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SCI/NASS COMBINATION CASE REPORT

CASE NUMBER - NASS-99-12-081G
LOCATION - Michigan
VEHICLE - 1998 OLDSMOBILE SILHOUETTE
CRASH DATE - May, 1999

Submitted:

April 26, 2000
Revised:
June 7, 2000

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

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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* SCI/NASS combination investigation of a side air bag deployment crash involving a 1998 Oldsmobile Silhouette minivan with manual safety belts and dual front and side air bags, and a 1998 Chevrolet S-10 pick-up truck			
16. *Abstract* This report covers a SCI/NASS combination investigation of a side air bag deployment crash that involved a 1998 Oldsmobile Silhouette minivan (case vehicle) and a 1998 Chevrolet S-10 pick-up truck (vehicle #1). This crash is of special interest because the case vehicle was equipped with seat back-mounted side air bags, one of which deployed as a result of a left side impact. The case vehicle's restrained driver [35-year-old, White (non-Hispanic), male] was not injured. The case vehicle was traveling north in the inside lane of a three-lane, two-way, undivided county roadway entering a partially controlled intersection. Vehicle #1was traveling east in the inside lane of another three-lane, two-way, undivided county roadway entering the same partially controlled intersection (east and westbound traffic had a flashing red beacon and stop sign). The left side of the case vehicle was impacted by the front of vehicle #1, causing the case vehicle driver's seat back-mounted side air bag to deploy. The case vehicle driver was seated with his seat track located in its middle position and the tilt steering wheel in its upmost position. He was restrained by his available, active, three-point, lap-and-shoulder safety belt and sustained only soreness as a result of this crash. The front right passenger in the case vehicle [36-year-old, White (non-Hispanic) female] was seated turned to her left with her seat track located in its middle position and was restrained by her available, active, three-point, lap-and-shoulder safety belt. She did not sustain any injuries as a result of this crash. The second seat left passenger in the case vehicle [9-year-old, White (non-Hispanic) female] was seated turned to her right and was restrained by her available, active, three-point, lap-and-shoulder safety belt. She sustained minor injuries including a contusion to the left side of her head and a seatbelt abrasion to her left shoulder. Both vehicles were towed from the scene due to damage.			
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BACKGROUND

NASS-99-12-081G

This combination SCI/NASS crash investigation concerns a 1998 Oldsmobile Silhouette (case vehicle/vehicle #2) and a 1998 Chevrolet S-10 (vehicle #1). The crash occurred in May, 1999, at 4:45 p.m., in Michigan and was investigated by the applicable police department. This crash is of special interest because the case vehicle was equipped with seat back-mounted side air bags, one of which deployed as a result of a left side impact, and the restrained driver [35-year-old White (non-Hispanic) male] was not injured. Another note of interest is that the vehicle #1 was equipped with a passenger air bag cut-off switch for the front right air bag which was turned to the off position. The NASS investigator inspected the scene and both vehicles in May 1999. This report is based on the Police Crash Report, the NASS investigator's coded forms and scene photographs, driver interviews, scene and vehicle inspections, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling north in the inside northbound lane of a three-lane, two-way, undivided county roadway and was approaching a four-leg, partially controlled intersection intending to continue traveling north (**Figure 1**). Vehicle #1 was traveling east in the eastbound lane of the intersecting, three-lane, two-way, undivided county roadway and entered into the intersection. The case vehicle's driver was unable to attempt any avoidance maneuvers and was struck by vehicle #1. The crash occurred in the intersection of the two roadways.

Figure 1: Case vehicle's path of travel prior to entering intersection; NOTE: right turn lane and overhead flashing yellow light

The front of vehicle #1 impacted the left side of the case vehicle, causing the case vehicle's driver side air bag to deploy. The case vehicle continued in a northerly direction rotating counterclockwise with its right rear tire impacting the curb on the northeast corner. The case vehicle came to rest on the street, in the northeast corner of the intersection, heading in a west-northwesterly direction. Both vehicles were towed from the scene due to damage.

None of the three occupants in the case vehicle nor the two occupants in vehicle #1 were transported to a hospital.

Both bituminous roadways were straight and level at the point of the crash. It was daylight at the time of the crash with the roadways being wet and with no defects. The posted speed limit is 89 km.p.h. (55 m.p.h.) for both roadways. The east/west traffic was controlled by a flashing red beacon and a stop sign. The north/south traffic was controlled by a flashing yellow beacon. Both roadways were divided by a double yellow line.

