TRANSPORTATION RESEARCH CENTER

Indiana University
Bloomington, Indiana 47403-1599

DEPOWERED AIR BAG REPORT

CASE NUMBER - IN97-056
LOCATION - ALABAMA
VEHICLE - 1998 CADILLAC DEVILLE CONCOURS
CRASH DATE - December 1997

Submitted:

March 13, 1998

Contract Number: DTNH22-94-D-17058

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 STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
IN97-056			

4. Title and Subtitle	5. Report Date:
On-site Depowered/Second Generation Air Bag Investigation Vehicle: 1998 Cadillac DeVille Concours Location: Alabama	March 13, 1998
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Special Crash Investigations Team #2	Task #138
9. Performing Organization Name and Address	10. Work Unit No.
Indiana University Transportation Research Center 222 West Second Street Bloomington, Indiana 47403-1599	
	11. Contract or Grant No. DTNH22-94-D-17058
12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U.S. Department of Transportation National Highway Traffic Safety Administration National Center for Statistics and Analysis Washington, DC 20590-0003	Technical Report Crash Date: December, 1997
	14. Sponsoring Agency Code

15. Supplementary Notes

On-site depowered/second generation air bag deployment investigation involving a 1998 Cadillac DeVille Concours and a 1979 Oldsmobile Cutlass Supreme.

16. Abstract

The report covers an on-site investigation of an air bag deployment crash. This case is of special interest because the case vehicle (1998 Cadillac DeVille Concours) was equipped with a depowered/second generation front air bag system that deployed as a result of the crash events. The case vehicle was also equipped with side air bags that did not deploy. The case vehicle was traveling northwest in the inside northwestbound lane of an undivided four-lane state highway intending to continue straight. Vehicle #2 (1979 Oldsmobile Cutlass Supreme) was also headed northwest in the same lane and was stopped in traffic. The front left corner of the case vehicle impacted the back right corner of vehicle #2, causing the case vehicle's driver and front right passenger front air bags to deploy. The case vehicle rotated a few degrees counter-clockwise, continued traveling essentially straight ahead and came to rest headed northwest in its original travel lane. Vehicle #2 was pushed across the center line and came to rest headed west-northwest in the inside southeastbound lane. There was one occupant in the case vehicle and three occupants in vehicle #2. This was a crash of moderate severity for both vehicles. No person sustained any police reported injury and no ambulance came to the scene. Both vehicles were towed away from the scene due to disabling damage.

17. Key Words	18. Distribution Statement
Depowered Air Bag Second Generation Air Bag 1998 Cadillac DeVille Concours	General Public

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	8	

TABLE OF CONTENTS IN97-056

This on-site investigation was brought to the NHTSA's attention on December 15, 1997 by NASS/GES sampling activities. This case is of special interest because the case vehicle (1998 Cadillac DeVille Concours) was equipped with a depowered/second generation front air bag system that deployed as a result of the crash events. The case vehicle was also equipped with side air bags that did not deploy. The driver (sole occupant) of the case vehicle did not sustain any specific injuries. The crash occurred in Alabama in December, 1997. The investigating police agency was contacted on December 16, with scene and vehicle inspections performed December 18-20, 1997.

CRASH CIRCUMSTANCES

The case vehicle was traveling northwest in the inside northwestbound lane of an undivided four-lane state highway intending to continue straight. Vehicle #2 (1979 Oldsmobile Cutlass Supreme) was also headed northwest in the same lane and was stopped in traffic. The speed limit was 56 km.p.h. [35 m.p.h.]. It was daylight and the weather was clear. The roadway was straight and level (see **Figure 1**). The case vehicle's driver observed the stopped vehicle ahead and braked with no lock-up and steered right. The front left corner of the case vehicle impacted the back right corner of vehicle #2, causing the case vehicle's driver and front right passenger front air bags to deploy. The case vehicle rotated a few degrees counter-clockwise, continued traveling essentially straight ahead and came to rest headed northwest in its original travel lane. Vehicle #2 was pushed across the center line and came to rest headed west-northwest in the inside southeastbound lane. There was one occupant in the case vehicle and three occupants in vehicle #2. This was a crash of moderate severity for both vehicles. No person sustained any police reported injury and no ambulance came to the scene. Both vehicles were towed away from the scene due to disabling damage.

