TRANSPORTATION RESEARCH CENTER

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REMOTE AIR BAG GAS FIRE REPORT

CASE NUMBER - 97-013
VEHICLE - 1995 DODGE RAM 1500 PICKUP
LOCATION - MISSOURI
CRASH DATE - December, 1996

Submitted:

September 8, 1998

Contract Number: DTNH22-94-D-17058

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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.

Technical Report Documentation Page

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15. *Supplementary Notes*
Remote air bag deployment investigation involving a 1995 Dodge Ram 1500, 4x2, conventional cab pickup truck, with manual safety belts and driver's air bag

16. *Abstract*

This report covers a remote investigation of an air bag deployment crash that involved a 1995 Dodge Ram 1500 pickup (case vehicle) and a tree. This crash is of special interest because the jacket worn by the case vehicle's driver (28-year-old female) reportedly caught on fire as a result of the heat contained in the exhaust gases generated by the deploying driver air bag. The case vehicle was traveling east on a negatively graded, one-lane, residential driveway. The case vehicle lost traction on an icy patch of the driveway, and the driver attempted to brake and steer right in an attempt to avoid striking a tree which was located off the north side of the driveway. The front of the case vehicle impacted the tree, causing the case vehicle's driver supplemental restraint system (air bag) to deploy. The case vehicle's driver was seated with her seat track located between its middle and forward-most positions, and the tilt steering wheel was in its down-most position. She was not wearing her available, active, three-point, lap and shoulder belt and sustained, according to her interview, minor injuries which included: an abrasion to her left eyebrow from the deploying air bag, a contusion to her left knee from contacting the lower instrument panel, and a complaint of lower abdominal pain from contacting the steering wheel. The driver indicated that she observed sparks from (i.e., wiring sparks) her air bag module. Further, she stated that she never saw any flame but rather there was a ***"smoldering"*** and a ***"little smoke"*** coming from the left sleeve and left chest area of her jacket. Subsequently, the driver had her jacket dry cleaned. When asked to describe what happened to her jacket as a result of the air bag's deployment, she indicated that her jacket had been ***"scorched"***.

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CASE SUMMARY

TRC/IU REMOTE AIR BAG GAS FIRE REPORT

SCI Team #2, TRC/IU Case Number IN97-013

Missouri

December, 1996

This remote report was brought to NHTSA's attention on January 15, 1997 by the Auto Safety Hotline in Washington, D.C. This crash involved a 1995 Dodge Ram 1500 pickup (case vehicle). The crash occurred in December, 1996 at approximately 5:00 a.m., on private property, and was not investigated by any law enforcement agency. This crash is of special interest because the jacket worn by the Dodge Ram's driver (28-year-old female) reportedly caught on fire as a result of the heat contained in the exhaust gases generated by the deploying driver air bag. After numerous contact attempts, the TRC contacted both the vehicle's owner and the vehicle's driver (i.e., separate individuals) on April 22, 1997.

The case vehicle was traveling east on a negatively graded, one-lane, residential driveway and intended to make a left-hand turn and travel northward on a city street. According to the interview with the case vehicle's driver, the case vehicle lost traction on an icy patch of the driveway, and the driver stated she attempted to brake and steer right in an attempt to avoid striking a tree which was located off the north side of the driveway. The crash occurred on private property, immediately prior to reaching a sidewalk on the city trafficway.

The front of the case vehicle impacted the tree, causing the case vehicle's driver supplemental restraint system (air bag) to deploy. This impact to the case vehicle was estimated as minor [2-13 km.p.h. (1-8 m.p.h.)].

The case vehicle's driver [160 centimeters and 66 kilograms (63 inches and 145 pounds)] was not wearing her available, active, three-point, lap and shoulder belt. In addition, she did not report any belt pattern bruising or abrasions to her torso.

The case vehicle's driver steered to the right and braked attempting to avoid the crash. As a result of these attempted avoidance maneuvers and the nonuse of her available safety belts, she most likely moved slightly forward and to her left just prior to impact. The case vehicle's impact with the tree not only deployed the driver air bag but thrust the driver generally forward and slightly upward. Because the case vehicle's driver could not recall where the vehicle's frontal damage was located (i.e., left, center, and/or right), it is unknown whether she moved straight forward, forward and further leftward, or forward and rightward. The driver's occupant kinematics, therefore, can only be estimated. Based on the driver's self-reported injuries (i.e., see following paragraph), the driver moved forward and slightly leftward into the deploying air bag, steering wheel, and instrument panel. The driver remained in her seat post-crash, but she does not recall exactly where her body came to rest.

