



INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER

School of Public and Environmental Affairs

222 West Second Street

Bloomington, Indiana 47403-1501

(812) 855-3908 Fax: (812) 855-3537

ON-SITE SIDE IMPACT INFLATABLE OCCUPANT PROTECTION INVESTIGATION

CASE NUMBER - IN-06-018

LOCATION - TEXAS

VEHICLE - 2006 MINI COOPER

CRASH DATE - May 2006

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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 side impact inflatable occupant protection investigation involving a 2006 Mini Cooper (case vehicle) and a 2002 Buick Regal (1 st other vehicle) and a 2004 Subaru Forester (2 nd other vehicle), which were involved in a back end crash on a divided state U.S. highway. This crash is of special interest because the case vehicle was equipped with front seat back-mounted side impact air bags and side curtain air bags, which deployed on the passenger's side, and the front right passenger [48-year-old, White (non-Hispanic) female] sustained a police-reported "B" (non-incapacitating-evident) injury as a result of the crash. The case vehicle, Subaru and Buick were all traveling west in the inside through lane of a four lane, divided U.S. highway. The case vehicle was behind the Subaru and the Buick was behind the case vehicle. Due to suddenly slowing traffic, all three vehicle's applied their brakes. In addition the Buick's driver steered right. The front left of the Buick impacted the back right of the case vehicle (event 1). The case vehicle was accelerated forward and rotated counterclockwise. The case vehicle's right front door then impacted the Subaru's back left corner (event 2) causing the case vehicle's front right seat back-mounted side impact air bag and right side curtain air bag to deploy. The case vehicle rotated clockwise and crossed the median shoulder and its front left corner sustained a minor impact to the concrete median barrier (event 3). The case vehicle came to final rest against the median barrier heading southwest. The Subaru came to final rest in the inside through lane heading west. The Buick came to final rest in the inside through lane heading northwest. The case vehicle's front right passenger was restrained by her manual, three-point, lap-and-shoulder safety belt system. She was transported by ambulance to a medical facility and was treated and released.					
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This investigation was brought to NHTSA's attention on or before June 13, 2006 by NASS CDS/GES sampling activities. This crash involved a 2006 Mini Cooper S (case vehicle), a 2002 Buick Regal LS (1st other vehicle), and a 2004 Subaru Forester XT (2nd other vehicle) which were involved in a back end crash on a divided U.S. highway. The crash occurred in May 2006, at 8:35 a.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 front seat back-mounted side impact air bags and side curtain air bags, which deployed on the passenger's side, and the front right passenger [48-year-old, White (non-Hispanic) female] sustained a police-reported "B" (non-incapacitating-evident) injury as a result of the crash. This contractor inspected the case vehicle and the Buick on July 18, 2006 and inspected the scene on July 20, 2006. The Subaru was not inspected. It could not be located. The case vehicle's driver was interviewed on July 26, 2006. This report is based on the police crash report, scene and vehicle inspections, driver interview, case vehicle's front right passenger medical records, occupant kinematic principles, and this contractor's evaluation of the evidence.

SUMMARY

The case vehicle, Subaru and Buick were all traveling west in the inside through lane of a four lane, divided U.S. highway. The case vehicle was behind the Subaru and the Buick was behind the case vehicle. Due to suddenly slowing traffic, all three vehicles applied their brakes. In addition the Buick's driver steered right. The front left of the Buick impacted the back right of the case vehicle (event 1). The case vehicle was accelerated forward and rotated counterclockwise. The case vehicle's right front door then impacted the Subaru's back left corner (event 2) causing the case vehicle's front right seat back-mounted side impact air bag and right side curtain air bag to deploy. The case vehicle rotated clockwise and crossed the median shoulder and its front left corner sustained a minor impact to the concrete median barrier (event 3). The case vehicle came to final rest against the median barrier heading southwest. The Subaru came to final rest in the inside through lane heading west. The Buick came to final rest in the inside through lane heading northwest. At the time of the crash the light condition was daylight, the atmospheric condition was clear and the roadway pavement was dry.

