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SCI/NASS COMBINATION CASE REPORT

CASE NUMBER - NASS-1999-05-103G

LOCATION - Pennsylvania

VEHICLE - 2000 MERCEDES BENZ S430V

CRASH DATE - September, 1999

Submitted:

December 21, 2000

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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> SCI/NASS combination investigation of a side air bag deployment crash involving a 2000 Mercedes Benz S430V with manual safety belts, dual front air bags, door-mounted side air bags in the front and rear doors and side curtain air bags in the roof side rail, and a 1997 Oldsmobile 88.					
16. <i>Abstract</i> This report covers a SCI/NASS combination investigation of a side air bag deployment crash that involved a 2000 Mercedes Benz S430V (case vehicle) and a 1997 Oldsmobile 88. This crash is of special interest because the Mercedes was equipped with door-mounted side air bags in the front and back seat rows and side curtain air bags in the roof side rails. All three of the left side air bags deployed as a result of the collision events. None of the three occupants in the Mercedes sustained any injury. The Mercedes was traveling west negotiating a left curve in the westbound lane of a two-lane, undivided, county roadway. The Oldsmobile was traveling east in the eastbound lane of the same roadway and steered into the westbound lane to avoid an animal. The Mercedes driver braked and steered right. The left side of the Mercedes was impacted by the front of the Oldsmobile, causing the Mercedes' front and back seat left door-mounted side air bags and the left side curtain to deploy. The Mercedes was redirected to the north edge of the roadway where it impacted a guardrail with its right front fender and came to rest heading in a westerly direction. The Oldsmobile continued traveling in a northeasterly direction and also impacted the guardrail on the north edge of the roadway and came to rest in the westbound lane heading in a westerly direction. Both vehicles were towed from the scene due to damage.					
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Additional photographs are available in EDCS case NASS-1999-05-103G.

This combination SCI/NASS crash investigation concerns a 2000 Mercedes Benz S430V (case vehicle, NASS vehicle #2) and a 1997 Oldsmobile 88 (NASS vehicle #1). The crash occurred in September 1999, at 1:34 p.m., in Pennsylvania and was investigated by the applicable police department. This crash is of special interest because the Mercedes was equipped with door-mounted side air bags in the front and rear doors and roof side rail-mounted inflatable curtains. The three left side air bags deployed as a result of a left side impact. The restrained driver (43-year-old male) was not injured. The NASS investigator inspected the scene and the case vehicle and interviewed the case vehicle driver in September 1999. This report is based on the Police Crash Report, the NASS investigator's coded forms and photographs, the Mercedes' driver interview, scene and vehicle inspections, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The Mercedes was traveling west in the westbound lane of a two-way, undivided county roadway, negotiating a curve left and intending to continue traveling west (**Figure 1**). The Oldsmobile was traveling east in the eastbound lane of the same roadway negotiating a curve right. The bituminous roadway was curved and level at the point of the crash, with no defects. It was daylight at the time of the crash with no adverse weather and the roadway was dry. The posted speed limit was 40 km.p.h. [25 m.p.h.]. The roadway was controlled by a curve warning sign. The roadway was divided by a double yellow line and bordered by solid white fog lines, with a W-beam guardrail along the north edge. According to the Police Crash Report, the driver of the Oldsmobile steered into the westbound lane to avoid an animal. The Mercedes' driver braked and steered to the right in an attempt to avoid the crash with the Oldsmobile. The crash occurred in the westbound lane of the roadway.

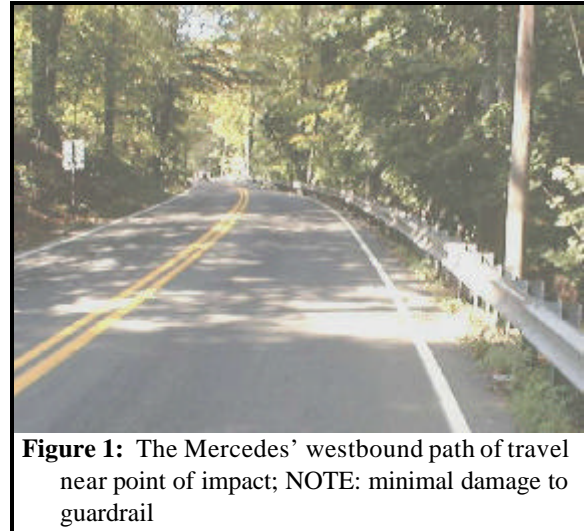


Figure 1: The Mercedes' westbound path of travel near point of impact; NOTE: minimal damage to guardrail

The front of the Oldsmobile impacted the left side of the Mercedes, causing the Mercedes' left side door-mounted air bags (front and rear doors) and left side roof rail-mounted curtain to deploy. The Mercedes veered in a west-northwesterly direction and its right front fender impacted the guardrail along the north edge of the roadway. The Mercedes came to rest on the roadway, in the westbound lane heading in a westerly direction.

