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## ON-SITE CHILD SAFETY SEAT INVESTIGATION

CASE NUMBER - IN08026

LOCATION - OHIO

VEHICLE - 2000 CHRYSLER CONCORDE LX

CRASH DATE - May 2008

Submitted:

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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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15. <i>Supplementary Notes</i> On-Site Child Safety Seat Investigation involving a 2000 Chrysler Concorde LX with a high backed booster seat installed in the second row left seat position.					
16. <i>Abstract</i> This report covers an On-Site Child Safety Seat Investigation that involved a 2000 Chrysler Concorde LX and a 2001 Ford Focus. The focus of this on-site investigation was the Chrysler's second row left passenger (3-year-old, female), who was restrained in an Evenflo Big Kid High Backed Booster Child Safety Seat (CSS). The Chrysler was occupied by an unrestrained 31-year-old male driver, an unrestrained 27-year-old female front right passenger, and three restrained second row child passengers. The Chrysler was traveling north on a 2-lane state highway approaching the crest of a hill and the Ford was traveling south. The Ford entered the northbound lane and the vehicles collided in an off-set frontal configuration. The Chrysler's driver and front right passenger sustained fatal injuries. The three second row child passengers were injured and transported by helicopter to a children's hospital. The second row left passenger's CSS was undamaged in the crash and she was treated in the emergency room for minor injuries and released. The second row center and right passengers were hospitalized for one day.					
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The focus of this on-site investigation was the 2000 Chrysler Concord's second row left passenger (3-year-old, female), who was restrained in an Evenflo Big Kid High Backed Booster Child Safety Seat (CSS). This crash was brought to the National Highway Traffic Safety Administration's attention on May 22, 2008 by an article from an Ohio newspaper. This on-site investigation was assigned on July 24, 2008. The crash involved a 2000 Chrysler Concorde LX (**Figure 1**) and a 2001 Ford Focus SE. The crash occurred in May 2008, at 0043 hours in Ohio and was investigated by the Ohio State Highway Patrol. This contractor inspected the Chrysler, the crash scene, and interviewed a relative of the Chrysler's front right passenger on August 6 and 7, 2008. The Ford was not inspected because it had been salvaged. This report is based on the police crash report, scene and vehicle inspections, interview information, occupant medical records, occupant kinematic principles, and this contractor's evaluation of the evidence.



**Figure 1:** The damaged 2000 Chrysler Concorde LX

## CRASH CIRCUMSTANCES

**Crash Environment:** The trafficway on which both vehicles were traveling was a 2-lane, state highway that traversed in a north-south direction. The roadway had one travel lane in each direction and was bordered by bituminous shoulders and shallow ditches. The northbound lane was 3.0 m (9.8 ft) in width while the southbound lane was 2.8 m (9.2 ft) in width. Each shoulder was 0.4 m (1.3 ft) in width. The posted speed limit was 88 km/h (55 mph). It was dark at the time of the crash and the atmospheric condition was cloudy. The roadway pavement was dry bituminous and the grade was 4.8% positive for the Chrysler and level for the Ford. The site of the crash was rural and the traffic density was not known; however, given the time of the crash and the rural location, the traffic density was probably light. See the Crash Diagram on page 17 of this report.

**Pre-Crash:** The Chrysler was occupied by an unrestrained 31-year-old male driver, an unrestrained 27-year-old female front right passenger, and three restrained second row child passengers. The Chrysler was traveling north approaching the crest of a hill (**Figure 2**) and the Ford was traveling south (**Figure 3**). The Ford entered the northbound lane where the crash occurred (**Figure 4**). There was no evidence of any pre-crash avoidance maneuvers by either driver.



**Figure 2:** Approach of Chrysler northbound to impact (arrow); number on pavement shows meters to impact



**Figure 3:** Approach of the Ford southbound; arrow shows area of impact



**Figure 4:** Arrow shows impact gouges in northbound lane

**Crash:** The front of the Ford (**Figure 5**) impacted the front of the Chrysler (event 1, **Figure 6**) in a front left offset configuration on each vehicle. The Chrysler’s direction of force was within the 12 clock sector and the impact force was sufficient to trigger a deployment of the vehicle’s driver and front right passenger frontal air bags. The Ford’s driver’s frontal air bag also deployed. The Chrysler traveled 7.4 m (24.3 ft) and rotated 115 degrees to its final rest position heading southwest on the east side of the roadway (**Figure 7**). Following the impact with the Chrysler, the Ford rotated counterclockwise, departed the west side of the roadway, and the front plane impacted a mailbox and two newspaper boxes (events 2,3, and 4). The Ford entered a ditch and rolled over, left side leading, two quarter turns (event 5) and the right quarter panel impacted a second mailbox (event 6) during the rollover. The Ford came to final rest on its top heading northwest (**Figure 7**). The Ford traversed a distance of 18.3 m (60 ft) and rotated 215 degrees counterclockwise from the point of impact to its final rest position.



