honda Accord LX (vehicle #1). This crash is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of collision events and the case vehicle's restrained front right passenger (73-year-old female) was fatally injured and the restrained driver (71-year-old female) sustained “evident-not disabling” injuries. The case vehicle (vehicle #2) was originally traveling south in the inside southbound lane of a two-lane roadway that was part of a four-lane divided U.S. highway, approaching a four-leg intersection, intending to make a left turn and travel east on the intersecting county road. Vehicle #1 was traveling north in the outside northbound lane of the same four-lane divided U.S. highway, intending to continue its northbound travel. The right front wheel and fender area of the case vehicle was impacted by the front left of vehicle #1, causing the case vehicle's driver and front right passenger air bags to deploy. The case vehicle rotated over 360 degrees counterclockwise and traveled nearly 23 meters (75 feet) in a north-northwest direction, coming to rest straddling the northbound lanes’ (west) yellow edge line, facing east. Vehicle #1 rotated counterclockwise nearly 240 degrees and traveled about 29 meters (95 feet) onto the roadside northeast of the intersection. The case vehicle front right passenger’s pre-crash seat adjustments and posture are not known. She was restrained by her available, manual, three-point, lap-and-shoulder, safety belt system and sustained, according to her death certificate (no autopsy was performed), fatal head trauma. The case vehicle driver’s police reported injuries were “evident-not disabling.” She was restrained by her available, manual, three-point, lap-and-shoulder safety belt system. Her pre-crash seat adjustments, steering wheel position, and posture are not known. Both vehicles were towed due to disabling damage.

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Additional photographs are available in SCI EDCS case IN99-105

BACKGROUND

This case was brought to the NHTSA's attention by a review of the 1998 Fatality Analysis Reporting System (FARS) in June 1999. The crash involved a 1998 Ford Escort ZX2 (case vehicle, vehicle #2) and a 1997 Honda Accord LX (vehicle #1). The crash occurred in August 1998, at 8:50 p.m., in Missouri, and was investigated by the applicable state police agency. This case is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of collision events, and the case vehicle's restrained front right passenger (73-year-old female) was fatally injured. The restrained driver (71-year-old female) sustained police-reported "evident-not disabling" injuries. The Police Crash Report was received in December 1999. No autopsy was performed on the case vehicle's front right passenger but a copy of her death certificate accompanied the police report. Police photographs were obtained in January 2000. This report is based on the Police Crash Report, the death certificate, police photographs, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle (vehicle #2) was originally traveling south in the inside southbound lane of a two-lane roadway that was part of a four-lane, divided, U.S. highway, approaching a four-leg intersection intending to make a left-hand turn through a median cut, cross the northbound lanes and travel eastbound on the intersecting county road (**Figure 1**). Vehicle #1 was traveling north in the outside northbound lane of the same four-lane, divided, U.S. highway, also approaching the intersection and intending to continue its northbound travel path. It was dark with no street lights and clear weather. The trafficway was bituminous, dry, straight, without defects and had a grade negative to the north. The posted speed limit for the U.S. highway was 105 km.p.h. (65 m.p.h.), while the posted speed limit for the intersecting county roadway was 89 km.p.h. (55 m.p.h.). Investigating officers estimated the pre-impact speed of the case vehicle at 11 km.p.h. (7 m.p.h.) and for vehicle #1 at 105 km.p.h. (65 m.p.h.). Both southbound and northbound roadways had single broken white center lines and single solid yellow edge lines on the median side of the respective inside travel lanes and single solid white edge lines on the outside travel lanes' right-hand pavement edges. There was a YIELD sign [Manual on Uniform Traffic Control Devices, R1-2] and a ONE-WAY (north) sign [MUTCD, R6-1] for traffic

Figure 1: Reverse view of case vehicle's approach (looking north); Note: median cut for intersection; arrow points to impact area (case photo #01)

Figure 2: View of case vehicle's separated front bumper fascia on the northeast quadrant of the four-leg intersection; Note: arrow points to final rest position of vehicle #1 (case photo #15)

facing east in the median cut area. There were no reported pre-impact avoidance maneuvers by the case vehicle. A witness indicated that vehicle #1's brake lights came on, but there was no physical evidence. The crash occurred within the intersection of the two roadways, in the outside, northbound lane of the U.S. highway.

