

INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER

School of Public and Environmental Affairs
501 S. Madison Street-Suite 105
Bloomington, Indiana 47403-2452
(812) 855-3908 Fax: (812) 855-3537

ON-SITE SIDE IMPACT INFLATABLE OCCUPANT PROTECTION INVESTIGATION

CASE NUMBER - IN08012
LOCATION - TEXAS
VEHICLE - 2006 HONDA CIVIC LX
CRASH DATE - January 2008
Submitted:

February 3, 2009



Contract Number: DTNH22-07-C-00044

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
National Center for Statistics and Analysis
Washington, D.C. 20590-0003

DISCLAIMERS

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no responsibility for the contents or use thereof.

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the National Highway Traffic Safety Administration.

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

1. <i>Report No.</i> IN08012		2. <i>Government Accession No.</i>		3. <i>Recipient's Catalog No.</i>	
4. <i>Title and Subtitle</i> On-Site Side Impact Inflatable Occupant Protection Investigation Vehicle - 2006 Honda Civic LX Location - Texas			5. <i>Report Date:</i> February 3, 2009		
			6. <i>Performing Organization Code</i>		
7. <i>Author(s)</i> Special Crash Investigations Team #2			8. <i>Performing Organization Report No.</i>		
9. <i>Performing Organization Name and Address</i> Transportation Research Center Indiana University 501 S. Madison Street–Suite 105 Bloomington, Indiana 47403-2452			10. <i>Work Unit No. (TRAIS)</i>		
			11. <i>Contract or Grant No.</i> DTNH22-07-C-00044		
12. <i>Sponsoring Agency Name and Address</i> U.S. Department of Transportation (NVS-411) National Highway Traffic Safety Administration National Center for Statistics and Analysis Washington, D.C. 20590-0003			13. <i>Type of Report and Period Covered</i> Technical Report Crash Date: January 2008		
			14. <i>Sponsoring Agency Code</i>		
15. <i>Supplementary Notes</i> On-site side air bag deployment investigation involving a 2006 Honda Civic LX, 4-door sedan with manual safety belts and advanced front, side, and curtain air bags, and a 1998 Mitsubishi Galant, 4-door sedan					
16. <i>Abstract</i> The focus of this report involves a 2006 Honda whose right front seat back-mounted side impact air bag deployed as a result of an impact. This report covers an on-site investigation of a right angle crash that involved a 2006 Honda Civic LX and a 1998 Mitsubishi Galant. The Honda was traveling west, and the driver intended to proceed straight ahead. The Mitsubishi was traveling south, and the driver intended to proceed straight ahead. The crash occurred in the four-leg intersection of the two trafficways. The Honda's driver (20-year-old, male) was seated and restrained by his lap-and-shoulder, safety belt system. The driver sustained only minor soft tissue injuries as a result of this crash. The front right passenger (22-year-old, male) was also seated and restrained by his lap-and-shoulder, safety belt system. This occupant did not sustain any encodable injuries as a result of this crash. The Honda's second row right passenger (22-year-old, male) was seated and restrained by his lap-and-shoulder, safety belt system. The second row right passenger sustained only a minor injury as a result of this crash.					
17. <i>Key Words</i> Side Air Bag Deployment			Motor Vehicle Traffic Crash Injury Severity		18. <i>Distribution Statement</i> General Public
19. <i>Security Classif. (of this report)</i> Unclassified	20. <i>Security Classif. (of this page)</i> Unclassified		21. <i>No. of Pages</i> 12	22. <i>Price</i>	

TABLE OF CONTENTS

IN08012

Page No.

