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REMOTE CERTIFIED ADVANCED 208-COMPLIANT VEHICLE INVESTIGATION

CASE NUMBER - IN-03-043
LOCATION - Texas
VEHICLE - 2003 Honda Odyssey
CRASH DATE - September 2003

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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> Remote investigation of an air bag deployment crash involving a 2003 Honda Odyssey minivan that impacted several objects plus a parked and unoccupied 1991 Toyota MR2.					
16. <i>Abstract</i> This report covers a remote investigation of an air bag deployment crash involving a 2003 Honda Odyssey minivan (case vehicle) that ran off the road and impacted several objects including a legally parked and unoccupied 1991 Toyota MR2 coupe. This crash is of special interest because the case vehicle's manufacturer has certified that it meets the advanced air bag requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 208 and it was equipped with an Event Data Recorder (EDR) that was successfully downloaded. The safety belt-restrained driver (71-year-old male) did not sustain any injuries and the safety belt-restrained front right passenger (64-year-old female) sustained very minor injuries. The case vehicle had been traveling northward in the outside northbound lane of a multi-lane roadway that was part of a divided trafficway and was approaching a four-leg intersection, intending to turn right to travel eastward. It was daylight, there were no adverse atmospheric conditions and the concrete road surface was dry. As the case vehicle driver was beginning the intended right turn, he suffered a syncopic episode (i.e., lost consciousness). The front right passenger attempted to steer by grabbing the steering wheel, but the vehicle failed to negotiate the turn and ran off the road at northeast corner of the intersection. The case vehicle's front left corner area impacted a traffic signal control box on the northeast corner of the intersection and continued forward over some shrubs and into a parking lot. The case vehicle's front impacted the left side of the parked Toyota, causing the case vehicle's driver and front right passenger air bags to deploy. The impact caused the Toyota to rotate and its front impacted a brick wall. The case vehicle continued across the parking lot in a northeasterly direction and came to rest. Both occupants were transported via ambulance to a hospital. The driver was not injured but was admitted for observation after suffering a syncopic episode. The front right passenger was treated and released at the emergency department. There was no other occupant in the case vehicle. The case vehicle was towed due to disabling damage.					
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This remote investigation was brought to the NHTSA's attention on October 24, 2003 by NASS-GES sampling activities. This crash involved a 2003 Honda Odyssey EXL minivan (case vehicle) that ran off the road and struck two fixed objects plus a parked and unoccupied 1991 Toyota MR2. The crash occurred in September 2003, at 11:03 a.m., in Texas, and was investigated by the applicable municipal police department. This crash is of special interest because the case vehicle's manufacturer has certified that it meets the advanced air bag requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 208 and it was equipped with an Event Data Recorder (EDR) that was successfully downloaded. The case vehicle's driver (71-year-old male, white, non-Hispanic) did not sustain any injuries and the front right passenger (64-year-old female, white, non-Hispanic) sustained very minor injuries as a result of the crash. The case vehicle had been repaired and no on-site inspection was performed, but the body shop supplied photographs of the damage and sent the EDR to this contractor. The EDR was subsequently forwarded to the manufacturer to be downloaded. This report is based on the police crash report, body shop/insurance photographs, an interview with the case vehicle occupants, the downloaded EDR report provided by manufacturer technicians, medical records, occupant kinematic principles, and this contractor's evaluation of the available evidence.

CRASH CIRCUMSTANCES

The case vehicle had been traveling northward in the outside northbound lane of a multi-lane roadway that was part of a divided trafficway and was approaching a four-leg intersection, intending to turn right to travel eastward in the eastbound lanes of the intersecting divided trafficway. The intersection was controlled by automatic signals. It was daylight, there were no adverse atmospheric conditions and the concrete road surface was dry. The speed limit on both roadways was 56 km.p.h. [35 m.p.h.] and both roadways were straight and level. The Toyota was legally parked and unoccupied in the parking lot of a car wash at the northeast corner of the intersection, heading west, near the car wash structure. As the case vehicle driver was beginning the intended right turn, he suffered a syncopic episode (i.e., lost consciousness). The front right passenger attempted to steer by grabbing the steering wheel, but the vehicle failed to negotiate the turn and ran off the road at northeast corner of the intersection. Other than the passenger's effort to steer, there were no avoidance actions attempted. The crash occurred on the roadside at the northeast corner of the intersection.