The CDC for the case vehicle's back impact with the Buick (event 1) was determined to be: **06-BZEW-2 (180 degrees)**. The residual maximum crush for this impact was measured as 11 centimeters (4.3 inches) occurring at C₅. The CDC for the right side impact with the Subaru (event 2) was determined to be: **02 RPEW-2 (60 degrees)**. The residual maximum crush for this impact was measured as 18 centimeters (7.1 inches) occurring at C₃. The CDC for the front left corner impact with the median barrier (event 3) was determined to be: **12-FLES-1 (0 degrees)**. There was no residual crush from this impact. The WinSMASH reconstruction program, damage only algorithm, calculated the case vehicle's Total, Longitudinal, and Lateral Delta Vs for the back impact with the front of the Buick (i.e., most severe impact) respectively as: 22.0 km.p.h. (13.7 m.p.h.), 22.0 km.p.h. (13.7 m.p.h.), and 0.0 km.p.h. (0.0 m.p.h.). The WinSMASH reconstruction program, missing vehicle algorithm, calculated the Total, Longitudinal, and Lateral

Delta Vs for the right side impact with the back of the Subaru respectively as: 16.0 km.p.h. (9.9 m.p.h.), -8.0 km.p.h. (-5.0 m.p.h.), and -13.9 km.p.h. (-8.6 m.p.h.). The case vehicle was towed due to damage.

The CDC for the Buick's impact to the back of the case vehicle (event 1) was determined to be: **12-FYEW-2 (00 degrees)**. The WinSMASH reconstruction program, damage only algorithm, calculated the Buick's Total, Longitudinal, and Lateral Delta Vs respectively as: 18.0 km.p.h. (11.2 m.p.h.), -18.0 km.p.h. (-11.2 m.p.h.), and 0.0 km.p.h. (0.0 m.p.h.). The Buick was towed due to damage.

The case vehicle's front right passenger was restrained by her three-point, lap-and-shoulder safety belt system. She was transported by ambulance to a medical facility and was treated and released. She sustained a lower back strain due to impact force from the back impact and small lacerations to her upper right arm due to flying glass fragments from the right front window. She sustained no reported injuries from her deployed seat back mounted side impact air bag or side curtain air bag. The front right passenger's use of her safety belt system and the deployment of her seat back-mounted side impact air bag and side curtain air bag mitigated her interaction with the case vehicle's interior side components and reduced her injury potential.

The case vehicle's driver was restrained by her three-point, lap-and-shoulder safety belt system. She was not transported to a medical facility, but sought medical treatment later. She sustained a lower back strain due to impact force from the back impact.

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which the case vehicle was traveling was a four-lane, divided, U.S. highway, traversing in an east and west direction. The westbound roadway had two through lanes, an exit ramp and wide bituminous shoulders. The eastbound roadway had two through lanes and wide bituminous shoulders. Each through lane was approximately 3.7 meters in width (12 feet). The trafficway was divided by a concrete median barrier. Roadway pavement markings consisted of solid white outside edge line, broken white center line and solid yellow median edge line. The speed limit was 97 km.p.h. (60 m.p.h.). There was no regulatory speed limit sign 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, level, traffic polished bituminous with an estimated coefficient of friction of 0.65. Traffic density was heavy and the site of the crash was commercial. See the Crash Diagram at the end of this report.

