REDESIGNED AIR BAG REPORT

CASE NUMBER - IN97-046
LOCATION - TEXAS
VEHICLE - 1998 DODGE DAKOTA PICKUP TRUCK
CRASH DATE - November, 1997

Submitted:

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Contract Number: DTNH22-94-D-17058

Prepared for:

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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* On-site, redesigned air bag, deployment investigation involving a 1998 Dodge Dakota pickup truck, with manual safety belts and dual front air bags; a 1979 Chevrolet Monte Carlo, two-door coupe; and a 1992 Toyota Previa minivan			
16. *Abstract* This report covers an on-site investigation of an air bag deployment crash involved a 1998 Dodge Dakota pickup truck (case vehicle), a 1979 Chevrolet Monte Carlo (vehicle #2), and a 1992 Toyota Previa minivan (vehicle #3). This crash is of special interest because the case vehicle was equipped with redesigned air bags, and the unrestrained, front right passenger (20-year-old male) sustained a self-reported broken nose from contact with the windshield because the front right passenger air bag had been disabled by a key-operated switch. The case vehicle was traveling north in the center northbound through lane of a seven-lane, divided, city trafficway and intended to continue its northerly travel path through a "Tee" intersection (i.e., both the north and south roadways had three through lanes and a left-hand turn lane). Vehicle #2 had been traveling west in the westbound lane of a two-lane, undivided, intersecting city street and was entering the "Tee" intersection, intending to cross the northbound roadway and turn left and travel south on the southbound roadway. Vehicle #3 was traveling north in the inside (westernmost) through lane of the northbound roadway and also intended to continue its northerly travel path. The crash occurred in the center through lane of the northbound roadway, in the "Tee" intersection of the two trafficways. The front of the case vehicle impacted the left side of vehicle #2, causing the case vehicle's driver supplemental restraint (air bag) to deploy. The front right passenger air bag module did not deploy because it had been disabled by a key-operated switch which had been turned to the "off" position. The case vehicle's front right passenger was seated upright and his seat track was located in its rearmost position. He was not wearing his available, active, three-point, lap and shoulder belt and sustained, according to his interview, a broken nose. The case vehicle's driver (22-year-old male) was seated upright with his seat track located in its rearmost position, and the tilt steering wheel was located in its middle position. He was not wearing his available, active, three-point, lap and shoulder belt and sustained, according to his interview, a contused left elbow.			
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BACKGROUND

IN97-046

This on-site investigation was brought to NHTSA's attention on November 25, 1997, through NASS/CDS sampling activities. This crash involved a 1998 Dodge Dakota Sport pickup (case vehicle), a 1979 Chevrolet Monte Carlo (vehicle #2), and a 1992 Toyota Previa minivan (vehicle #3). The crash occurred in November, 1997, at 6:05 a.m., in Texas, 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 unrestrained, front right passenger (20-year-old male) reportedly sustained a broken nose from contact with the windshield because the front right passenger air bag had been disabled by a key-operated switch. This contractor's investigative consultant inspected the case vehicle on December 29, 1997, and vehicle #2 on March 4, 1998. Vehicle #3 was not inspected. The scene was inspected on January 13, 1998. An interview with the case vehicle's driver was conducted on July 7, 1998. This report is based on the Police Crash Report, an interview with the case vehicle's driver, scene and vehicle inspections, occupant kinematic principles, self-reported medical information, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

Figure 1: Case vehicle's northward travel path from center northbound through lane (case photo #02)

The case vehicle was traveling north in the center northbound through lane (**Figure 1**) of a seven-lane, divided, city trafficway and intended to continue its northerly travel path through a "Tee" intersection (i.e., both the north and south roadways had three through lanes and a left-hand turn lane). Vehicle #2 had been traveling west in the westbound lane of a two-lane, undivided, intersecting city street and was entering the "Tee" intersection, intending to cross the northbound roadway and turn left and travel south on the southbound roadway. Vehicle #3 was traveling north in the inside (westernmost) through lane of the northbound roadway and also intended to continue its northerly travel path. The case vehicle's driver locked-up his brakes, attempting to avoid the crash. His pre-impact travel speed was estimated at 66-80 km.p.h.(41-50 m.p.h.), the same speed he estimated for his vehicle at-impact. The posted speed limit for this location was 56 km.p.h. (35 m.p.h.). The crash occurred in the center through lane of the northbound roadway, in the "Tee" intersection of the two trafficways.