**Figure 5:** Police photograph showing damage to the front of the Ford from impact with the Chrysler



**Figure 6:** Damage to front and left side of the Chrysler from the impact with the ford; a second set of crush measurements was also taken above the bumper level

**Post-Crash:** The police were notified of the crash at 0043 hours and arrived on scene at 0101 hours. Emergency rescue and medical personnel also responded to the scene. According to the police crash report, both drivers were extricated from their vehicles by mechanical means. The Chrysler’s front right passenger was removed from the vehicle through the right front door. The

drivers of both vehicles and the Chrysler’s front right passenger were all pronounced deceased at the scene by the county coroner. The Chrysler’s three second row child passengers were reported in the medical records to have exited the vehicle prior to arrival of emergency responders. They were transported by helicopter to a children’s hospital.



**Figure 7:** Police on-scene photograph showing the final rest position of the Ford; arrow shows final rest position of the Chrysler

**CASE VEHICLE**

The 2000 Chrysler Concorde LX was a front-wheel drive, 4-door sedan (VIN: 2C3HD46R2YH-----) equipped with a 2.7 L, V6 engine and automatic transmission. Four wheel anti-lock brakes and traction control were optional for this vehicle, but it was not so equipped. The front row was equipped with bucket seats, adjustable head restraints, and driver and front right passenger depowered frontal air bags. The second row was equipped with a bench seat with integral head restraints in the outboard seating positions and child seat tether anchors in all three seating positions. Due to the damage to the instrument panel, the vehicle’s mileage at the time of the inspection could not be determined. The vehicle’s specified wheelbase was 287 cm (113 in).

**CASE VEHICLE DAMAGE**

**Exterior Damage:** The Chrysler’s impact with the Ford involved the front plane (**Figure 6**). The direct damage also extended onto the Chrysler’s left side doors due to the post impact rotation of the Ford. The direct damage to the Chrysler’s front plane involved the bumper, left headlamp/turn signal assembly, hood, and the left fender. The direct damage began at the front left bumper corner and extended 71 cm (28 in) along the front bumper. The bumper bar extended only slightly beyond the unibody frame rails, and the engagement at the front left corner missed the frame rail and involved the left fender, hood and left front wheel, which were significantly crushed rearward. As a result, it was necessary to take one set of crush measurements on the bumper bar and a second set at the upper radiator support level. The maximum residual crush at the bumper level was 59 cm (23.2 in) occurring at C<sub>1</sub>. The maximum residual crush at the upper radiator support level was 106 cm (41.7 in) and also occurred at C<sub>1</sub>. The two sets of crush measurements were averaged according to the vehicle measurement techniques protocol, and the table below shows the crush profile.

Units	Event	Direct Damage		Field L	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	1	71	106	111	83	77	32	25	14	3	-36	0
in		28.0	41.7	43.7	32.7	30.3	12.6	9.8	5.5	1.2	-14.2	0.0

The left side wheelbase was reduced 55 cm (21.7 inches) while the right side wheelbase was extended 8 cm (3.1 in). Induced damage involved the hood, roof, left rear door, left quarter panel, right fender, and right front door.

**Damage Classification:** The Chrysler's Collision Deformation Classification was **12-FYEW-5 (350 degrees)**. The Missing Vehicle algorithm of the WinSMASH program calculated the Chrysler's total Delta V as 37 km/h (23 mph). The longitudinal and lateral velocity changes were -36 km/h (-22 mph) and 6 km/h (4 mph), respectively. The results were based only on the Chrysler's crush profile and should be considered as a borderline reconstruction of the Chrysler's Delta V.