Pre-Crash: The case vehicle, Subaru and Buick were all traveling west in the inside through lane



Figure 1: Overview of approach of case vehicle, Buick and Subaru in inside westbound lane to area of impact

(Figure 1 above). The case vehicle was behind the Subaru and the Buick was behind the case vehicle. The drivers were all intending to continue straight ahead. Traffic was heavy and began to slow rapidly. In response, the Subaru’s driver braked suddenly as did the case vehicle’s driver. The Buick’s driver also braked, but was unable to stop before impacting the case vehicle. The case vehicle’s driver saw the approaching Buick in his rearview mirror, but was unable to take any action to avoid being rear-ended. He indicated the Buick was moving to the right at the time of the impact, indicating the Buick’s driver steered right in an attempt to avoid the impact. The crash occurred in the inside westbound lane.



Figure 2: Overview of front damage to Buick from impact with back of case vehicle, vertical scale in tenths of meter, each increment on rods is 5 cm (2 in)



Figure 3: Overview of damage to back of case vehicle from impact with Buick and damage to right front door from impact with Subaru



Figure 4: Damage to case vehicle’s right front door from impact with Subaru and induced damage to right quarter panel from back impact with Buick



Figure 5: Arrow shows damage to front left bumper corner from impact with concrete median barrier

Crash: The case vehicle’s driver indicated he had slowed to less than 32 km.p.h. (20 m.p.h.) when the front left of the Buick impacted the back right of the case vehicle (event 1, Figures 2 and 3). The impact accelerated the case vehicle forward and caused it to rotate counterclockwise. The case vehicle’s right front door (Figure 4) then impacted the Subaru’s back left corner (event 2) causing the case vehicle’s front right seat back-mounted side impact air bag and right side curtain air bag to deploy. The case vehicle rotated clockwise and crossed the median shoulder and its

front left corner sustained a minor impact (**Figure 5** above) to the concrete median barrier (event 3). Deployment of the case vehicle's front air bags did not occur in this crash because the front impact with the barrier was not severe enough to require their deployment.

Post-Crash: The case vehicle came to rest against the median barrier heading southwest. The Subaru came to rest in the inside through lane heading west. The Buick came to final rest in the inside through lane heading northwest.

CASE VEHICLE

The 2006 Mini Cooper S was a front wheel drive, two-door hatchback (VIN: WMWRE33546T-----) equipped with 1.6 L, I4 engine; six-speed manual transmission, anti-lock brakes and "cornering brake control". The front seating row was equipped with a tilt steering column, dual stage driver and front right passenger air bags, bucket seats with folding backs and adjustable head restraints; manual, three-point, lap-and-shoulder safety belt systems with buckle-mounted pretensioners and load limiters and a front right passenger occupant presence sensor. The back seat was equipped with a bench seat with folding back, adjustable head restraints and lap-and-shoulder safety belt systems. In addition, the case vehicle was equipped with a LATCH system for securing child safety seats. The case vehicle's specification wheelbase was 247 centimeters (97.2 inches). The odometer reading at the time of the case vehicle inspection is unknown because the case vehicle was equipped with an electronic odometer. Lastly, the manufacturer of this vehicle has certified that it meets the advanced air bag requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 208.

The various sensors in the case vehicle's advanced occupant restraint system analyze a combination of factors including the predicted crash severity to determine the front air bag inflation level appropriate for the severity of the crash. In the event of a side impact, crash sensors analyze side impact forces and deploy the driver or front right passenger seat back-mounted side impact air bag and the side curtain air bag to provide added head and chest protection.

CASE VEHICLE DAMAGE

Exterior Damage: The case vehicle's impact with the Buick (event 1) involved approximately the right half of the case vehicle's back end. The back bumper, hatch and back of the right quarter panel were directly damaged and crushed forward. The direct damage began at the back right bumper corner and extended 68 centimeters (26.8 inches) across the back bumper. The residual maximum crush was measured as 11 centimeters (4.3 inches) occurring at C₅ (**Figure 6**). The table below shows the case vehicle's back crush profile.



