

TRANSPORTATION RESEARCH CENTER

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ON-SITE SIDE AIR BAG REPORT

CASE NUMBER - IN98-008
LOCATION - ARKANSAS
VEHICLE - 1997 MERCEDES BENZ E320
CRASH DATE - October, 1997

Submitted:

July 30, 1998

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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. <i>Supplementary Notes</i> On-site side air bag deployment investigation involving a 1997 Mercedes Benz E320, 4-door sedan, equipped with manual belts, dual front and side air bags, and a 1986 Honda Accord, 4-door sedan					
16. <i>Abstract</i> This report covers an on-site investigation of an air bag deployment crash that involved a 1997 Mercedes Benz E320 (case vehicle) and a 1986 Honda Accord (vehicle #2). The crash is of special interest because the case vehicle was equipped with a side air bag that deployed as a result of the collision events. The case vehicle was stopped in traffic at an intersection, headed east in the eastbound lane of a two-lane, undivided, city street and was waiting to turn left to travel north. Vehicle #2 was traveling south in the inside lane of a two-lane, southbound roadway--which was part of a four-lane, divided, intersecting trafficway, and was approaching the intersection and intending to continue straight ahead. Starting from a stop, the case vehicle entered the intersection. The crash occurred within the four-leg intersection of the two trafficways. The left side of the case vehicle was impacted by the front of vehicle #2, causing the case vehicle's left side air bag to deploy. The case vehicle was also equipped with driver, front right passenger, and right side supplemental restraints (air bags), none of which deployed. Both vehicles were towed from the scene due to disabling damage. The case vehicle's driver (49-year-old female) was seated with seat track located in its forward-most position, and the tilt steering wheel was located in its middle position. She was not wearing her available, active, three-point, lap and shoulder belt and presented herself at an emergency room later the same day, where she was treated and released. She sustained, according to her interview and her medical records, minor injuries which included: contusions to her left shoulder and left and right lower legs, abrasions to her chin and right thumb, a laceration and abrasion to her lip, and two fractured teeth. Her left side contusions occurred when she loaded the driver's door during impact, and her mouth and chin injuries occurred when her unrestrained torso contacted the steering wheel during the case vehicle's subsequent counterclockwise rotation. No thoracic or abdominal cavity injuries were reported, nor were there any injuries associated with the case vehicle's side air bag.					
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BACKGROUND

This on-site investigation was brought to the NHTSA's attention on January 20, 1998 by an independent investigator working for the NHTSA. The crash involved a 1997 Mercedes-Benz E320 (case vehicle) and a 1986 Honda Accord (vehicle #2). The crash occurred in October 1997, in Arkansas, at 7:25 a.m., and was investigated by the applicable municipal police agency. This crash is of special interest because the case vehicle was equipped with a side air bag that deployed as a result of the collision events. The case vehicle's driver (49-year-old female) sustained minor injuries and was treated and released at a hospital emergency room. The investigating police agency was contacted in late January, 1998. The scene and case vehicle were inspected on 3 February, vehicle #2 was inspected on 18 February, and the official medical data were received in May, 1998.

CRASH CIRCUMSTANCES

The case vehicle was stopped in traffic at an intersection, headed east in the eastbound lane of a two-lane, undivided, city street and was waiting to turn left to travel north. Vehicle #2 was traveling south in the inside lane of a two-lane, southbound roadway--which was part of a four-lane, divided (i.e., two lanes each direction with a landscaped median), intersecting trafficway (see **Figure 1**), and was approaching the intersection and intending to continue straight ahead. Starting from a stop, the case vehicle entered the intersection. The crash occurred within the four-leg intersection. The left side of the case vehicle was impacted by the front of vehicle #2, causing the case vehicle's left side air bag to deploy. The case vehicle was also equipped with driver, front right passenger, and right side supplemental restraints (air bags), none of which deployed. The case vehicle's driver did not attempt any avoidance actions and was traveling approximately 16 km.p.h. (10 m.p.h.) at impact. The case vehicle rotated approximately 180 degrees counterclockwise after impact and came to rest heading west within the intersection. Vehicle #2 continued essentially straight ahead, for a short distance, after impact and came to rest in the intersection heading south. There was one occupant in the case vehicle and three occupants in vehicle #2. This was a crash of low severity for both vehicles. A passenger in vehicle #2 was transported to a hospital via ambulance, with all other parties indicating they would seek their own treatment. The case vehicle driver presented herself at an emergency room later the same day, where she was treated for minor injuries and released. Both vehicles were towed from the scene due to disabling damage.