After impacting the Mercedes, the Oldsmobile continued in a northeasterly direction, struck the guardrail along the north edge of the roadway and came to rest in the westbound roadway heading in an easterly direction. Both vehicles were towed from the scene due to damage. None of the three occupants in the Mercedes nor the lone driver of the Oldsmobile were transported to a hospital.

The case vehicle was a rear wheel drive 2000 Mercedes Benz S430V, five-passenger, four-door sedan (VIN: WDBNG70J9YA-----) equipped with a 4.3 liter V8 engine, power-assisted rack-and-pinion steering, and a 5-speed automatic transmission with a console-mounted selector lever. Braking was achieved by a power-assisted, four-wheel disc anti-lock system. The Mercedes' wheelbase was 309 centimeters [121.5 inches] and it had a recorded mileage of 1,524 miles [2,453 kilometers].

CASE VEHICLE DAMAGE

The Mercedes' initial contact with the Oldsmobile involved the left front fender just behind the left front axle and extended rearward (**Figures 2 and 3**). The Mercedes' front left tire was restricted. The maximum crush to the Mercedes' left side was a measured 12 centimeters [4.7 inches]. The wheelbase on the left side was shortened 2 centimeters [0.8 inches], with the right side being lengthened 3 centimeters [1.2 inches]. The left front tire was deflated during the vehicle's initial impact with the Oldsmobile. Direct damage to the Mercedes from the right side impact with the guardrail was swiping-type damage with maximum crush limited to surface scratches only.

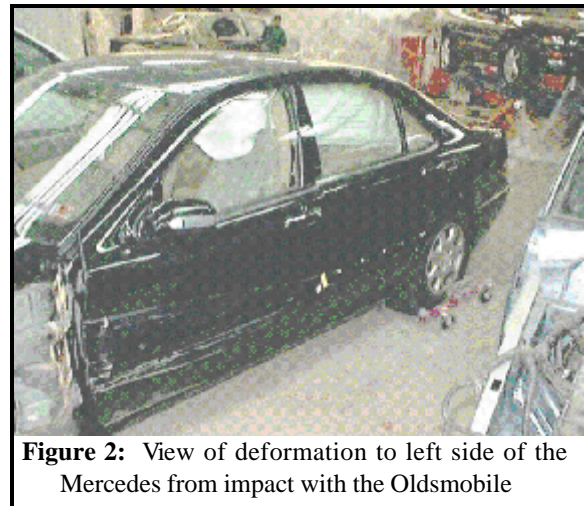


Figure 2: View of deformation to left side of the Mercedes from impact with the Oldsmobile

The CDCs were determined to be: **11-LYEW-1 (340)** and **01-RFES-1 (20)** for the Mercedes. No reconstruction program was used on the Mercedes' left side impact due to the collision conditions being beyond the scope of the WinSMASH reconstruction program (swiping-type damage). This contractor's visually estimated Delta V for the left side impact is between 8 km.p.h. [5 m.p.h.] and 16 km.p.h. [10 m.p.h.].

The Mercedes' interior showed no visible evidence of any contact by the vehicle's occupants except a hair on the inflatable curtain near the Mercedes driver's seat position. The Mercedes driver and front right passenger knee bolsters showed no evidence of scuffing or deformation, and there was no evidence of intrusion.

Because the right side damage was very minor and the Mercedes was partially disassembled, photos of the right side are not included in this report.



Figure 3: Vertical view of left front fender removed from the Mercedes

The Mercedes was equipped with a total of eight air bags, consisting of front air bags at the driver and front right seat positions, door-mounted side air bags at the four outboard seat positions, and inflatable curtains mounted in the roof side rails that extended from the front seat to the back seat positions on both sides. Both left side door-mounted air bags and the left side curtain in the left side roof rail deployed as a result of the left side impact.

Both left side door air bags deployed from their respective door panels above the armrests where each was mounted. Both door-mounted air bag module covers had overall dimensions of 5 centimeters [2 inches] vertically and 35 centimeters [13.8 inches] horizontally. The covers appear to be made of thick vinyl/leather type material. Both left side door-mounted air bags were 50 centimeters [19.7 inches] longitudinally and 15 centimeters [5.9 inches] vertically and were not tethered or vented. An inspection of both of the Mercedes' left side door-mounted air bags and cover flaps revealed no visible evidence of direct contact (**Figures 4 and 5**). It should be noted that there was no occupant in the left rear seat position.

