



INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER

School of Public and Environmental Affairs
222 West Second Street
Bloomington, Indiana 47403-1501
(812) 855-3908 Fax: (812) 855-3537

REMOTE CHILD AIR BAG-RELATED FATALITY INVESTIGATION

CASE NUMBER - IN-03-031
LOCATION - Florida
VEHICLE - 1993 LINCOLN TOWN CAR
CRASH DATE - December 2001

Submitted:
April 22, 2004
Revised:
July 25, 2007



Contract Number: DTNH22-01-C-07022

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
National Center for Statistics and Analysis
Washington, D.C. 20590-0003

DISCLAIMERS

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no responsibility for the contents or use thereof.

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the National Highway Traffic Safety Administration.

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

1. <i>Report No.</i> IN-03-031		2. <i>Government Accession No.</i>		3. <i>Recipient's Catalog No.</i>	
4. <i>Title and Subtitle</i> Remote Child Air Bag-Related Fatality Investigation Vehicle - 1993 Lincoln Town Car Location - Florida			5. <i>Report Date:</i> April 22, 2004		
			6. <i>Performing Organization Code</i>		
7. <i>Author(s)</i> Special Crash Investigations Team #2			8. <i>Performing Organization Report No.</i>		
9. <i>Performing Organization Name and Address</i> Transportation Research Center Indiana University 222 West Second Street Bloomington, Indiana 47403-1501			10. <i>Work Unit No. (TRAIS)</i>		
			11. <i>Contract or Grant No.</i> DTNH22-01-C-07002		
12. <i>Sponsoring Agency Name and Address</i> U.S. Department of Transportation (NRD-32) National Highway Traffic Safety Administration National Center for Statistics and Analysis Washington, D.C. 20590-0003			13. <i>Type of Report and Period Covered</i> Technical Report Crash Date: December 2001		
			14. <i>Sponsoring Agency Code</i>		
15. <i>Supplementary Notes</i> Remote investigation of an air bag deployment crash involving a 1993 Lincoln Town Car, with dual frontal air bags, and a 1987 Dodge Ram 50 pickup truck					
16. <i>Abstract</i> This report covers a remote child air bag-related fatality investigation involving a 1993 Lincoln Town Car (case vehicle) and a 1987 Dodge Ram 50 (other vehicle). This crash is of special interest because the case vehicle's front right passenger (3-year-old female) sustained fatal cervical spine injuries from the deploying front right passenger's air bag. The case vehicle was traveling east in the eastbound lane of a two-lane, undivided city street and was approaching a Tee intersection, intending to continue eastward. The Dodge pickup had also been traveling east in the same lane of the same street ahead of the case vehicle and had come to a stop, intending to make a left turn and travel north on the intersecting roadway. It was daylight, the weather was clear, the roadway was straight and level, and the asphalt road surface was dry and free of defects. The case vehicle's driver observed the stopped vehicle ahead, steered to the right and braked with lockup. The Dodge's driver observed the on-coming case vehicle and attempted to accelerate but had moved only a few feet forward when his vehicle was hit. The front of the case vehicle impacted the back of the other vehicle, causing the case vehicle's driver and front right passenger air bags to deploy. The case vehicle came to rest close to the point of impact and the other vehicle traveled on a short distance forward and was steered to final rest along the curb. Both vehicles were towed due to disabling damage. The case vehicle's front right child passenger pitched forward in response to the pre-impact braking deceleration and was struck by the deploying air bag and module cover flap. She was lifted and propelled over the front seat into the back seat and she sustained atlanto-occipital dislocation, fracture of the C1 vertebral body, subdural hemorrhage along the cervical spinal cord, cardiac contusions, and various abrasions on her face, neck and upper chest. The uninjured case vehicle driver carried her from the scene to a nearby residence. She was transported from this residence to a hospital, where she was pronounced dead approximately one-half hour post-crash.					
17. <i>Key Words</i> Air Bag Deployment			Motor Vehicle Traffic Crash Injury Severity		18. <i>Distribution Statement</i> General Public
19. <i>Security Classif. (of this report)</i> Unclassified	20. <i>Security Classif. (of this page)</i> Unclassified	21. <i>No. of Pages</i> 6	22. <i>Price</i> \$2,100		