The driver indicated that she observed sparks from (i.e., wiring sparks) her air bag module. Further, she stated that she never saw any flame but rather there was a ***"smoldering"*** and a ***"little smoke"*** coming from the left sleeve and left chest area of her jacket. Subsequently, the driver had her

jacket dry cleaned. When asked to describe what happened to her jacket as a result of the air bag's deployment, she indicated that her jacket had been ***"scorched"***.

The case vehicle's driver stated she was not transported from the crash scene by ambulance. She further stated she sustained only minor injuries and did not seek medical attention at any time. Her self-reported injuries included: an abrasion to her left eyebrow from the deploying air bag, a contusion to her left knee from contacting the lower instrument panel, and a complaint of lower abdominal pain from contacting the steering wheel.

The case vehicle was a rear wheel drive 1995 Dodge Ram 1500, 4x2, regular cab, pickup truck (VIN: 1B7HC16Y8SS------). It is unknown if the case vehicle was equipped with anti-lock brakes. The case vehicle was driven from the crash scene. Based on the available photograph, the CDC is estimated as: **12-FCEN-1**. No reconstruction program was used on this crash because the NASS, CDS, WinSMASH protocol requires that actual vehicular crush measurements be obtained. Further a visually estimated Delta V cannot be determined, but the Delta V is most certainly below 24 km.p.h. (15 m.p.h.). According to the driver's interview, the case vehicle was going between approximately 9.7 and 11.3 km.p.h. (6 and 7 m.p.h.) prior to the crash and slowed very little prior to impact. Based on the available photograph and the vehicle's reported departure (i.e., "driven") from the scene, the purported impact speed appears reasonable.

Immediately prior to the crash, the case vehicle's driver was seated upright with her back against the seat back, her left foot on the floor, her right foot on the brake, and both hands on the steering wheel. Her seat track was located between its middle and forward-most positions, the seat back was in its upright position, and the tilt steering wheel was in its down-most position.

TRC/IU REMOTE AIR BAG GAS FIRE REPORT

TRC/IU CASE NUMBER - 97-013

VEHICLE - 1995 DODGE RAM 1500 PICKUP
LOCATION - MISSOURI

CRASH DATA

Location/Street:	Private Residential Driveway
State:	Missouri
Area/Type:	Urban, residential
Crash Date/Time:	December, 1996, @ ~ 5:00 a.m.
Investigating Police Agency:	Not investigated
Crash Type:	Vehicle - ran-off road/Tree
Occupant Injury Severity (air bag vehicle):	Forehead abrasion (AIS-1)

AMBIENT CONDITIONS

Light Conditions:	Dark
Weather Condition:	Unknown
Precipitation:	Unknown
Road Surface:	Icy
Temperature:	Unknown (date of crash is unknown)

ROADWAY

	Case Vehicle
Location:	Private residential driveway
Number of Travel Lanes:	One
Width:	Unknown
Surface Type:	Unknown
Vertical alignment:	Unknown negative grade
Horizontal alignment:	Unknown
Traffic Density:	No other traffic present
Speed Limit:	Not applicable
Traffic Controls:	None

VEHICLES

	Case Vehicle
Year:	1995
Make:	Dodge
Model:	Ram 1500
Body Type:	Pickup truck, conventional cab, 4x2
V.I.N.	1B7HC16U8SS------
Mileage:	Unknown
Windshield damage/source:	None
Active Restraints:	Three-point, manual, lap and shoulder belts in front outboard seating positions; lap belt only at front center position
Passive Restraints:	Factory installed driver supplemental restraint system (air bag)
Anti-lock brakes:	Unknown
Fleet:	Private vehicle
Tow status:	Driven away
Reported Defects:	None

VEHICLE DAMAGE

EXTERIOR	**Case Vehicle**
Deployment Impact	
Event number:	First
Object Struck:	Tree, unknown diameter
Damage location:	Front
CDC:	12-FCEN-1
Estimated maximum crush:	Unknown
Damaged Components:	Bumper, grille per photograph
Repair estimate:	$4,500
Interior damage:	Unknown

COLLISION SEQUENCE

The following is based on the Police Crash Report, interviews with both the case vehicle's driver and the owner, and this contractor's evaluation of the evidence.