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	68	11	132	0	4	7	9	11	10	15	0
in		26.8	4.3	52.0	0.0	1.6	2.8	3.5	4.3	3.9	5.9	0.0

The case vehicle's right side impact with the back left corner of the Subaru (event 2) involved the right front door and quarter panel. The right front door and a small area of the right quarter panel behind the right front door were directly damaged and crushed inward. The direct damage ended 73 centimeters (28.7 inches) rear of the right front axle and was measured as 96 centimeters (37.8 inches) in length. The residual maximum crush was measured as 18 centimeters (7.1 inches) occurring at C₃ (Figure 7). The table below shows the case vehicle's right side crush profile.



Figure 7: Top view of crush to case vehicle's right front door from impact with back left corner of Subaru

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	2	96	18	128	8	17	22	16	8	2	-5	-9
in		37.8	7.1	50.4	3.2	6.7	8.7	6.3	3.2	0.8	-2.0	-3.5

The case vehicle's front impact with the concrete median barrier involved the left corner of the front bumper. The direct damage began at the left bumper corner and extended approximately 8 centimeters (3.1 inches) across the bumper corner. There was no residual crush due to this impact.

The back impact reduced the case vehicle's right side wheelbase 20 centimeters (7.8 inches). The case vehicle's left side wheelbase was reduced 6 centimeters (2.4 inches). The induced damage due to the back and right side impacts involved the case vehicle's right and left quarter panel and left portion of the back bumper and hatch. In addition, both right side windows and the backlite were broken out.

The case vehicle's recommended tire size was: P195/55R16, and the case vehicle was equipped with tires of this size. The case vehicle's tire data are shown in the table below.

Tire	Measured Pressure		Recommend Pressure		Tread Depth		Damage	Restricted	Deflated
	kpa	psi	kpa	psi	milli-meters	32 nd of an inch			
LF	165	24	207	30	5	6	None	No	No
RF	152	22	207	30	5	6	None	No	No
LR	172	25	207	30	7	9	None	No	No
RR	159	23	207	30	7	9	Small cut in sidewall	Yes	No

Vehicle Interior: Inspection of the case vehicle's interior (**Figure 8** and **Figure 9**) revealed no evidence of occupant contact to any of the interior surfaces or components. Intrusions involved the right front door, which intruded laterally 6 centimeters (2.4 inches) as did the right side panel rear of the "B"-pillar. In addition, the front seat backs intruded into the back seat area. Finally, there was no evidence of compression of the energy absorbing steering column or deformation of the steering wheel rim.



Figure 8: Overview of case vehicle's instrument panel, windshield and steering wheel

Damage Classification: Based on the vehicle inspection, the CDC for the case vehicle's back impact with the Buick (event 1) was determined to be: **06-BZEW-2 (180 degrees)**. The CDC for the right side impact with the Subaru (event 2) was determined to be: **02 RPEW-2 (60 degrees)**. The front left corner impact with the median barrier (event 3) was determined to be: **12-FLES-1 (0 degrees)**. The WinSMASH reconstruction program, damage only algorithm was used to reconstruct the case vehicle's Delta Vs for the back impact with the front of the Buick (i.e., most severe impact). The Total, Longitudinal, and Lateral Delta Vs are, respectively: 22.0 km.p.h. (13.7 m.p.h.), 22.0 km.p.h. (13.7 m.p.h.), and 0.0 km.p.h. (0.0 m.p.h.). The WinSMASH results appeared reasonable. The WinSMASH reconstruction program, missing vehicle algorithm, was also used to reconstruct the Delta Vs for the right side impact with the back of the Subaru. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 16.0 km.p.h. (9.9 m.p.h.), -8.0 km.p.h. (-5.0 m.p.h.), and -13.9 km.p.h. (-8.6 m.p.h.). This was a borderline reconstruction and the results appeared reasonable. The case vehicle was towed due to damage.