The case vehicle's front left corner area impacted a traffic signal control box on the northeast corner of the intersection. The case vehicle continued forward over some shrubs and into the car wash parking lot. The case vehicle's front impacted the left side of the parked Toyota, approximately 46 meters [150 feet] northeast of the first impact, causing the case vehicle's driver and front right passenger air bags to deploy. The impact caused the Toyota to rotate approximately 150 degrees clockwise and its front impacted a brick wall. The case vehicle continued across the parking lot in a northeasterly direction approximately an additional 91 meters [300 feet] and came to rest. There are no photographs of the scene.

The case vehicle was a 2003 Honda Odyssey EXL front wheel drive, four-door, six-passenger minivan (VIN: 5FNRL18913B-----), equipped with a 3.5 liter V6 gasoline engine and an automatic transmission with a column-mounted selector lever. Four-wheel anti-lock brakes and traction control were standard for this model. The vehicle was fitted with dual-stage frontal air bags, seat back-mounted side impact air bags and safety belt pretensioners for the two front seats. The driver's seat had a seat track position sensor and the front right passenger's seat had what the manufacturer calls an Occupant Posture Detector System (OPDS) in the seat back. The odometer reading is not known but the interviewee estimated 17,702 kilometers [11,000 miles]. Its specification wheelbase was 300 centimeters [118.1 inches]. The case vehicle was towed due to disabling damage.

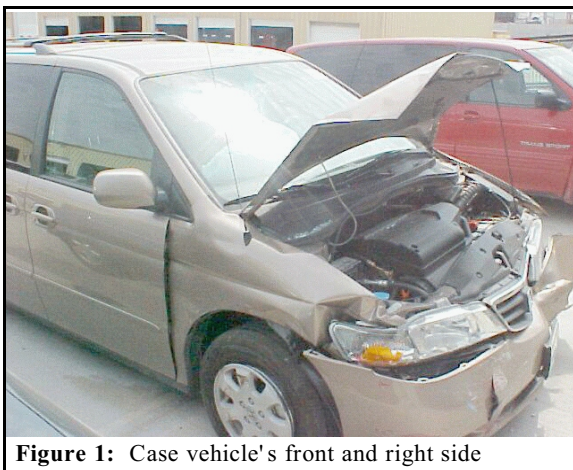


Figure 1: Case vehicle's front and right side



Figure 2: Case vehicle's front and left side

The case vehicle sustained direct contact damage at the front left corner area (**Figures 1 and 2**) from the impact with the traffic signal control box (event #1). The left headlamp/turn signal assembly was shattered and displaced rearward, the leading edge of the left fender was crushed and the entire fender was distorted and displaced rearward, the radiator and engine components on the left side were displaced, the hood was distorted, and the bumper cover was torn and displaced. The available photos do not show any visible damage that can be attributed to the impact with the shrubbery (event #2). The left outside rearview mirror lens was broken out. The impact with the parked Toyota (event #3) resulted in direct contact across the entire front bumper, with induced damage to the right fender and the right side of the engine hood. The two frontal impacts involved overlapping damage that cannot be separated with the information available.

The CDCs were estimated from the available photographs. For the impact with the traffic signal control box (event #1), the estimated CDC is **12-FLEW-1 (0 degrees)**. With no damage visible in the available photographs, the CDC for the shrubbery impact (event #2) is not known. Based on the police scene diagram, this was a swiping-type engagement along the left side and a partial CDC for event #2 is estimated as **12-L999-9 (0 degrees)**.