The right front of the case vehicle (vehicle #2) was impacted by the front left of vehicle #1, causing the case vehicle's driver and front right passenger air bags to deploy. Pavement gouge marks and post-impact tire marks show that the case vehicle rotated approximately 360 degrees counterclockwise and traveled approximately 23 meters (75 feet) in a north-northwest direction, coming to rest straddling the northbound lanes' (west) yellow edge line and facing east. During its counterclockwise rotation, the case vehicle's right rear quarterpanel impacted the left front fender of vehicle #1 in a sideslap, second impact. Vehicle #1 also rotated counterclockwise nearly 240 degrees, but traveled in a northeasterly direction for approximately 29 meters (95 feet). Vehicle #1 came to rest off the northbound travel lanes' east side, facing southwest (**Figure 2** above). The crash severity for the case vehicle was moderate [24-40 km.p.h. (15 to 25 m.p.h.)].

CASE VEHICLE

The case vehicle (vehicle #2) was a front wheel drive, 1998 Ford Escort ZX2, five-passenger, two-door coupe (VIN: 3FAKP1139WR------) equipped with a 2.0 liter gasoline engine and either a five-speed manual or a four-speed automatic transmission. The location of the transmission selector lever is not known. Four-wheel anti-lock brakes were an option for this vehicle, but it is not known if it was so equipped. The wheelbase for the case vehicle was 250 centimeters (98.4 inches). No odometer reading was reported. The case vehicle was towed from the scene due to disabling damage.

Figure 3: Case vehicle's right front damage; Note: post-impact cant of right front wheel (case photo #13)

The case vehicle (vehicle #2) sustained direct contact damage along its entire right front fender from the initial impact with vehicle #1 **(Figure 3**). Damaged components included: the front bumper fascia separated from the bumper reinforcement bar; the front right corner of the bumper reinforcement bar pushed inward, bowing the bar outward at its center; the sheet metal of the right front fender was displaced inward; the right front wheel and tire were tilted inward; and the front right suspension was displaced inward. There were no direct views of the case vehicle's front plane

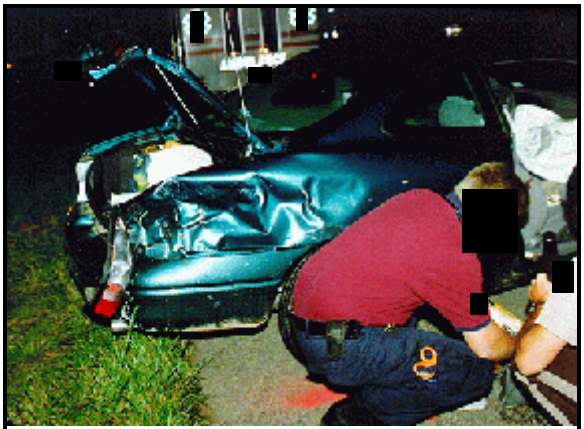

Figure 4: Case vehicle's right rear damage from second (side-slap) impact (case photo #12)

but indirect damage probably included: the front grille, both front headlamp assemblies, the front engine compartment brackets, the right seam edge of the hood, the right edge of the windshield (splintered), and the right front door glazing (possibly broken out by the front right passenger's head). No view of the case vehicle's interior was sufficient to detect the existence of intrusion. The second impact, a sideslap involving the case vehicle's right rear with the left side of vehicle #1, damaged the case vehicle's right rear quarterpanel, the right rear taillight assembly, the back right bumper corner, and the right seam edge of the trunk (**Figure 4** above).

The CDC for the case vehicle's first (most severe) impact, estimated from police photographs, is **02-RYEW-3** (principal direction of force 60 degrees). The WinSMASH reconstruction program, with a CDC-only estimated crush profile, provided a borderline reconstruction, but the results appear reasonable. The estimated Total, Longitudinal, and Lateral Delta Vs are, respectively: 27.0 km.p.h. (16.7 m.p.h.), -13.5 km.p.h. (-8.4 m.p.h.), and -23.4 km.p.h. (-14.5 m.p.h.).

CASE VEHICLE'S FRONT RIGHT PASSENGER

The case vehicle's front right passenger (73-year-old female, White (non-Hispanic), height and weight not known) was restrained by her available, manual, three-point, lap-and-shoulder safety belt system. Her pre-crash seat adjustments and posture are not known. She was pronounced dead at the crash scene. No autopsy was performed. The front right passenger's injuries and kinematics are based on her Certificate of Death, on-scene police photographs (all photographs were exterior vehicle views, with interior details unclearly depicted; **Figure 5**), and the principles of occupant kinematics.