The case vehicle was a front wheel drive 1998 Oldsmobile Silhouette, seven-passenger, four-door minivan (VIN: 1GHDX03E5WD------) equipped with a 3.4 liter V6 engine, power-assisted rack-and-pinion steering, and a 4-speed automatic transmission with column-mounted selector lever. Braking was achieved by an power-assisted, front disc and rear drum system. The case vehicle's wheelbase of 305 centimeters (120 inches). The case vehicle had a recorded mileage of 33,701 kilometers (20,941 miles).

The front seat of the case vehicle was equipped with adjustable front bucket seats with adjustable head restraints and manual, three-point, lap-and-shoulder safety belts. The vehicle was equipped with rigid knee bolsters for the driver and front right passenger seat positions. The second row of seats were box mounted seats with adjustable head restraints and manual, three-point lap-and-shoulder safety belts. The third row had a bench seat with folding back and adjustable head restraints for the outward positions. The front safety belt systems were equipped with manually operated height adjusters for the D-rings with both in the full-down position. Automatic restraint was provided by a Supplemental Restraint System (SRS) that consisted of a front air bags and seat back-mounted side air bags for the driver and front right seat positions.

CASE VEHICLE DAMAGE

The case vehicle's initial contact with vehicle #1 involved the left side from just behind the left rear axle forward (**Figure 2**). The case vehicle's right rear tire impact with the curb involved the tire only. Direct damage from the case vehicle's initial impact extended from 6 centimeters (2.4 inches) behind the left rear axle forward 202 centimeters (79.5 inches). The maximum crush to the case vehicle's left side was a measured 16 centimeters (6.3 inches) and was located between C3 and C4 (**Figure 3**). The wheel base on the left side was shortened 1 centimeter (0.4 inches) with the right side remaining unchanged. The right rear tire had been deflated during the curb impact and subsequently broke off from the rear axle. There was no glazing damage to the case vehicle.

Figure 2: Front left oblique view of case vehicle

Figure 3: Case vehicle's left side damage

The CDCs were determined to be: **11-LZEW-2 (-40)** and **03-RBWN-1 (+90)** for the case vehicle [maximum crush was 16 centimeters (6.3 inches) on the left side]. No reconstruction program was used on the case vehicle's left side impact due to one of the collision conditions (i.e., vehicle #1 was repaired) being beyond the scope of the WinSMASH reconstruction program; however, this contractor's visually estimated Delta V for the left side impact is

between 10 km.p.h. (6 m.p.h.) and 18 km.p.h. (11 m.p.h.).

An examination of the case vehicle's interior showed no visible evidence of contact by the vehicle's occupants. The energy absorbing steering column showed no evidence of compression. The case vehicle driver and front right passenger knee bolsters showed no evidence of scuffing or deformation. There was no visible evidence of intrusion to the case vehicle's interior.

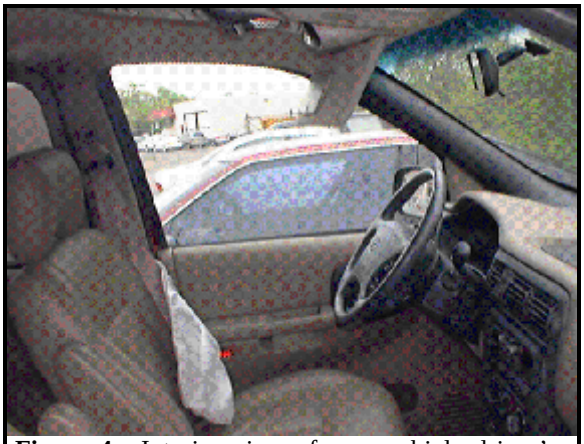


Figure 4: Interior view of case vehicle driver's seating area with deployed seat back-mounted air bag visible

AUTOMATIC RESTRAINT SYSTEM

The case vehicle was equipped with a SRS that consisted of front air bags and seat back-mounted side air bags at the driver and front right passenger seat positions. The only air bag that deployed was the case vehicle driver's side air bag (**Figure 4**). The driver's side air bag deployed as a result of the case vehicle's left side impact with vehicle #1. The driver's side air bag deployed from the outside of the driver's seat back where it was mounted. The module cover consisted of a single symmetrical cover flap with overall dimensions of 18 centimeters (7.1 inches) at the vertical seam and 7 centimeters (2.8 inches) horizontally. The flap were made of thick vinyl- type material. The side air bag was 45 centimeters (17.7 inches) longitudinally and 27 centimeters (10.6 inches) vertically and was not tethered (**Figure 5**). The driver's side air bag had one vent port (unknown diameter) located at the 11 o'clock position.