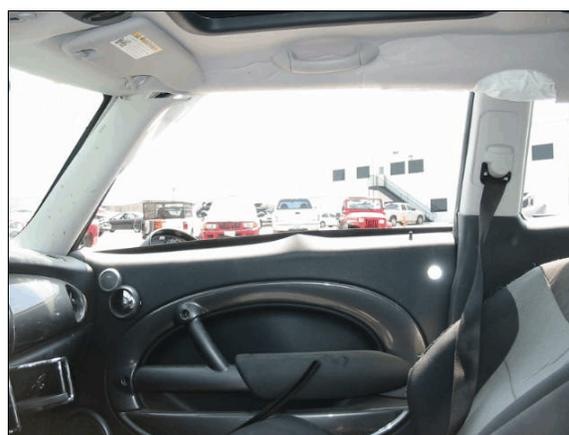


Figure 9: Case vehicle's right front door and side curtain air bag tucked into headliner

The case vehicle was equipped with front seat back-mounted side impact air bags and side curtain air bags, as well as a manufacturer certified 208-compliant front air bag system. The front right passenger's seat back-mounted side impact air bag and the right side curtain air bag deployed as a result of the case vehicle's right side impact with the back of the Subaru. The driver and front right passenger's front air bags did not deploy in this crash because the front impact with the median barrier was not severe enough to require their deployment.

The front right passenger's seat back-mounted side impact air bag was located in the front right seat back (**Figure 10**). The deployed air bag was approximately oval in shape (**Figure 11**). The overall dimensions of the air bag were approximately 54 centimeters (21.3 inches) in height and 24 centimeters (9.5 inches) in width. The air bag was designed without tethers and vent ports. There was no module flap on the side of the seat back. The air bag deployed through a tear-seam in the side of the seat back. There was no evidence of damage to the air bag due to deployment. However, there were a few small holes in the outside surface of the air bag due to cuts from flying tempered glass fragments from the right front window. There was no evidence of occupant contact on the air bag. However, a few blood spots were found on the inside surface of air bag, which most likely came from a laceration the front right passenger sustained to her right upper arm due to flying side window glass fragments.



Figure 10: Case vehicle's front right passenger seat back-mounted air bag located in right side of seat back

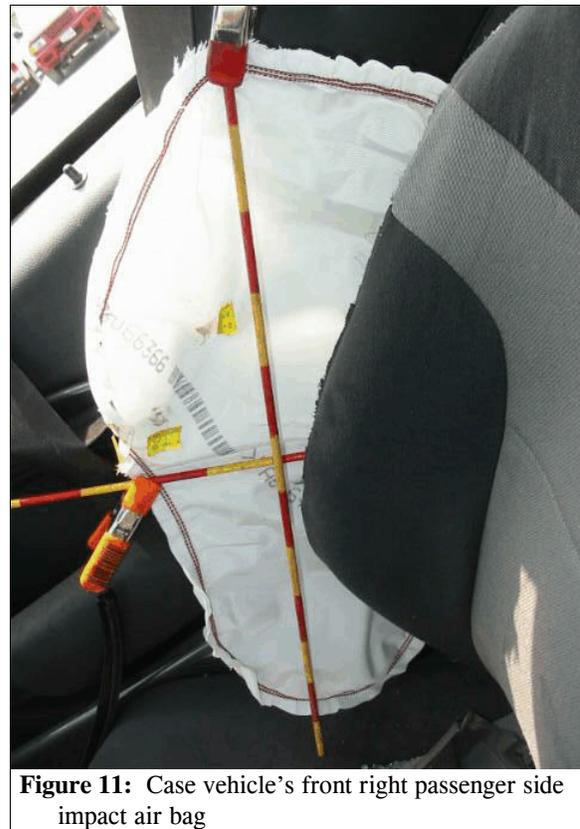


Figure 11: Case vehicle's front right passenger side impact air bag

The right side curtain air bag was located along the right roof side rail (**Figures 12 and 13**) inside the headliner and extended along the front right and back right seat positions. The air bag appeared to be tubular-shaped. It was constructed of nylon mesh and was located inside an outer nylon bag (**Figure 14**). The air bag was anchored to the upper right “A”-pillar by an approximate 16 centimeters (6.3 inches) long nylon cord and to the right “C”-pillar by another nylon cord. The outer nylon bag was approximately 125 centimeters (49.2 inches) in length and approximately 21 centimeters (8.3 inches) in height. There was no evidence of occupant contact to the side curtain air bag.