PRE-CRASH: The case vehicle (Ram 1500 pickup) was traveling east on a negatively graded, one-lane, residential driveway and was attempting to make a left-hand turn at the end of her driveway and travel north on the intersecting city trafficway. The driver of the case vehicle lost traction on an icy patch on the driveway, and the driver attempted to brake and steer right in an attempt to avoid departing the north side of the driveway and striking a tree located in that area. The case vehicle's exact response to the driver's attempted

COLLISION SEQUENCE (CONTINUED)

avoidance maneuvers is unknown, but the case vehicle continued essentially straight ahead, off the driveway, prior to impact. The crash occurred on private property, immediately prior to reaching a sidewalk on the city trafficway.

CRASH: The front of the case vehicle impacted the unknown diameter tree, causing the driver side supplemental restraint system (air bag) to deploy. The case vehicle's post-impact trajectory is unknown.

HUMAN FACTORS/OCCUPANT DATA

DRIVER:	**Case Vehicle**
Age:	28-year-old
Sex:	Female
Height:	160 cm (63 in)
Weight:	66 kg (145 lbs)
Occupation:	Manager
Active Restraint System/Usage:	Three-point lap and shoulder/Not used
Usage Source:	Interviewee
Passive Restraint System/Usage:	Factory installed air bag/air bag deployed
Usage Source:	Interviewee
Eyeglasses/contacts:	None
Vehicle Familiarity:	Seven months; 11,265 km (7,000 mi) total
Route Familiarity:	Daily
Trip Plan:	Home to work
Manner of Leaving Scene:	Drove away
Type of Medical Treatment:	Not medically treated

CASE VEHICLE DRIVER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Abrasion left eyebrow	290202.1 minor	Air bag, driver's side	Probable	Interviewee (driver)
2	Contusion left knee	890402.1 minor	Left instrument panel and below	Probable	Interviewee (driver)

DISCUSSION

Based on the interview with the case vehicle's driver, immediately prior to the crash she was seated upright with her back against the seat back, her left foot on the floor, her right foot on the brake (i.e., "pumping"), and both hands on the steering wheel. Her seat track was located between its middle and forward-most positions, the seat back was in its upright position, and the tilt steering wheel was located in its down-most position. She was not wearing her available, active, three-point, lap and shoulder belt. In addition, she did not report any belt pattern bruising or abrasions to her torso.

The case vehicle's driver steered to the right and braked attempting to avoid the crash. As a result of these attempted avoidance maneuvers and the nonuse of her available safety belts, she most likely moved slightly forward and to her left just prior to impact. The case vehicle's impact with the tree, not only deployed the driver air bag, but thrust the driver generally forward and slightly upward.

Because the case vehicle's driver could not recall where the vehicle's frontal damage was located (i.e., left, center, and/or right), it is unknown whether she moved straight forward, forward and further leftward, or forward and rightward. The one available photograph (i.e., see **Figure #1**) does not clarify the situation because of the vehicle's ***"under repair status"*** and the lack of knowledge concerning what degree of yaw, if any, the case vehicle had at impact. The driver's occupant kinematics, therefore, can only be estimated. Based on the driver's self-reported injuries (i.e., see above), the driver moved forward and slightly leftward into the deploying air bag, steering wheel, and instrument panel. The driver remained in her seat post-crash, but she does not recall exactly where her body came to rest.

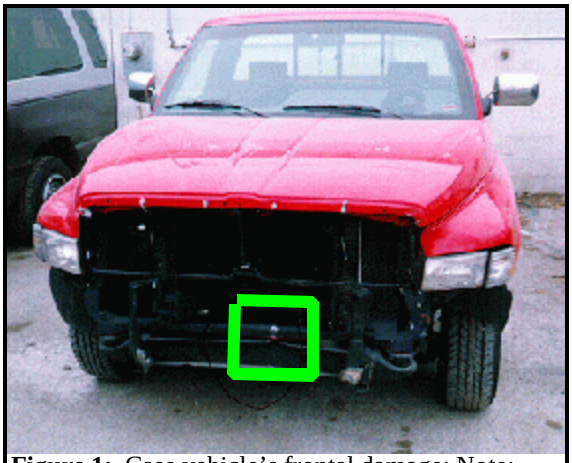

Figure 1: Case vehicle's frontal damage; Note: vehi-cle under repair and boxed area shows indentation in bumper reinforcement bar (Case Photo #01)

The driver indicated that she observed sparks from (i.e., wiring sparks) her air bag module. Further, she stated that she never saw any flame but rather there was a ***"smoldering"*** and a ***"little smoke"*** coming from the left sleeve and left chest area of her jacket. Subsequently, the driver had her jacket dry cleaned. When asked to describe what happened to her jacket as a result of the air bag's deployment, she indicated that her jacket had been ***"scorched"***.