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REMOTE REDESIGNED AIR BAG REPORT

CASE NUMBER - IN98-017
LOCATION - MICHIGAN
VEHICLE - 1998 PLYMOUTH BREEZE
CRASH DATE - January, 1998

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February 18, 2002

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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.

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15. Supplementary Notes Remote air bag deployment investigation involving a 1998 Plymouth Breeze, four-door sedan, with manual safety belts and dual front redesigned air bags, and a 1994 Chevrolet S-10, pickup truck					
16. Abstract This report covers a remote investigation of an air bag deployment crash that involved a 1998 Plymouth Breeze (case vehicle) and a 1994 Chevrolet S-10, pickup truck (other vehicle). This crash is of special interest because the case vehicle was equipped with redesigned air bags and the front right passenger (7-year-old female) sustained only minor injuries from her deploying front right passenger air bag. The case vehicle was traveling west-northwest in the inside lane of a five-lane, undivided, city street (i.e., there were two essentially westbound and eastbound through lanes, separated by a bidirectional left-hand turn lane). The Chevrolet was traveling south-southwestward and exiting a two-lane, commercial driveway, intending to turn left, across the case vehicle's path of travel. The crash occurred in the junction of the commercial driveway and the inside west-northwestbound lane. The front of the case vehicle impacted the front left of the Chevrolet causing the case vehicle's driver and front right passenger supplemental restraints (air bags) to deploy. The case vehicle either continued straight ahead a short distance or was redirected slightly leftward while the Chevrolet was rotated clockwise. The front right passenger was seated with her seat track located between its middle and rearmost positions and was restrained by her available, active, three-point, lap-and-shoulder, safety belt system. She sustained, according to the interview with the case vehicle's driver (i.e., father) and her medical records, minor injuries which included: abrasions to left forehead, left cheek, and to her nose, and unspecified contusions. These abrasions resulted from her contact with her deploying air bag. The driver (35-year-old male) was seated with his seat track located between its middle and rearmost positions, and the tilt steering wheel was located in its middle position. He was restrained by his available, active, three-point, lap-and-shoulder, safety belt system and did not sustain any injuries as a result of this crash.					
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This remote report was brought to NHTSA's attention on March 13, 1998 through GES sampling activities. This crash involved a 1998 Plymouth Breeze (case vehicle) and a 1994 Chevrolet S-10, pickup truck (other vehicle). The crash occurred in January, 1998, at 2:39 p.m., in Michigan and was investigated by the applicable city police department. This crash is of special interest because the case vehicle was equipped with redesigned air bags and the front right passenger [7-year-old, White (non-Hispanic) female] sustained only minor injuries from her deploying front right passenger air bag. This contractor interviewed the driver for the case vehicle on March 19, 1998. This report is based on the Police Crash Report, an interview with the case vehicle's driver, occupant kinematic principles, the occupant's medical records, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling west-northwest in the inside lane of a five-lane, undivided, city street and intended to continue traveling west-northwestward (i.e., there were two essentially westbound and eastbound through lanes, separated by a bidirectional left-hand turn lane). Traffic had stopped in the outside west-northwestbound lane; as a result the Chevrolet pulled out between the stopped vehicle's. The Chevrolet was traveling south-southwestward and exiting a two-lane, commercial driveway, intending to turn left, across the case vehicle's path of travel, and travel east-southeastward. According to the case vehicle's driver, he braked, attempting to avoid the crash. The crash occurred in the junction of the commercial driveway and the inside west-northwestbound lane.

The city roadway was straight, according to the Police Crash Report, but very little else is known about the environment at the area of impact, including: the vertical alignment, the type of pavement surface, the presence or absence of shoulders and/or curbs or edge lines, and the type of pavement markings present. It is also unknown if any traffic controls were present, but the posted speed limit was 40 km.p.h. (25 m.p.h.). Based on the available information, at the time of the crash the light condition was daylight, the atmospheric condition was cloudy, and the road pavement was dry. Traffic density was moderate, and the site of the crash was urban but the developmental characteristics of the area are unclear.

The front (**Figure 1**) of the case vehicle impacted the front left of the Chevrolet causing the case vehicle's driver and front right passenger supplemental restraints (air bags) to deploy. Based on the converging trajectories and the available vehicular damage information, the case vehicle either continued straight ahead a short



Figure 1: Rental company photo of damage to case vehicle's front; Note: damage appears to involve primarily front right half

distance or was redirected slightly leftward. On the other hand, the Chevrolet was most likely rotated clockwise.