Figure 5: Close-up of backside of case vehicle's seat back-mounted driver side air bag; NOTE: vent port

An inspection of the case vehicle driver's side air bag and cover flap revealed no visible evidence of direct contact from the driver.

CASE VEHICLE DRIVER KINEMATICS

The case vehicle's [35-year-old, White (non-Hispanic) male) driver was restrained by his available, active, three-point, lap-and-shoulder safety belt system. Seatbelt usage was based on the police report and the driver's interview since the left side impact would not have caused any significant loading to the system.

The case vehicle's driver [168 centimeters and 95 kilograms (66 inches, 209 pounds)] 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 accelerator, and both hands on the steering wheel. His seat track was located in its middle position, the seat back was slightly reclined, and the tilt steering wheel was in the full-up position.

The case vehicle's driver made no avoidance maneuvers and his pre-impact posture remained unchanged. The case vehicle's impact with vehicle #1 resulted in the case vehicle's driver continuing forward and leftward, contacting the side arm rest with his abdomen as the case vehicle rotated counterclockwise. The case vehicle's subsequent impact with the curb resulted in the driver moving back to the right. At final rest the driver was conscious and remained in his seat.

CASE VEHICLE DRIVER INJURIES

The driver was not transported and was not treated by EMS personnel. The driver complained of only soreness to the left side of his abdomen.

CASE VEHICLE FRONT RIGHT PASSENGER KINEMATICS

The case vehicle's front right passenger [36-year-old, White (non-Hispanic) female] was restrained by her available, active, three-point, lap-and-shoulder safety belt system. Seatbelt usage was based on the police report and the driver's interview since the left side impact would not have caused any significant evidence of loading to the system.

The case vehicle's front right passenger [165 centimeters and 68 kilograms (65 inches,150 pounds)] was seated in an upright posture sitting sideways turned to talk with another occupant, her feet on the floor, and both hands on her lap. Her seat track was located in its middle position, and the seat back sightly reclined.

The case vehicle's driver made no avoidance maneuvers and the front right passenger's pre-impact posture remained unchanged. The case vehicle's impact with vehicle #1 resulted in the front right passenger continuing forward and leftward as the case vehicle rotated counterclockwise. The front right passenger's seat belt usage kept her from being thrown onto the driver and/or center instrument panel. The case vehicle's subsequent impact with the curb resulted in her moving back to her right. At final rest the front right passenger remained in her seat near her original seating position.

CASE VEHICLE FRONT RIGHT PASSENGER INJURIES

The front right passenger was not transported or treated by EMS personnel. She reported no injuries or complaints of soreness.

CASE VEHICLE SECOND SEAT LEFT PASSENGER KINEMATICS

The case vehicle's [9-year-old, White (non-Hispanic) female] second seat left passenger was restrained by her available, active, three-point, lap-and-shoulder safety belt. Safety belt usage was based

on the police report and the driver's (father) interview since the left side impact would not have caused any significant loading to the system.

The case vehicle's second seat left passenger [137 centimeters and 39 kilograms (54 inches, 86 pounds)] was seated in an upright posture, sitting sideways turned to the right talking with the front right occupant (i.e., mother), her feet were on the seat, and both hands on her lap. Her seat track was not adjustable and her seat back was upright.

The case vehicle's driver made no avoidance maneuvers and the second seat left passenger's pre-impact posture remained unchanged. The case vehicle's impact with vehicle #1 resulted in the case vehicle's second seat left passenger continuing slightly forward and leftward contacting the left B-pillar with her head as the case vehicle rotated counterclockwise. The case vehicle's subsequent impact with the curb resulted in this passenger moving back to the right. At final rest she was conscious and remained in her seat near her original seating position (**Figure 6**).

Figure 6: Interior view of CV's second seat left passenger's seat position

CASE VEHICLE SECOND SEAT LEFT PASSENGER INJURIES

The second seat left passenger was not transported or treated by EMS personnel. The second seat left passenger sustained a contusion to the left side of her head and a seat belt abrasion to her left shoulder.