CASE VEHICLE

The case vehicle was a front wheel drive 1998 Cadillac DeVille Concours four-door sedan (VIN: 1G6KD54Y3W4------) equipped with four-wheel traction control and anti-lock brakes. The case vehicle was partially dis-assembled for repair and crush measurements were not obtained, but the damaged components were inspected (see **Figures 2 - 6**). The damage was located at the front left corner, with direct contact to the bumper, headlight area, hood and left front fender. There was no passenger compartment integrity loss, nor any intrusion. All doors remained closed and operational. The CDC for the case vehicle is **12-FYEW-2**. The ROLDMIS reconstruction algorithm was used to compute delta v based on vehicle #2's crush profile (discussed below). The calculations for the case vehicle indicate total delta v of 22 km.p.h. [14 m.p.h.], with -22 km.p.h. [-14 m.p.h.] longitudinal and 0 lateral.

The case vehicle was fitted with a split bench seat in the front row, with the seat track adjusted in the middle position and the seatback slightly reclined. There was no evidence of any seat or track failure and the seatback retained its pre-crash adjustment. The second seat row was fitted with a non-adjustable bench seat. The vehicle was equipped with manual three-point lap-and-shoulder safety belts in the four outboard seat positions, with manual lap-only belts in the two center positions. The driver's safety belt was the only belt system that showed any signs of use in this nearly-new vehicle. The tilt steering wheel was adjusted between the middle and down-most position. The driver's front air bag was located in the steering wheel hub with cover flaps in the I-configuration (see **Figure 7**). The cover flaps opened along the seams and there was no evidence of damage to the flaps or the air bag. The deployed driver's air bag was round, with diameter 51 centimeters [20 inches], no tether strap and two vent ports located at 3 and 9 o'clock positions. The steering wheel rim was not deformed and there was no evidence that the steering column had moved. The right front passenger front air bag was located in the top of the instrument panel. The single flap opened along the seams, with no evidence of damage to the flaps or the air bag. The deployed passenger air bag was a rectangle 46 centimeters [18 inches] wide and 76 centimeters [30 inches] high with two tether straps and no vent ports. The passenger air bag cover flap impacted the windshield, causing an area of spider web cracking low on the windshield and directly above the air bag module. This vehicle was also equipped with side air bags in the front seat outboard positions. These were mounted in the front door panels and did not deploy.

CASE VEHICLE OCCUPANT

The case vehicle's driver was female, 74 years, 168 centimeters, 73 kilograms [66 inches, 160 pounds]. There was no other occupant in the case vehicle. The driver was restrained by the available manual 3-point lap-and-shoulder safety belt system with the upper anchorage adjustment in the full down position. She did not sustain any specific injuries and did not seek any medical attention, but did suffer general soreness. She exited the vehicle under her own power and was driven from the scene by friends in a private car. The driver was seated in an upright posture with her back against the seatback, both hands on the steering wheel and her feet on the floor and foot controls. Inspection of the driver's air bag revealed a smudge of lipstick slightly above and left of center (see **Figures 8 - 9**). There was no other evidence of occupant contact anywhere in the car, nor any other marks on the driver's air bag.

As a result of her pre-impact braking and steering right, the case vehicle's driver's torso shifted slightly forward and to the left. The impact at the front left corner caused the case vehicle to rotate a few degrees counter-clockwise, causing her to move further forward and back to the right as the air bag deployed. Because she was restrained by her safety belt, her motion was restricted and she encountered the fully-deployed air bag in an upright posture, leaving a lipstick smudge near the center. Because the air bag cushioned her forward motion, she did not load the safety belt webbing with much force and thus did not sustain any safety belt bruising. The driver was wearing sunglasses that stayed in position and were not broken.