CASE VEHICLE

The 1998 Plymouth Breeze was a front wheel drive, five-passenger, four-door sedan (VIN: 1P3EJ46C7WN-----) equipped with a 2.0L, I-4 engine and the optional three-speed automatic transmission. Four wheel anti-lock brakes are an option for this model, but it is unknown if the case vehicle was so equipped. The case vehicle's wheelbase was 274 centimeters (108.0 inches), and the odometer reading is unknown because the case vehicle was not inspected.

The interior of the case vehicle was equipped with adjustable front bucket seats; a non-adjustable back bench seat; continuous loop, three-point, lap-and-shoulder, safety belt systems at the front and back outboard positions; and a two-point, lap belt system at the back center position. The adjustability (i.e., integral versus adjustable) and location of the head restraints (i.e., back as well as front) is unknown. It is also unknown whether the front seat belt systems were equipped with manually operated height adjusters for the "D"-rings. The vehicle was equipped with knee bolsters for both the driver and front right passenger. Automatic restraint was provided by a Supplemental Restraint System (SRS) that consisted of a frontal air bag for the driver and front right passenger seating positions. Both frontal air bags deployed as a result of the case vehicle's frontal impact with the Chevrolet.

The case vehicle's contact (**Figure 1** above) with the Chevrolet involved its front right half (most likely). Based on the photograph, direct damage began near the front right bumper corner and extended an unknown distance along the front bumper. Maximum crush was estimated to be 8 centimeters (3.1 inches). Based on the available photograph, the case vehicle's front bumper fascia, grille, and hood were directly damaged and crushed rearward. It is unknown if any of the case vehicle's tires were damaged or deflated. According to the case vehicle's driver, neither of the front tires were physically restricted. Both the right and left headlight and turn signal assemblies sustained induced damage as well both the left and right fenders.

Based on the one available photograph, the CDC for the case vehicle is estimated as: **01-FZEW-1 (20)**. The WinSMASH reconstruction program, CDC damage only algorithm, was used on the case vehicle's highest severity impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 15.4 km.p.h. (9.6 m.p.h.), -14.5 km.p.h. (-9.0 m.p.h.), and -5.3 km.p.h. (-3.3 m.p.h.). The case vehicle was towed due to damage.

The case vehicle was equipped with a Supplemental Restraint System (SRS) that contained frontal air bags at the driver and front right passenger positions. Both air bags deployed as a result of the frontal impact with the Chevrolet. The case vehicle's driver air bag was located in the steering wheel hub. Because this case is a remote investigation, there is no information available about the air bag module's cover flaps and air bag. Furthermore, the existence, number, and size of tethers or vent ports could not be assessed nor could the shape or size of the driver's air bag be described. The investigating police officer made no mention of any evidence of contact or damage to the air bag's fabric.

Based on the driver's interview, the front right passenger's air bag was located in the top of the instrument panel. Because this case is a remote investigation, there is likewise no information available about the front right air bag module's cover flaps and air bag. Likewise, the existence, number, and size of tethers or vent ports could not be assessed nor could the shape or size of the front right passenger's air bag be described. The investigating police officer made no mention of any evidence of contact or damage to the air bag's fabric.

CASE VEHICLE FRONT RIGHT PASSENGER

According to the case vehicle's driver, immediately prior to the crash the case vehicle's front right passenger [[7-year-old, White (non-Hispanic) female; 135 centimeters and 28 kilograms (53 inches, 62 pounds)] was seated in an upright posture with her back against the seat back, both feet angled downward over the front edge of the seat's cushion, her left hand on her lap, and her right hand on the right front door's arm rest. Her seat track was located between its middle and rearmost positions.

The case vehicle's front right passenger was restrained by her available, active, three-point, lap-and-shoulder, safety belt system. However, there was no mention of belt pattern bruising and/or abrasions to the front right passenger's body.