CASE VEHICLE FRONT RIGHT PASSENGER KINEMATICS

Immediately prior to the crash the case vehicle's front right passenger [48-year-old, White (non-Hispanic) female; 76 kilograms and 163 centimeters (168 pounds, 64 inches)] was seated in an upright position with her back against the seat back and both feet on the floor. In addition, she was using a “Blackberry” at the time. Her seat track was adjusted to its rear-most position and her seat back was slightly reclined. The passenger was also wearing contact lenses at the time of the crash.

Based on the case vehicle inspection, the front right passenger was restrained by her manual, three-point, lap-and-shoulder, safety belt system. A load abrasion was found on the latch plate belt guide (**Figure 15** below). In addition, the buckle-mounted pretensioner had actuated.

The case vehicle driver’s pre-impact braking most likely locked the front right passenger’s safety belt retractor. As a result, the passenger most likely moved forward within her safety belt and may have been bracing for a potential impact with the Subaru as the case vehicle decelerated. The Buick’s impact to the case vehicle’s back right then caused the front right passenger to move rearward along a path opposite the case vehicle 180 degree direction of principal force as the case vehicle was accelerated forward. She loaded



Figure 12: Front portion of case vehicle’s right side curtain air bag



Figure 13: Back portion of case vehicle’s right side curtain air bag



Figure 14: Mesh inner lining of side curtain air bag located inside outer nylon bag

her seat back displacing it rearward and causing a lower back strain. As the case vehicle rotated counterclockwise, the passenger’s upper torso most likely moved to the right. The case vehicle’s right side impact with the back of the Subaru caused the passenger to continue to the right and forward along a path opposite the case vehicle’s 60 degree direction of principal force as the vehicle decelerated and she loaded her safety belt. The impact broke out the right front glazing, and she sustained a few small lacerations and abrasions on her right arm from flying glass. Her right flank impacted the deployed seat back-mounted side impact air bag and her head impacted the deployed side curtain air bag. She sustained no reported injuries from the air bags. The passenger then most likely continued slightly forward along a path opposite the case vehicle’s 0 degree direction of principal force as the case vehicle’s front left corner impacted the concrete median barrier and decelerated to final rest. The front right passenger remained restrained in her seat following the impact and exited the case vehicle under her own power. The deployment of the front right passenger’s seat back-mounted side impact air bag and side curtain air bag mitigated her interaction with the case vehicle’s interior side components and reduced her injury potential.

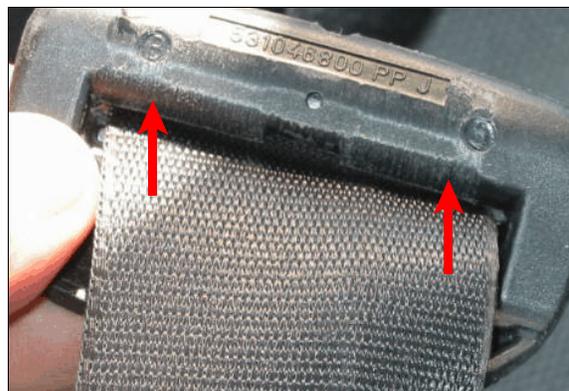


Figure 15: Load abrasions on case vehicle’s front right passenger latch plate belt guide

