Remote, Redesigned Air Bag Special Study

FOR NHTSA'S INTERNAL USE ONLY

Dynamic Science, Inc., Case Number (1998-048-801A)

1998 Ford F150 4 x 2 pickup

Alabama

August/1998

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient Catalog No.
1998-048-801A		

4. Title and Subtitle	5. Report Date
	6. Performing Organization Report No.

7. Author(s)	8. Performing Organization Report No.
Dynamic Science, Inc.	

9. Performing Organization name and Address	10. Work Unit No. (TRAIS)
Dynamic Science, Inc. 530 College Parkway, Ste. K Annapolis, MD 21401	11. Contract or Grant no. DTNH22-94-D-27058

12. Sponsoring Agency Name and Address	13. Type of report and period Covered [Report Month, Year]
U.S. Dept. of Transportation (NRD-32) National Highway Traffic Safety Administration 400 7th Street, SW Washington, DC 20590	14. Sponsoring Agency Code

15. Supplemental Notes

16. Abstract

This remote investigation focused on the depowered air bag system deployment of a 1998 Ford F-150 4 x 2 pickup. This fatal injury crash occurred in August 1998 at dusk. The weather was clear and the bituminous roadway was dry. This crash occurred in a four-leg intersection. The southbound leg of the intersection is a two-way undivided roadway and is comprised of two travel lanes. It is controlled by a stop sign. The westbound leg of the intersection is a two-way divided roadway and is comprised of two westbound travel lanes and two eastbound travel lanes. The travel lanes are separated by a grass covered median. There was downhill grade at this location. The speed limit is 89 km/h (55 mph) for both roadways. Vehicle 1, a 1995 Oldsmobile Achieva four-door sedan driven by a restrained 40-year-old female, was traveling southbound approaching the intersection at a police reported speed of 35 km/h (22 mph). The rear left seat was occupied by a 1-year-old male who was seated in a child seat. Vehicle 2, a 1998 Ford F150 (case vehicle) pickup truck driven by an unrestrained 30-year-old male (183 cm/72 in., 109 kg/240 lbs.), was traveling westbound approaching the intersection at a police reported speed of 108 km/h (67 mph). Police indicate that the driver of Vehicle 2 was under the influence of both alcohol and drugs. The driver had been engaged in an argument with his wife (who was following the case vehicle in a non-contact vehicle) and had just "taken off". Vehicle 2 did not have its headlights on. The driver of Vehicle 1 failed to stop and entered the intersection in front of Vehicle 2. The front of Vehicle 2 (12FDEW4) struck the left side of Vehicle 1 (89LDAW6). Impact speed for Vehicle 1 was calculated to be 14 km/h (9 mph); the impact speed of Vehicle 2 was calculated to be 127 km/h (79 mph). Vehicle 1 sustained a lateral delta V of 77.3 km/h (48 mph); Vehicle 2 sustained a longitudinal delta V of -55.6 km/(-34.5 mph); the driver side and passenger side air bags both deployed. Vehicle 1 was pushed laterally in a westerly direction through the intersection and onto the median. Vehicle 2 remained in contact with Vehicle 1 until the vehicles came rest. The driver of Vehicle 1 was fatally injured. The rear seat passenger in this vehicle was transported from the scene but later died. The unrestrained driver of Vehicle 2 was transported from the scene and was hospitalized for five days with incapacitating injuries.

17. Key Words	18. Distribution Statement
Redesigned, air bag, injury	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No of pages	22. Price

Remote, Redesigned Air Bag Special Study
FOR NHTSA'S INTERNAL USE ONLY
Dynamic Science, Inc., Case Number (1998-048-801A)
1998 Ford F150 4 x 2 pickup
Texas
August/1998

Summary

This remote investigation focused on the depowered air bag system deployment of a 1998 Ford F-150 4 x 2 pickup. This fatal injury crash occurred in August 1998 at dusk. The weather was clear and the bituminous roadway was dry. This crash occurred in a four-leg intersection. The southbound leg of the intersection is a two-way undivided roadway and is comprised of two travel lanes. It is controlled by a stop sign. The westbound leg of the intersection is a two-way divided roadway and is comprised of two westbound travel lanes and two eastbound travel lanes. The travel lanes are separated by a grass covered median. There was downhill grade at this location. The speed limit is 89 km/h (55 mph) for both roadways.