For the impact with the parked Toyota, the case vehicle's CDC is estimated as **12-FDEW-1 (0 degrees)**. The WinSMASH reconstruction program, missing vehicle algorithm based on the

case vehicle's photo-estimated CDC, was used on event #3, which was the deployment event. The total, longitudinal and lateral delta Vs for the case vehicle are, respectively: 21.0 km.p.h [13.0 m.p.h.], -21.0 km.p.h. [-13.0 m.p.h.] and 0 km.p.h [0 m.p.h.]. This is a borderline reconstruction but the results appear reasonable. Event #3 was of low severity (14-23 km.p.h. [9-14 m.p.h.]) for the case vehicle.

AUTOMATIC RESTRAINT SYSTEM

The case vehicle was equipped with dual-stage frontal air bags and seat back-mounted side impact air bags for the two front seat positions, for a total of four air bags. The two frontal air bags deployed while the two side impact air bags did not (**Figure 3**).

The driver's air bag was mounted in the steering wheel hub, with the module cover flap(s) in an unknown configuration. The air bag's size and shape are unknown, and it is not known if the air bag had any tether(s) or vent port(s). There is no obvious damage nor any evidence of occupant contact visible in the one photo that shows the air bags.



Figure 3: Case vehicle's front seat row, showing deployed driver's and front right passenger's air bags (case photo #08)

The front right passenger's air bag was located in the top of the right instrument panel, with the module cover flap(s) in an unknown configuration. The air bag's size and shape are unknown, and it is not known if the air bag had any tether(s) or vent port(s). There is no obvious damage nor any evidence of occupant contact visible in the one photo that shows the air bags.

EVENT DATA RECORDER

The case vehicle's Event Data Recorder (EDR) was removed by the repair shop and forwarded, via the NHTSA, to the manufacturer to be downloaded and interpreted. The following discussion is based on the manufacturer's report about the downloaded data.

The manufacturer's report indicates that the driver's and front right passenger's safety belts were buckled and both pretensioners actuated. The commentary provided by the technicians who produced the report indicates that the impact which caused algorithm enable ("trigger turned on") was evaluated as being of high severity and the dual-stage air bags deployed with both stages firing simultaneously. The report further indicates that the command to deploy the air bags was issued at 6 milliseconds [0.006 seconds] after algorithm enable. The commentary explains that the side impact air bags have separate sensors mounted in the side sills, and the report shows that these sensors did not experience algorithm enable ("no trigger"). The commentary indicates that the sensor recorded the longitudinal delta V for the deployment event as -22.2 km.p.h. [-13.8 m.p.h.].

According to the manufacturer's commentary, the Occupant Posture Detector System (OPDS) uses the data from the front right seat back sensors to classify a front right occupant as a child safety seat, a child or an adult. The case vehicle's OPDS recorded that the case vehicle's front right passenger was a child. This appears to be an artifact of the front right passenger being relatively small for an adult (150 centimeters, 57 kilograms [59 inches, 125 pounds]) and, especially, because she was leaning to the left attempting to steer after the driver suffered a syncopic episode. In this posture, her torso and head would have been lifted off of the seat back such that the data from the sensors did not detect enough size/mass for the EDR's algorithm to classify the occupant as an adult.

CASE VEHICLE DRIVER'S KINEMATICS

The case vehicle driver (71-year-old male, white, non-Hispanic, 175 centimeters, 75 kilograms [69 inches, 165 pounds]) was restrained by his available, active, three-point, lap-and-shoulder safety belt system. According to the interview information, his seat back was slightly reclined, his seat track was adjusted between the middle and forward positions and the tilt steering wheel was adjusted at the middle position, but this cannot be verified. According to the interview, the driver passed out while beginning an intended right turn and was slumped in his seat. There were no avoidance actions attempted, except the front right passenger observed that the driver had passed out and reached across and attempted to steer.

