Remote Passenger Air Bag Related Child Fatality Investigation/ Vehicle to Object
Dynamic Science, Inc. / Case Number: DS06008
1997 Ford F150 SuperCab Pickup
Washington
March 2002

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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.

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16. Abstract

This remote investigation focused on the front right passenger air bag system in a 1997 Ford F150 SuperCab pickup truck. This single vehicle crash occurred in March 2002 at 1030 hours in a sparsely populated, mountainous area of Washington. The case vehicle was a 1997 Ford F-series pickup truck driven by a restrained driver of an unknown sex and age. There were three additional occupants in the vehicle, including a 4-year-old male passenger in the front center seat. The Ford F150 was traveling east in lane one on a three lane, two-way highway with no traffic controls. The roads were icy and it was snowing. For unknown reasons, the driver lost control of the pickup, and the vehicle traveled across lanes two and three, departed the north side of the roadway; and the front of the Ford F150 impacted a snowbank. At impact, the Ford's dual front air bags deployed. The Ford F150 came to final rest facing northeast near the point of impact. The 4-year-old male passenger sustained fatal injuries and was declared dead at the scene. His injuries included: a basilar skull fracture, a subarachnoid hemorrhage, a spinal contusion, multiple facial contusions and abrasions, neck abrasions, and upper extremity contusions. It is not known if any of the other occupants were injured or if they received medical treatment. The case vehicle was towed from the scene.

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BACKGROUND:

Description

This remote investigation focused on an alleged air bag fatality in a 1997 Ford F150 SuperCab pickup truck. This single vehicle crash occurred in March 2002 at 1030 hours in a sparsely populated, mountainous area of Washington. The case vehicle was a 1997 Ford F-series pickup truck being driven by a restrained driver of an unknown sex and age. There were three additional occupants in the vehicle, including a 4-year-old male passenger in the front center seat. The Ford F150 was traveling east in lane one on a three lane, two-way highway with no traffic controls. The roads were icy and it was snowing. For unknown reasons, the driver lost control of the pickup, and the vehicle traveled across lanes two and three, departed the north side of the roadway and the front of the Ford F150 impacted a snowbank. At impact, the Ford's dual front air bags deployed. The Ford F150 came to final rest facing northeast near the point of impact.

Figure 1. Front/Left - 1997 Ford F150 SuperCab

The 4-year-old male passenger sustained fatal injuries and was declared dead at the scene. His injuries included: a basilar skull fracture, a subarachnoid hemorrhage, a spinal contusion, multiple facial contusions and abrasions, neck abrasions, and upper extremity contusions. It is not known if any of the other occupants were injured or if they received medical treatment. The vehicle was towed from the scene.

This crash was identified by NHTSA during a review of cases investigated under a different NHTSA program. DSI was assigned the case on March 30, 2006 with instructions to conduct the investigation remotely if the subject vehicle was no longer available. The subject vehicle could not be located and this investigation was conducted remotely using information from the previous investigation.

SUMMARY

Crash Site

This single vehicle crash occurred on a three lane highway in a sparsely populated, mountainous area. The crash occurred during daylight hours. It was snowing and the asphalt roadway was icy. The east/west roadway was configured with two eastbound lanes and one westbound lane divided by double yellow, no passing lane lines. The two eastbound lanes are separated by a dashed white line. Adjacent to both of the outer travel lanes, there were asphalt shoulders that

were partially obscured by large snowbanks. In the area just prior to the point of impact, the roadway was straight and had an uphill grade greater than 2%. The posted speed limit was 97 km/h (60 mph).

Pre-Crash

Figure 2. Approach of case vehicle (east)

The 1997 Ford F150 SuperCab was being driven by a restrained driver of an unknown sex and age. There were three other passengers in the vehicle. The front center seat was occupied by a restrained 4-year-old male (109 cm/43 in, 23 kg/51 lbs), the front right seat was occupied by a restrained occupant of an unknown sex and age and the second row left seat was occupied by a restrained occupant of an unknown sex and age. The Ford F150 was traveling east in lane one of the three lane, two-way highway, and had no traffic controls. There was no cargo in the bed of the pickup truck and the left rear tire was found to be significantly under-inflated at the time of the vehicle inspection. It is not known whether or not either of these conditions contributed to the driver's loss of control. The roadway was icy and it was snowing.

Crash

For unknown reasons, the driver of the Ford F150 lost control of the vehicle, and the vehicle traveled in a northeasterly direction across the other travel lanes. The front of the case vehicle (01FDEW1) struck a snowbank adjacent to the north shoulder. The impact severity was moderate, and resulted in the deployment of both of the pickup's front air bags. The barrier equivalent routine of the WinSmash program computed a Barrier Equivalent Speed of 16.0 km/h (9.9 mph).