CASE VEHICLE FRONT RIGHT PASSENGER INJURIES

The police crash report indicated the case vehicle’s front right passenger sustained a “B” (non-incapacitating-evident) injury and was transported from the scene by ambulance to a medical facility. The passenger was treated and released from the emergency room. She sought no follow-up treatment and lost two work days as a result of the crash. The table below shows the front right passenger’s injuries and injury mechanisms.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Strain lower back, not further specified, with degenerative facet disease but without disk protrusion or canal stenosis	minor 640678.1,8	Noncontact injury: impact forces	Probable	Emergency room records
2	Abrasion posterior right upper arm	minor 790202.1,1	Noncontact injury: flying glass, right front glazing	Certain	Emergency room records
3	Laceration, irregular, multiple, right forearm, not further specified	minor 790602.1,1	Noncontact injury: flying glass, right front glazing	Certain	Emergency room records

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
4	Contusion, possibly upper posterior right arm, but not further specified and unknown	minor 990400.1,0	Unknown contact mechanism	Unknown	Emergency room records

CASE VEHICLE DRIVER KINEMATICS

Immediately prior to the crash the case vehicle's driver [36-year-old, White (non-Hispanic) male; 79 kilograms and 160 centimeters (174 pounds, 67 inches)] was seated in an upright position with his back against his seat back, his right foot on the brake, left foot on the floor, left hand on the steering wheel and right hand on the gear shift lever. He was also looking in the rear view mirror at the approaching Buick. His seat track was adjusted to between its forward and middle position and his seat back was slightly reclined. The driver was also wearing sunglasses at the time of the crash.

Based on the case vehicle inspection, the driver was restrained by his manual, three-point, lap-and-shoulder, safety belt system. A load abrasion was found on the latch plate belt guide (Figure 16). In addition, the buckle-mounted pretensioner had actuated (Figure 17).

The Buick's impact to the case vehicle's back right caused the driver to move rearward along a path opposite the case vehicle 180 degree direction of principal force as the case vehicle was accelerated forward. He loaded his seat back displacing it rearward and causing a back strain. As the case vehicle rotated counterclockwise, the driver's upper torso most likely moved to the right to some degree. The case vehicle's right side impact with the Subaru caused the driver to continue to the right and forward along a path opposite the case vehicle's 60 degree direction of principal force as the vehicle decelerated and he loaded his safety belt. The driver then most likely continued slightly forward along a path opposite the case vehicle's 0 degree direction of principal force as the case vehicle's front left corner impacted the concrete median barrier and decelerated to final rest. The driver remained restrained in his seat following the impact and exited the case vehicle under his own power.



Figure 16: Load abrasion on case vehicle driver's latch plate belt guide

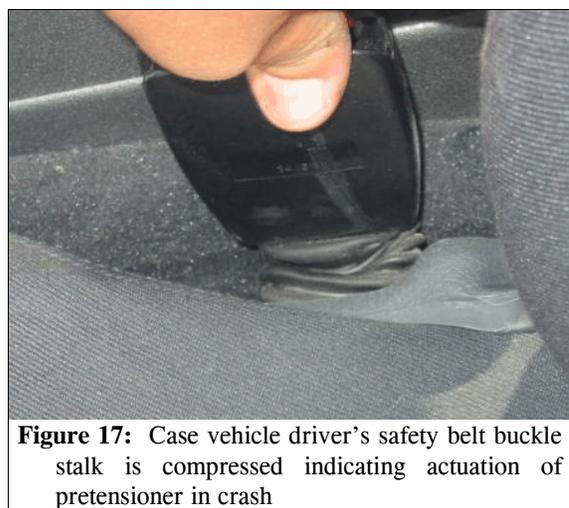


Figure 17: Case vehicle driver's safety belt buckle stalk is compressed indicating actuation of pretensioner in crash

The police crash report indicated the driver sustained no injury and was not transported from the scene to a medical facility. The driver indicated that he subsequently visited a medical clinic and was treated and released. He indicated he lost two work days as a result of the crash. The table below shows the case vehicle driver's reported injury and injury mechanism.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1	Strain lower back, not further specified	minor 640678.1,8	Noncontact injury: impact forces	Probable	Interviewee (same person)

1ST OTHER VEHICLE

The 2002 Buick Regal LS was a front wheel drive, four-door sedan (VIN: 2G4WB52KX21-----) equipped with a 3.8L, V6 engine; four speed automatic transmission, four wheel anti-lock brakes and redesigned driver and front right passenger air bags, which deployed as a result of its impact to the back of the case vehicle.

