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ON-SITE ADVANCED OCCUPANT PROTECTION SYSTEM INVESTIGATION

CASE NUMBER - IN-02-008
LOCATION - TEXAS
VEHICLE - 2003 TOYOTA COROLLA CE
CRASH DATE - September 2002

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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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16. <i>Abstract</i> This report covers an on-site investigation of a crash involving a 2003 Toyota Corolla CE (case vehicle) and a 1995 Chevrolet C1500 pickup truck (other vehicle). This crash is of special interest because the case vehicle was equipped with <u>A</u> dvanced <u>O</u> ccupant <u>P</u> rotection <u>S</u> ystem (AOPS) features as well as an <u>E</u> vent <u>D</u> ata <u>R</u> ecorder (EDR) and the case vehicle's restrained driver (19-year-old, male) sustained only minor injuries as a result of the crash. The case vehicle had been traveling north in the northbound lane of a two-lane, undivided roadway and came to a stop, heading north at a "Tee" intersection. The case vehicle entered the intersection, intending to turn left and proceed westward. The Chevrolet pickup was traveling east in the center through lane of the eastbound roadway which was part of a six-lane, divided trafficway. The case vehicle's driver made no avoidance maneuvers prior to the crash. The crash occurred in the center eastbound through lane of the eastbound roadway, within the "Tee" the intersection of the two trafficways. The left center of the case vehicle was impacted by the front of the Chevrolet. The case vehicle's driver and front right passenger supplemental restraints (air bags) did not deploy during the crash sequence. Just prior to the crash, the case vehicle's driver was seated with his arms were covering his face in response to the imminent collision. His seat track was located between its middle and rearmost positions, and the tilt steering wheel was located in its down-most position. He was restrained by his available, active, three-point, lap-and-shoulder, safety belt system; although, the shoulder belt portion of the system was placed under his left arm. He sustained, according to his interview and his medical records minor injuries which included: a small laceration on the left side of his head, abrasions to his nose and left chest—underneath his left arm, and a chest contusion.					
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This on-site investigation was brought to NHTSA's attention on October 22, 2002 by NASS GES sampling activities. This crash involved a 2003 Toyota Corolla CE (case vehicle) and a 1995 Chevrolet C1500 pickup truck (other vehicle). The crash occurred in September 2002, at 6:10 p.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 Advanced Occupant Protection System (AOPS) features as well as an Event Data Recorder (EDR) and the case vehicle's driver [19-year-old, White (non-Hispanic) male] sustained only minor injuries as a result of the crash. Permission to harvest the Electronic Control Unit, which houses the EDR technology, was given by the owner on October 23, 2002. This contractor inspected the scene and vehicles on October 29, 2002. This contractor interviewed the driver of the case vehicle on November 2, 2002. This summary is based on the Police Crash Report, an interview with the case vehicle's driver, scene and vehicle inspections, occupant kinematic principles, occupant medical records, and this contractor's evaluation of the evidence.

SUMMARY

Crash Environment: The trafficway on which the case vehicle was traveling was a two-lane, undivided, city street, traversing in a north-south direction, and the case vehicle was approaching a controlled "Tee" intersection. The trafficway on which the other vehicle was traveling was a six-lane, divided, city street, traversing in an east-west direction and was approaching the same three-leg ("Tee") intersection. On the western leg of the intersection, both the east and west roadways had three through lanes. At the time of the crash the light condition was daylight, the atmospheric condition was clear, and the roadway pavement was dry. Traffic density was undetermined, and the site of the crash was primarily urban residential; see **CRASH DIAGRAM** at end.

Pre-Crash: The case vehicle had been traveling north and came to a stop, heading north at the **STOP** sign. The case vehicle entered the intersection, intending to turn left and proceed westward. The Chevrolet pickup was traveling east in the center through lane and intended to proceed straight ahead. The case vehicle's driver made no avoidance maneuvers prior to the crash. The crash occurred in the center through lane of the eastbound roadway, within the "Tee" the intersection of the two trafficways.

Crash: The left center of the case vehicle was impacted by the front of the Chevrolet. The case vehicle's driver and front right passenger supplemental restraints (air bags) did not deploy during the crash sequence.