The case vehicle's driver braked, attempting to avoid the crash. As a result of this attempted avoidance maneuver and the use of her available safety belts, the front right passenger most likely moved slightly forward just prior to impact. The case vehicle's impact with the Chevrolet enabled the case vehicle's front right passenger to continue forward and slightly rightward toward the case vehicle's 20 degree Direction of Principal Force as the case vehicle decelerated. The passenger's seat belt system most likely locked, preventing the passenger's forward movement from getting dangerously within the excursion area of the deploying air bag. Based on the available injury information, the deploying air bag contacted the front right passenger's face as the passenger reached her maximum forward movement. The passenger's interaction with the deploying air bag was most likely minimized because of her seat belt usage and the placement of the seat between its middle and rearmost track positions. As the case vehicle reached maximum engagement, the front right passenger further loaded her safety belts as she moved forward and/or slightly to her right as the case vehicle decelerated toward final rest. Because of the safety belts, the front right passenger most likely moved back and to her left toward the left side of her seat back as the vehicle came to final rest. 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 occupant was transported by ambulance to the hospital. She sustained minor injuries and was treated and released. Based on her medical records and the interview with the case vehicle's driver, the injuries sustained by the front right passenger included: abrasions to her left forehead, left cheek, and to her nose, and unspecified contusions. These abrasions resulted from her contact with her deploying air bag.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Abrasion left forehead	290202.1 minor	Air bag, front right passenger's	Certain	Emergency room records
2	Abrasion left cheek	290202.1 minor	Air bag, front right passenger's	Certain	Emergency room records
3	Contusions, location not further specified	990400.1 minor	Unknown contact mechanism	Unknown	Emergency room records
4	Abrasion nose	290202.1 minor	Air bag, front right passenger's	Certain	Interviewee (driver)

CASE VEHICLE DRIVER

The case vehicle's driver [i.e., father of front right passenger; 35-year-old, White (non-Hispanic) male; 185 centimeters and 91 kilograms (73 inches, 200 pounds)] was seated in a slightly reclined posture with his back against the seat back, his left foot on the floor, his right foot on the brake, and both hands on the steering wheel. The driver's seat track was located between its middle and rearmost positions, and the tilt steering wheel was located in its middle position. The case vehicle's driver was restrained by his available, active, three-point, lap-and-shoulder, safety belt system.

The case vehicle's driver braked, attempting to avoid the crash. As a result of this attempted avoidance maneuver and the use of his available safety belts, the driver most likely moved slightly forward just prior to impact. The case vehicle's impact with the Chevrolet enabled the case vehicle's driver to continue forward and slightly rightward toward the case vehicle's **20** degree Direction of Principal Force as the case vehicle decelerated. The driver's seat belt system most likely locked, preventing his forward movement from getting within the excursion area of the deploying air bag. The deploying air bag most likely contacted the driver's face and chest as he reached his maximum forward movement. The driver's interaction with the deploying air bag was most likely minimized because of his seat belt usage and the placement of the seat at its rearmost track position. As the case vehicle reached maximum engagement, the driver further loaded his safety belts and moved forward and/or slightly to his right as the case vehicle decelerated toward final rest. Because of the safety belts, the driver most likely moved back and to his left toward the left side of his seat back as the vehicle came to final rest. At final rest the exact posture of the driver is unknown, but he was most likely near his original seating position. The case vehicle's driver accompanied his daughter in the ambulance to the hospital, but did not receive any treatment. He did not sustain any injuries as a result of this crash.

OTHER VEHICLE

The 1994 Chevrolet S-10 was a rear wheel drive, three-passenger, two-door, regular cab pickup truck (VIN: 1GCCS1443RK-----) equipped with a 2.2L, L-4 engine and either standard

five-speed manual or the optional four-speed automatic transmission. Two-wheel, anti-lock brakes are standard for this model. Depending on the length of the bed of the pickup, the case vehicle's wheelbase was either 275 or 299 centimeters [108.3 (standard bed) or 117.9 (long bed) inches], and the odometer reading at inspection is unknown because the Chevrolet was not inspected.

With no available photographs, the CDC for the Chevrolet is not estimable. Maximum crush is unknown for the Chevrolet. The WinSMASH reconstruction program, missing vehicle algorithm, was used on the Chevrolet's highest severity impact. Assuming that this vehicle's truck bed was a regular bed, the Total, Longitudinal, and Lateral Delta Vs are, respectively: 16.5 km.p.h. (10.3 m.p.h.), -5.7 km.p.h. (-3.5 m.p.h.), and +15.5 km.p.h. (+9.6 m.p.h.). The Chevrolet was driven from the scene.