On-Site Certified Advanced 208 Compliant Investigation
Dynamic Science, Inc. (DSI), Case Number 2008-81-055B
2004 Honda Odyssey
Washington
May 2008

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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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16. Abstract

This on-site investigation focused on the Certified Advanced 208-Compliant (CAC) air bag system in a 2004 Honda Odyssey. The multi-stage air bags were certified by the manufacturer to meet the advanced air bag requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. This case was originally initiated by the local National Automotive Sampling System (NASS) Crashworthiness Data System (CDS) team in response to a report of a fatally injured driver. This single vehicle crash occurred in May 2008 at 0040 hours. The subject vehicle was being driven by an unrestrained 36-year-old male. The crash occurred on a northbound 3-lane, one-way roadway. The Honda Odyssey was traveling southbound against traffic. As the driver of the Odyssey saw oncoming traffic, he steered to the left, departed the roadway, and the vehicle struck a bridge rail with its front end. The driver's air bag deployed during this impact. The vehicle came to rest on the roadway facing southeast. The driver was transported from the scene to a local trauma center for treatment where he died from his injuries approximately 5 hours after arrival. The Honda was towed from the scene due to damage. It was later declared to be a total loss by the insurance company and was sold to an auto parts company.

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BACKGROUND

This on-site investigation focused on the Certified Advanced 208-Compliant (CAC) air bag system in a 2004 Honda Odyssey (**Figure 1**). The multi-stage air bags were certified by the manufacturer to meet the advanced air bag requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. This case was originally initiated in response to a report of a fatally injured driver by the local National Automotive Sampling System (NASS) Crashworthiness Data System (CDS) team. This single vehicle crash occurred in May 2008 at 0040 hours. The subject vehicle was being driven by an unrestrained 36-year-old male. The crash occurred on a northbound 3-lane, one-way roadway. The Honda Odyssey was traveling southbound against traffic. As the driver of the Odyssey saw oncoming traffic, he steered to the left and departed the roadway and the vehicle struck a bridge rail with its front end. The driver's air bag deployed during this impact. The vehicle came to rest on the roadway. The driver was transported from the scene to a local trauma center for treatment where he died from his injuries approximately 5 hours after arrival. The Honda was towed from the scene due to damage. It was later declared to be a total loss by the insurance company and was sold to an auto parts company.

Figure 1. Subject vehicle, 2004 Honda Odyssey

DSI was assigned the case on July 11, 2008. A copy of the electronic case was uploaded and the police report was obtained. DSI conducted an on-site visit July 28, 2008 to the subject vehicle to remove the Electronic Data Recorder (EDR) and to further examine the interior of the vehicle. The EDR was removed and submitted to the National Highway Traffic Safety Administration (NHTSA) Crash Investigation Division (CID). CID submitted the EDR to Honda for the purposes of imaging any crash data. A summary of the imaged crash data was received on October 15, 2008 and is summarized in the Supplemental Restraint Systems section of this report.

SUMMARY

Crash Site

This single vehicle crash occurred on a northbound 3-lane, 1-way divided roadway (**Figure 2**). The travel lanes were separated by raised pavement markers. The asphalt roadway was curved to the right in the southbound direction. Prior to the area of impact, the roadway narrowed into two travel lanes as it approached a bridge overpass. The overpass was bordered by metal bridge rails on either side. At the northern end of the overpass, there was a red "Do Not Enter - Wrong Way" warning sign. It was dark at the time of the crash and overhead streetlights were present and illuminated. The posted speed limit was 40 km/h (25 mph).

Pre Crash

The southbound Odyssey was traveling the wrong way on a one-way street in the middle lane of the northbound roadway at an unknown speed. A non-contact vehicle was traveling northbound. According to the autopsy report, the driver of the Odyssey had been drinking alcohol and had a Blood Alcohol Content (BAC) of 0.18. As the Odyssey approached a bridge overpass, the driver saw the oncoming non-contact vehicle. He steered the vehicle to the left and crossed the outboard travel lane.

Figure 2. Southbound approach to impact with bridge rail

Crash

The Odyssey continued to the left until it departed the roadway on the left side and struck the end of the bridge rail (**Figure 3**). The driver's air bag deployed upon impact. The barrier algorithm of the WinSmash program computed a barrier equivalent speed of 24.0 km/h (14.9 mph), based on an estimated crush profile.