Post-Crash: The case vehicle's impact with the Chevrolet caused the case vehicle to rotate approximately 90 degrees counterclockwise and, as a result, the front portion of the left front fender side slapped the Chevrolet, most likely in its left front fender. The force from the initial impact caused the case vehicle to move in an east-northeasterly direction into a raised, paved median while continuing to rotate counterclockwise. The case vehicle came to rest on the median heading southeastward, straddling the east and westbound roadways.

Case Vehicle: The 2003 Toyota Corolla CE was a front wheel drive, four-door sedan (VIN: 1NXBR32E03Z-----). The case vehicle was equipped with dual stage driver and front right passenger air bag inflators. Furthermore, front seat back-mounted side impact air bags were an option on the case vehicle, but this vehicle was not so equipped.

Vehicle Exterior: Based on the vehicle inspection the CDCs for the case vehicle were determined to be: **09-LPEW-2 (280 degrees)** and **09-LFMW-1**. The WinSMASH reconstruction program, missing vehicle algorithm, was used on the case vehicle's highest severity impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 23.0 km.p.h. (14.3 m.p.h.), -4.0 km.p.h. (-2.5 m.p.h.), and +22.7 km.p.h. (+14.1 m.p.h.). In this contractor's opinion, these results appear reasonable. No reconstruction program was used on the side slap impact because the damage was only superficial and was initially thought to have occurred prior to this crash. For the side slap impact, the crash severity to the case vehicle was minor [2-13 km.p.h. (1-8 m.p.h.)]. The case vehicle was towed due to damage.

Exterior Damage: The case vehicle's initial contact with the Chevrolet involved the left front and rear doors. Direct damage began 41 centimeters (16.1 inches) forward of the left rear axle and extended toward the front a measured distance of 175 centimeters (68.9 inches) along the door panels. The Field L began 16 centimeters (6.3 inches) rearward of the left rear axle and extended toward the front a measured distance of 251 centimeters (98.8 inches). Maximum crush was measured as 23 centimeters (9.1 inches) at C₃. The case vehicle's side slap impact with the Chevrolet involved the front portion of the left fender. Direct and induced damage began 10 centimeters (3.9 inches) forward of the left front axle and extended toward the front left headlight assembly a measured distance of 60 centimeters (23.6 inches). Crush along the entire area was only superficial and unmeasurable. The wheelbase on the case vehicle's left side was unaltered while the right side was extended at most 1 centimeter (0.4 inches). The case vehicle's left side doors and "B"-pillar were directly damaged and crushed inward toward the center of the vehicle from the initial impact. The left fender was also directly damaged during the side slap impact. Induced damage was noted to the hood and to the left rear wheel well. No obvious induced damage or remote buckling was noted to the remainder of the case vehicle's exterior. None of the case vehicle's tires were damaged, deflated, or physically restricted.

Vehicle Interior: Inspection of the case vehicle's interior revealed a minor scuff on the left front door's arm rest and left "B"-pillar of the case vehicle. There was no apparent evidence of occupant contact to the case vehicle's steering wheel, instrument panel, or greenhouse areas. Lateral intrusion was present along the case vehicle's left side, involving both doors, both door sills, the left "B"-pillar, the driver's seat back, and the back left seat cushion. The largest intrusion occurred to the left rear door and was measured as 14 centimeters (5.5 inches). The greatest intrusion near the case vehicle's occupant occurred to the left "B"-pillar and measured 8 centimeters (3.1 inches). Finally, there was no evidence of compression of the energy absorbing shear capsules in the base of the steering column and no deformation to the steering wheel rim.

Supplemental Restraints: The case vehicle's driver air bag was located in the steering wheel hub. The Police Crash Report noted that at least the driver's air bag deployed, but our inspection

revealed that this was not the case. The front right passenger air bag was located in the top of the instrument panel. This air bag also did not deploy.

Crash Data Recording: The Electronic Control Unit which was located underneath the center dash, was removed by this contractor and submitted to the agency. The ECU was sent to the manufacturer for data interpretation and no response has been received at the time of report submission.