Vehicle #2 was a rear wheel drive 1979 Oldsmobile Cutlass Supreme two-door sedan (VIN: 3M47H9D------). The damage was located at the back right corner, with direct contact to the bumper, tail light area, trunk lid and right rear quarter panel. The wheelbase was shortened by 8 centimeters [3 inches] on the right and maximum crush was 59 centimeters [23 inches] at the back right corner (see **Figures 10 - 12**). The CDC for vehicle #2 is **06-BZEW-3**. The ROLDMIS reconstruction algorithm was used to compute delta v because the case vehicle was dis-assembled and a crush profile could not be measured. The calculations for vehicle #2 indicate total delta v of 25 km.p.h. [15 m.p.h.], with +25 km.p.h. [+15 m.p.h.] longitudinal and +2 km.p.h. [+1 m.p.h.] lateral. There were three occupants in vehicle #2, none of whom sustained any police reported injury.

SELECTED PHOTOGRAPHS

Figure 1: Case vehicle's north-bound approach (case photo #1)

Figure 2: Case vehicle with damaged components removed (case photo #6)

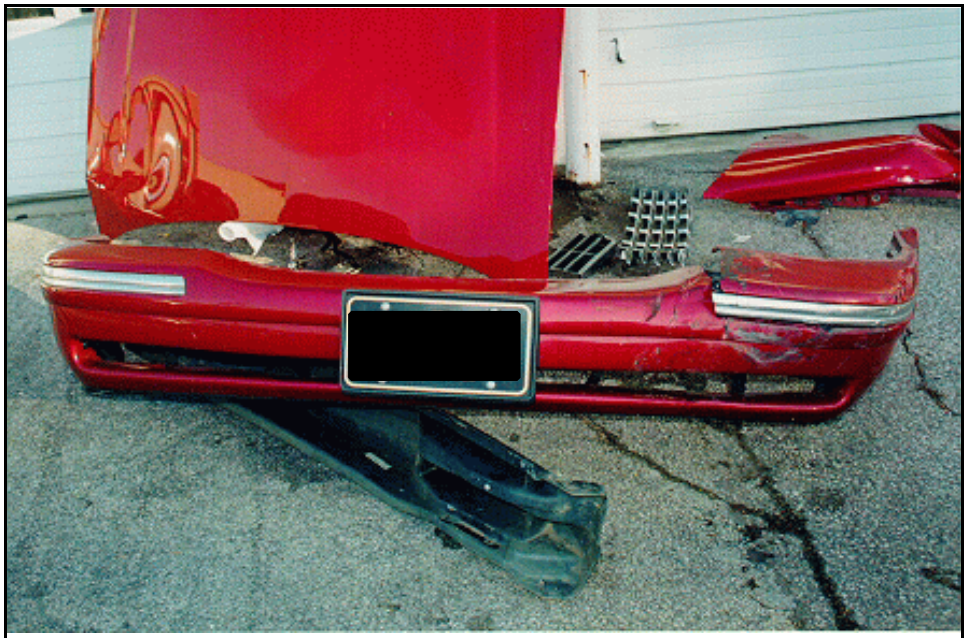


Figure 3: Case vehicle's damaged components (case photo #12)

Figure 4: Front left corner of case vehicle's bumper cowl (case photo #13)