Post-Crash

The 4-year-old male passenger seated in the front center seat was fatally injured in the crash and was declared dead at the scene. He sustained a basilar skull fracture, a subarachnoid hemorrhage, a spinal contusion, multiple facial contusions and abrasions, neck abrasions, and upper extremity contusions. It is not known if any of the other occupants were injured or if they received medical treatment.

The Ford F150 was towed from the scene.

Vehicle Data - 1997 Ford F150 SuperCab

The 1997 Ford F150 SuperCab pickup was identified by the Vehicle Identification Number (VIN): 2FTDX18W5VCxxxxxx. The Ford F150 is a three-door, four wheel drive, large pickup with an extended cab and seating for six. It was equipped with a 4.6 liter 8 cylinder engine, 4 speed automatic transmission, anti-lock front and rear disc brakes, and a tilt steering wheel. The vehicle odometer reading was 92,055 km (57,200 miles) at the time of the inspection.

The Ford F150 was equipped with front row driver and passenger air bags.

The 1997 Ford F-Series pickup was equipped with Goodyear Wrangler AT/S LT305/70R16 tires. The auto manufacturer's recommended tire size for the front and rear was LT245/75R16. The left rear tire was significantly under-inflated at the time of the inspection. The specific tire information is as follows:

Position	Measured Pressure	Vehicle Manufacturer Recommended Pressure	Restricted	Damage
LF	279 kPa (40 psi)	276 kPa (40 psi)	No	None
LR	97 kPa (14 psi)	276 kPa (40 psi)	No	None
RR	303 kPa (44 psi)	276 kPa (40 psi)	No	None
RF	293 kPa (42 psi)	276 kPa (40 psi)	No	None

The front row seating in the 1997 Ford F150 was configured as a fabric covered split bench with separate back cushions. The front center seat back can also be folded forward in order to be used as a center armrest. The outboard seats were equipped with integral head restraints that were not damaged. The second row was configured as a fabric covered bench seat. The second row outboard seating positions were equipped with adjustable head restraints that were not damaged. The front and second row center seating positions were not equipped with head restraints.

Figure 3. Left rear tire under-inflated at inspection

VEHICLE DAMAGE

Exterior Damage - 1997 Ford F150 SuperCab

Damage Description:	The 1997 Ford F150 sustained light front end damage as a result of the impact with the snowbank. The case vehicle sustained 130.0 cm (51.2 in) of direct damage along the front bumper, beginning 50.0 cm (19.7 in) right of center and extending to the left front bumper corner. There was no integrity loss and the three doors remained closed and operational. Six crush measurements were documented along the front bumper as follows: C1=10.0 cm (3.9 in), C2=11.0 cm (4.3 in), C3=9.0 cm (3.5 in), C4=5.0 cm (2.0 in), C5=5.0 cm (2.0 in), C6=2.0 cm (0.8 in).	
CDC:	Impact 1: 01FDEW1	
Delta V:	Total	Unknown
	Longitudinal	Unknown
	Latitudinal	Unknown
	Barrier Equivalent Speed	16.0 km/h (9.9 mph)
	Energy	Unknown

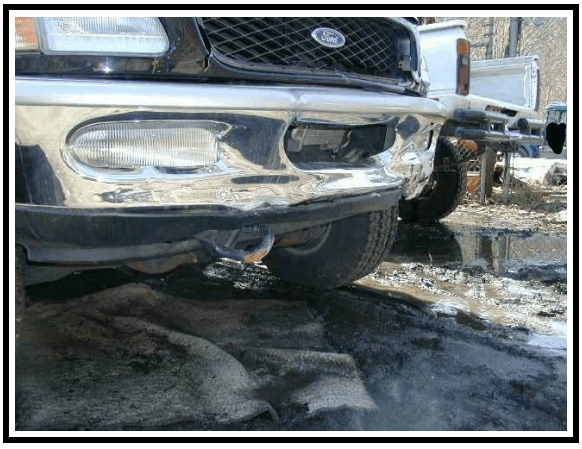

Figure 4. Closer view of damage to right front bumper

Figure 5. Closer view of damage to left front bumper

Interior Damage - 1997 Ford F150 SuperCab

The 1997 Ford F150 sustained moderate interior damage due to occupant contacts and normal air bag deployment related damage.