Other Vehicle: The 1995 Chevrolet C1500 was a rear wheel drive, 4x2, two-door, extended cab pick-up truck (VIN: 2GCEC19K8S-----). Four wheel, anti-lock brakes are standard on this model. With no available vehicle photographs, the CDCs for this vehicle are not estimable. The Chevrolet pickup was towed due to damage.

Case Vehicle's Driver: Immediately prior to the crash the case vehicle's driver [19-year-old, White (non-Hispanic) male; 180 centimeters and 70 kilograms (71 inches, 155 pounds)] was seated in a slightly reclined posture with his back against the seat back, his left foot on the floor and his right foot on the accelerator. According to the case vehicle's driver, his arms were covering his face as he saw imminent collision. His seat track was located between its middle and rearmost positions, the seat back was slightly reclined, and the tilt steering wheel was located in its downmost position.

The case vehicle's driver was restrained by his available, active, three-point, lap-and-shoulder, safety belt system; although, the shoulder belt portion of the system was placed under his left arm. Furthermore, according to his interview and his medical records, he sustained an abrasion on his left chest, underneath his left arm. However, an inspection of the driver's seat belt webbing, "D"-ring, and latch plate showed no evidence of loading.

The case vehicle's driver made no known pre-crash avoidance maneuvers. As a result and independent of the use of his available safety belts, his pre-impact body position did not change just prior to impact. The case vehicle's primary impact with the Chevrolet enabled the case vehicle's driver to move leftward and slightly forward along a path opposite the case vehicle's 280 degree Direction of Principal Force as the case vehicle decelerated. As a result the driver loaded the interior surface of his door at the same time the door was intruding inward. The case vehicle rotated approximately 90 degrees counterclockwise as a result of the initial impact and side slapped the Chevrolet. During the rotation, the driver most likely remained in contact with the interior side surface while moving backward along the side surface toward the left "B"-pillar. When the side slap impact occurred, the case vehicle's driver, once again, loaded the interior surface of the driver's door and the left "B"-pillar. After separating from the Chevrolet, the case vehicle moved backwards while continuing to rotate counterclockwise. As a result, the driver moved forward and eventually toward the right as the case vehicle mounted the median and rotated to final rest. During this period, the driver most likely loaded his safety belts which inhibited his forward and rightward movement. The vehicle inspection showed no apparent evidence of occupant contact to the front of the vehicle's interior. As the vehicle was slowing to rest, the driver's restraints enabled him to rebound backwards towards his original seating position. The exact posture of the driver at final rest is unknown, but he was able to exit his vehicle without assistance.

The driver was transported by ambulance to the hospital. He sustained minor injuries and was treated and released. According to his interview and his medical records, the injuries sustained by the case vehicle's driver included: a small laceration on the left side of his head, abrasions to his nose and left chest—underneath his left arm, and a chest contusion. The laceration and nasal abrasion most likely resulted from contact by the disintegrated glazing from the driver's door, the chest abrasion was caused by the shoulder belt which was improperly worn under the left arm, and the contusion was most likely caused by contacting the intruding driver's door surface.

Chevrolet's Occupants: Based on the Police Crash Report, the Chevrolet's driver [52-year-old, Black (unknown if Hispanic) female] and front seat passenger—unknown position [41-year-old (unknown race and/or ethnic) male] were restrained by their available, active, three-point, lap-and-shoulder, safety belt systems. Neither occupant was transported by ambulance to the hospital, and they did not sustain any injuries as a result of this crash.

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which the case vehicle was traveling was a two-lane, undivided, city street, traversing in a north-south direction, and the case vehicle was approaching a controlled "Tee" intersection (**Figure 1**). The trafficway on which the other vehicle was traveling was a six-lane, divided, city street, traversing in an east-west direction and was approaching the same three-leg ("Tee") intersection (**Figure 2**). On the western leg of the intersection, both the east and west roadways had three through lanes; see **CRASH DIAGRAM** at end.