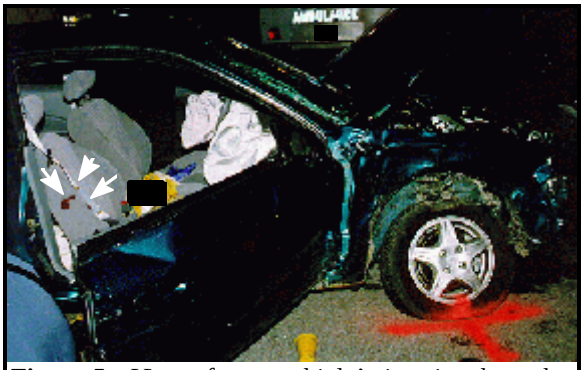

Figure 5: View of case vehicle's interior through right front door; Note: deployed dual front air bags and arrows pointing to bloodstains (case photo #14)

The case vehicle's front right passenger was probably seated in a normal posture with her back against the seat back and her feet on the floor; her hand positioning is not known. There was no indication from investigating officers or scene photographs that the case vehicle's driver attempted any avoidance maneuvers prior to the first impact. The first impact caused the case vehicle's driver and front right passenger air bags to deploy. The front right passenger's body moved right, loading the upper torso safety belt webbing and possibly forcing her head into the right front door window glazing and frame with sufficient force to disintegrate the glass. This contact may have caused the head trauma that led to this occupant's death. The second, sideslap impact occurred during the severe counterclockwise rotation initiated by the large travel speed differential between the two vehicles. The post-impact counterclockwise rotation of the case vehicle continued the right-leaning pressure on the front right passenger's body. This occupant's positioning at final rest is not known. She was pronounced dead at the scene of the crash and was transported by ambulance to a medical facility. An autopsy was not performed. According to her certificate of death, head trauma was the sole listing for immediate cause of

death.

CASE VEHICLE FRONT RIGHT PASSENGER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	"Head Trauma" (blunt head trauma, NFS)	115099.7 unknown	right side window glazing and/or frame	possible	death certificate

Case Vehicle's Driver

The case vehicle's driver (71-year-old female, race, ethnicity, height and weight unknown) was restrained by her available, manual, three-point, lap-and-shoulder, safety belt system. Her pre-crash seat adjustments, steering wheel position, and posture are not known. With no pre-crash avoidance maneuvers attempted, her body posture did not change because of any vehicular maneuver. Her at-crash and post-crash kinematics mirrored those of the front right passenger, moving forward and to the right. As with the front right passenger, the driver's body positioning at final rest is not known. She was transported from the scene by ambulance to a medical facility, but her treatment status is unknown. Her police-reported injuries were assessed as "evident-not disabling."

Vehicle #1

Vehicle #1 was a front wheel drive, 1997 Honda Accord LX, five-passenger, four-door sedan (VIN: 1HGCE6646VA------) equipped with a 2.7 liter, V-6 gasoline engine and a four-speed automatic transmission with the selector lever location unknown. Four-wheel anti-lock brakes are an option for this vehicle, but it is not known if vehicle #1 was so equipped. Its wheelbase was 272 centimeters (106.9 inches). No odometer reading was reported. Vehicle #1 was towed from the scene due to disabling damage. Vehicle #1 was equipped with dual front air bags that deployed as a result of the collision events. The driver (58-year-old female, race, ethnicity, height and weight unknown) sustained police-reported "disabling" injuries. She was transported from the scene by ambulance to a medical facility. Her treatment status is not known.

Figure 6: Vehicle #1's front left damage; Note: missing front bumper fascia and deployed dual front air bags (case photo #19)

Vehicle #1 sustained direct contact damage to the left half of its front plane from the first impact with the case vehicle (**Figure 6**). Damaged components included: the front bumper fascia separated from the vehicle; the left side of the grille, the left side of the reinforcement bar and the left lower corner of the radiator displaced rearward; the left headlight assembly smashed; the left front hood corner displaced rearward, buckling the left hood seam upward at its mid-point; the left front fender was pushed back and buckled at the front half of the wheel well; and the left front tire and wheel pushed into the lower left A-pillar. Visible induced damage to vehicle #1 included the forward seam of the left front door and cracked glazing on the windshield's right side (passenger air bag module cover flap struck windshield). There may have been some slight intrusion to vehicle #1's left toe pan or foot well, but there were no photographs of the interior. Based on police photographs, the CDC for vehicle #1's first impact was: **11-FYEW-2** (principal direction of force 330 (-30) degrees). The WinSMASH reconstruction program, with a CDC-only estimated crush profile, provided a borderline reconstruction, but the results appear reasonable. The Total, Longitudinal and Lateral Delta Vs for vehicle #1's most severe (first) impact are, respectively: 24.9 km.p.h. (15.5 m.p.h.), -21.5 km.p.h. (13.4 m.p.h.) and 12.4 km.p.h (7.7 m.p.h.).