TRANSPORTATION SCIENCES
CRASH RESEARCH SECTION

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REDESIGNED AIR BAG SPECIAL STUDY (RABSS)
SCI TECHNICAL SUMMARY REPORT

NASS CDS CASE NO. 1998-05-095K

RABSS VEHICLE - 1998 HONDA ACCORD LX

LOCATION - STATE OF PENNSYLVANIA

CRASH DATE - JULY, 1998

Contract No. DTNH22-94-D-07058

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 are 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 STANDARD TITLE PAGE

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16. *Abstract* This investigation focused on a two-vehicle crash involving a 1998 Honda Accord LX 4-door sedan (subject vehicle) and a 1990 Infinity Q45 4-door sedan. The Honda Accord was equipped with redesigned frontal air bags that deployed as a result of a right angle collision with the Infinity Q45. The Infinity was northbound and attempted to turn left (west) at a 4-leg intersection when it crossed into the path of the eastbound Honda. As the Infinity turned left and crossed the eastbound lane the front of the Honda struck the left passenger area of the Infinity. Impact resulted in moderate frontal damage to the Honda and moderate left side damage to the Infinity. The 27 year old male driver of the Honda Accord was unrestrained (3-point manual lap and shoulder belt system available) and seated in an upright posture with the seat track adjusted to the rear most position. At impact, the he initiated a forward trajectory in response to the 1 o'clock impact force and loaded the deployed redesigned driver air bag. His lower extremities loaded the knee bolster as the left forearm contacted the windshield. Injury information was limited as the driver refused the NASS interview and the medical records were not obtained. The police reported an (unspecified) bleeding wound to the chest/stomach. The driver of the Honda Accord was transported to a local hospital for unspecified treatment. The driver of the Infinity Q45 was transported via helicopter to a trauma center where he was hospitalized for 18 days. The front right passenger of the Infinity was transported by ambulance to a local hospital for treatment and released.			
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TABLE OF CONTENTS

REDESIGNED AIR BAG SPECIAL STUDY (RABSS)
SCI TECHNICAL SUMMARY REPORT
NASS CDS CASE NO. 1998-05-095K
RABSS VEHICLE - 1998 HONDA ACCORD LX
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BACKGROUND

This investigation focused on a two-vehicle crash involving a 1998 Honda Accord LX 4-door sedan (subject vehicle) and a 1990 Infinity Q45 4-door sedan. The Honda Accord was equipped with redesigned frontal air bags that deployed as a result of a right angle collision with the Infinity Q45. The Infinity was northbound and attempted to turn left (west) at a 4-leg intersection when it crossed into the path of the eastbound Honda. As the Infinity turned left and crossed the eastbound lane the front of the Honda struck the left passenger area of the Infinity. Impact resulted in moderate frontal damage to the Honda and moderate left side damage to the Infinity. The 27 year old male driver of the Honda Accord was unrestrained (3-point manual lap and shoulder belt system available) and seated in an upright posture with the seat track adjusted to the rear most position. At impact, the he initiated a forward trajectory in response to the 1 o'clock impact force and loaded the deployed redesigned driver air bag. His lower extremities loaded the knee bolster as the left forearm contacted the windshield. Injury information was limited as the driver refused the NASS interview and the medical records were not obtained. The police reported an (unspecified) bleeding wound to the chest/stomach. The driver of the Honda Accord was transported to a local hospital for unspecified treatment. The driver of the Infinity Q45 was transported via helicopter to a trauma center where he was hospitalized for 18 days. The front right passenger of the Infinity was transported by ambulance to a local hospital for treatment and released.

This crash was initially selected for investigation by the National Automotive Sampling System (NASS) as CDS case number 98-05-095K and was also included in the Redesigned Air Bag Special Study. The Field Operations Branch of the National Highway Traffic Safety Administration (NHTSA) assigned the Special Crash Investigation (SCI) team at Veridian/Calspan the task of case review and final report preparation.

SUMMARY

Crash Site

This two-vehicle crash occurred during the afternoon hours of July, 1998. At the time of the crash, it was daylight with no adverse conditions as the roads were dry. The crash occurred in the eastbound lane of an east/west four lane (level) asphalt roadway **(see Figure 9 - page 6)**. Traffic control at the scene included overhead tri-lights for all travel lanes. The speed limit at the crash scene was 64 km/h (40 mph) for east/westbound traffic and 56 km/h (35 mph) for north/southbound traffic.

Figure 1. Eastbound approach for the 1998 Honda Accord LX.