TABLE OF CONTENTS

IN-03-031

	<u>Page No.</u>
BACKGROUND	1
CRASH CIRCUMSTANCES	1
CASE VEHICLE: 1993 LINCOLN TOWN CAR	1
AUTOMATIC RESTRAINT SYSTEM	2
CASE VEHICLE'S FRONT RIGHT PASSENGER KINEMATICS	3
FRONT RIGHT PASSENGER'S INJURIES	3
CASE VEHICLE DRIVER'S KINEMATICS	4
OTHER VEHICLE: 1987 DODGE RAM 50	4
SCENE DIAGRAM (copied from police crash report)	6
SELECTED PHOTOGRAPHS	
Figure 1: Front of case vehicle	2
Figure 2: Exemplar non-deployed passenger's air bag (not the case vehicle) . .	2
Figure 3: Case vehicle's front right air bag	2

This report was brought to the NHTSA's attention in June 2003 through a review of the 2001 Fatality Analysis Reporting System (FARS) data. This crash involved a 1993 Lincoln Town Car (case vehicle) and a 1987 Dodge Ram 50 pickup truck (other vehicle). The crash occurred in December 2001, at 4:15 p.m., in Florida and was investigated by the applicable municipal police. This crash is of special interest because the case vehicle's front right passenger (3-year-old female, black, unknown if Hispanic) sustained critical neck and chest injuries from her deploying front right passenger air bag, resulting in her death. Police investigative materials were received in August 2003 and medical data were received in November 2003. This report is based on the police crash report and photographs, the autopsy report for the fatal victim, occupant kinematic principles and this contractor's evaluation of the available evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling east in the eastbound lane of a two-lane, undivided city street and was approaching a Tee intersection, intending to continue eastward. The Dodge pickup had also been traveling east in the same lane of the same street ahead of the case vehicle and had come to a stop, intending to make a left turn and travel north on the intersecting roadway. It was daylight, the weather was clear, the roadway was straight and level, and the asphalt road surface was dry and free of defects. The speed limit was 56 km.p.h. [35 m.p.h.] and there were no controls for east-west traffic. The case vehicle's driver observed the stopped vehicle ahead, steered to the right and braked with lockup, depositing approximately 7 meters [23 feet] of braking skid marks. The police reconstructionist estimated that the case vehicle was traveling 51-60 km.p.h. [32-37 m.p.h.] prior to braking. The Dodge's driver observed the on-coming case vehicle in his rearview mirror and attempted to accelerate but had moved only a few feet forward when his vehicle was hit. The impact occurred within the intersection (there are no scene photographs available).

The case vehicle's front left two-thirds impacted the back right area of the Dodge pickup, causing the case vehicle's driver and front right passenger air bags to deploy. The case vehicle came to rest near the point of impact. The Dodge's driver steered his vehicle a short distance forward and came to a stop along the south curb on the east-west roadway.

CASE VEHICLE: 1993 LINCOLN TOWN CAR

The case vehicle was a 1993 Lincoln Town Car rear wheel drive, four-door, six-passenger sedan (VIN: 1LNLM81W7PY-----), equipped with a 4.6 liter V8 gasoline engine and an automatic transmission with a column-mounted selector lever. The case vehicle was not equipped with anti-lock brakes. The odometer reading is unknown due to the non-functional electronic instrument panel. Its specification wheel base was 298 centimeters [117.4 inches]. The case vehicle was towed due to disabling radiator and engine damage.

The case vehicle sustained direct contact damage beginning at the right edge of the grille and extending leftward across the front. The available photographs do not show the entire front end, but it appears that there was only minor contact on the bumper, with most of the contact and crush

above the bumper in a classic front underride damage configuration (**Figure 1**). The right headlamp assembly was partially broken and displaced, with the grille and radiator crushed rearward and the left headlamp assembly shattered and broken away. The leading edge of the hood was folded downward and crushed rearward. There was some light scratching on the bumper. The windshield had a stress crack on the right side. The police report indicated that none of the tires were deflated or restricted.



Figure 1: Front of case vehicle (case photo #01)

The CDC was estimated from photographs as **12-FDEW-2 (0)**. The WinSMASH reconstruction program, missing vehicle algorithm with CDC-only, was used on the case vehicle's single impact. The total, longitudinal and lateral delta Vs are, respectively: 24.0 km.p.h. [14.9 m.p.h.], -24.0 km.p.h. [-14.9 m.p.h.] and 0 km.p.h. [0 m.p.h.]. This is a borderline reconstruction but the results appears reasonable. This was a crash of moderate severity (24-40 km.p.h. [15-25 m.p.h.]) for the case vehicle.

