Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1998-048-149C)

1998 Ford F-150

Alabama

December/1998

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16. Abstract

This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford F-150 large pickup truck. This moderate injury crash occurred in December, 1998 in the morning. The weather was clear and the bituminous roadway was dry. The crash occurred on a two-way, undivided roadway. The road contains two travel lanes; one northbound lane, and one southbound lane. The speed limit for this road is 72 kmph (45 mph). There are no traffic controls at the area of impact. There is a >2% southbound downhill grade at this location. Vehicle 1, a 1985 Chevrolet Astro minivan driven by a 35 year old male (unknown ht/wt), was traveling northeast on a private dirt driveway approaching the roadway at a police estimated speed of 24 kmph (15 mph). The driver was preparing to enter the northbound travel lane of the north/south roadway. It is unknown if the driver was restrained. There were no other occupants in Vehicle 1. Vehicle 2, a 1998 Ford F-150 large pickup truck (case vehicle) driven by a 30 year old male (178 cm/70 in , 84 kg/185 lbs), was traveling south in the southbound travel lane approaching the dirt driveway at a police estimated speed of 97 kmph (60 mph). The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 34 year old male (178 cm/70 in, 73 kg/160 lbs) who was unrestrained. The driver of Vehicle 1 did not see Vehicle 2 approaching and entered the southbound travel lane in the path of Vehicle 2 and was struck. The front plane of Vehicle 2 (12FDEW2) struck the front plane of Vehicle 1 (12FDEW6) in the southbound travel lane. The impact pushed vehicle 1 northward approximately 20 meters (66 feet). Vehicle 1 came to rest off the west edge of the road facing northeast. Vehicle 2 came to rest in the southbound travel lane next to Vehicle 1 facing south. Due to insufficient data, no Delta V was computed for either vehicle. The Delta V for Vehicle 2 was estimated to be >40 kmph (>25 mph). As a result of the frontal impact, the supplemental restraint system (driver's frontal air bag) of the case vehicle deployed. The passenger's frontal air bag switch was turned to the "off" position at the time of the crash and the air bag did not deploy. The driver of Vehicle 1 sustained incapacitating injuries and was transported from the scene by land to a hospital where his course of treatment is not known. The driver of Vehicle 2 sustained non-incapacitating injuries and was transported from the scene by land to a hospital where he was treated and released. The passenger of Vehicle 2 sustained incapacitating injuries and was transported from the scene by land to a hospital where he was treated, and then was transferred to a trauma center where he was hospitalized for one day. Both vehicles were disabled due to damage sustained in the crash, however Vehicle 1 was not towed. Vehicle 2 was towed from the scene.

17. Key Words	18. Distribution Statement
Redesigned air bag, moderate injuries, unrestrained front right occupant, AB switch off	

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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford F-150 large pickup truck. This moderate injury crash occurred in December, 1998 in the morning. The weather was clear and the bituminous roadway was dry. The crash occurred on a two-way, undivided roadway. The road contains two travel lanes; one northbound lane, and one southbound lane. The speed limit for this road is 72 kmph (45 mph). There are no traffic controls at the area of impact. There is a >2% southbound downhill grade at this location.

Figure 1. Exterior, Vehicle 1 (Chevrolet Astro)

Vehicle 1, a 1985 Chevrolet Astro minivan driven by a 35 year old male (unknown ht/wt), was traveling northeast on a private dirt driveway approaching the roadway at a police estimated speed of 24 kmph (15 mph). The driver was preparing to enter the northbound travel lane of the north/south roadway. It is unknown if the driver was restrained. There were no other occupants in Vehicle 1.

Vehicle 2, a 1998 Ford F-150 large pickup truck (case vehicle) driven by a 30 year old male (178 cm/70 in , 84 kg/185 lbs), was traveling south in the southbound travel lane approaching the dirt driveway at a police estimated speed of 97 kmph (60 mph). The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 34 year old male (178 cm/70 in, 73 kg/160 lbs) who was unrestrained.

Figure 2. Exterior, Vehicle 2 (Ford F-150)

Crash Events

The driver of Vehicle 1 did not see Vehicle 2 approaching and entered the southbound travel lane in the path of Vehicle 2 and was struck. The front plane of Vehicle 2 (12FDEW2) struck the front plane of Vehicle 1 (12FDEW6) in the southbound travel lane. The impact pushed vehicle 1 northward approximately 20 meters (66 feet). Vehicle 1 came to rest off the west edge of the road facing northeast. Vehicle 2 came to rest in the southbound travel lane next to Vehicle 1 facing south.

Due to insufficient data, no Delta V was computed for either vehicle. The Delta V for Vehicle 2 was estimated to be >40 kmph (>25 mph).

Figure 3. Crash scene. Vehicle 2 approach path.

As a result of the frontal impact, the supplemental restraint system (driver's frontal air bag) of the case vehicle deployed. The passenger's frontal air bag switch was turned to the "off" position at the time of the crash and the air bag did not deploy.