BACKGROUND. 1

CRASH CIRCUMSTANCES. 1

CASE VEHICLE: 2006 HONDA CIVIC LX. 3

 CASE VEHICLE DAMAGE. 4

 MANUAL RESTRAINT SYSTEM. 6

 AUTOMATIC RESTRAINT SYSTEM. 7

 CASE VEHICLE KINEMATICS–OVERVIEW. 8

 DRIVER KINEMATICS. 8

 DRIVER INJURIES. 9

 FRONT RIGHT PASSENGER KINEMATICS.. . . . 9

 FRONT RIGHT PASSENGER INJURIES. 10

 SECOND ROW RIGHT PASSENGER KINEMATICS. 10

 SECOND ROW RIGHT PASSENGER INJURIES.. . . . 10

OTHER VEHICLE: 1998 MITSUBISHI GALANT. 11

CRASH DIAGRAM. 12

This crash was brought to the National Highway Traffic Safety Administration's attention on or before March 7, 2008 by the sampling activities of the National Automotive Sampling System. This investigation was assigned on March 13, 2008. This crash involved a 2006 Honda Civic LX and a 1998 Mitsubishi Galant. The crash occurred in January 2008 at 1810 hours, in Texas and was investigated by the applicable city police department. The focus of this investigation are the Honda's seat back-mounted side impact air bags. This contractor inspected the scene and the Honda on March 19, 2008. The driver interview was completed on April 3, 2008. The Mitsubishi was not inspected because it could not be located. This report is based on the police crash report, scene and vehicle inspections, an interview with the Honda's driver, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which the Honda was traveling was an eight-lane, divided, city street, traversing in a generally east-west direction, and the Honda was approaching a four-leg intersection. On the eastern leg of the intersection, both the eastern and western roadways contained three through lanes while the eastern roadway also contained two left-hand turn lanes (**Figure 1**). The trafficway on which the Mitsubishi was traveling was a four-lane, undivided, city street, traversing in a north-south direction, and the Mitsubishi was approaching the same four-leg intersection (**Figure 2**). On the north leg of the intersection, the north-south roadway had one northbound lane, two southbound through lanes, and one left-hand turn lane.



Figure 1: Honda's westward approach to 4-leg intersection in the outside through lane

The Honda's city trafficway was straight and level, at the area of impact. The pavement was concrete, and the width of the outside eastern lane was 3.3 meters (10.8 feet). The western roadway was bordered by curbs with associated concrete rain gutters. The eastern leg of the trafficway was divided by a raised, curbed, concrete median that measured 1.1 meters (3.6 feet) in width. On the eastern leg at the mouth of the intersection, pavement markings consisted of four solid white lane lines that separated the five lanes—three through and two left-hand turn lanes. No center or edge lines were present. Traffic controls consisted of four horizontal mounted on-colors, pre-timed, traffic control signals which were located on the northwest quadrant of the intersection. In addition, two regulatory left turn only arrows (Manual on Uniform Traffic Control



Figure 2: Arrow indicates Mitsubishi's southward approach to intersection in the inside through lane

Devices, R3-5) and one No U-Turn sign (MUTCD, R3-4) were also present on arm of the signal light pole mention above (**Figure 3**). The speed limit was 56 km/h (35 mph).

The Mitsubishi's city roadway was straight and level, at the area of impact. The pavement was concrete, and the width of the inside southbound lane was 3.3 meters (10.8 feet). The northern leg was bordered by curbs with associated concrete rain gutters. Pavement markings consisted of a double solid yellow centerline for both north and southbound traffic, and the lanes were separated by a solid white lines. No edge lines were present. Traffic controls consisted of three horizontal mounted on-colors, pre-timed, traffic control signals which were located on the southwest quadrant of the intersection. In addition, one advanced intersection lane control sign (MUTCD, R3-8 series) was also present on the arm of the signal light pole. The speed limit was 48 km/h (30 mph).

At the time of the crash, the light condition was dark with overhead artificial lighting, the atmospheric condition was clear, and the roadway pavement was dry. Traffic density was moderate to heavy. The site of the crash was urban commercial. See the Crash Diagram at end of this report.

Pre-Crash: The Honda was traveling west in the outside westbound through lane, and the driver intended to continue straight through the intersection (**Figures 1 and 3**). The Mitsubishi was traveling south in the inside through lane, and the driver intended to continue straight through the intersection (**Figure 2**). The Honda's driver indicated that he applied the brakes just prior to the impact when he heard the front right passenger scream. The crash occurred in the 4-leg intersection of the two trafficways.