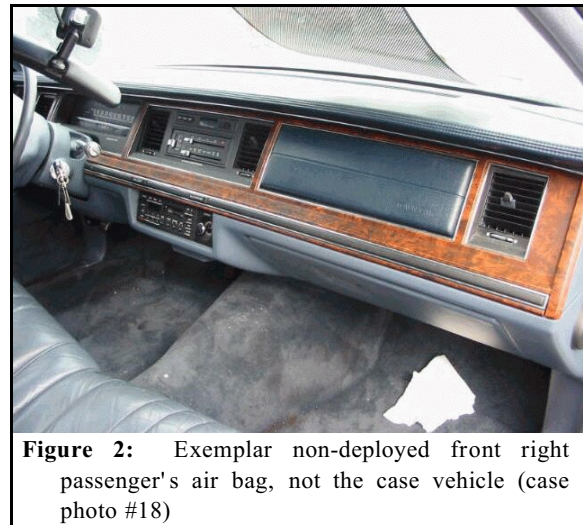


Figure 2: Exemplar non-deployed front right passenger's air bag, not the case vehicle (case photo #18)

AUTOMATIC RESTRAINT SYSTEM

The case vehicle was equipped with driver and front right passenger frontal air bags. Both air bags deployed.

The driver's air bag was mounted in the steering wheel hub. There are no photos of the driver's air bag and there is no information about it other than that it did deploy.

The front right passenger's air bag was mounted in the mid-instrument panel position (**Figure 2** shows an exemplar non-deployed air bag from an identical vehicle in the NASS database). There were two module cover flaps with a seam horizontally across the middle. The police noted a possible skin transfer on the front of the air bag fabric and cut the air bag out of the vehicle (**Figure 3**). There is no other information about the front right passenger's air bag.

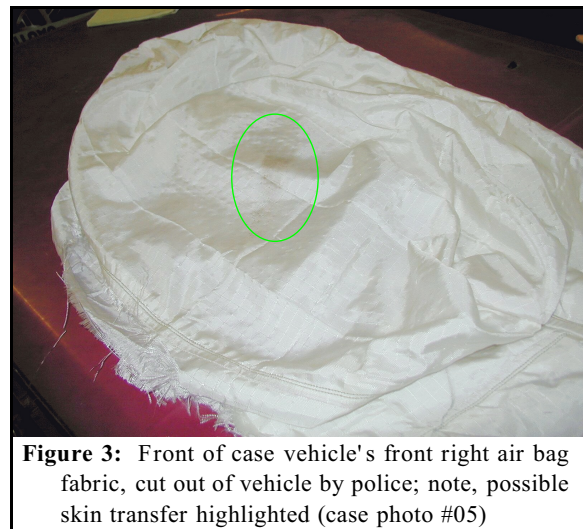


Figure 3: Front of case vehicle's front right air bag fabric, cut out of vehicle by police; note, possible skin transfer highlighted (case photo #05)

The case vehicle's front right passenger (3-year-old female, black, unknown if Hispanic, 97 centimeters, 10 kilograms [38 inches, 22 pounds]) was not using the available, manual, three-point, lap-and-shoulder safety belt system. The police report notes that the front right safety belt system was found in its stowed position, with no evidence of use. Her pre-crash seat adjustments and posture are not known. She was probably in an approximately normal, forward-facing seated posture.

The case vehicle was traveling approximately 56 km.p.h. [35 m.p.h.] when the driver braked with full lockup immediately prior to the impact. The front right passenger probably pitched forward in response to the sudden braking deceleration. The front of the case vehicle impacted the back of the other vehicle, causing the driver's and front right passenger's air bags to deploy. The child was in very close proximity to the air bag module at the moment of deployment. The expanding air bag contacted her chest, neck and face, causing abrasions. The force of the air bag's deployment lifted and propelled her over the front right seat and into the back seat. She sustained atlanto-occipital dislocation and a fracture of the C1 vertebral body, with attenuation of the cervical spinal cord and hemorrhage of the pre-vertebral fascia from C1 to C5. She also sustained cardiac bruising. At final rest, she was in an unknown position in the back right seat area. Immediately after the impact, the uninjured driver exited the vehicle, opened the right rear door, gathered the child into his arms and carried her to a residence, approximately two blocks away from the crash scene. An ambulance arrived at the scene in response to the notice of a traffic crash involving injury but found no injured parties. Meanwhile, a call for emergency services was received from the residence and the on-scene ambulance was dispatched to the residence. The injured child was found at the residence.