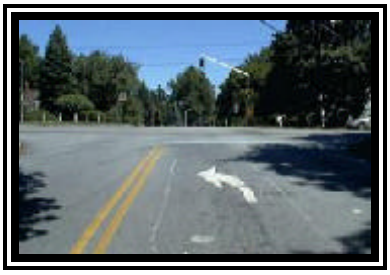

Figure 2. Northbound approach for the 1990 Infinity Q45.

Pre-Crash

The 27 year old male driver of the 1998 Honda Accord LX was operating the vehicle eastbound **(Figure 1)** in the outboard travel lane at a (police reported) speed of 64 km/h (40 mph) when he noticed the signal change to yellow and decided that he was too close to come to a safe stop. As he approached the 4-leg intersection he observed the Infinity Q45 turning left (west) across his lane of travel. Upon recognition of the impending harmful event, the driver braked and steered left into the (eastbound) inboard lane prior to the collision. The 81 year old male driver of the 1990 Infinity Q45 was operating the vehicle northbound when he stopped at the red light and proceeded to turn left (west) at a (police reported) speed of 8 km/h (5 mph) **(Figure 2)**. The police report stated that the driver observed westbound traffic coming to a stop and proceeded into the intersection without looking at the signal light or eastbound traffic for a clear path. The front right passenger position was occupied by a 76 year old female.

Crash

As the Infinity Q45 crossed the eastbound lane of the four lane roadway, the front of the Honda struck the left passenger area of the Infinity. The impact induced deceleration was sufficient to deploy the Honda's redesigned frontal air bag system. The damage algorithm of the WinSMASH program computed velocity changes of 33.6 km/h (20.9 mph) for the subject vehicle and 24.2 km/h (15.0 mph) for the struck Infinity. The specific longitudinal components were -29.1 km/h (-18.1 mph) and -12.1 km/h (-7.5 mph). The Collision Deformation Classification (CDC) for this impact to the Honda Accord was 81-FDEW-2 (PDOF incremented for lateral shifting to the left) and 10-LPEW-4 for the Infinity Q45. During the impact sequence, the Infinity rotated counterclockwise as both vehicles began their respective post-impact trajectories to final rest in the northeast sector of the intersection with the Honda facing northeast and the Infinity facing southwest.

Post-Crash

The driver of the Honda Accord exited the vehicle under his own power. Both occupants of the Infinity were removed from their vehicle due to perceived serious injuries. Treatment was rendered at the scene by fire department personnel and emergency medical technicians (EMT's). The driver of the Honda

was transported by ambulance to a local hospital for unspecified treatment. The driver of the Infinity was transported by helicopter to a nearby trauma center and hospitalized for 18 days. The front right passenger was transported by ambulance to a local hospital for treatment and released. Both vehicles were towed from the scene.

RABSS VEHICLE

The 1998 Honda Accord LX was identified by the Vehicle Identification Number (VIN): 1HGCG5649WA (production sequence deleted). The vehicle was a 4-door sedan equipped with front wheel drive and a 2.3 liter, 4 cylinder engine. The vehicle's odometer reading was unknown at the time of the crash. The police report listed the driver as the owner of the vehicle. The seating was configured with front bucket seats and a folding (back) rear bench. The driver refused the NASS interview, therefore previous crashes or maintenance on the air bag system were unknown.

VEHICLE DAMAGE

Exterior Damage

The Honda Accord LX sustained moderate frontal damage as a result of the impact with the Infinity Q45 **(Figure 3)**. The direct contact damage encompassed the full frontal width resulting in a combined direct and induced damage length (Field L) of 155.0 cm (61.0 in). Six crush measurements were taken at the level of the bumper: C1= 26.0 cm (10.2 in), C2= 18.0 cm (7.1 in), C3= 10.0 cm (3.9 in), C4= 29.0 cm (11.4 in), C5= 10.0 cm (3.9 in), C6= 15.0 cm (5.9 in). Damage was noted to the hood which was displaced up and rearward from engagement against the side surface of the Infinity. Both fenders were damaged from 11.0 cm (4.3 in) of lateral end structure shifting to the left which restricted the left front wheel/tire. The windshield was fractured from induced impact forces and (interior) driver contact.

Figure 3. Frontal damage to the 1998 Honda Accord LX.

Figure 4. Left side damage to the 1990 Infinity Q45.