The manufacturer's recommended tire size was P225/60R16. The Chrysler was equipped with the recommended size tires. The vehicle'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 <sup>nd</sup> of an inch			
LF	Flat	Flat	221	32	5	6	Torn sidewall	Yes	Yes
LR	145	21	221	32	3	4	None	No	No
RR	Unk	Unk <sup>1</sup>	221	32	6	8	None	No	No
RF	310	45	221	32	4	5	None	No	No

**Vehicle Interior:** The Chrysler's instrument panel was extensively deformed and broken (**Figure 8**) as a result of the crash. The right half of the steering wheel was deformed and it had been cut out of the vehicle. The left lower instrument panel was deformed on the left side of the steering column as a result of loading by the driver's left knee. While the driver's right knee also probably loaded the left lower instrument panel, it was not possible to determine the extent of contact due to the damage to the instrument panel. Both the driver and front right passenger seat backs were nearly fully reclined, which was probably related to the extrication of the driver and front right passenger.



**Figure 8:** The Chrysler's damaged instrument panel

<sup>1</sup>The right rear tire's valve stem was clogged and the pressure could not be measured



The left rear door was jammed shut. The left front door had been removed and was not present at the inspection. The police on-scene photographs showed that the left front door was jammed shut. The right front and right rear doors remained closed and operational. All of the window glazing with the exception of the left front was either fixed or closed. The open/closed status of the left front window glazing could not be determined since the door was not present. The police on-scene photographs showed that the windshield glazing was in place and holed from impact forces. There was a possible occupant contact scuff on the left portion of the windshield.

Passenger compartment intrusion involved both the driver and front right passenger's occupant space. The most severe intrusion into the driver's occupant space involved the left instrument panel, which intruded longitudinally 32 cm (12.6 in). The most severe intrusion into the front right passenger's occupant space involved the toe pan, which intruded longitudinally 3 cm (1.2 in).

### AUTOMATIC RESTRAINT SYSTEM

The Chrysler was equipped with driver and front right passenger redesigned frontal air bags. The driver's frontal air bag was located in the steering wheel hub and the front right passenger air bag was located in the middle of the right instrument panel. Both air bags deployed as a result of the front impact with the Ford.

The driver's frontal air bag module cover was a two-flap configuration constructed of pliable vinyl. The cover flaps separated at the designated tear seams during the deployment. The top cover flap was 18 cm (7.1 in) in length and 9 cm (3.5 in) in height. The bottom cover flap was 13 cm (5.1 in) in length and 5 cm (2.0 in) in height. There was no evidence of damage to the cover flaps. The deployed driver's air bag (**Figure 9**) was round with a diameter of 62 cm (24.4 in). There was no evidence of damage to the air bag. Body fluid transfers were present on the air bag's lower left quadrant. The center of the transfers was located 17 cm (6.7 in) to the left and 8 cm (3.1 in) below the center of the air bag. A blood transfer was also present on the right lower quadrant located 27 cm (10.6 in) to the right and 7 cm (2.8 in) below the center of the air bag.

The front right passenger's air bag module cover consisted of a single vinyl flap that was 28 cm (11.0 in) in width and 19 cm (7.5 in) in



**Figure 9:** The driver's deployed air bag; yellow tape shows body fluid deposit on left



**Figure 10:** The front right passenger's deployed air bag

height. The cover flap separated at the designated tear seams during the deployment and there was no evidence of damage. The deployed front right passenger air bag was rectangular (**Figure 10**) and was 65 cm (25.6 in) in width and 46 cm (18.1 in) in height. There was no discernable evidence of occupant contact on the air bag and the air bag was not damaged. Isolated grease smears unrelated to the deployment were present on the air bag fabric.

## MANUAL RESTRAINT SYSTEM

Chrysler was equipped with lap-and-shoulder belts for both front row seating positions and the outboard second row seating positions. The second row center seating position was equipped with a lap belt. The driver's seat belt consisted of continuous loop belt webbing, an Emergency Locking Retractor (ELR), sliding latch plate, and an adjustable upper anchor that was in the full down position. The front right seat belt was equipped with a switchable ELR/Automatic Locking Retractor (ALR), locking latch plate, and adjustable upper anchor that was located in the full down position. The seat belts were not equipped with pretensioners.

The inspection of the driver and front right passenger seat belt assemblies revealed historical usage scratches on the latch plates, but there was no evidence of loading on the D-rings, latch plate belt guide or belt webbing. The evidence indicated that neither the driver nor front right passenger was restrained.

The second row lap-and-shoulder belts were equipped with continuous loop belt webbing, switchable ELR/ALR retractors, locking latch plates and fixed upper anchors. They were not equipped with pretensioners. The second row center lap belt was not equipped with a retractor and had a locking latch plate. The second row was also equipped with CSS tether anchors.