Crash: The right front of the Honda (**Figure 4**) was impacted by the front left portion of the Mitsubishi (event 1), causing the Honda's front right seat back-mounted side impact air bag and



Figure 3: Honda's travel path into intersection and arrow indicates likely point of impact with Mitsubishi; traffic signal pole with traffic controls on northwest quadrant of intersection



Figure 4: Honda's right front damage from frontal impact (event 1) by Mitsubishi



Figure 5: Side slap damage to right rear of Honda (event 2) from impact with Mitsubishi's left rear

right side curtain air bag to deploy. This impact caused the Mitsubishi to rotate rapidly clockwise while the Honda was redirected slightly counterclockwise. During their respective rotations, the Honda's right quarter panel (**Figure 5**) side slapped the Mitsubishi's left quarter panel (event 2). The Mitsubishi was redirected in a west-northwesterly direction, departed the roadway, and impacted a traffic signal pole with its front plane (event 3). The Honda continued in a west-southwesterly direction into the western leg of the intersection and came to rest in the center westbound lane facing westward. The Mitsubishi came to rest on the northwest corner of the intersection facing west-northwest with its front end against the traffic signal pole (**Figure 6**).

Post-Crash: The driver, front right passenger, and second row right passenger of the Honda, all remained inside the vehicle at final rest. They were conscious and were able to exit their vehicle without any assistance. The investigating police agency was notified of the crash within 1 minute post-crash and arrived on-scene 10 minutes later. Traffic control procedures were established and towing services were called to assist. The driver and second row right passenger were not transported. The front right passenger refused transport to a medical facility and did not require medical treatment. Following the police investigation, the Honda and Mitsubishi were towed from the scene due to damage.



Figure 6: Eastward view from northwest quadrant of intersection with arrow indicating likely point of initial impact (event 1); Mitsubishi impacted and came to rest against signal pole (event 3)

CASE VEHICLE

The 2006 Honda Civic LX was a front wheel drive, 5-passenger, 4-door sedan (VIN: 1HGFA16576L-----) equipped with a 1.8L, I-4 engine and a 4-speed automatic transmission, and this vehicle's frontal air bags are certified by the manufacturer to be compliant to the Advanced Air Bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. Braking was achieved by a power-assisted, front disc and rear drum, 4-wheel, anti-lock system with electronic brake force distribution. The Honda was equipped with multi stage driver and front right passenger air bag inflators, front seat back-mounted side impact air bags, and right and left side head curtain air bags protecting all outboard seating positions. According to the manufacturer's website "the side curtain air bag system utilizes sensors located in the side of the vehicle to determine the most appropriate timing and rate of deployment of the air bags in the event of a side impact." The Honda was equipped with front height adjustable seat belts, a front seat whiplash protection system, and Lower Anchors and Tethers for Children (LATCH) system features. Inspection of the vehicle's interior revealed adjustable front bucket seats with adjustable head restraints and a non-adjustable, folding, second row bench seat with adjustable head restraints for all occupant positions. The Honda's wheelbase was 270 centimeters (106.3 inches), and the odometer reading at inspection is unknown because the vehicle was equipped with an electronic odometer; however, the driver indicated that the vehicle had approximately 27,750 kilometers (16,000 miles).

Damage Classification: The Collision Deformation Classifications for the Honda were determined to be 02-RFEW-3 (60 degrees) for the initial impact (event 1) with the Mitsubishi and 03-RZEW-1 (90 degrees) for the side slap impact (event 2). The WinSMASH reconstruction program, missing vehicle algorithm was used to reconstruct the Honda's Delta Vs for the right side impacts with the Mitsubishi. The Total, Longitudinal, and Lateral Delta Vs for the highest severity impact (event 1) are, respectively: 19 km/h (11.8 mph), -9.5 km/h (-5.9 mph), and -16.5 km/h (-10.2 mph). The Total, Longitudinal, and Lateral Delta Vs for the Honda's second highest severity impact (event 2) are, respectively: 9.0 km/h (5.6 mph), 0 km/h, and -9 km/h (5.6 mph).

Exterior Damage: The Honda's initial impact (event 1) with the Mitsubishi involved the right side with the damage distributed on the right fender (Figures 4 and 7). Direct damage began 252 centimeters (99.2 inches) forward of the rear axle and extended 103 centimeters (40.6 inches) along the fender to the right front bumper corner. Induced damage began 221 centimeters (87.0 inches) forward of the right rear axle. Residual maximum crush was measured as 37 centimeters (14.6 inches) at C₆ (Figure 8). The Honda's right fender, right front wheel assembly, right corner of front bumper, front bumper fascia, hood, and right headlight and turn signal assemblies were directly damaged and crushed inward. There was induced damage to the hood, front bumper fascia, grille, left fender, and left headlight and turn signal assemblies as well as the windshield's glazing.

