

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1998-073-802E)

1998 Ford Escort 2-door coupe

Indiana

October/1998

Technical Report Documentation Page

1. Report No. 1998-073-802E		2. Government Accession No.		3. Recipient Catalog No.	
4. Title and Subtitle				5. Report Date May 18, 1999	
				6. Performing Organization Report No.	
7. Author(s) Dynamic Science, Inc.				8. Performing Organization Report No.	
9. Performing Organization name and Address Dynamic Science, Inc. 530 College Parkway, Ste. K Annapolis, MD 21401				10. Work Unit No. (TRAIS)	
				11. Contract or Grant no. DTNH22-94-D-27058	
12. Sponsoring Agency Name and Address U.S. Dept. of Transportation (NRD-32) National Highway Traffic Safety Administration 400 7th Street, SW Washington, DC 20590				13. Type of report and period Covered [Report Month, Year]	
				14. Sponsoring Agency Code	
15. Supplemental Notes					
16. Abstract This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Escort 2-door coupe. This crash occurred in October, 1998 in the late evening. The weather was clear and the bituminous roadway was dry. The crash occurred on a two-way undivided residential street. The roadway contained two travel lanes; one southbound lane and one northbound lane. There also was legal street parking on both sides of the street. The southbound lane is separated from the northbound lane by a double yellow painted line. The speed limit is 40 kmph (25 mph). There are no traffic controls at the area of impact. The road is level at this location. The road was dark but lighted by street lights at the time of the crash. Vehicle 1, a 1998 Ford Escort 2-door sedan (case vehicle) driven by a 20 year old female (168 cm/66 in, 64 kg/140 lbs), was traveling south in the southbound travel lane at an unknown speed. The driver was unrestrained. There were no other occupants in the vehicle. The struck vehicle, a 1994 Ford Thunderbird 2-door coupe, was parked and unoccupied against the southbound curb. The third vehicle, a 1988 Oldsmobile Cutlass 4-door sedan, was parked and unoccupied against the southbound curb just ahead of the second vehicle. The driver of Vehicle 1 fell asleep and the vehicle drifted to the right/west edge of the road. The front plane of Vehicle 1 (12FZEW2) struck the back plane of the parked Ford Thunderbird. That impact caused the front plane of the Ford to strike the back plane of the Oldsmobile Cutlass. A Delta V was calculated, utilizing the Missing Vehicle Algorithm of WinSMASH, as 31 kmph (19 mph). As a result of the frontal impact, the supplemental restraint system (driver's and passenger's side redesigned air bags) of the case vehicle deployed. Vehicle 1 came to rest engaged with the first parked vehicle facing south. The driver of the case vehicle was reported by police to have sustained non-incapacitating injuries and was transported by land to a local hospital. When the driver was interviewed however, she reported that she was not injured and was not transported from the scene. Which of these scenarios is correct is not known.					
17. Key Words Redesigned air bag system, unrestrained driver			18. Distribution Statement		
19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No of pages	22. Price		

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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Escort 2-door coupe. This crash occurred in October, 1998 in the late evening. The weather was clear and the bituminous roadway was dry. The crash occurred on a two-way undivided residential street. The roadway contained two travel lanes; one southbound lane and one northbound lane. There also was legal street parking on both sides of the street. The southbound lane is separated from the northbound lane by a double yellow painted line. The speed limit is 40 kmph (25 mph). There are no traffic controls at the area of impact. The road is level at this location. The road was dark but lighted by street lights at the time of the crash.

Vehicle 1, a 1998 Ford Escort 2-door sedan (case vehicle) driven by a 20 year old female (168 cm/66 in, 64 kg/140 lbs), was traveling south in the southbound travel lane at an unknown speed. The driver was unrestrained. There were no other occupants in the vehicle.

The struck vehicle, a 1994 Ford Thunderbird 2-door coupe, was parked and unoccupied against the southbound curb.

The third vehicle, a 1988 Oldsmobile Cutlass 4-door sedan, was parked and unoccupied against the southbound curb just ahead of the second vehicle.



Figure 1. Exterior, Vehicle 1 (Ford Escort)



Figure 2. Exterior, Vehicle 1 (Ford Escort)

Crash Events

The driver of Vehicle 1 fell asleep and the vehicle drifted to the right/west edge of the road. The front plane of Vehicle 1 (12FZEW2) struck the back plane of the parked Ford Thunderbird. That impact caused the front plane of the Ford to strike the back plane of the Oldsmobile Cutlass.

A Delta V was calculated, utilizing the Missing Vehicle Algorithm of WinSMASH, as 31 km/h (19 mph).

As a result of the frontal impact, the supplemental restraint system (driver's and passenger's side redesigned air bags) of the case vehicle deployed.



Figure 3. Crash scene, point of impact.

Vehicle 1 came to rest engaged with the first parked vehicle facing south.

The driver of the case vehicle was reported by police to have sustained non-incapacitating injuries and was transported by land to a local hospital. When the driver was interviewed however, she reported that she was not injured and was not transported from the scene. Which of these scenarios is correct is not known.

Vehicle 1 became disabled due to damage sustained in the crash and was towed from the scene.