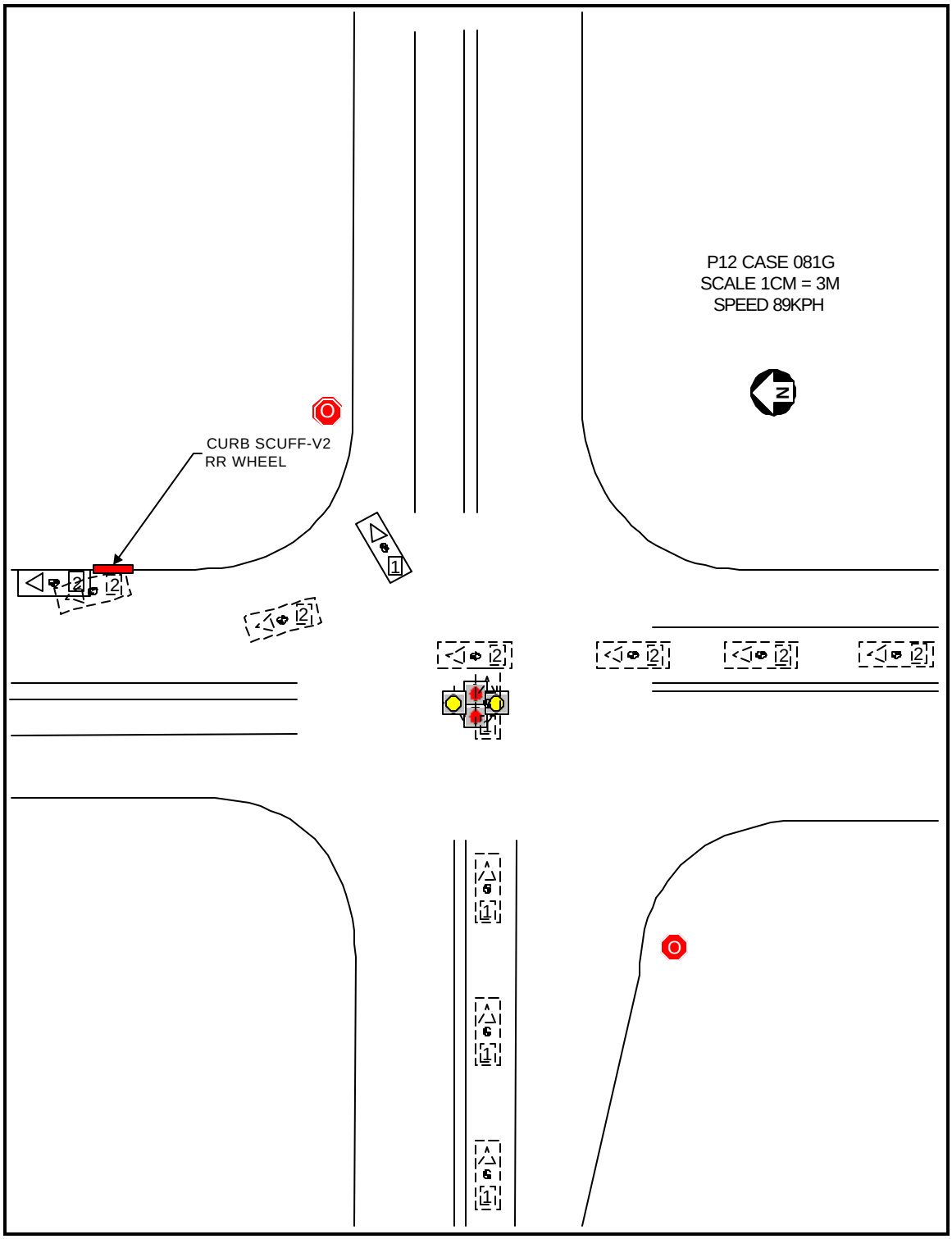
Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Contusion, front-left head	190402.1 minor	Left B-pillar	Certain	Interview
2.	Abrasion, left shoulder	790202.1 minor	Safety belt webbing	Certain	Interview

VEHICLE #1

Vehicle #1 was a rear wheel drive 1998 Chevrolet S-10, three-passenger, two-door, pick-up truck (VIN: 1GCCS144XWK------) equipped with a 4-speed automatic transmission and a 2.2 liter,V4 engine vehicle. Vehicle #1's wheelbase was 275 centimeters (112 inches). Braking was achieved by a dual hydraulic, self adjusting front disk and rear drum anti-lock system. The vehicle's odometer was electronic so the recorded mileage is unknown.

Vehicle #1 was equipped with front air bags for the driver and front right passenger seat positions and three-point lap-and-shoulder safety belts for the front outboard seating positions. There was a cut-off switch located in the center of the case vehicle's instrument panel for the front right passenger's front air bag which was turned to the off position. The interior was equipped with adjustable bucket seats with integral head restraints for the driver and front right passenger. Damage to vehicle #1 is unknown because it was repaired prior to the NASS researcher's inspection (**Figure 7**).

Figure 7: View of vehicle #1's repaired front end


P12 CASE 081G
SCALE 1CM = 3M
SPEED 89KPH
N
CURB SCUFF-V2
RR WHEEL