Figure 3. Impact with bridge rail

Post Crash

The Odyssey rotated 90 degrees in a counterclockwise direction and came to rest on the roadway facing southeast. The driver sustained a heart laceration, a facial abrasion, an upper arm contusion, and a left knee abrasion and laceration. He was transported from the scene to a local trauma center for treatment where he arrived with a Glasgow Coma Score (GCS) of 3. The driver survived for approximately 5 hours after arrival.

The Odyssey was towed from the scene due to damage. It was later declared to be a total loss by the insurance company and was sold to an auto parts company.

VEHICLE DATA - 2004 Honda Odyssey

The 2004 Honda Odyssey was identified by the Vehicle Identification Number (VIN): 5FNRL18024Bxxxxxx. The vehicle date of manufacture was 12/03. The Odyssey was a 7-passenger minivan that was equipped with a 6-cylinder, 3.5 liter engine, automatic transmission, 4-wheel antilock brakes, and front wheel drive. The Odyssey was equipped with Michelin X-Radial P225/60R16 tires. The tire manufacturer's maximum tire pressure was 303 kPa (44 psi); the vehicle manufacturer's recommended cold tire pressure was 248 kPa (36 psi).

The specific tire information is as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	Tire Flat	8 mm (10/32 in)	Unknown	Tire cut
LR	255 kPa (37 psi)	8 mm (10/32 in)	No	None
RR	248 kPa (36 psi)	8 mm (10/32 in)	No	None
RF	241 kPa (35 psi)	8 mm (10/32 in)	No	None

The seating in the Odyssey was configured with front bucket seats, second row bucket seats with folding backs, and a third row bench seat with a folding back. The front seats were adjusted to between the forwardmost and middle track positions. The driver's seat back was slightly reclined.

Vehicle Damage - 2004 Honda Odyssey

Exterior Damage

The Honda Odyssey sustained moderate damage as a result of the impact with the bridge rail. The direct damage began at the left front bumper corner and extended 29 cm (11.4 in) laterally across the frontal plane. The damage occurred outboard of the frame rails and per NASS protocol no crush profile was generated.

Figure 4. Left side damage

The damage extended rearward down the left side plane. The left fender was peeled rearward. The left front wheel and tire were fractured and separated from the vehicle.

It was not known if the left front door was jammed shut. The Collision Deformation Classification (CDC) for the impact with the bridge rail was 12FLEE6.

Interior Damage

The Odyssey sustained minor interior damage as a result of passenger compartment intrusion. The specific passenger compartment intrusions were as follows:

Row/Position	Intruded Component	Magnitude of Intrusion	Direction
Front seat left	Toe pan	8 cm (3.1 in)	Longitudinal
Front seat left	Sill	4 cm (1.6 in)	Lateral

The left lower instrument panel and the steering column were fractured due to occupant contact. A scuff was located on the top of the steering wheel rim.

The area beneath the instrument panel was examined to determine if there was any column movement (**Figure 5**). Comparisons were also made between the subject vehicle and an exemplar vehicle, and it was determined there was no column movement.

Figure 5. Area beneath instrument panel and steering column

Manual Restraints

The Odyssey was equipped with 3-point manual lap and shoulder belts for each of the seven seating positions. The front safety belts were configured with adjustable D-ring anchorages; the driver's belt anchorage was in the full down position, the front right passenger anchorage was in the middle position. All the safety belts were configured with sliding latch plates. At the time of the initial inspection, the driver's safety belt was located in the stowed position and then was latched for photographic purposes.

The Odyssey was equipped with B-pillar retractor pretensioners that did not actuate. At the time of the SCI inspection, the driver's belt had been cut and the latch plate was missing. The retractor end of the belt retracted into the B-pillar. At 132 cm (51.9 in) from the anchor, there was a 34 cm (13.4 in) area of scuffing located on the seat belt webbing. At a point 32 cm (12.6 in) from the first area of scuff there were two additional areas of scuffing. The first measured 3 cm (1.2 in) and second measured 3.5 cm (1.4 in) . These two were separated by a 4 cm (1.6 in) gap. The belt was used to tie the door closed at some point.