There were no avoidance actions and the driver's posture did not change. The case vehicle ran off the road and its front left corner impacted a traffic signal control box. The driver probably moved slightly forward in response to the impact deceleration, but was held in place by his safety belt. The case vehicle continued essentially straight and its front and left side swiped/ran over some shrubs. This impact probably did not effect the driver's posture. The case vehicle continued essentially straight ahead through the shrubbery and into a parking lot. The case vehicle's front impacted the left side of a parked and unoccupied Toyota passenger car, causing the case vehicle's driver and front right passenger air bags to deploy, and causing the safety belt pretensioners to actuate. The driver probably moved forward and slightly upward in response to the impact deceleration, but was held in place by his safety belt. He probably encountered the deployed driver's air bag, but, because of his unknown out-of-position posture, the manner of his interaction with the air bag is not known. The case vehicle pushed the Toyota away and continued essentially straight ahead, eventually coming to rest further on in the parking lot. The driver's position at final rest is not known. He recovered consciousness and was able to exit the vehicle with some assistance.

DRIVER'S INJURIES

The driver was transported via ground ambulance to a hospital, where he was admitted for three days for observation after suffering a syncopic episode. He was diagnosed as suffering transient cerebral ischemia, hypertension and atrial fibrillation. He did not sustain any injuries as a result of the crash.

The case vehicle's front right passenger (64-year-old female, white, non-Hispanic, 150 centimeters, 57 kilograms [59 inches, 125 pounds]) was restrained by her available, active, three-point, lap-and-shoulder safety belt system. According to the interview information, her seat back was slightly reclined and her seat track was adjusted between the middle and forward positions, but this cannot be verified. The front right passenger observed that the driver had passed out and reached across to try to steer. She stated that she was bracing against the driver's seat back with her left hand and gripping the steering wheel with her right hand. The front right bucket seat had a fold down arm rest that was in the down position and she was leaning with the left side of her abdomen against the arm rest.

The front right passenger was leaning to the left and reaching to grasp the steering wheel. The case vehicle ran off the road and its front left corner impacted a traffic signal control box. The front right passenger probably moved slightly forward in response to the impact deceleration, but was held in place by her safety belt. The case vehicle continued essentially straight and its front and left side swiped/ran over some shrubs. This impact probably did not effect the passenger's posture. The case vehicle continued essentially straight ahead through the shrubbery and into a parking lot. The case vehicle's front impacted the left side of a parked and unoccupied Toyota passenger car, causing the case vehicle's driver and front right passenger air bags to deploy, and causing the safety belt pretensioners to actuate. The passenger probably moved forward and slightly upward in response to the impact deceleration, with the left side of her torso loading against the torso portion of the safety belt webbing and her abdomen loading against the arm rest. Because she was leaning to the left, she probably encountered the deployed passenger's air bag with the right side of her torso. The case vehicle pushed the Toyota away and continued essentially straight ahead, eventually coming to rest further on in the parking lot. The passenger's position at final rest is not known. She was able to exit the vehicle with some assistance.

FRONT RIGHT PASSENGER'S INJURIES

The front right passenger was transported via ground ambulance to a hospital, where she was treated and released in the emergency department.