The Honda's side slap impact (event 2) with the Mitsubishi involved the right side with damage distributed on the right quarter panel (Figures 5 and 7). Direct damage began 31 centimeters (12.2 inches) forward of the right rear axle and extended 106 centimeters (41.7 inches) rearward to the rear bumper corner. Residual maximum crush was measured as 12 centimeters (4.7 inches) occurring at C₄ (Figure 9). The direct damage is greater than Field L because C₁ is located at the top of the right quarter panel while the rear end of the direct



Figure 7: Honda's right side damage from impacts with Mitsubishi—initial impact (event 1) to front, side slap impact (event 2) to rear

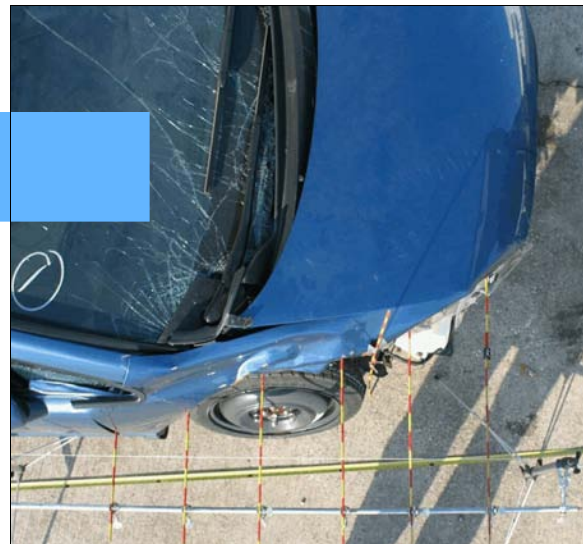


Figure 8: Overhead view of crush profile to Honda's right front (event 1)



Figure 9: Overhead view of crush profile to Honda's right quarter panel

damage is located at the bumper corner, further out than C₁. The vehicle’s right quarter panel, right rear wheel assembly, right side of the rear bumper fascia, and right brakelight and turn signal assemblies were directly damaged and crushed inward. In addition, the rear portion of the right rear door was damaged. There was induced damage to the right rear door and truck lid. Remote buckling was also found on the left rear wheel assembly which was tilted outward at the top and displaced from its original position. The table below shows the Honda’s crush profiles.

Units	Event	Direct Damage		Field L	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	1	83	37	103	0	5	18	24	30	37	159	138
in		32.7	14.6	40.6	0.0	2.0	7.1	9.4	11.8	14.6	62.6	54.3
cm	2	106	12	102	2	6	5	12	4	0	-159	-156
in		41.7	4.7	40.2	0.8	2.4	2.0	4.7	1.6	0.0	-62.6	-61.4

The Honda’s left side wheelbase was shortened 9 centimeters (3.5 inches) probably because of the induced damage from the side slap impact which involved the right rear wheel. The right side wheelbase was shortened 1 centimeter (0.4 inch).

The Honda’s recommended tire size was: P205/55R16, and the vehicle was equipped with the proper sized tires. The Honda’s right front wheel had been removed and the spare tire had been mounted in its place prior to this contractor’s inspection. The right front tire was not available for inspection. Therefore, the right front tire information is unknown. The Honda’s tire data are shown in the table below.

Tire	Measured Pressure		Vehicle Manufacturer’s Recommended Cold Tire Pressure		Tread Depth		Damage	Restricted	Deflated
	kPa	psi	kPa	psi	milli-meters	32 nd of an inch			
LF	152	22	221	32	6	7	None	No	No
LR	Flat	Flat	221	32	5	6	None	No	Yes
RR	138	20	221	32	6	8	None	No	No
RF	Unk	Unk	221	32	Unk	Unk	Not available	No	Unk

Interior Damage: Inspection of the Honda’s interior (**Figure 10**) revealed occupant contact evidence on the right front door armrest (**Figure 11**), which was dented. Friction burns were observed on the front right passenger’s shoulder belt and D-ring, and the buckle-mounted pretensioner had actuated. No other occupant contact evidence was found and no intrusion of the

passenger compartment was observed. There was also no deformation of the steering wheel or compression of the energy absorbing steering column.



Figure 10: Honda's front seating areas viewed from driver's door



Figure 11: Arrow shows occupant contact dent in armrest of Honda's right front door

MANUAL RESTRAINT SYSTEM

The Honda's manual restraint systems are shown in the table below.