Figure 6. Damage/Occupant contacts to the instrument panel

There was a scuff to the driver's knee bolster due to occupant contact. The center section of the instrument panel was deformed and the rearview mirror was broken off its base. A cup holder mounted in the center of the instrument panel appeared to have been moved and the cup in the holder was deformed, but this may have occurred post-impact. The right A pillar and glove compartment door were scuffed and the right instrument panel was cracked, most likely due to occupant contact. The back of the driver's integral head restraint was deformed due to contact from the second row left seat passenger. There was blood found on the driver and passenger air bags, the front row center lap belt, the left and center front row seat backs and seat cushions, as well as the left sill area. There was no intrusion and no integrity loss. The three side doors remained closed and operational. The windshield was in place, but was cracked on the right side due to occupant contact. There was no other glazing damage**.**

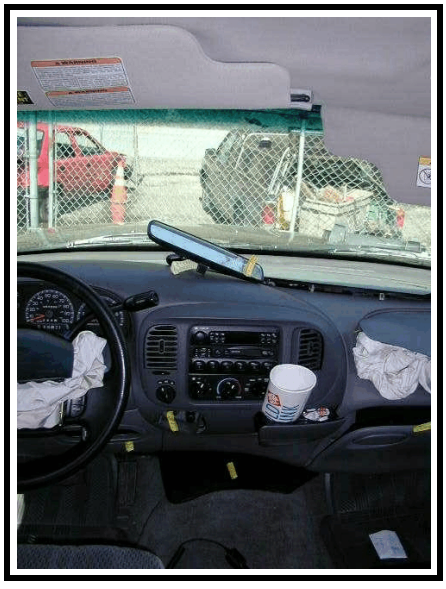

Figure 7. Damage/Occupant contacts - center instrument panel

Figure 8. Blood in driver's area - from fatally injured front center occupant

Manual Restraint Systems - 1997 Ford F150 SuperCab

The 1997 Ford F150 was configured with manual 3-point lap and shoulder belts with sliding latchplates for the first and second row outboard seating positions. The center seating positions in both rows were equipped with manual lap belts and locking latchplates. The left front seat belt was equipped with a seat belt height adjuster that was in the full down position. The right front passenger's seat belt and the two second row lap and shoulder belts were not equipped with anchorage adjustments. The driver's seat belt was equipped with an Emergency Locking Retractor (ELR). The front right and second row outboard seat belts had switchable ELR/Automatic Locking Retractors that were in the ELR mode. The two center seat lap belts were not equipped with retractors.

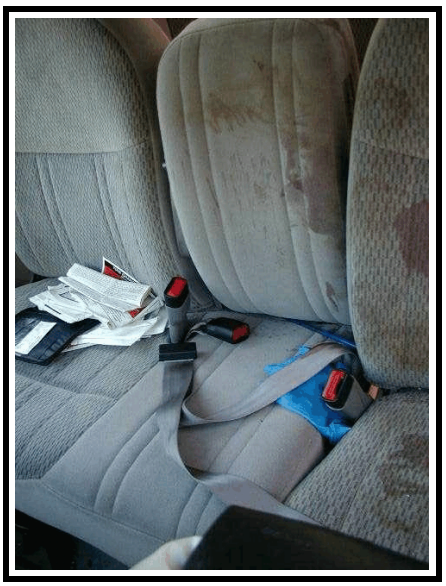

Figure 9. Front center lap belt

Supplemental Restraint System - 1997 Ford F150 SuperCab

The case vehicle was equipped with driver and front right passenger air bags. The air bags were not redesigned. The passenger air bag is equipped with an On/Off switch that was in the "On" position at the time of the crash. Both front air bags deployed as a result of the longitudinal deceleration of the case vehicle during the impact with the snowbank.

Figure 10. Driver air bag

The driver's air bag was mounted in the center of the steering wheel hub. The driver's tilt steering wheel was set between the center and full down tilt positions. The air bag module had an H configuration. The top flap measured 20.0 cm (7.9 in) wide by 20.0 cm (7.9 in) high. The bottom flap measured 19.0 cm (7.5 in) wide by 8.0 cm (3.1 in) high. The air bag was circular in shape and in its deflated state, measured 58.0 cm (22.8 in) in diameter. There were black cover flap deployment streaks located in the center left section and the upper right quadrant. There was blood in the center section and on the left side of the air bag face. On the back of the air bag, there were black deployment streaks at the 8 o'clock and 11 o'clock locations. There were bloodstains at the 1 to 2 o'clock positions. The air bag had two internal tethers and no vent ports. There was no damage to the air bag module cover flaps.