Figure 2: Case vehicle's front damage; Note: front bumper, grille, and both fenders missing (case photo #10)

The front (**Figure 2** and **Figure 3** below) of the case vehicle impacted the left side of vehicle #2 (**Figure 4** below), causing the case vehicle's driver supplemental restraint system (air bag) to deploy. The front right passenger air bag module did not deploy because it had been disabled by a key-operated switch which had been turned to the "off" position (**Figures**

5 and **6**). After the initial impact, the case vehicle rotated approximately 30 degrees counterclockwise and was, subsequently, impacted in the left side (**Figure 7** below) by the front right corner of vehicle #3. The second impact to the case vehicle involved the left front corner of its cargo bed and the left front door panel. The second impact of the crash sequence arrested the case vehicle's counterclockwise rotation and caused it to rotate approximately 260 degrees clockwise while moving northeastward toward the east edge of the northbound roadway. The case vehicle came to rest straddling the east curbline, heading southwestward. After the initial impact with the case vehicle, vehicle #2 was pushed northwestward and rotated approximately 45 degrees counterclockwise before coming to rest atop the raised concrete median separating the roadways on the north leg of the intersection. Vehicle #3 continued northward in its lane and came to rest in the inside (westernmost) lane of the northbound roadway, north of vehicle #2's final rest location.

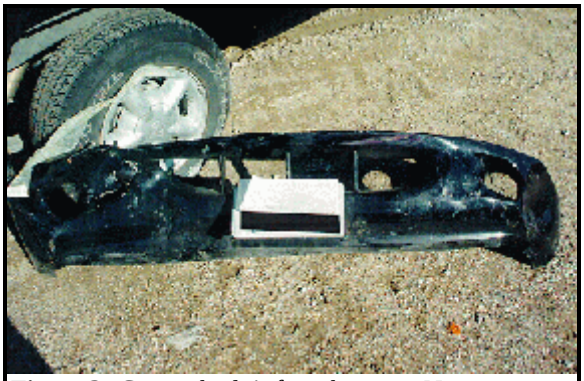

Figure 3: Case vehicle's front bumper; Note: corner to corner direct damage (case photo #12)

Figure 4: Vehicle #2's left-side damage; Note: direct contact to "B" pillar and "C" pillar (case photo

Figure 5: Case vehicle's instrument panel; Note: front right passenger air bag did not deploy, off-switch located under stereo (case photo #35)

Figure 6: Close-up of off (disabling) switch for case vehicle's front right passenger air bag; Note: center key lock turned to "off" position (case photo #36)

CASE VEHICLE

The case vehicle was a rear wheel drive, 1998 Dodge Dakota Sport, two-passenger, two-door pickup truck (VIN: 1B7FL26P3WS------) equipped with a 2.5L, SMPFI, I-4 engine and a five-speed manual transmission. Two-wheel anti-lock brakes are standard, while four-wheel anti-lock brakes are an option for the case vehicle, but it is unknown if the vehicle had the standard or the optional anti-lock brakes. The case vehicle's wheel base was 284 centimeters (111.9 inches), and the driver-reported odometer

Figure 7: Case vehicle's left-side damage from impact (2nd event) with vehicle #3 (case photo #17)

reading (i.e., an electronic odometer) was approximately 4,023 kilometers (2,500 miles). The case vehicle was towed due to disabling damage. Direct damage from the first (deployment) impact was corner-to-corner to the front bumper, with other damaged components including: grille, radiator and brackets, front splash guard, both right and left headlight and turn signal assemblies, both right and left fenders, and the hood. Maximum crush was 13 centimeters (5.1 inches) at the front right hood corner. No intrusion from the case vehicle's first impact was detected. Based on the vehicle inspection, the CDC was determined to be: **12-FDEW-1** (**Figure 2** above) for the case vehicle's deployment impact. The WinSMASH reconstruction program, damage only algorithm, was used on the case vehicle's highest severity (first) impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 24.1 km.p.h. (15.0 m.p.h.), -23.7 km.p.h. (-14.7 m.p.h.), and -4.2 km.p.h. (-2.6 m.p.h.). Direct damage from the case vehicle's second impact, involving vehicle #3, included: the forward portion of the left quarter panel, the lower left "B" pillar, the left front door panel, and the left rocker panel under the door panel (**Figure 7**). At the time of inspection, the backlite glazing was missing; it is unknown if crash forces were responsible for the missing glazing. Intrusion from the second impact to the driver's seating area measured 11 centimeters (4.3 inches) at both the left front door and rocker panel and 12 centimeters (4.7 inches) at the lower "B" pillar. A CDC for the case vehicle's second impact was estimated to be: **08-LZEW-01**. WinSMASH was not attempted on the second impact because vehicle #3 was not inspected and part of the outer metal covering of the case vehicle's left front door was missing.

Figure 8: Case vehicle's front right passenger seating area (case photo #37)

The front right passenger's seat track was found to be at its middle position and the driver's at its rearmost position during the vehicle inspection (**Figure 8**). Both seat track positions were reported by the driver to have been in their rearmost positions. Both seat backs were slightly reclined. No evidence of seat or track failure was detected. The tilt steering wheel was found to be in its upmost position during the vehicle inspection, but the driver reported it to be adjusted to its center position. No evidence of steering wheel deformity or steering column movement was detected.

The case vehicle's nondeployed, front right passenger air bag, which had been disabled, was located in the middle of the instrument panel (**Figure 5** above). The dimensions of its single cover flap were not measured. An inspection of the nondeployed passenger air bag module's cover flap did not reveal any occupant contacts; however, the front right passenger impacted the windshield directly above that cover flap.