	Left	Center	Right
First Row	continuous loop, lap-and-shoulder, safety belt system with upper anchorage adjustor for the D-ring located in its down-most position; buckle stalk pretensioner without force limiter; sliding type latch plate with ELR		continuous loop, lap-and-shoulder, safety belt system with upper anchorage adjustor for the D-ring located in its down-most position; buckle stalk pretensioner without force limiter; sliding type latch plate with ELR
Second Row	continuous loop, lap-and-shoulder, safety belt system without upper anchorage adjustment for shoulder belt guide; sliding type latch plate with switch-able retractor type; lower anchor present; top tether anchor located behind the seat back	continuous loop, lap-and-shoulder, safety belt system; sliding type latch plate with switchable retractor type; no lower anchor present; top tether anchor located behind the seat back	continuous loop, lap-and-shoulder, safety belt system without upper anchorage adjustment for shoulder belt guide; sliding type latch plate with switch-able retractor type; lower anchor present; top tether anchor located behind the seat back

ELR = Emergency Locking Retractor Switchable = either ALR = Automatic Locking Retractor

Only the front right passenger safety belts exhibited indications of usage during this crash. The inspection of the driver's safety belt webbing, D-ring, and latch plate revealed that the pretensioner had not actuated and showed no evidence of loading. The inspection of the front right passenger's safety belt webbing, D-ring, and latch plate is discussed above. A comparison

between the driver and front right passenger buckle stalks revealed that there was an 8 centimeter (3.2 inch) difference in length. In addition, the front right safety belt would not re-spool indicating it was in use at the time of the crash.

AUTOMATIC RESTRAINT SYSTEM

The Honda was equipped with multi stage frontal air bags at the driver and front right passenger positions, and the Honda’s frontal air bags were manufacturer Certified Advanced 208-Compliant. Furthermore, there was an occupant weight sensor for the front right passenger seating position. Based on the manufacturer’s website, the multi stage frontal air bag system senses the severity of a crash, then determines if the air bags should be deployed and whether a full or less-than-full amount of inflation is to be used. The front right passenger sensing system automatically switches the front right passenger air bag on or off based on the passenger’s weight and the type of pressure on the seat. In addition, the vehicle was equipped with front, seat back-mounted, side impact air bags and side inflatable curtain air bags which extend from A-pillar to C-pillar (**Figure 10**). The crash sensors in the side of the Honda analyze side impact forces and deploy the front right passenger’s seat back-mounted side impact air bag and the roof mounted, side curtain air bags to provide added protection to passengers seated along the side of the vehicle.

The Honda’s driver air bag was located in the steering wheel hub. The front right passenger’s air bag was located in the top of the instrument panel. Neither frontal air bag, nor the driver’s seat back-mounted side air bag or left side curtain air bag deployed as a result of the vehicle’s right side impacts with the Mitsubishi.

The Honda’s right side inflatable curtain air bag and front right side impact air bag deployed during the Honda’s initial (event 1) right side impact with the front of the Mitsubishi. The Honda’s right side curtain air bag was located along the right roof side rail (**Figure 12** and **13**), inside the head liner and extended along the side rail from the middle of the right A-pillar, across the front right and back right seat positions and right C-pillar. The right side curtain air bag was approximately 192 centimeters (75.6 inches) in length and 35 centimeters (13.8 inches) in height. It was constructed with inflation chambers adjacent to the front right and back right seat position. In addition, there was an inflation



Figure 12: Honda’s deployed right side curtain air bag (front portion); arrow shows deployed front right seat back-mounted side impact air bag

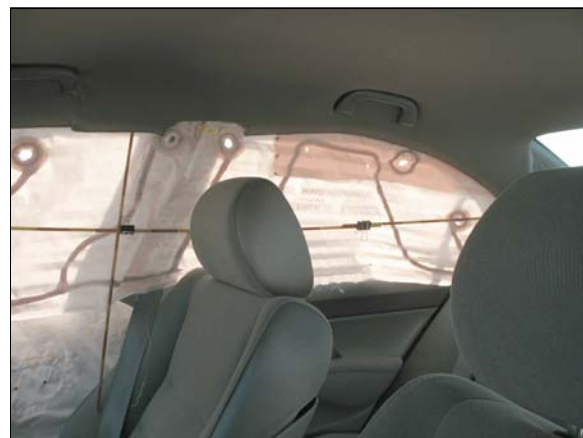


Figure 13: Center and rear portions of Honda’s deployed right side curtain air bag

chamber over the right B-pillar. There were no obvious vent ports in the air bag. Inspection of the air bag revealed no evidence of occupant contacts, and there was no damage to the air bag due to deployment.