Vehicle 1, a 1995 Oldsmobile Achieva four-door sedan driven by a restrained 40-year-old female, was traveling southbound approaching the intersection at a police reported speed of 35 km/h (22 mph). The rear left seat was occupied by a 1-year-old male who was seated in a child seat. Vehicle 2, a 1998 Ford F150 (case vehicle) pickup truck driven by an unrestrained 30-year-old male (183 cm/72 in., 109 kg/240 lbs.), was traveling westbound approaching the intersection at a police reported speed of 108 km/h (67 mph). Police indicate that the driver of Vehicle 2 was under the influence of both alcohol and drugs. The driver had been engaged in an argument with his wife (who was following the case vehicle in a non-contact vehicle) and had just "taken off". Vehicle 2 did not have its headlights on. The driver of Vehicle 1 failed to stop and entered the intersection in front of Vehicle 2. The front of Vehicle 2 (12FDEW4) struck the left side of Vehicle 1 (89LDAW6).

Figure 1. Final rest (police photo)

Figure 2. Exterior Vehicle 1 (Achieva) and Vehicle 2 (Ford F150)

Impact speed for Vehicle 1 was calculated to be 14 km/h (9 mph); the impact speed of Vehicle 2 was calculated to be 127 km/h (79 mph)[1]. Vehicle 1 sustained a lateral delta V of 77.3 km/h (48 mph); Vehicle 2 sustained a longitudinal delta V of -55.6 km/(-34.5 mph); the driver side and passenger side air bags both deployed.

Vehicle 1 was pushed laterally in a westerly direction through the intersection and onto the median. Vehicle 2 remained in contact with Vehicle 1 until the vehicles came rest.

The driver of Vehicle 1 was fatally injured. The rear seat passenger in this vehicle was transported from the scene but later died.

The unrestrained driver of Vehicle 2 was transported from the scene and was hospitalized for five days with incapacitating injuries.

Both vehicles sustained substantial damage and were towed from the scene due to damage.

Table 1. Delta V

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	55.8	34.7	77.6	48.2
Longitudinal	-55.6	-34.5	6.8	4.2
Lateral	-4.9	-3	77.3	48

[1]Calculated using WinSmash with the trajectory option

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Ford F150 4 x 2 pickup
VIN	1FTZF1720WNxxxxxx
CDC	12FDEW4

Figure 3. Exterior, Vehicle 2 (1998 Ford F-series pickup)

Figure 4. Exterior, Vehicle 2 (1998 Ford F-series pickup)

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	178	71	57	52	37	35	63
	70.1	28	22.4	20.5	14.6	13.8	24.8

Interior of Case Vehicle

The interior of the Ford F150 sustained minor damage from intrusion and occupant contact. There was a minimal amount of intrusion of toe pan on both sides of the vehicle. The intruded values are reported in Table 4. There was occupant contact damage to the windshield, left lower instrument panel, and the lower rim of the steering wheel.

Table 4. Intrusions

Intruded Component	Location of Intrusion	Intruded Value cm/in.		Dominant Crush Direction
Toe pan	Left front	7	2.8	Longitudinal (rearward)
Toe pan	Right front	3	1.2	Longitudinal (rearward)

This vehicle was equipped with split bench seat with folding backs. The seat had been adjusted to the rear most track position. It was equipped with integral head restraints–which were not damaged.