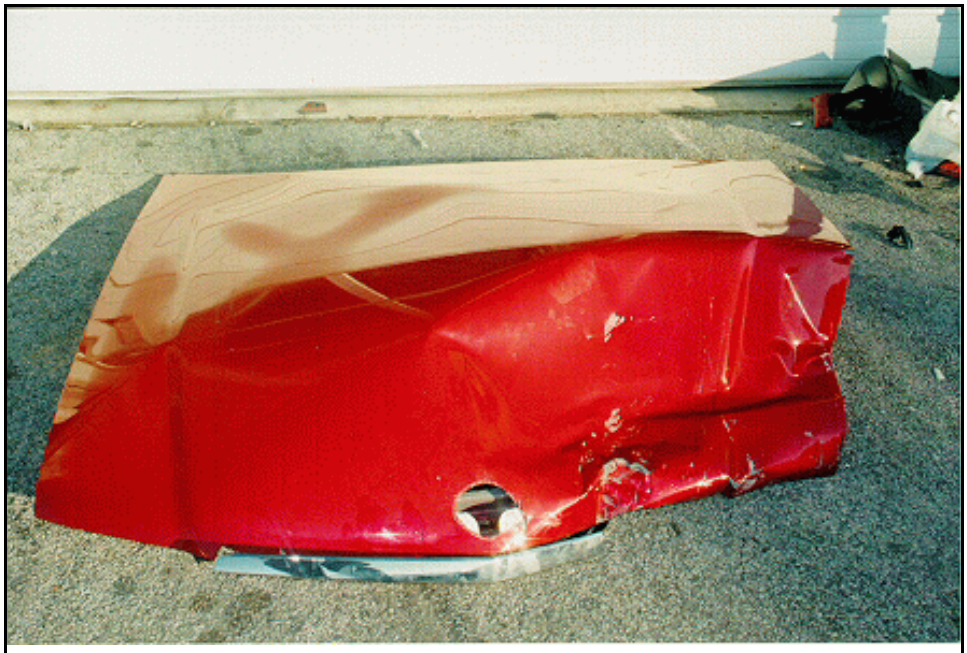


Figure 5: Case vehicle's hood (case photo #14)

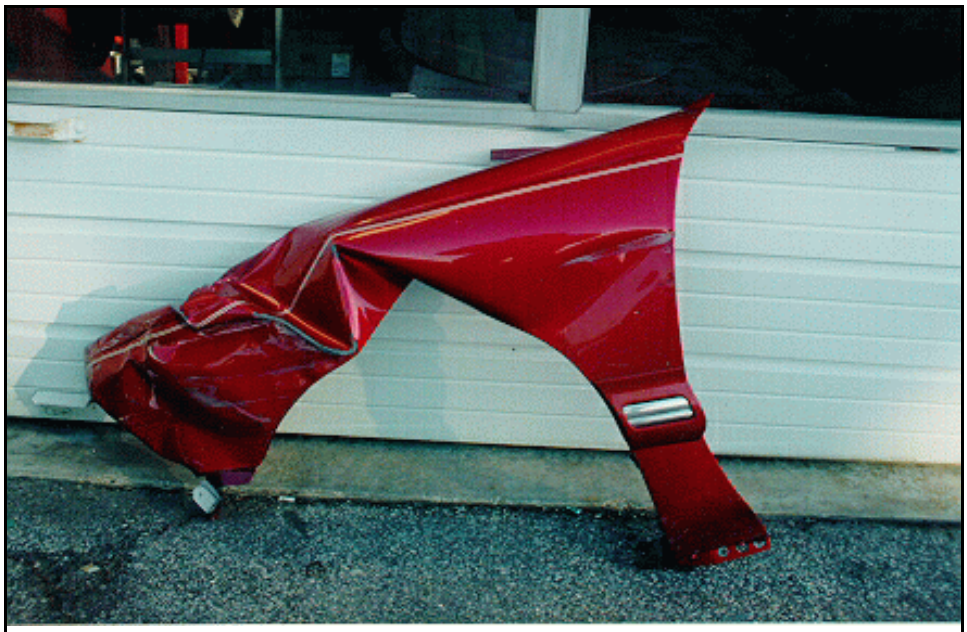


Figure 6: Case vehicle's left front fender (case photo # 15)