The Honda's front right seat back-mounted side impact air bag was located in the right side of the seat back. The air bag deployed through a tear-seam in the side of the seat back. The deployed air bag (**Figure 14**) was approximately oval in shape, and measured approximately 50 centimeters (19.7 inches) in height and 30 centimeters (11.8 inches) in width. It was designed without tethers and had a oval shaped area of stitching in the approximate middle of the air bag, which appeared to control the width of the air bag during deployment and have a tether-like effect on the bag's shape (i.e., there was no tether per se within the bag). What appeared to be a single vent port was located on the front edge of the air bag. There was no evidence of damage to the air bag. A small dark scuff was observed on the inboard surface of the air bag approximately 15 centimeters (5.9 inches) above the bottom of the air bag. There was no other evidence of possible occupant contact on the inboard surface of the air bag.



Figure 14: Inboard surface of Honda's front right seat back-mounted air bag; arrow shows location of small dark scuff

CASE VEHICLE KINEMATICS—OVERVIEW

The Honda's driver braked just prior to impact, attempting to avoid the crash. As a result of this attempted avoidance maneuver and the use of their available safety belts, the occupants moved slightly forward just prior to impact. The Honda's primary impact (event 1) with the 1998 Mitsubishi enabled the occupants to continue forward and rightward along a path opposite the Honda's **60** degree direction of principal force as the vehicle decelerated. After maximum engagement the vehicle continued forward and was redirected leftward when the side slap impact (event 2) to the right quarter panel occurred. As a result, the occupants move to the right along a path opposite to the Honda's **90** degree direction of principal force during the deceleration. After the slide slap while the vehicle was continuing to move forward obliquely to the roadway, the occupants rebounded to their left and moved forward and the vehicle decelerated to rest.

DRIVER KINEMATICS

Immediately prior to the crash the driver of the Honda [20-year-old, male; 168 centimeters and 64 kilograms (66 inches and 140 pounds)] was seated in an upright posture with his back against his seat back and his right foot on the brake. The driver did not recall the position of his hands on the steering wheel. His seat track was adjusted to its middle position, the seat back was slightly reclined, the location of the steering column's tilt adjustment was full down, and telescoping adjustment was full forward. The driver indicated he was wearing glasses at the time of the crash.

Based on this contractor's vehicle inspection and the interview with the driver, the driver was restrained by his lap-and-shoulder, safety belt system. The driver does not recall how either of his belts were positioned on his shoulder or waist. There was no mention by the driver of belt pattern bruising and/or abrasions to the driver's torso.

The driver's braking probably caused his safety belt retractor to lock. As a result of the initial impact (event 1) the Honda's driver moved forward and rightward loading his safety belts. During the side slap impact (event 2), the driver moved further to the right. After the secondary impact, the driver rebounded back toward his original lateral position and remained leaning forward as the vehicle came to rest. The driver remained in his seating position throughout the crash.

DRIVER INJURIES

The driver was not transported by ambulance to the hospital; however, he went later to a medical clinic by private vehicle. He sustained minor soft tissue injuries and was treated and released. The injuries sustained by the Honda's driver include a neck strain, back pain and a bruise on the inside of his left knee.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Strain, cervical, not further specified	minor 640278.1,6	Noncontact injury: impact forces	Probable	Interviewee (same person)
2	Contusion {bruise} medial {inside} knee, not further specified	minor 890402.1,2	Occupant's right medial knee	Possible	Interviewee (same person)

FRONT RIGHT PASSENGER KINEMATICS

Immediately prior to the crash the Honda's front right passenger [22-year-old, male; 180 centimeters and 73 kilograms (69 inches and 160 pounds)] was seated in an upright posture with his back against the seat back. The position of his feet and hands is not known. His seat track was adjusted to its middle position and the seat back was slightly reclined. The front right passenger was wearing contact lenses at the time of the crash.

The Honda's front right passenger was restrained by his lap-and-shoulder, safety belt system. There was no mention by the driver of any belt pattern bruising and/or abrasions to the front right passenger's torso.