The Mercedes' left side inflatable curtain deployed from the left roof rail where it was mounted. The single cover flap had overall dimensions of 160 centimeters [63 inches] longitudinally and 8 centimeters [3.2 inches] vertically. The inflatable curtain's dimensions were 160 centimeters [63 inches] longitudinally and 28 centimeters [11 inches] vertically and was not tethered or vented (**Figure 6**). An inspection of the Mercedes' left side inflatable curtain and cover flap revealed no visible evidence of direct contact except for a hair on the curtain near the driver's seat position.

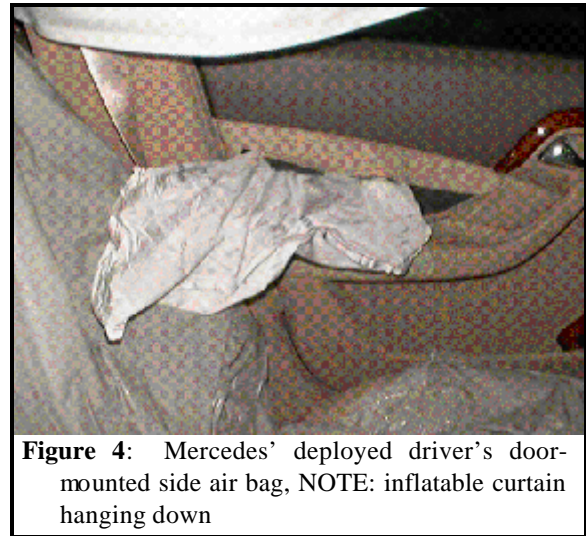


Figure 4: Mercedes' deployed driver's door-mounted side air bag, NOTE: inflatable curtain hanging down



Figure 5: Deployed left rear door-mounted side air bag; NOTE: inflatable curtain hanging down

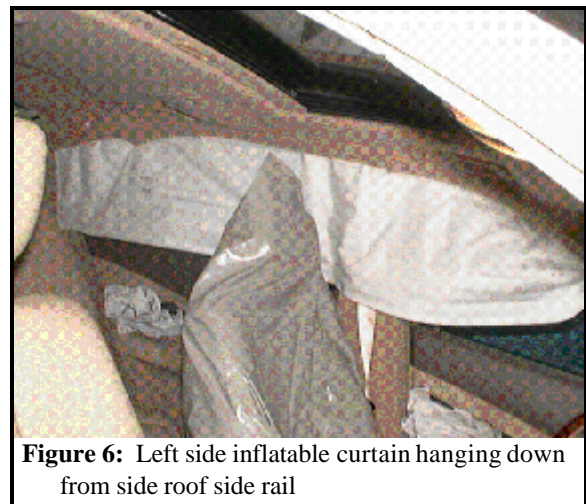


Figure 6: Left side inflatable curtain hanging down from side roof side rail

The Mercedes' two frontal air bags did not deploy in the left side impact. The driver's front air bag was mounted to the steering wheel hub and the front right passenger's front air bag was mounted to the knee bolster (**Figure 7**).

CASE VEHICLE DRIVER

The Mercedes' driver (43-year-old male, White, non-Hispanic, 188 centimeters and 88 kilograms [74 inches, 194 pounds]) was restrained by his available, active, three-point, lap and shoulder safety belt system which was equipped with an Emergency Tensioning Retractor (ETR). Safety belt usage was based on the police report and the driver's interview because the left side impact would not have caused any significant loading to the system. There was no mention of the driver's ETR actuating during the crash.