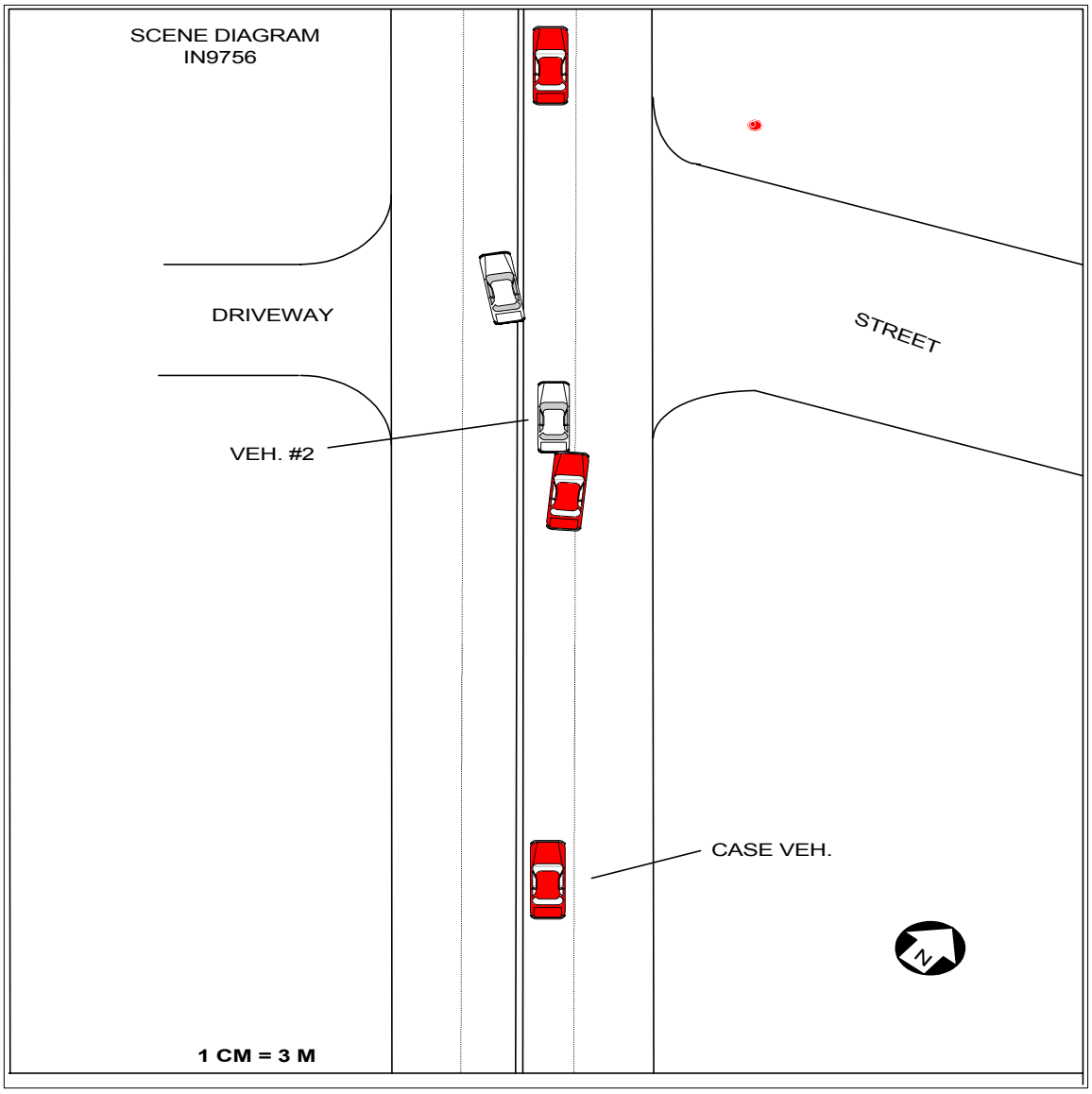
Figure 7: Case vehicle's steering wheel with cover flaps
(case photo #22)

Figure 8: Case vehicle's driver air bag with contact evidence marked (case photo #24)

Figure 9: Case vehicle's non-deployed driver's side air bag above arm rest (case photo #31)

Figure 10: Vehicle #2's back damage (case photo #28)

Figure 11: Right side of vehicle #2 (case photo #40)


SCENE DIAGRAM
IN9756
DRIVEWAY
STREET
VEH. #2
CASE VEH.
N
1 CM = 3 M