The front right passenger air bag was a mid instrument panel mount. The module had a single forward opening cover flap that was rectangular in shape and measured 39.0 cm (15.4 in) wide by 17.0 cm (6.7 in) high. The air bag measured 75.0 cm (29.5 in) seam to seam laterally and was

60.0 cm (23.6 in) high. There were black streaks located on the top center portion of both the front and back of the air bag. There was a dot of blood on the back left section of the bag, at the 9 o'clock location. There was one vertical tether located in the left half of the air bag. There were no vent ports. There was no damage to the module cover flap.

Figure 11. Front passenger air bag

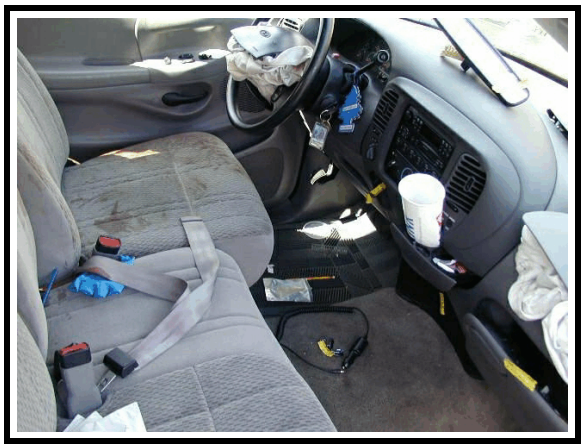

Figure 12. Seat track positions in relation to air bag modules

Figure 13. View of front center seat in relation to the deployed driver and passenger air bags

Occupant Demographics - 1997 Ford F150 SuperCab

	Driver	Occupant 2	Occupant 3	Occupant 4
Age/Sex:	Unknown age/sex	4/Male	Unknown age/sex	Unknown age/sex
Seated Position:	Front left	Front center	Front right	Second row left
Seat Type:	Split bench with separate back cushions. Seat track at middle track position.	Split bench with separate back cushions. Seat track at rearmost track position.	Split bench with separate back cushions. Seat track at rearmost track position.	Bench seat. Seat track not adjustable.
Height:	Unknown	109 cm (43 in)	Unknown	Unknown
Weight:	Unknown	23 kg (51 lbs)	Unknown	Unknown
Occupation:	Unknown	Not Applicable	Not Applicable	Not Applicable
Pre-existing Medical Condition:	Unknown	Not Applicable	Not Applicable	Not Applicable
Alcohol/Drug Involvement:	None noted	Not Applicable	Not Applicable	Not Applicable
Driving Experience:	Unknown	Not Applicable	Not Applicable	Not Applicable
Body Posture:	Unknown	Unknown	Unknown	Unknown
Hand Position:	Unknown	Unknown	Unknown	Unknown
Foot Position:	Unknown	Unknown	Unknown	Unknown
Restraint Usage:	Lap and shoulder belt available, used	Lap belt available, used	Lap and shoulder belt available, used	Lap and shoulder belt available, used
Air bag:	Steering wheel mounted front air bag - deployed.	Driver's steering wheel mounted front air bag - deployed. Mid instrument panel mounted front passenger air bag - deployed.	Mid instrument panel mounted front air bag - deployed.	None

Occupant Injuries - 1997 Ford F150 SuperCab

Driver: Unknown if injured.

Front center occupant (Occupant 2): Injuries obtained from autopsy report.

Injury	OIC CODE	Injury Mechanism	Confidence Level
Basilar skull fracture, complex	150206.4,8	Passenger air bag	Probable
Cerebrum subarachnoid hemorrhage, left	140684.3,2	Passenger air bag	Probable
Cerebrum subarachnoid hemorrhage, right	140684.3,1	Passenger air bag	Probable
Cerebellum subarachnoid hemorrhage	140466.3,6	Passenger air bag	Probable
Cervical spine cord contusion with transient neurological signs with fracture	640204.3,6	Passenger air bag	Probable
Cerebrum contusion, single, small	140606.3,9	Passenger air bag	Probable
Scalp contusion/subgaleal hematoma	190402.1,2	Passenger air bag	Probable
Facial abrasion, right	290202.1,1	Passenger air bag	Probable
Eyelid contusion, right	297402.1,1	Passenger air bag	Probable
Facial contusion, right	290402.1,1	Passenger air bag	Probable
Facial abrasion, right	290202.1,1	Passenger air bag	Probable
Facial abrasion, right	290202.1,1	Passenger air bag	Probable
Facial laceration, inferior	290602.1,8	Passenger air bag	Probable
Facial contusion, inferior	290402.1,8	Passenger air bag	Probable
Facial abrasion, inferior	290202.1,8	Passenger air bag	Probable
Neck abrasion, right	390202.1,1	Passenger air bag	Probable
Neck abrasion, left	390202.1,2	Passenger air bag	Probable
Acromioclavicular joint contusion, left	750210.1,2	Passenger air bag	Probable
Acromioclavicular joint contusion, right	750210.1,1	Passenger air bag	Probable
Shoulder contusion, right	751010.1,1	Passenger air bag	Probable
Upper extremity abrasion, right	790202.1,1	Passenger air bag	Probable

Upper extremity abrasion, left	790202.1,2	Passenger air bag	Probable

Front right occupant (Occupant 3): Unknown if injured.