The driver of Vehicle 1 sustained incapacitating injuries and was transported from the scene by land to a hospital where his course of treatment is not known. The driver of Vehicle 2 sustained non-incapacitating injuries and was transported from the scene by land to a hospital where he was treated and released. The passenger of Vehicle 2 sustained incapacitating injuries and was transported from the scene by land to a hospital where he was treated, and then was transferred to a trauma center where he was hospitalized for one day.

Both vehicles were disabled due to damage sustained in the crash, however Vehicle 1 was not towed. Vehicle 2 was towed from the scene.

Table 1. Delta V

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	Unknown		Unknown	
Longitudinal	Unknown		Unknown	
Lateral	Unknown		Unknown	

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Ford F-150
VIN	1FTZX18W8WN
CDC	12FDEW2

Figure 4. Exterior, Vehicle 2 (1998 Ford F-150)

Figure 5. Exterior, Vehicle 2 (1998 Ford F-150)

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	164	42	44	46	43	41	45
	64.6	16.5	17.3	18.1	16.9	16.1	17.7

Interior of Case Vehicle

The interior of the Ford F-150 sustained minor damage from occupant contact. There were no areas of intrusion into the passenger compartment. There was occupant contact evidence to the instrument panel, windshield, mirror, sun visor, glove compartment door, seat belt webbing, and seat backs.

The case vehicle was equipped with split bench seats with separate backs and integral head restraints in the front left and front right seating positions. Both front seats were adjusted to the rear most track positions. Neither the seats nor the head restraints were damaged. The rear of the vehicle was equipped with bench seats with folding backs and no head restraints.

Case Vehicle Occupant Protection Systems

The Ford F-150 large pickup truck 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, and a front right 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 which were not damaged. The circular air bag was equipped with two tether straps and two vent ports. No contact evidence was found on the air bag and the bag was not damaged.

The front right air bag was housed in the mid-instrument panel position. The single air bag module cover flap was a rectangular configuration. The air bag was shut off at the time of the crash and did not deploy.

The front right air bag shut off switch was located on the center-instrument panel. The switch is key activated and was turned to the "off" position (see Figure 7). The switch is marked "Passenger Airbag" and the "Off" lamp was illuminated at the time of the crash.

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

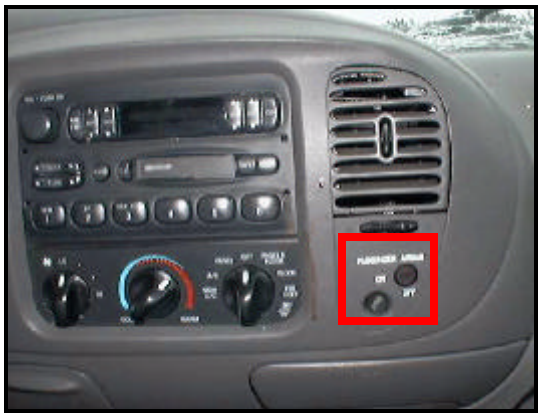


Figure 7. Interior, case vehicle. Box indicates location of passenger's air bag shut off switch.

Case Vehicle Occupant Demographics

Table 4. Case Vehicle Occupant(s) Demographics

	Occupant 1	Occupant 2
Age/Sex:	30/Male	34/Male
Seated Position:	Front left	Front right
Seat Type:	Split bench with separate backs - cloth covered	Split bench with separate backs - cloth covered
Height (cm/in:):	178 70	178 70
Weight (kg/lbs).:	84 185	73 160
Pre-existing Medical Condition:	None noted	None noted
Body Posture:	Bracing on surface in front of occupant	Bracing on surface in front of occupant
Hand Position:	Both hands bracing on steering wheel at the 9 & 3 o'clock positions	Both hands bracing on right instrument panel
Foot Position:	On floor or foot controls	On floor
Restraint Usage:	Manual lap & shoulder restraint	None used
Air bag:	Deployed redesigned air bag system	Non-deployed redesigned air bag system - air bag shut off at time

Occupant Injuries

Table 5. Injuries

Occupant #	Injury	Injury Severity (AIS)	Injury Mechanism
1	Chest contusion	1	Shoulder belt webbing
1	Right hand contusion	1	Left instrument panel
1	Left shoulder contusion	1	Shoulder belt webbing
1	Left knee contusion	1	Knee bolster
1	Left ankle sprain	1	Foot controls
1	Right wrist sprain	1	Steering wheel rim
2	Amnesia	2	Windshield
2	Facial abrasion	1	Windshield
2	Minor facial abrasion	1	Windshield
2	Facial avulsion	1	Windshield
2	Right eye lid laceration	1	Windshield
2	Right eye lid avulsion	1	Windshield
2	Bilateral knee abrasions	1	Right instrument panel
2	Right closed radius head fracture	2	Right instrument panel