Just prior to the impact, the Honda's driver applied the brakes probably causing the front right passenger's safety belt retractor to lock. As a result of the initial impact (event 1) the front right passenger moved forward and rightward loading his safety belts. In addition, his right hip and upper torso loaded the deployed seat back-mounted side impact air bag, and the right side of his head contacted the deployed right side curtain air bag. During the side slap impact (event 2),

the front right passenger moved further to the right with his right hip contacting and riding down the deflating side impact air bag. Furthermore, he loaded and deformed his right arm rest (**Figure 11**). After the secondary impact, he likewise rebounded back toward his original lateral position and remained leaning forward as the vehicle came to rest. The front right passenger remained in his seating position throughout the crash.

FRONT RIGHT PASSENGER INJURIES

According to the police crash report, the front right passenger refused transport by ambulance at the scene; however, according to the Honda's driver, he went later to a medical clinic by private vehicle. He sustained a police-reported "C" (possible) injury and was treated for complaint of pain to his neck and lower back and released. No specific injuries were reported for the front right passenger by the driver.

SECOND ROW RIGHT PASSENGER KINEMATICS

Immediately prior to the crash, the Honda's back right passenger [22-year-old, male; 175 centimeters and 68 kilograms (69 inches and 150 pounds)] was seated in an upright posture with his back against the seat back. The position of his feet and hands is not known. His seat track and seat back were not adjustable. The back right passenger was not wearing either glasses or contacts at the time of the crash.

According to the driver, the Honda's back right passenger was restrained by his lap-and-shoulder, safety belt system. There was no mention by the driver of any belt pattern bruising and/or abrasions to the second row right passenger's torso.

Just prior to the impact, the Honda's driver applied the brakes which probably causing the second row right passenger's safety belt retractor to lock. As a result of the initial impact (event 1) the Honda's second row right passenger moved forward and rightward loading his safety belts. During the side slap impact (event 2), he moved further to the right. There was no contact evidence on the right rear door or side curtain air bag, but it is almost certain that the right side of the passenger's body contacted the door and the right side of his head and face contacted the side curtain air bag during the crash. In this contractor's opinion, this occupant struck the side curtain air bag during the side slap impact because his head had moved forward, downward, and rightward during the initial impact. When the side slap occurred, this occupant probably contacted his face and mouth against the right rear window sill after riding down the side curtain air bag. After the secondary impact, the second row right passenger rebounded back toward his original lateral position and remained leaning forward as the vehicle came to rest. The second row right passenger remained in his seating position throughout the crash.

SECOND ROW RIGHT PASSENGER INJURIES

The police crash report indicated the back right passenger was not injured as a result of the crash and was not transported to a medical facility. The Honda's driver indicated that the back right passenger was transported later to a medical clinic by private vehicle and was treated for

complaint of pain to his neck and lower back. The driver also indicated that the back right passenger chipped a tooth in the crash.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Fractured {broken} upper tooth, not further specified	minor 251404.1,8	Right rear window sill	Probable	Interviewee (driver)

OTHER VEHICLE

Based on the VIN and manufacturer’s specifications, the 1998 Mitsubishi Galant was a front wheel drive, 5-passenger, 4-door sedan (VIN: 4A3AJ56G0WE-----) 2.4L, I-4 engine and either the standard 5-speed manual or an optional 4-speed automatic. Braking was achieved by a power-assisted, front disc and rear drum system. Four wheel anti-lock brakes are an option on this model, but it is unknown if it was so equipped. The Mitsubishi’s wheelbase was 263 centimeters (103.7 inches), and the odometer reading is unknown because the vehicle’s interior was not inspected. The Mitsubishi was also equipped with driver and front passenger air bags. The police crash report indicated the driver’s air bag deployed in this crash. The vehicle was equipped with manual, lap-and-shoulder, safety belt systems for the front and second row outboard seating positions. The second row center seat had a manual, lap belt. Standard interior equipment included bucket seats for the driver and front right passenger, and a non-adjustable second row bench seat. The Mitsubishi was towed due to damage

Exterior Damage: This contractor was unable to locate the Mitsubishi and no inspection was completed. There were no photographs of the Mitsubishi available, so no damage could be determined and no CDC could be estimated.

Other vehicle (insert)’s Occupants: According to the police crash report, the driver of the Mitsubishi fled the crash scene. No information about the driver was available.