Figure 1: Case vehicle's northward travel path approaching Tee intersection (case photo #01)



Figure 2: Chevrolet's eastward travel path in center through lane; Note: arrow marks approximate point of impact with case vehicle (case photo #09)



Figure 3: Southward view of case vehicle's northbound pre-crash path into Tee intersection; Note: downgrade on approach path (case photo #08)

The case vehicle's city roadway was straight and level (i.e., actual slope was slightly negative to the north) at the area of impact (**Figure 3** above). The pavement was bituminous, but traveled, and the width of the case vehicle's northbound travel lane was 4.7 meters (15.4 feet) and the southbound lane was 4.6 meters (15.1 feet). The shoulders were not improved (i.e., grass) on either the north or south sides of the roadway. Pavement markings consisted of a double solid yellow centerline for both north and southbound traffic. In addition, solid white edge lines were present. The estimated coefficient of friction was 0.75. Traffic controls consisted of a **STOP** sign (Manual on Uniform Traffic Control Devices, R1-1) located on the southeast quadrant of the intersection. The statutory speed limit was 56 km.p.h. (35 m.p.h.). No regulatory speed limit sign was posted near the crash site.

The other vehicle's city roadway was straight and level at the area of impact (**Figure 2** above). The pavement was concrete, and the width of the center eastbound travel lane was 3.4 meters (11.2 feet). The shoulders were not improved (i.e., grass), but the roadway was bordered by barrier curbs. The north side of the eastbound road had a barrier curb protecting the 4.1 meter (13.5 feet) wide unprotected, tree-lined, grassy median. No pavement markings were present on the roadway; however, the through lanes were divided by a series of white raised pavement markers. The estimated coefficient of friction was 0.70. There were no visible traffic controls in the immediate area of the crash. The statutory speed limit was 64 km.p.h. (40 m.p.h.). No regulatory speed limit sign was posted near the crash site.

At the time of the crash the light condition was daylight, the atmospheric condition was clear, and the roadway pavement was dry. Traffic density was undetermined, and the site of the crash was primarily urban residential.

Pre-Crash: The case vehicle had been traveling north and came to a stop, heading north at the **STOP** sign (**Figure 1** above). The case vehicle entered the intersection, intending to turn left and proceed westward. The Chevrolet pickup was traveling east in the center through lane and intended to proceed straight ahead (**Figure 2** above). The case vehicle's driver made no avoidance maneuvers prior to the crash. The crash occurred in the center through lane of the eastbound roadway, within the "Tee" the intersection of the two trafficways.

Crash: The left center of the case vehicle (**Figure 4** and **Figure 5** below) was impacted by the front of the Chevrolet. The case vehicle's driver and front right passenger supplemental restraints (air bags) did not deploy during the crash sequence.

Post-Crash: The case vehicle's impact with the Chevrolet caused the case vehicle to rotate approximately 90 degrees counterclockwise and, as a result, the front portion of the left front



Figure 4: Forward portion of case vehicle's left side impact with contour gauge present; Note: single arrow indicates forward-most location of direct damage and double arrow shows side slap impact to front portion of left fender (case photo #17)

fender (**Figure 4** above) side slapped the Chevrolet, most likely in its left front fender. The force from the initial impact caused the case vehicle to move in an east-northeasterly direction into a raised, paved median while continuing to rotate counterclockwise (**Figure 6**). The case vehicle came to rest on the median heading southeastward, straddling the east and westbound roadways (**Figure 7**).



Figure 6: Northeasterly view from approximate point of impact with Chevrolet showing case vehicle's post-crash trajectory across eastbound lanes and into (arrow) raised paved median (case photo #04)

CASE VEHICLE

The 2003 Toyota Corolla CE was a front wheel drive, five-passenger, four-door sedan (VIN: 1NXBR32E03Z-----) equipped with a 1.8L, I-4 engine and a four-speed automatic transmission. The case vehicle was equipped with advanced occupant protection system features including redesigned air bags with dual stage driver and front right passenger air bag inflators and pretensioners. Furthermore, front seat back-mounted side impact air bags were an option on the case vehicle, but this vehicle was not so equipped. Finally, the case vehicle was also equipped with an Electronic Control Unit, which houses the Event Data Recorder (**EDR**) technology. Braking was achieved by a power-assisted, front disc and rear drum system. The case vehicle's wheelbase was 260 centimeters (102.4 inches), and the odometer reading at inspection is unknown because the case vehicle was equipped with an electronic odometer.