Exterior Damage: The Buick's impact with the back of the case vehicle involved the front left portion of the vehicle. The front bumper, grille, hood, left headlamp/turn signal assembly and left fender were directly damaged and crushed rearward. Direct damage began at the front left bumper corner and extended 44 centimeters (17.3 inches) across the bumper. Crush measurements were taken at the bumper level and the maximum residual crush was measured as 29 centimeters (11.4 inches) occurring at C₂. The table below shows the Buick's front crush profile.

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	44	131	131	20	29	14	6	0	0	-36	0
in		17.3	51.6	51.6	7.9	11.4	5.5	2.4	0.0	0.0	-14.2	0.0

The left side wheelbase was reduced 8 centimeters (3.1 inches) while the right side wheelbase was extended 1 centimeter (0.4 inch). Induced damage involved the right portion of the front bumper, hood and grille as well as the back portion of the left fender.

The Buick's recommended tire size was P225/60R16, and the vehicle was equipped with tires of this size. The Buick's tire data are shown in the table below.

Tire	Measured Pressure		Recommend Pressure		Tread Depth		Damage	Restricted	Deflated
	kpa	psi	kpa	psi	milli-meters	32 nd of an inch			
LF	Flat	Flat	207	30	4	5	Puncture in sidewall	Yes	Yes
RF	324	47	207	30	4	5	None	No	No
LR	310	45	207	30	4	5	None	No	No
RR	124	18	207	30	2	3	None	No	No

Damage Classification: Based on the vehicle inspection, the CDC for the Buick's impact to the back of the case vehicle was determined to be: **12-FYEW-2 (00 degrees)**. The WinSMASH reconstruction program, damage only algorithm was used to reconstruct the Buick's Delta Vs for this impact. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 18.0 km.p.h. (11.2 m.p.h.), -18.0 km.p.h. (-11.2 m.p.h.), and 0.0 km.p.h. (0.0 m.p.h.). The WinSMASH results appeared reasonable. The Buick was towed due to damage.

Buick's Driver: According to the police crash report, the driver of the Buick [26-year-old, Black (unknown if Hispanic) male] was not restrained by his manual, three-point, lap-and-shoulder, safety belt system. The police crash report indicated the driver sustained a "B" (non-incapacitating-evident) injury and was transported by ambulance to a medical facility.

Buick's Front Right Passenger: According to the police crash report, the Buick's front right passenger [21-year-old, (unknown race and ethnic origin) male] was not restrained by his manual, three-point, lap-and-shoulder safety belt system. The police crash report indicated the front right passenger sustained a "B" (non-incapacitating-evident) injury, but was not transported to a medical facility.

2ND OTHER VEHICLE

The 2004 Subaru Forester XT was an all wheel drive, four door, sport utility vehicle (VIN: JF1SG69624H-----) equipped with a 2.5L, four cylinder engine; four wheel anti-lock brakes, dual stage driver and front right passenger air bags and front and rear seat back-mounted side impact air bags. No air bags deployed in this vehicle as a result of the crash.

Exterior Damage: The Subaru was not inspected. With no damage photographs available, a CDC could not be assigned.

Subaru's Driver: According to the police crash report, the driver of the Subaru [48-year-old, White (unknown if Hispanic) female] was restrained by her manual, three-point, lap-and-shoulder safety belt system. The police crash report indicated the driver sustained no injury and was not transported to a medical facility.