An exemplar vehicle was located and the areas of scuffing were mapped onto this vehicle's seat belt. The belt was placed in the buckled position and the webbing left slack in order to determine where the areas of scuffing may have occurred. The mapped out areas roughly matched up with the area near the D-ring and were likely from historical usage. The D-ring had evidence of historical usage but no obvious abrasions. While there was some evidence of historical usage, it appears more likely that the driver was not restrained at the time of this crash. The non-usage was based on the type of injuries sustained, the lack of seat belt related injuries, the lack of pretensioner actuation, and the police report. Honda was contacted and confirmed that if the driver was unrestrained the pretensioner would not actuate.

Supplemental Restraint Systems

The Odyssey was equipped with a Certified Advanced 208-Compliant (CAC) air bag system. A CAC vehicle is certified by the manufacturer to be compliant to the Advanced Air Bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. In addition to the frontal air bags, the Honda was equipped with seat mounted side air bags. The driver's frontal air bag deployed as a result of the impact with the bridge rail. The front right passenger frontal air bag was suppressed due to the seat being unoccupied. The seat mounted side air bags did not deploy. The driver's seat belt was found in the stowed position at the time of the initial NASS inspection. The belt was free to move and it was probable that the pretensioner did not actuate.

Figure 6. Deployed driver's air bag

The EDR was removed and submitted to Honda. The EDR report from Honda indicated the following:

- The driver's air bag deployed.
- The passenger frontal air bag was suppressed from the empty seat status provided by the passenger side seat weight sensor and buckle switch.
- Details from the crash records were not stored. Most of the Virtual Memory Address (VMA) block information was set to zero.

There was no data reported for the seat belt status and pretensioner fire command.

The driver's air bag deployed through H-configuration module flaps (**Figure 6**). The top flap was 16 cm (6.3 in) wide by 5 cm (2 in) high; the bottom flap was 16 cm (6.3 in) wide by 7 cm (2.8 in) high. There were two 4.5 cm (1.8 in) circular vent ports at the 11 and 1 o'clock locations on the rear aspect of the air bag. There was a single tether strap affixed to the circular stitching on the face of the air bag. A 4 x 4 cm (1.6 x 1.6 in) blue cloth transfer was located at the right bottom quadrant, 6 cm (2.4 in) from the center of the air bag and 3 cm (1.2 in) from the edge of the bag. There was a black grease smear located just above the center of the air bag face that was not related to an occupant contact. The smear was 10 cm (3.9 in) wide by 3 cm (1.2 in) high.

OCCUPANT DEMOGRAPHICS - 2004 Honda Odyssey

	Driver
Age/Sex:	36/Male
Seated Position:	Left front
Seat Type:	Bucket
Seat Track Position:	Between forward most and mid track position
Height:	157 cm (62 in)
Weight:	89 kg (196 lbs)
Alcohol/Drug Involvement:	None
Body Posture:	Unknown
Hand Position:	Unknown
Foot Position:	Unknown
Restraint Usage:	Lap and shoulder belt not used
Air bag:	Steering wheel mounted air bag deployed

OCCUPANT KINEMATICS

Driver Kinematics

The 36-year-old male driver was seated in an unknown posture and was unrestrained. The seat was adjusted to between the forward most and mid track position and the seat back was slightly reclined. The driver was actively steering to the left prior to impact. At impact, the driver's air bag deployed. The driver initiated a forward trajectory and loaded the deployed air bag. The driver's left knee contacted the lower instrument panel, causing a knee abrasion and laceration (**Figure 7**). The Odyssey rotated sharply in a counterclockwise direction and the driver probably contacted the left door with the left side of his chest before the vehicle came to rest, possibly causing the heart injury (**Figure 8**).

Figure 7. Left knee contact to lower instrument panel

Figure 8. Possible contact to door panel

OCCUPANT INJURIES - 2004 Honda Odyssey

Injuries obtained from autopsy report and emergency room records.

Injury	OIC Code	Injury Source	Confidence Level
Vena cava laceration minor with or without thrombosis	421804.3,4	Door/forward upper quadrant	Possible
Pericardium injury with tamponade without heart injury	441604.3,4	Door/forward upper quadrant	Possible
Left forehead /brow abrasion	290202.1,7	A-pillar	Possible
Right upper arm contusion, posterolateral	790402.1,1	Left instrument panel	Possible
Knee laceration, left	890602.1,2	Left lower instrument panel	Certain
Left thigh/knee abrasion	890202.1,2	Left lower instrument panel	Certain

Attachment 1. Scene Diagram