Inspection of the vehicle's interior revealed adjustable front bucket seats with adjustable head restraints; a non-adjustable back bench seat with adjustable head restraints for the back outboard seating positions; and continuous loop, three-point, lap-and-shoulder, safety belt systems at all five front and back positions. The exact position adjustment for any of the adjustable head restraints



Figure 5: Rearward portion of case vehicle's left side impact with contour gauge present; Note: arrow indicates rear-most portion of direct damage (case photo #18)



Figure 7: Southwesterly view from beyond case vehicle's obliquely oriented, final rest position atop raised paved median; Note: arrow marks approximate point of impact (case photo #06)

was not determined. The front seat belt systems were equipped with manually operated, upper anchorage adjusters for the “D”-rings. The driver’s upper anchorage adjuster was located in the down-most position, but the adjuster was located in upmost position for the front right seating position. The vehicle was equipped with knee bolsters for both the driver and front right seating positions, neither of which showed evidence of contact or deformation. Automatic restraint was provided by a Supplemental Restraint System (SRS) that consisted of an advanced frontal air bag for the driver and front right passenger seating positions. Neither frontal air bag deployed as a result of the case vehicle’s left side impact with the Chevrolet pickup.

CASE VEHICLE DAMAGE

Exterior Damage: The case vehicle’s initial contact with the Chevrolet involved the left front and rear doors (**Figure 8**). Direct damage began 41 centimeters (16.1 inches) forward of the left rear axle (**Figure 9** and **Figure 5** above) and extended toward the front a measured distance of 175 centimeters (68.9 inches) along the door panels (**Figure 10** and **Figure 4** above). The Field L began 16 centimeters (6.3 inches) rearward of the left rear axle and extended toward the front a measured distance of 251 centimeters (98.8 inches). Maximum crush was measured as 23 centimeters (9.1 inches) at C₃. The case vehicle’s side slap impact with the Chevrolet involved the front portion of the left fender. Direct and induced damage began 10 centimeters (3.9 inches) forward of the left front axle (**Figure 4** above) and extended toward the front left headlight assembly a measured distance of 60 centimeters (23.6 inches). Crush along the entire area was only superficial and unmeasurable. The wheelbase on the case vehicle’s left side was unaltered while the right side was extended at most 1 centimeter (0.4 inches). The case vehicle’s left side doors and “B”-pillar were directly damaged and crushed inward toward the center of



Figure 8: Case vehicle’s left side impact viewed from left of back with contour gauge present (case photo #22a)

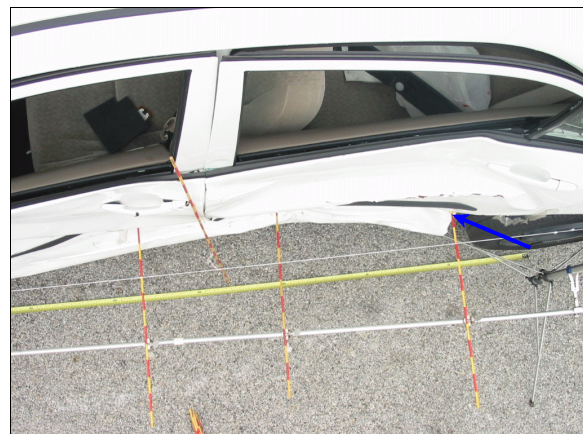


Figure 9: Overhead view of rearmost damage to case vehicle’s left sill area from impact by Chevrolet pickup; Note: arrow indicates rearmost location of direct damage (case photo #21)