FRONT RIGHT PASSENGER'S INJURIES

The child was transported via ambulance from a private residence to a local hospital. She was pronounced dead approximately one-half hour after the crash and her body was taken to the morgue.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Contusion {subdural hemorrhage} of upper cervical spinal cord with atlanto-occipital dislocation and fracture of body of C ₁ ; complications, not related to head injury, included loss of consciousness; unresponsiveness, apnea, and cardiac arrest	640236.6 maximum	Air bag, front right passenger's	Probable	Autopsy

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
2	Contusions: right atrial appendage and junction of inferior vena cava with right atrium	441002.1 minor	Air bag, front right passenger's	Probable	Autopsy
3	Abrasion, small, inner lower lip	290202.1 minor	Air bag, front right passenger's	Probable	Autopsy
4	Abrasion, 5 x 5 cm (2.0 x 2.0 in), irregular, under chin	390202.1 minor	Air bag, front right passenger's	Probable	Autopsy
5	Abrasion, 8 x 4 cm (3.1 x 1.6 in), irregular over left clavicle	790202.1 minor	Air bag, front right passenger's	Probable	Autopsy
6	Abrasions, superficial, under right armpit and over lateral right shoulder	790202.1 minor	Air bag, front right passenger's	Probable	Autopsy

CASE VEHICLE DRIVER'S KINEMATICS

The case vehicle's driver (30-year-old male, black, unknown if Hispanic, unknown height and weight) was not using his available, active, three-point, lap-and-shoulder safety belt system. The police report notes that the driver's safety belt system was found in its stowed position, with no evidence of use. His seat adjustments and pre-crash posture are not known. He stated to the police that, immediately prior to his recognition that there was a stopped vehicle ahead, he was distracted while trying to insert a CD into the player, and he may have been leaning forward and to the right.

The driver observed the stopped vehicle ahead and braked with full lock-up. He moved slightly forward in response to the braking deceleration, but he probably braced with his hands/arms against the steering wheel, and his leg pressure against the brake pedal kept him approximately in his pre-crash posture. The front of the case vehicle impacted the back of the other vehicle, causing the driver's and front right passenger's air bags to deploy. He probably encountered the deployed air bag with his chest. The driver did not sustain any injuries as a result of this crash, but he accompanied the injured passenger to the hospital in the ambulance. His blood was drawn 3 hours 14 minutes after the crash and his blood alcohol concentration (BAC) was measured as 0.161 mg/dl.

OTHER VEHICLE

The other vehicle was a 1987 Dodge Ram 50 rear wheel drive (4x2), conventional cab, two-door, long bed, pickup truck (VIN: JB7FL49E9HP-----), equipped with a 2.6 liter I4 gasoline engine and a manual transmission with a floor-mounted shift lever. The odometer reading showed 361,652 kilometers [224,726 miles]. Its specification wheelbase was 295 centimeters [116.1

inches]. The Dodge pickup was towed due to damage.

There are no photographs of the Dodge available and a CDC cannot be estimated. The WinSMASH reconstruction program, missing vehicle algorithm, was used on the Dodge's single impact. The total, longitudinal and lateral delta Vs are, respectively: 33 km.p.h. [20.5 m.p.h.], + 33 km.p.h. [+ 20.5 m.p.h.] and 0 km.p.h. [0 m.p.h.]. This is a borderline reconstruction, but the results appear reasonable. This was a crash of moderate severity (24-40 km.p.h. [15-25 m.p.h.]) for the Dodge.

The Dodge's driver (39-year-old male, black, unknown if Hispanic) and front right passenger (45-year-old male, unknown race/ethnicity) were both not using their available, active, three-point, lap-and-shoulder, safety belt systems. Neither occupant sustained any injuries as a result of the crash and neither was transported by ambulance to a hospital.