Second row left occupant (Occupant 4): Unknown if injured

Occupant Kinematics - 1997 Ford F150 SuperCab

Driver Kinematics

The driver of the case vehicle was seated on the fabric covered split bench seat with separate back cushions and was restrained by the 3-point manual lap and shoulder belt. The shoulder belt anchorage was in the full down position, the seat back was slightly reclined, and the seat track was adjusted to the middle track position. The case vehicle was traveling on an icy roadway with snowy weather conditions. For unknown reasons, the driver lost control of the Ford F150 and the case vehicle began moving to its left, traveled onto the shoulder of the highway, and impacted a snowbank with its front end. At impact, the driver's front air bag deployed. The driver initiated a forward trajectory towards the 1 o'clock direction of force and likely loaded the safety belt and engaged the deployed front air bag with his/her face. The driver's right knee likely contacted the left knee bolster, leaving a scuff. The Ford F150 came to final rest facing northeast near the point of impact. It is not known if the driver was injured or if he/she received any medical treatment. The bloodstains found on the driver's air bag, left front seat back and seat cushion and left sill area likely occurred post-impact and were from the front center occupant who was fatally injured in the collision.

Figure 14. Possible driver contact to knee bolster

Figure 15. Possible occupant contacts - center instrument panel and below

Front Center Occupant Kinematics

The 4-year-old male passenger in the front row center seat was seated forward facing on the fabric covered split bench seat with separate back cushions and was restrained by the manual lap belt. The seat track was set to the rearmost track position and the seat back was found upright at

the time of the vehicle inspection. This seat back can also be folded forward in order to be used as a center armrest.

At impact, the driver and front right passenger air bags deployed. The passenger air bag is equipped with an On/Off switch that was in the "On" position at the time of the crash. This passenger initiated a forward trajectory towards the 1 o'clock direction of force and likely loaded the safety belt and engaged the deployed passenger air bag with his face and head, resulting in severe head injuries. Based on the abrasive injuries to this passenger's face and neck, it would appear that the air bag fully engaged his face and forced his head rearward. This hyperextending motion likely caused the spinal contusion . His feet and/or lower legs appear to have contacted the plastic cover located below the center instrument panel, deforming it.

The 4-year-old was fatally injured in the crash and declared dead at the scene. He sustained a basilar skull fracture, a subarachnoid hemorrhage, a spinal contusion, multiple facial contusions and abrasions, neck abrasions, and upper extremity contusions. The bloodstains found on the center lap belt, left and center seat backs and seat cushions, driver's air bag and left sill area likely occurred post-impact and were a result of this occupant's injuries.

Front Right Occupant Kinematics

The front right passenger was seated forward facing on the fabric covered split bench seat with separate back cushions and was restrained by the 3-point manual lap and shoulder belt. The seat track was set to the rearmost track position and the seat back was upright at the time of the vehicle inspection.

Figure 16. Possible occupant contacts to windshield and right A pillar

This passenger initiated a forward trajectory toward the 12 o'clock direction of force and likely loaded the safety belt and engaged the deployed passenger air bag with his/her face. This occupant's knees appear to have contacted the glove compartment door, leaving scuffs. This occupant's right hand and wrist appear to have been pushed upward due to the deploying passenger air bag, cracking the windshield and scuffing the right A pillar. This passenger's lower right arm appears to have contacted the right instrument panel, cracking it. It is not known if this occupant was injured or if he/she received any medical treatment.

Second Row Left Occupant Kinematics

The second row left seat passenger was forward facing on the fabric covered bench seat and was restrained by the 3-point manual lap and shoulder belt. The seat track and seat back were not adjustable.

At impact, this passenger initiated a forward trajectory towards the 1 o'clock direction of force and likely loaded the safety belt. This occupant's head appears to have contacted the back of the driver's integral head restraint, deforming it slightly. The Ford F150 came to final rest facing northeast near the point of impact. It is not known if this occupant was injured or if he/she received any medical treatment.

Attachment 1. Scene Diagram