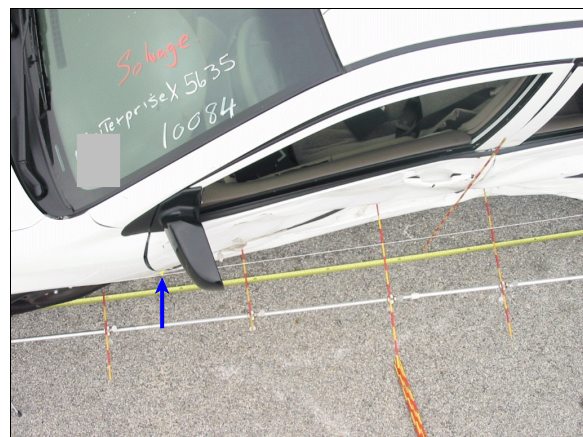


Figure 10: Overhead view of forward-most damage to case vehicle’s left sill area from impact by Chevrolet pickup; Note: arrow indicates forward-most location of direct damage (case photo #20)

the vehicle from the initial impact. The left fender was also directly damaged during the side slap impact. Induced damage was noted to the hood and to the left rear wheel well. No obvious induced damage or remote buckling was noted to the remainder of the case vehicle's exterior. None of the case vehicle's tires were damaged, deflated, or physically restricted.

Interior Damage: Inspection of the case vehicle's interior revealed a minor scuff on the left front door's arm rest and left "B"-pillar of the case vehicle (Figures 11 and 12). There was no apparent evidence of occupant contact to the case vehicle's steering wheel, instrument panel, or greenhouse areas. Lateral intrusion was present along the case vehicle's left side, involving both doors, both door sills, the left "B"-pillar, the driver's seat back, and the back left seat cushion. The largest intrusion occurred to the left rear door and was measured as 14 centimeters (5.5 inches). The greatest intrusion near the case vehicle's occupant occurred to the left "B"-pillar and measured 8 centimeters (3.1 inches). Finally, there was no evidence of compression of the energy absorbing shear capsules in the base of the steering column and no deformation to the steering wheel rim (Figure 11).



Figure 11: Occupant contact evidence on interior surface of case vehicle's driver door and left "B"-pillar; Note: no movement to steering wheel rim or deployment of driver's air bag (case photo #35)



Figure 12: Close-up of occupant contact evidence on interior surface of case vehicle's driver door and left "B"-pillar (case photo #37)

Damage Classification: Based on the vehicle inspection the CDCs for the case vehicle were determined to be: **09-LPEW-2 (280 degrees)** and **09-LFMW-1**. The WinSMASH reconstruction program, missing vehicle algorithm, was used on the case vehicle's highest severity impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 23.0 km.p.h. (14.3 m.p.h.), -4.0 km.p.h. (-2.5 m.p.h.), and +22.7 km.p.h. (+14.1 m.p.h.). In this contractor's opinion, these results appear reasonable. No reconstruction program was used on the side slap impact because the damage was only superficial and was initially thought to have occurred prior to this crash. For the side slap impact, the crash severity to the case vehicle was minor [2-13 km.p.h. (1-8 m.p.h.)]. The case vehicle was towed due to damage.

AUTOMATIC RESTRAINT SYSTEM

The case vehicle was equipped with a Supplemental Restraint System (SRS) that contained advanced (i.e., dual stage inflators) frontal air bags at the driver and front right passenger positions. Neither frontal air bag deployed as a result of the left side impact with the Chevrolet pickup. The case vehicle's driver air bag was located in the steering wheel hub. The Police Crash

Report noted that at least the driver's air bag deployed, but our inspection revealed that this was not the case (Figure 13). The front right passenger air bag was located in the top of the instrument panel (Figure 14).

CRASH DATA RECORDING

The Electronic Control Unit, which houses the EDR technology for this vehicle, was located underneath the center dash. The ECU was removed by this contractor and submitted to the agency. The ECU was sent to the manufacturer for data interpretation, and no response has been received at the time of report submission.

CASE VEHICLE DRIVER KINEMATICS

Immediately prior to the crash the case vehicle's driver [180 centimeters and 70 kilograms (71 inches, 155 pounds)] was seated in a slightly reclined posture with his back against the seat back, his left foot on the floor and his right foot on the accelerator. According to the case vehicle's driver, his arms were covering his face as he saw imminent collision. His seat track was located between its middle and rearmost positions, the seat back was slightly reclined, and the tilt steering wheel was located in its down-most position.