The 1990 Infinity Q45 sustained moderate left side damage as a result of the impact with the Honda Accord **(Figure 4)**. The direct contact damage began 60.0 cm (23.6 in) aft of the left front axle and extended 220.0 cm (86.6 in) rearward. Induced damage was noted to the left fender and quarter panel. The left front door panel and roof were removed by rescue personnel during the occupants' extrication from the vehicle.

Interior Damage

Interior damage to the Honda Accord identified through the NASS vehicle inspection was minimal and was attributed to occupant contact **(Figure 5)**. Although routine wear marks were noted to the

latchplate of the 3-point manual lap and shoulder belt system, no loading marks were identified to the belt webbing which would support restraint usage during the crash. No contact evidence was found to the exterior surface of the driver or passenger air bag module cover flap, but blood spattering was noted to the left upper quadrant of the driver air bag. The upper portion of the steering wheel rim was deformed forward 4.0 cm (1.6 in) while the lower portion was deformed forward 2.0 cm (0.8 in) (tilt column set to the full up position). A web type fracture was documented to the left windshield with a skin transfer embedded into the glazing. The knee bolster on both sides of the steering column was fractured and scuffed (rigid plastic type). A scuff mark was documented on the front left door panel. No intrusion of interior components were found in the vehicle.

Figure 5. Interior view of the 1998 Honda Accord LX.

REDESIGNED AIR BAG SYSTEM

The 1998 Honda Accord LX was equipped with redesigned frontal air bags for the driver and front right passenger positions. The air bags had deployed as a result of the crash. Air bag warning labels were affixed to each sun visor. The driver air bag was housed in the center of the steering wheel with a horizontally oriented flap tear seam (H-configuration). The upper flap measured 18.5 cm (7.3 in) in width and 8.5 cm (3.3 in) in height while the lower flap measured 13.0 cm (5.1 in) in width and 4.0 cm (1.6 in) in height. There was no contact evidence on the air bag or exterior surface of the module cover flaps, but blood spattering was noted to the left upper quadrant of the air bag which was attributed to the driver's left forearm contact to the windshield. The NASS researcher measured the diameter of the driver air bag at 54.0 cm (21.3 in) in its deflated state **(Figure 6)**. The bag was tethered by two internal straps and vented by two ports located at the 11 o'clock and 1 o'clock (centered) sectors on the rear aspect of the air bag.

Figure 6. 1998 Honda Accord LX redesigned driver air bag.

Figure 7. 1998 Honda Accord LX redesigned passenger air bag.

The front right redesigned passenger air bag deployed from a top mount module in the right instrument panel with a single cover flap design hinged at the rear aspect. There was no contact evidence on the module cover flap which was rectangular in shape and measured 26.0 cm (10.2 in) in width and 5.5 cm (2.2 in) in height. There was no contact evidence on the passenger air bag which measured 75.0 cm (29.5 in) in width and 60.0 cm (23.6 in) in height in its deflated state **(Figure 7)**. No internal tether straps were present. The bag was vented by two ports located at the 9 o'clock and 3 o'clock sectors on the side aspect of the air bag. No cutoff switch was reported for the front right air bag.

DRIVER DEMOGRAPHICS

Age/Sex:	27 year old male
Height:	173 cm (68 in)
Weight:	Unknown
Seat Track Position:	Rear most position
Manual Restraint Use:	None
Usage Source:	NASS vehicle inspection, police report
Eyeware:	Unknown
Type of Medical Treatment:	Transported to a local hospital (not further specified)

Driver Injuries

Injury	*Severity (AIS 90)*	*Injury Mechanism*
Unknown	N/A	N/A

Driver Kinematics

The unrestrained 27 year old male driver of the 1998 Honda Accord LX was seated in an upright posture with the seat back slightly reclined and the seat track adjusted to the rear most position. The police report noted that the driver was not belted, further evidenced by the lack of loading marks to the belt webbing and extent of deformation to the driver space **(Figure 8)**. At impact, he initiated a forward trajectory in response to the 1 o'clock impact force and loaded the deployed redesigned driver air bag, evidenced by the kinematic response pattern in relation to the rearward extent of the deployed air bag. The redesigned air bag provided protection to the head/face against further contact to the windshield. The driver subsequently bottomed out the air bag as evidenced by the deformation to the upper and lower sections of the steering wheel rim. His lower extremities loaded the knee bolster as the left forearm contacted the windshield, evidenced by the indentations/scuff marks to the bolster and web type fracture/skin transfer to the windshield. Injury information was limited as the driver refused the NASS interview and the medical records were not obtained. The police reported an (unspecified) bleeding wound to the chest/stomach. The driver was transported to a local hospital for unspecified treatment.