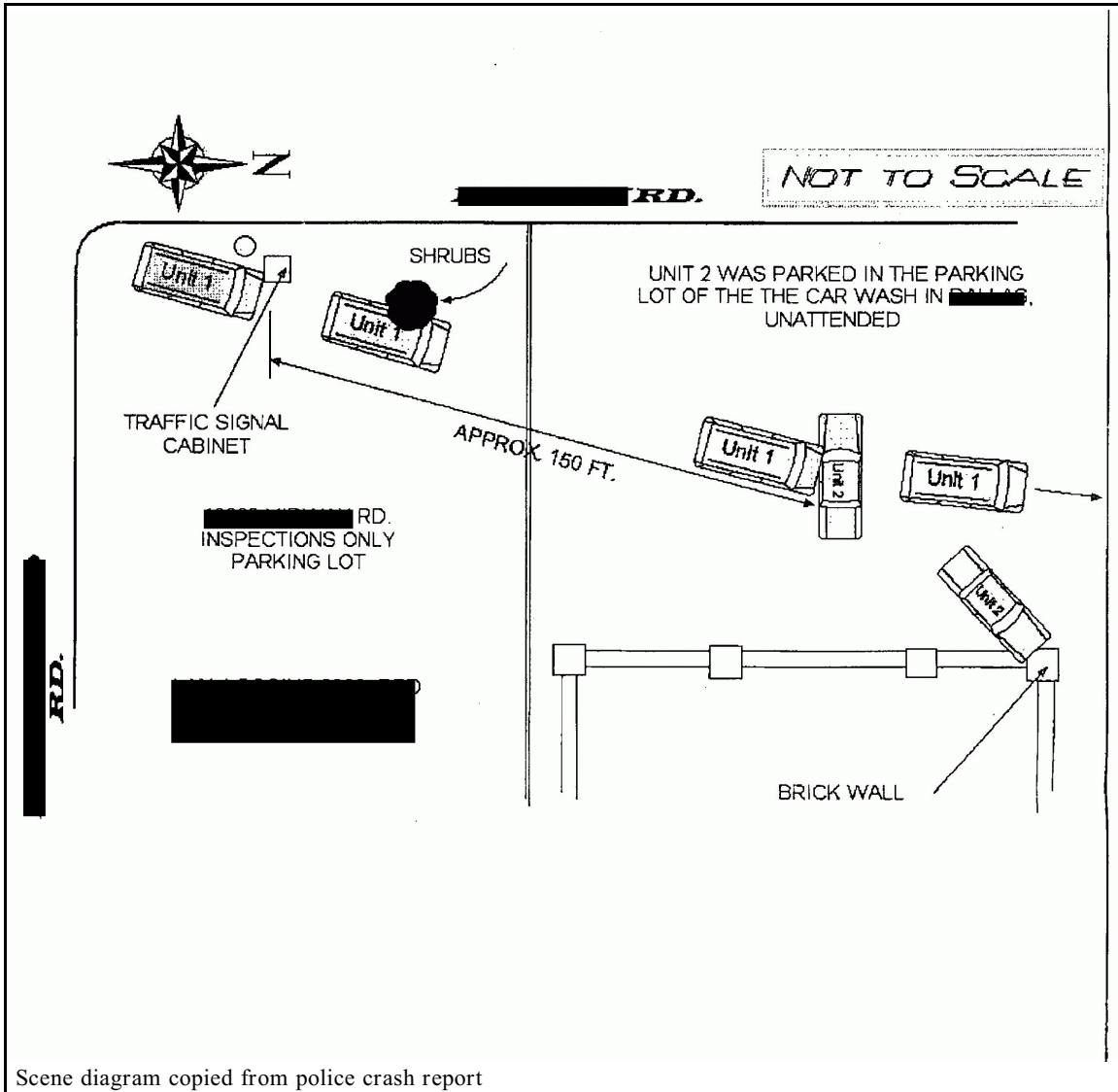
Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Contusion, left chest wall, not further specified	minor 490402.1,2	Torso portion of safety belt system	Probable	Emergency room records
2	Contusion, left abdomen to waist, not further specified	minor 590402.1,2	Armrest, left side of front right seat	Probable	Interviewee (same person)

OBJECT CONTACTED

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The case vehicle's most severe impact (event #3) involved a passenger car that was legally parked and unoccupied. This vehicle was a 1991 Toyota MR2 rear wheel drive, two-door, four passenger coupe (VIN: JT2SW22N4M0-----). Its specification wheelbase was 240 centimeters [94.5 inches]. There are no photos available. The Toyota was towed due to disabling damage.

The WinSMASH reconstruction program, missing vehicle algorithm based on the case vehicle's photo-estimated CDC only, was used. The Toyota's total, longitudinal and lateral delta Vs are, respectively: 38.0 km.p.h. [23.6 m.p.h.], -6.6 km.p.h. [-4.1 m.p.h.] and 37.4 km.p.h. [23.2 m.p.h.]. This is a borderline reconstruction and, with no photos available, the WinSMASH results for the Toyota cannot be evaluated.



Scene diagram copied from police crash report