Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1998-049-810G)

1998 Ford Explorer compact utility vehicle

Texas

November/1998

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16. Abstract

This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Explorer compact utility vehicle. This minor injury crash occurred on November, 1998 in the early morning hours. It was raining at the time and the bituminous roadway was wet. The crash occurred on a three lane divided roadway. The two-way road is comprised of a total of seven travel lanes; three eastbound lanes, three westbound lanes, and one westbound left turn lane. The eastbound lanes are separated for the westbound lanes by a raised concrete median. The speed limit for this road is 56 kmph (35 mph). There are no traffic controls present and the road is straight and level at the area of impact. It was dark at the time of the crash but the road was illuminated by street lights. Vehicle 1, a 1998 Ford Explorer compact utility vehicle (case vehicle) driven by a 29 year old male (183 cm/72 in, 88 kg/195 lbs), was traveling east in the eastbound left travel lane. The driver was restrained by the available manual lap/shoulder restraint. There were no other occupants in the vehicle. As Vehicle 1 was passing through an uncontrolled intersection, the driver lost control and the vehicle drove up onto the concrete median strip. The front plane of Vehicle 1 then struck the concrete base of a street light pole (12FLEE3). A Delta V was calculated, utilizing WinSMASH, as 48 kmph (30 mph). As a result of the frontal impact, the supplemental restraint system (driver and passenger side redesigned air bags) of the case vehicle deployed. After the impact, Vehicle 1 rotated counter-clockwise approximately 25 degrees and came to rest partially up on the median facing northeast. The driver of Vehicle 1 sustained non-incapacitating injuries of an unknown nature and received on-scene treatment from EMS personnel. He was not transported for medical attention and was released at the scene.

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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Explorer compact utility vehicle. This minor injury crash occurred on November, 1998 in the early morning hours. It was raining at the time and the bituminous roadway was wet. The crash occurred on a three lane divided roadway. The two-way road is comprised of a total of seven travel lanes; three eastbound lanes, three westbound lanes, and one westbound left turn lane. The eastbound lanes are separated for the westbound lanes by a raised concrete median. The speed limit for this road is 56 kmph (35 mph). There are no traffic controls present and the road is straight and level at the area of impact. It was dark at the time of the crash but the road was illuminated by street lights.

Vehicle 1, a 1998 Ford Explorer compact utility vehicle (case vehicle) driven by a 29 year old male (183 cm/72 in, 88 kg/195 lbs), was traveling east in the eastbound left travel lane. The driver was restrained by the available manual lap/shoulder restraint. There were no other occupants in the vehicle.

Figure 1. Exterior, Vehicle 1 (Ford Explorer)

Figure 2. Struck light pole

Crash Events

As Vehicle 1 was passing through an uncontrolled intersection, the driver lost control and the vehicle drove up onto the concrete median strip. The front plane of Vehicle 1 then struck the concrete base of a street light pole (12FLEE3). A Delta V was calculated, utilizing WinSMASH, as 48 kmph (30 mph).

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

After the impact, Vehicle 1 rotated counter-clockwise approximately 25 degrees and came to rest partially up on the median facing northeast.

The driver of Vehicle 1 sustained non-incapacitating injuries of an unknown nature and received on-scene treatment from EMS personnel. He was not transported for medical attention and was released at the scene.

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	48	30
Longitudinal	-48	-30
Lateral	0	0
Barrier speed	48	30

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Ford Explorer
VIN	1FMZU32X6WZ
CDC	12FLEE3

Figure 3. Exterior, Vehicle 1 (Ford Explorer SUV)

Figure 4. Exterior, Vehicle 1 (Ford Explorer SUV)

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	109	77	66	44	21	4	0
	42.9	30.3	26	17.3	8.3	1.6	0

Interior of Case Vehicle

The interior of the Ford Explorer sustained moderate damage from intrusion and occupant contact. The was a moderate amount of intrusion of the left toe pan, left side panel, and roof. The steering assembly and rear seats also shifted during the crash. The intruded values are reported in Table 4. There was occupant contact damage to the left instrument panel, left side interior surface, rearview mirror and driver's side air bag.

Table 4. Intrusions

Intruded Component	Location of Intrusion	Intruded Value cm/in.		Dominant Crush Direction
Toe pan	Front left	13	5.1	Longitudinal
Second seat back	Back right	9	3.5	Longitudinal
Steering assembly	Front left	9	3.5	Vertical
Second seat back	Back center	8	3.1	Longitudinal
Roof	Front left	3	1.2	Vertical
Side panel	Front left	3	1.2	Lateral

Case Vehicle Occupant Protection Systems

The Ford Explorer sport utility vehicle 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. Contact evidence consisting of blood was found on the upper right and lower left quadrants of the front of the bag from contact with the driver's face. A small thermal burn was discovered on the back/left of the bag measuring approximately 2.5 cm (1 in). The air bag flaps were not damaged.

The front right air bag was housed in the top-instrument panel position. The single air bag module cover flap was an irregularly shaped rectangular configuration. The rectangular air bag was equipped with two vent ports and no tethers. Neither the air bag nor the cover flap was damaged.

Figure 5. Interior, case vehicle. Driver's side air bag

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

Case Vehicle Occupant Demographics

Table 5. Case Vehicle Occupant Demographics

	Occupant 1	
Age/Sex:	29/Male	
Seated Position:	Front left	
Seat Type:	Bucket, cloth covered	
Height (cm/in:):	183	72
Weight (kg/lbs).:	88	195
Pre-existing Medical Condition:	None noted	
Body Posture:	Unknown	
Hand Position:	Unknown	
Foot Position:	Unknown	
Restraint Usage:	Manual lap & shoulder restraint	
Air bag:	Deployed redesigned air bag system	

Occupant Injuries

Table 6. Case Vehicle Occupant(s) Injuries

Injury	Injury Severity (AIS)	Injury Mechanism
Injured, details unknown	Unknown	Unknown

Occupant Kinematics

The driver (case occupant 01) of the Ford Explorer was seated in an unknown posture in the front left position of the vehicle. He was wearing the manual lap/shoulder restraint. There were no other occupants in the vehicle. Seat belt usage was determined through visual inspection by the researcher and observations of the investigating officer at the scene of the crash. The seat belt webbing showed stretching and blood spots indicative of usage during the crash. There was no evidence at the scene of pre-impact avoidance maneuvers, however the wet road may have obscured locked wheel skid marks. Occupant movement prior to impact is therefore unknown.

At impact, the case occupant reacted to the 360 degree principle direction of force by moving sharply forward and loading the lap/shoulder restraint. As the restraints locked, further frontal movement of the occupant was prevented. The driver had moved far enough forward to impact the left instrument panel with his left knee. The mirror had been pushed out of place and blood appeared on the left side interior surface and seat belt webbing. The driver also engaged the deploying driver's side air bag. Blood was found on the front of the bag from contact with the driver's face. The case occupant was treated at the scene for his injuries and was released without being transported. The nature and severity of his injuries are not known.

Figure 7. Interior, case vehicle. Occupant contact to left instrument panel.

Figure 8. Interior, case vehicle. Occupant contact to left side interior surface.

Scene Diagram

Case 49 810G 4

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Scale 1c : 2.5m