CASE VEHICLE

The case vehicle was a rear wheel drive 1997 Mercedes-Benz E320, four-door sedan (VIN: WDBJF55F3VJ-----) equipped with four-wheel anti-lock brakes. Direct contact was confined to the two left side doors, with some minor buckling of the left rear quarter panel (see **Figures 2 and 3**). Maximum crush was 27 centimeters (10.6 inches) and was located slightly rearward of the left "B"-pillar and approximately 30 centimeters (12 inches) above the sill. There was intrusion by left side components into the second seating row, including deformation of the seat cushion and buckling of the floor; see **Figure 7**. Intrusion into the driver's seating area was minor. The glazing in the left rear door was broken out, and both left side doors were jammed shut. The CDC for the case vehicle was determined to be **10-LPEW-2**. The winSMASH reconstruction program, damage only algorithm, was used on the case vehicle's highest severity impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 17 km.p.h. (10 m.p.h.), -8 km.p.h. (-5 m.p.h.), and +14 km.p.h. (+9 m.p.h.). This was a low severity impact for the case vehicle.

The driver's bucket seat track was adjusted at the forward most position, with the seat back slightly reclined. There was no evidence of seat or track failure. The tilt steering wheel was adjusted in the center position. The steering wheel rim was not deformed, and there was no evidence of steering column movement.

The driver's side air bag was located in the driver's door, immediately above the arm rest (see **Figure 4**). The deployed air bag was pear-shaped with the narrow end toward the front, approximately 50 centimeters (20 inches) long, 30 centimeters (12 inches) high at the wide end and 15 centimeters (6 inches) high at the narrow end (see **Figure 5**). The air bag module cover was made of flexible plastic/fabric with a pre-stressed seam running the entire length. The cover parted along the seam, with no evidence of damage to the cover panels or the adjacent door structures. The deployed air bag had several areas of scorching along the lower edge on the inside and outside surfaces (see **Figures 5 and 6**).

CASE VEHICLE OCCUPANT

The case vehicle driver [49-year-old female, not pregnant, 163 centimeters and 58 kilograms (64 inches, 128 pounds)] and was not restrained by the available manual three-point lap-and-shoulder safety belt system. In addition, there was no evidence of belt pattern bruising and/or abrasions to the driver's body, and the inspection of the driver's seat belt webbing, "D"-ring, and latch plate showed no evidence of loading. The driver was seated upright, with her back against the seat back, both hands on the steering wheel, her left foot on the floor, and her right foot on the accelerator pedal. At the moment of impact, she had not yet begun her intended left-turn maneuver, due to the width of the intersection. She did not attempt any avoidance actions. The impact caused the left side air bag to deploy and caused the unrestrained driver to move to the left and forward, toward the 10 o'clock direction of force (PDOF). Her left shoulder struck the left door in the window sill area, her left lower leg struck the lower door and her right lower leg struck the underside of the instrument panel, causing contusions in these areas. The force of the impact caused her right hand to lose its grip on the steering wheel and her right thumb struck the steering wheel spoke or hub, resulting in an abrasion. Because she was not restrained, the post-impact counterclockwise rotation caused her to move forward and to the right, and her face struck the steering wheel rim, resulting in the chin and mouth injuries. No thoracic or abdominal cavity injuries were reported, nor were there any injuries associated with the case vehicle's side air bag.