Figure 13: Case vehicle's driver seating area showing non-deployment of driver's air bag and no apparent occupant contact evidence on steering wheel, instrument panel, or greenhouse areas (case photo #39)



Figure 14: Case vehicle's non-deployed front right passenger air bag and no apparent occupant contact evidence on center and right instrument panel or front right greenhouse areas (case photo #41)

The case vehicle's driver was restrained by his available, active, three-point, lap-and-shoulder, safety belt system; although, the shoulder belt portion of the system was placed under his left arm. The belt system was equipped with a retractor-mounted pretensioner housed within the "B"-pillar. Furthermore, according to the driver's interview and his medical records, there was an abrasion on the driver's left chest, under his left arm. However, an inspection of the driver's seat belt webbing, "D"-ring, and latch plate showed no evidence of loading, but this is not inconsistent given the case vehicle's 280 degree Direction of Principal Force.

The case vehicle's driver made no known pre-crash avoidance maneuvers. As a result and independent of the use of his available safety belts, his pre-impact body position did not change just prior to impact. The case vehicle's primary impact with the Chevrolet enabled the case vehicle's driver to move leftward and slightly forward along a path opposite the case vehicle's 280 degree Direction of Principal Force as the case vehicle decelerated. As a result the driver loaded the interior surface of his door at the same time the door was intruding inward. The case vehicle

rotated approximately 90 degrees counterclockwise as a result of the initial impact and side slapped the Chevrolet. During the rotation, the driver most likely remained in contact with the interior side surface while moving backward along the side surface toward the left “B”-pillar. When the side slap impact occurred, the case vehicle’s driver, once again, loaded the interior surface of the driver’s door and the left “B”-pillar. After separating from the Chevrolet, the case vehicle moved backwards while continuing to rotate counterclockwise. As a result, the driver moved forward and eventually toward the right as the case vehicle mounted the median and rotated to final rest. During this period, the driver most likely loaded his safety belts which inhibited his forward and rightward movement. The vehicle inspection showed no apparent evidence of occupant contact to the front of the vehicle’s interior (**Figures 9 and 10** above). As the vehicle was slowing to rest, the driver’s restraints enabled him to rebound backwards towards his original seating position. The exact posture of the driver at final rest is unknown, but he was able to exit his vehicle without assistance.

CASE VEHICLE DRIVER INJURIES

The driver was transported by ambulance to the hospital. He sustained minor injuries and was treated and released. According to his interview and his medical records, the injuries sustained by the case vehicle’s driver included: a small laceration on the left side of his head, abrasions to his nose and left chest–underneath his left arm, and a chest contusion. The laceration and nasal abrasion most likely resulted from contact by the disintegrated glazing from the driver’s door, the chest abrasion was caused by the shoulder belt which was improperly worn under the left arm, and the contusion was most likely caused by contacting the intruding driver’s door surface.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Laceration {cut} scalp, 1.3 cm (0.5 in) above left ear	minor 190602.1,2	Noncontact injury: flying glass, left front glazing	Probable	Interviewee (same person)
2	Abrasion, superficial, nose	minor 290202.1,4	Noncontact injury: flying glass, left front glazing	Possible	Emergency room records
3	Abrasion, 5.1 x 2.5 cm (2 x 1 in) left chest under left arm	minor 490202.1,2	Torso portion of safety belt system {worn under arm}	Certain	Emergency room records
4	Contusion chest, not further specified	minor 490402.1,2	Left side interior surface, excluding hardware and/or armrest	Possible	Emergency room records

OTHER VEHICLE

IN-02-008

The 1995 Chevrolet C1500 was a rear wheel drive, 4x2, two-door, extended cab pick-up truck (VIN: 2GCEC19K8S-----). Four wheel, anti-lock brakes are standard on this model. With no available vehicle photographs, the CDCs for this vehicle are not estimable. The Chevrolet pickup was towed due to damage.

Based on the Police Crash Report, the Chevrolet's driver [52-year-old, Black (unknown if Hispanic) female] and front seat passenger-unknown position [41-year-old (unknown race and/or ethnic) male] were restrained by their available, active, three-point, lap-and-shoulder, safety belt systems. Neither occupant was transported by ambulance to the hospital, and they did not sustain any injuries as a result of this crash.