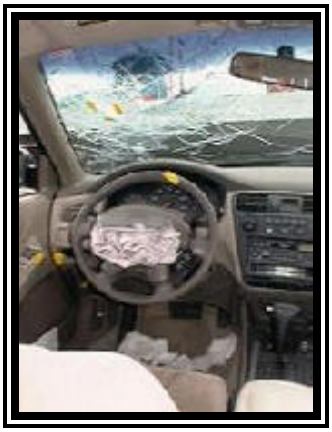

Figure 8. Interior view of the driver space.

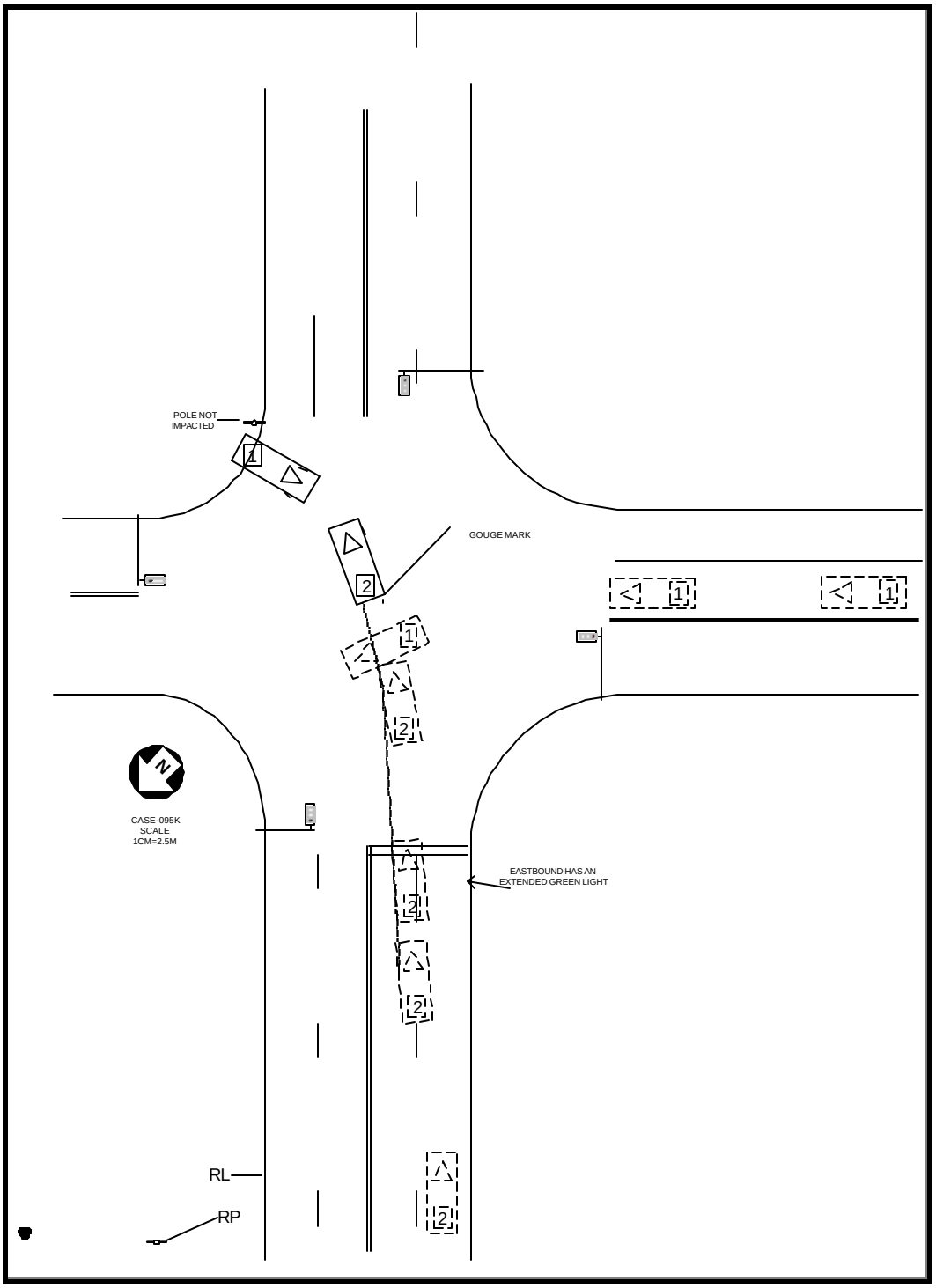

Figure 9. NASS Scene Diagram