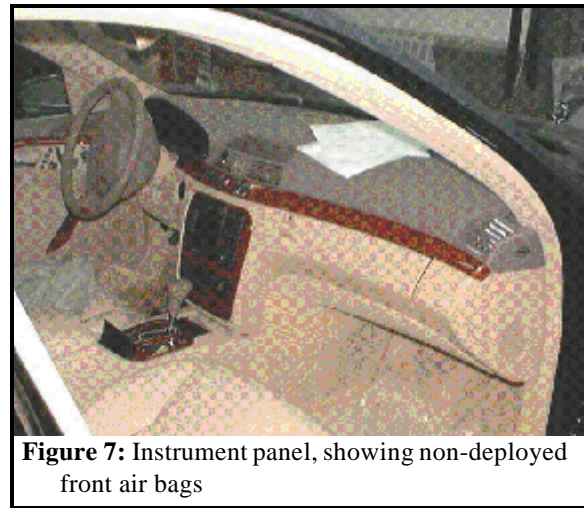


Figure 7: Instrument panel, showing non-deployed front air bags

The Mercedes' driver was seated in an upright posture with his back against the seat back, his left foot was on the floor, his right foot on the brake, and both hands on the steering wheel. His seat track was located between its middle and rearmost position, the seat back was slightly reclined, and the tilt steering wheel was in the center position. He steered to the right and braked just prior to impact in an attempt to avoid the crash. His attempted avoidance maneuvers caused him to move slightly forward and to the left prior to impact. The Mercedes' impact with the Oldsmobile resulted in the Mercedes' driver moving further forward and leftward, toward the 11 o'clock direction of principal force. He contacted the deploying door-mounted air bag, causing an abrasion on his left forearm, and his head contacted the inflatable curtain as the Mercedes veered to the right. The Mercedes' subsequent impact with the guardrail resulted in the driver moving back to the right. At final rest the driver was conscious and remained in his seat.

CASE VEHICLE DRIVER'S INJURIES

The driver was not transported and was not treated by EMS personnel. The driver's only complaint was an abrasion to his left forearm from contacting the deploying door-mounted side air bag.

CASE VEHICLE'S FRONT RIGHT PASSENGER

The Mercedes' front right passenger (11-year-old male, White, non-Hispanic, 150 centimeters, 30 kilograms [59 inches, 66 pounds]) was wearing his available, active, three-point, lap-and-shoulder safety belt system equipped with an Emergency Tensioning Retractor (ETR). Safety belt usage was based on the police report and the driver's interview (father) because the left side impact would not have caused any significant loading to the system. There was no mention of the Mercedes' front right passenger ETR actuating during the crash.

The Mercedes' front right passenger was seated in an upright posture, his feet on the floor, and both hands on his lap. His seat track was located in its middle position, and the seat back slightly reclined. The Mercedes' driver steered to the right and braked just prior to impact in an attempt to avoid the crash. These attempted avoidance maneuvers caused the front right passenger to move slightly forward and to the left prior to impact. The Mercedes' impact with the Oldsmobile resulted in the Mercedes' front right passenger moving further forward and leftward, toward the 11 o'clock direction of principal force. The front right passenger's seat belt usage kept him from being thrown onto the driver and/or center instrument panel. The Mercedes' subsequent impact with the guardrail resulted in the front right passenger moving back to the right. At final rest the front right passenger remained in his seat near his original seating position. The front right passenger was not transported or treated by EMS personnel. He reported no injuries or complaints of soreness.

CASE VEHICLE'S BACK SEAT CENTER PASSENGER

The Mercedes' back seat center passenger (10-year-old female, White, non-Hispanic, 135 centimeters, 24 kilograms [53 inches, 53 pounds]) was restrained by her available, active, three-point, lap-and-shoulder safety belt system, which was configured such that the shoulder belt passed over her left shoulder and buckled at her right hip. Safety belt usage was based on the police report and the driver's (father) interview.

The Mercedes' back seat center passenger was seated in an upright posture, her feet hanging down above the floor, and both hands on her lap. The Mercedes' driver steered to the right and braked just prior to impact in an attempt to avoid the crash. These attempted avoidance maneuvers caused the back center passenger to move slightly forward and to the left prior to impact. The Mercedes' impact with the Oldsmobile resulted in the Mercedes' back center passenger continuing further forward and leftward, toward the 11 o'clock direction of principal force. The back center passenger's seat belt usage kept her from being thrown against the front seat backs and/or center console. The Mercedes' subsequent impact with the guardrail resulted in the back center passenger moving back to the right. At final rest the back center passenger remained in her seat near her original seating position. The back center passenger was not transported or treated by EMS personnel. She reported no injuries or complaints of soreness.

OTHER VEHICLE

The other vehicle was identified on the Police Crash Report as a rear wheel drive 1997 Oldsmobile 88, six-passenger, four-door sedan (VIN: unknown). Based on standard specifications, the Oldsmobile had a 4-speed automatic transmission, 3.8 liter V6 engine and a four-wheel anti-lock braking system. The Oldsmobile's wheelbase was 281 centimeters [110.8 inches]. Because the Oldsmobile was not inspected, the odometer reading is not known and it is not known how the vehicle's interior was finished. Based on standard specifications, it was probably equipped with front air bags for the driver and front right passenger seat positions and three-point lap-and-shoulder safety belts in the four outboard seat positions. Damage to the Oldsmobile is unknown.