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 inner side of left lower lip	290202.1 minor	Steering wheel rim	Probable	Emergency room records
2	Laceration, 1 centimeter, left inner lower lip	290602.1 minor	Steering wheel rim	Probable	Emergency room records
3	Abrasion chin	290202.1 minor	Steering wheel rim	Probable	Emergency room records
4	Abrasion right thumb	790202.1 minor	Steering wheel hub	Possible	Emergency room records

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
5	Contusion, large, left lower leg, location not specified	890402.1 minor	Left front door side surface	Probable	Emergency room records
6	Contusion, large, right lower leg, location not specified	890402.1 minor	Center instrument panel and below	Probable	Emergency room records
7	Fractured {broken} teeth, two	251404.1 minor	Steering wheel rim	Probable	Interviewee (driver)
8	Contusion {bruise} left shoulder	790402.1 minor	Left front side window sill	Possible	Interviewee (driver)

VEHICLE #2

Vehicle #2 was a front wheel drive 1986 Honda Accord, four door sedan (VIN: 1HGBA7433GA-----). Direct contact damage was present across the left two-thirds of the front plane, with maximum crush 22 centimeters (8.7 inches) at the front left corner (see **Figure 8**). The CDC for vehicle #2 was determined to be **01-FDEW-1**. The winSMASH reconstruction program, damage only algorithm, was used on vehicle #2's highest severity impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 21 km.p.h. (13 m.p.h.), -19 km.p.h. (-12 m.p.h.), and -7 km.p.h. (-4 m.p.h.).

SELECTED PHOTOGRAPHS

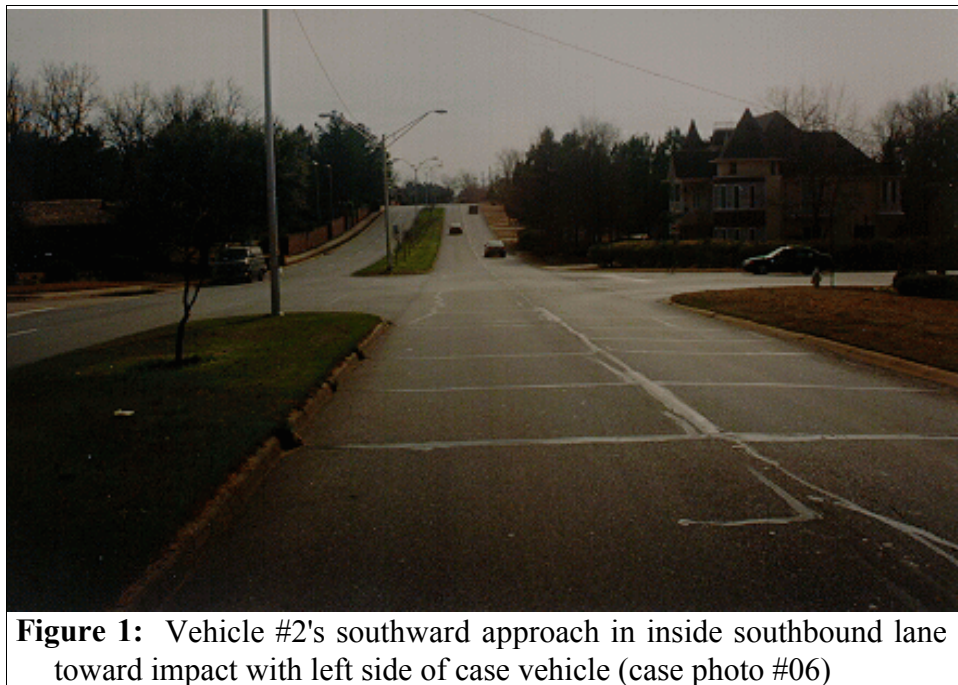


Figure 1: Vehicle #2's southward approach in inside southbound lane toward impact with left side of case vehicle (case photo #06)

Selected Photographs (continued)



Figure 2: Case vehicle's damaged left side, looking rearward (case photo #12)



Figure 3: Case vehicle's damaged left side, looking forward (case photo #14)

Selected Photographs (continued)



Figure 4: Case vehicle's driver seating area and left side air bag module (case photo #22)



Figure 5: Outside surface of case vehicle's left side air bag (case photo #24)

Selected Photographs (continued)



Figure 6: Inside surface of case vehicle's left side air bag (case photo #26)



Figure 7: Case vehicle's back seat showing intruded left rear door and removed left rear seat cushion (case photo #36)

Selected Photographs (continued)



Figure 8: Vehicle #2's front and left side (case photo #38)