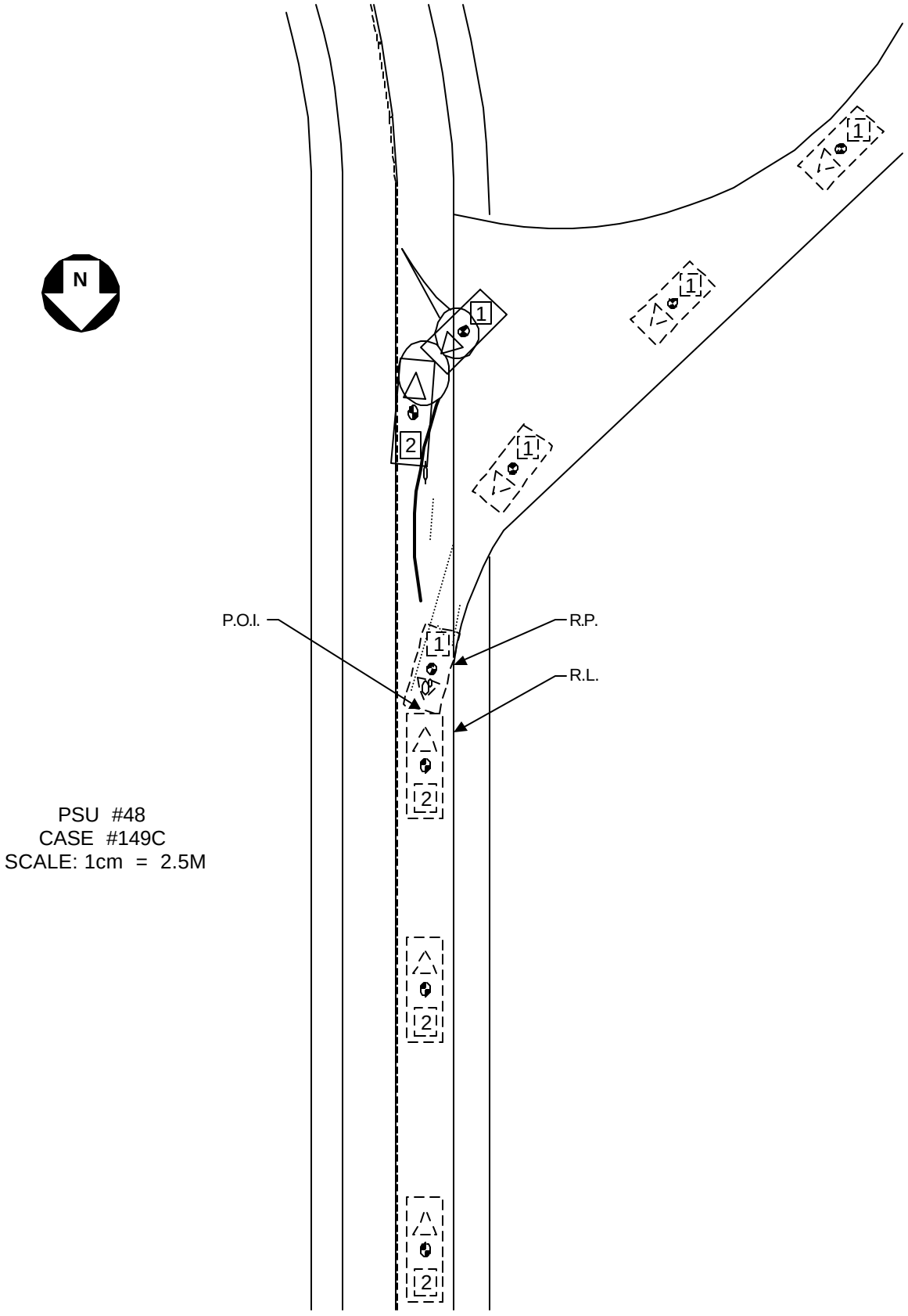
Occupant Kinematics

The driver of the 1998 Ford F-150 large pickup truck was seated in a normal upright posture in the front left position of the vehicle. He was bracing for the impact with both hands on the steering wheel. He was wearing the manual lap/shoulder restraint. The front right passenger was seated in a normal upright posture but was bracing for the impact with both hands on the right instrument panel. He was not wearing the available manual lap/shoulder restraint. Seat belt usage was determined through visual inspection by the researcher, and observations by the investigating police officer at the scene of the crash. A large amount of frontal contact evidence was observed in front of the front right seat but was not observed in front of the front left seat. The driver applied the brakes (no lockup) in an attempt to avoid the collision so the occupants had shifted somewhat closer to the front of the vehicle prior to impact.

At impact, the occupants reacted to the 10 degree principle direction of force by moving forward and slightly to the right. As the restraints locked, further forward movement of the driver was prevented. Loading of the lap/shoulder restraint caused the shoulder and chest contusions. His left knee struck the instrument panel-causing the knee contusion. The driver's right hand struck the instrument panel-causing the hand contusion. The driver also sprained his left ankle (foot controls) and right wrist (steering wheel rim) during the impact. The front right passenger, due to being unrestrained, moved sharply forward and struck the windshield-causing the multiple facial abrasions, lacerations, and avulsions. He also reportedly suffered from amnesia due to his head striking the windshield. The passenger also came into heavy contact with the right instrument panel-causing the bilateral knee abrasions and right closed radius head fracture. Both occupants of the case vehicle were transported from the scene to a hospital where the driver was treated and released and the passenger was hospitalized for one day.

Figure 8. Interior, case vehicle. Windshield contact.

Scene Diagram



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SCALE: 1cm = 2.5M