At the time of inspection, this contractor's investigative consultant discovered the case vehicle's driver air bag module, which was originally located in the steering wheel hub, had been removed. The module was found in the cargo area. Inspection of the air bag module's single cover flap revealed that the flap opened at the designated tear points (**Figure 9**), and there was no evidence of damage to the air bag or the cover flap. No evidence of occupant contact to the air bag (**Figure 10**) or cover flap was discerned, possibly because of the accumulated mud and dirt. The driver's deployed air bag was designed with: two, 2 centimeter (0.8 inch) tethers, no vent ports, and shaped round--with a diameter of 62 centimeters (24.4 inches). The single cover flap measured 15 centimeters (5.9 inches) along its top seam, 10 centimeters (3.9 inches) along its bottom seam, and 14 centimeters (5.5 inches) in height.

Figure 9: Close-up of case vehicle driver air bag module's cover flap; Note: steering wheel is rotated 180 degrees (case photo #45)

Figure 10: Case vehicle's deployed driver air bag; Note: air bag module had been removed post-crash and thrown into cargo area (case photo #40)

CASE VEHICLE OCCUPANTS

Neither the case vehicle's front right passenger [20-year-old male, 191 centimeters and 102 kilograms (75 inches, 225 pounds)] nor the driver [22-year-old male, 183 centimeters and 91 kilograms (72 inches, 200 pounds)] were wearing their available, active, three-point, lap and shoulder belts. In addition, there was no evidence of belt pattern bruising and/or abrasions to the front right passenger's body or to the driver's body. Inspection of the front right passenger's and driver's seat belt webbings, "D"-rings, and latch plates showed no evidence of loading.

Immediately prior to the crash, the case vehicle's front right passenger was seated upright with his back against the seat back, his feet on the floor, and his hands and arms in unknown positions. In this contractor opinion, his seat track was located in its rearmost position, and the seat back was slightly reclined. The driver was seated upright with his back against the seat back, his left foot on the floor, his right foot on the brake pedal, and both hands on the steering wheel. His seat track was located in its rearmost position, the seat back was slightly reclined, and the tilt steering wheel was located in its middle position.

The case vehicle's driver braked (with lock-up), attempting to avoid the crash. As a result of this attempted avoidance maneuver and the nonuse of their available safety belts, the driver and front right passenger most likely moved slightly forward just prior to impact. The case vehicle's impact with vehicle

#2, not only deployed the driver air bag (i.e., the front right passenger air bag had been disabled), but thrust the unrestrained driver and front right passenger forward and upward. The front right passenger struck the windshield and dash while the driver contacted his deploying driver air bag.

As the case vehicle rotated counterclockwise after the initial impact, the front right passenger and driver shifted towards the right. The second impact of the crash sequence, involving vehicle #3, arrested the case vehicle's counterclockwise rotation and caused it to begin a clockwise rotation to its final rest position, which induced the front right passenger and driver to move rearward and to the left. At final rest, both the driver and front right passenger remained in their seats, but their exact posture is unknown. Both exited the case vehicle under their own power.

OCCUPANT INJURIES

The front right occupant was not transported by ambulance to a medical facility. He sustained a minor injury and was treated at the scene. He later sought medical attention at a private physician's office. The case vehicle's front right passenger sustained a broken nose. The case vehicle's driver was neither treated at the scene nor transported to a medical facility. In addition, the driver did not seek medical attention, even at a later date; however, he sustained a minor, self-reported injury (i.e., a contused left elbow).

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	Contusion left elbow, not further specified	790402.1 minor	Interior surface of driver's door	Probable	Interviewee (same person)

CASE VEHICLE FRONT RIGHT PASSENGER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Fractured nose, not further specified	251000.1 minor	Windshield	Certain	Interviewee (driver)

VEHICLE #2

Vehicle #2 was a rear wheel drive 1979 Chevrolet Monte Carlo "S" ("Sport"), six-passenger, two-door coupe (VIN: 1Z37H9R------) equipped with a 5.0L, 4 Bbl, V-8 engine. The case vehicle's wheel base was 275 centimeters (108.1 inches). Direct damage extended from the middle of the left front door to the forward portion of the left rear wheel well (**Figure 4** above), with an averaged maximum crush of 41 centimeters (16.1 inches) near the back edge of the left front door panel. Based on the vehicle

inspection, the CDC was determined to be: **10-LZAW-04**. 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: 25.9 km.p.h. (16.1 m.p.h.), -12.9 km.p.h. (-8.0 m.p.h.), and 22.4 km.p.h. (13.9 m.p.h.).

VEHICLE #3

Vehicle #3 was a rear wheel drive 1992 Toyota Previa Deluxe, seven-passenger, four-door, 4x2, minivan (VIN: JT3AC11R9N1------) equipped with a 2.4L, EFI, I-4 engine and either a five-speed manual (standard) or a four-speed automatic transmission. The case vehicle's wheel base was 287 centimeters (112.8 inches). Vehicle #3 was towed due to damage. This vehicle was not inspected.