Case Vehicle Occupant Protection Systems

The Ford F150 pickup truck was equipped with a redesigned air bag system which consisted of a crash sensor control module, air bag lamp, and front left and front right air bag modules which housed air bags and depowered inflator units, and a front right air bag shut off switch.

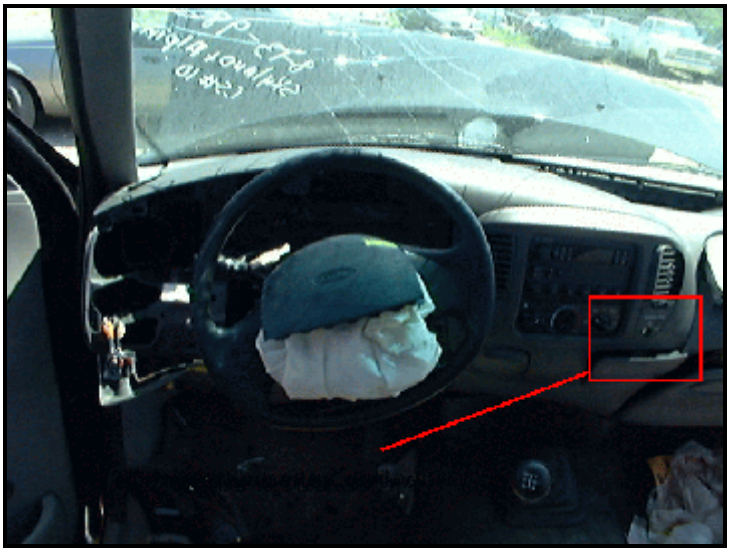

Figure 5. Interior, case vehicle. Box indicates location of air bag shut off switch.

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 holes. Blood was found on both the air bag and the module cover.

The front right air bag was located in the mid-instrument panel position. The module flap is in the shape of a bisected, inverted "D". The air bag was not equipped with either tethers or vent holes. There were no indications of damage or contact to either the air bag or the module cover.

Case Vehicle Occupant Demographics

Table 5. Case Vehicle Occupant(s) Demographics

	Occupant 1	
Age/Sex:	30/Male	
Seated Position:	Left front	
Seat Type:	Split bench - cloth covered	
Height (cm/in:):	183	72.1
Weight (kg/lbs).:	109	240
Pre-existing Medical Condition:	Allergic for penicillin, hypertension, using Wellbutrin[2], depression	
Body Posture:	Unknown	
Hand Position:	Unknown	
Foot Position:	Right presumed to be on accelerator	
Restraint Usage:	None used	

Occupant Injuries

Table 6. Injuries

Injury	Injury Severity (AIS)	Injury Mechanism
Concussion	2	Windshield
Bilateral knee abrasions	1	Lower instrument panel
Chest contusion	1	Air bag
Left side rib fracture (9)	1	Lower steering wheel rim

[2]Wellbutrin is the brand name for the generic drug buproprion. Used to treat depression.

Occupant Kinematics

Figure 6. Interior, case vehicle. Box shows head contact.

The driver of the Ford pickup was in a presumed upright posture in the left front position of the vehicle. He was not wearing the manual 3-point lap and should belt system. The lack of belt usage was determined from contact evidence within the vehicle and observations of the investigating officer at the scene of the crash. The taken medication for depression and was driving under the influence of alcohol. Prior to impact, the driver appears to have steered slight to the left but there was no indication of pre-impact braking.

At impact, the unrestrained driver initiated a forward trajectory in response to the frontal impact force. He went forward and engaged the deploying air bag. The driver wrapped around the steering wheel; this motion allowed the driver's upper body to go forward causing his head to come into contact with the windshield–causing the head injury, and allowed the driver's lower left side to come into contact with the lower steering wheel rim–causing the rib fracture and deforming the steering wheel. The driver continued forward and engaged the lower instrument with both knees–causing abrasions to both knees and causing damage to the panel.

Scene Diagram