Table 1. Delta V

	Case Vehicle	
	km/h	mph
Total	31	19.3
Longitudinal	-31	-19.3
Lateral	0	0
Barrier speed	26	16.2

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Ford Escort 2-door coupe
VIN	3FAKP1132WR
CDC	12FZEW2



Figure 4. Exterior, Vehicle 1, direct damage



Figure 5. Exterior, Vehicle 1 (1998 Ford Escort)

Table 3. Crush Measurements

Plane of Impact	Field L cm/in.	C1 cm/in.	C2 cm/in.	C3 cm/in.	C4 cm/in.	C5 cm/in.	C6 cm/in.
Bumper	135	7	5	9	16	26	39
	53.1	2.8	2	3.5	6.3	10.2	15.4

Interior of Case Vehicle

The interior of the Ford Escort sustained moderate damage from occupant contact. There appeared to be minimal intrusion to the right side instrument panel and toe pan, however when these intrusions were measured they were found to be less than 2 cm (1 in). The measurements are reported in Table 4. There was occupant contact evidence to the windshield and left instrument panel.

The case vehicle was equipped with bucket seats with folding backs in the front left and front right seating positions. The front left seat was adjusted middle track position (per interview). The front right seat was adjusted to the rear most track position. Both front seats were equipped with adjustable head restraints which were not damaged in the crash. The rear of the vehicle was equipped with bench seats with integral head restraints in the outboard positions. The center rear of the vehicle was not equipped with a head restraint system.

Table 4. Intrusions

Intruded Component	Location of Intrusion	Intruded Value cm/in.		Dominant Crush Direction
Instrument panel	Right	0	0	Longitudinal
Toe pan	Right	0	0	Longitudinal

Case Vehicle Occupant Protection Systems

The Ford Escort 2-door coupe was equipped with a redesigned air bag system which consisted of front left and front right air bag modules which housed air bags and depowered inflator units.

The front left air bag was housed in the steering wheel hub and was concealed by asymmetrical H-configuration cover flaps. The circular air bag was equipped with two tethers and two vent ports. No contact evidence was found on the bag and it was not damaged.

The front right air bag was housed in the top-panel position. The single air bag module cover flap was in the shape of an inverted “D”. The rectangular air bag was equipped with two vent ports and no tethers. The bag was not damaged.

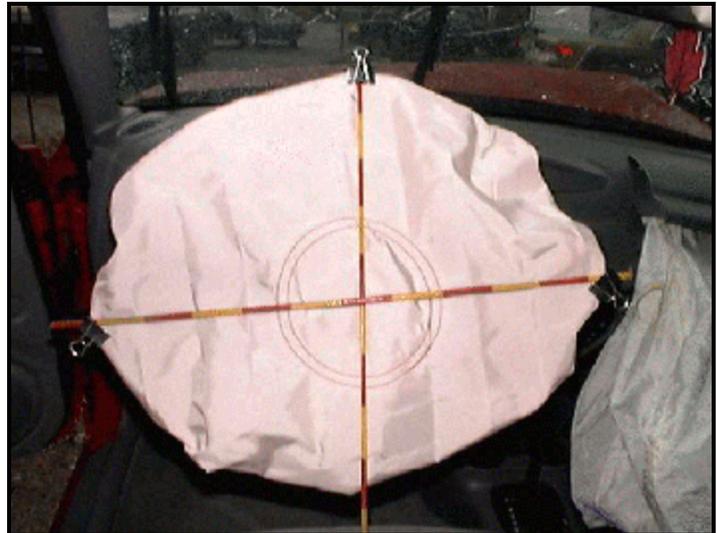


Figure 6. Interior, case vehicle. Driver's side air bag.

Case Vehicle Occupant Demographics

Table 5. Case Vehicle Occupant Demographics

	Occupant 1
Age/Sex:	20/Female
Seated Position:	Front left
Seat Type:	Bucket with folding back
Height (cm/in.):	168 66
Weight (kg/lbs):	64 140
Pre-existing Medical Condition:	None noted
Body Posture:	Unknown - occupant fell asleep
Hand Position:	Unknown
Foot Position:	Unknown
Restraint Usage:	Manual lap & shoulder restraint
Air bag:	Deployed redesigned air bag system

Occupant Injuries

Table 6. Injuries

Injury	Injury Severity (AIS)	Injury Mechanism
Injuries unknown		

Occupant Kinematics

The driver (case occupant) of the Ford Escort was seated in an unknown posture in the front left position of the vehicle. She was not wearing the available manual 3-point lap/shoulder restraint. Seat belt usage was determined by visual inspection by the researcher, the large amount of frontal contact evidence, and observations of the investigating police officer at the scene of the crash. There were no pre-impact avoidance maneuvers since the driver was asleep at the time so the driver should not have significantly prior to the impact. It is not known if the driver was out of position due to falling asleep.

At impact, the case occupant reacted to the 360 degree principle direction of force by moving forward. It appears that the driver's head struck the windshield and her knees struck the left instrument panel. A large spider web crack with embedded hair was found on the windshield (see Figure 7) and scuff marks were found on the instrument panel (see Figures 8 and 9). The driver reported that she was not injured and not treated but it is unclear if that is correct. The police accident report stated that the case occupant was transported to a hospital with non-incapacitating injuries of an unknown nature and severity.



Figure 7. Interior, case vehicle. Head contact.



Figure 8. Interior, case vehicle. Left knee contact.



Figure 9. Interior, case vehicle. Right knee contact.

Scene Diagram