The inspection of the second row left seat belt assembly revealed extensive historical usage scratches on the latch plate. The belt webbing had a slight stretched appearance and abrasions were present on the belt webbing 46 cm (18.1 in) above the stop button (**Figure 9**). The evidence indicated that the second row left passenger was restrained in the CSS by the lap-and-shoulder belt.

The inspection of the second row center seat belt assembly revealed historical usage scratches on the latch plate. There were no load marks on the belt webbing or latch plate. According to the medical records, the 6-year-old male passenger seated in this position was treated for abdominal



**Figure 9:** Second row left seat belt; arrow shows area of abrasions on belt webbing

injuries, which indicated he was probably restrained by the lap belt.

The inspection of the second row right seat belt assembly revealed historical usage scratches on the latch plate. The belt webbing had a slight stretched appearance and the plastic guide on the cinch bar was broken on one end. The evidence indicated that the second row right passenger was restrained in this crash. The medical records for the passenger seated in this position reported that she was restrained by only the lap portion of the lap-and-shoulder belt. The injuries the passenger sustained also supported usage of only the lap belt.

### CHILD SAFETY SEAT

The Chrysler's second row left passenger [3-year-old, female; 84 cm and 12 kg (33 in, 26 lbs)] was seated in an Evenflo Big Kid High Back Booster CSS (Figure 10) that was equipped with a removable back support (Figure 12). The CSS was manufactured on March 18, 2004 and the model number was 3371482. When used with the back support, the CSS was designed for children who weighed 14-45 kg (30-100 lbs) and were 145 cm (57 in) or less in height. When used without the back support, the CSS was designed for children who weighed 18-45 kg (40-100 lbs) and who were 145 cm (57 in) or less in height and whose ears were below the top of the vehicle's head restraint. The CSS was used with the back support in this crash.

The CSS shell was constructed of plastic and equipped with a 1 cm (0.4 in) thick fabric cover. The removable back was designed with a shoulder belt guide on each side, and the CSS was equipped with arm rests. The CSS was designed only for use with a lap-and-shoulder belt.

Inspection of the CSS revealed only a black scuff on the right side of the cushion. No other damage or evidence of loading was observed. The CSS was found in the second row left seating position along with numerous components that had been jammed into the second row seat post-



Figure 10: The Evenflo High Back Booster CSS



Figure 11: Back of the CSS

crash. It is probable that this was the source of the scuff. The second row left shoulder belt was also found routed through the CSS's left shoulder belt guide at that time.

### CASE VEHICLE DRIVER KINEMATICS

The driver [31-year-old, male; 165 cm and 75 kg (65 in, 166 lbs)] was seated in an unknown posture. At the time of the vehicle inspection, the seat track was adjusted to between the middle and rear most positions. The positions of the tilt steering column and the driver's seat back could not be determined. The driver was not restrained by the lap-and-shoulder belt. The driver was not wearing glasses or contact lenses at the time of the crash.

The Chrysler's front impact with the Ford displaced the driver forward opposite the 12 o'clock direction of force, and his face and chest loaded the deployed air bag. He rode down the air bag and his chest and abdomen loaded and deformed the steering wheel. The interaction with the steering wheel caused multiple rib fractures, a laceration of the left hemidiaphragm with herniation of the stomach and left colon into the left chest cavity, liver lacerations, laceration of the lower mesentery, contusions of the jejunum, fracture-separation of the symphysis pubis, and fracture-separation of the left and right sacroiliac joints. The driver's right arm loaded the center instrument panel and his left knee loaded the left lower instrument panel resulting in a displaced fracture of the right humerus and left femur, respectively. The driver's right foot also loaded the toe pan, which caused a displaced fracture of the distal right fibula and tibia.

### CASE VEHICLE DRIVER INJURIES

The driver was pronounced deceased at the crash scene by the county coroner. The table below shows the driver's injuries and injury sources.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Fractures ribs bilaterally: right 4 <sup>th</sup> through 8 <sup>th</sup> , left 4 <sup>th</sup> through 7 <sup>th</sup> , ventrally <sup>2</sup> with small hemothorax in each pleural cavity	critical 450242.5,3	Steering wheel hub and/or spokes and rim	Certain	Autopsy
2	Laceration, 12 cm (4.7 in) left hemidiaphragm with herniation of stomach and left colon into left chest cavity	severe 440606.4,8	Steering wheel hub and/or spokes and rim	Certain	Autopsy
3	Lacerations liver, superior capsule and internal, not further specified	moderate 541820.2,1	Steering wheel hub and/or spokes and rim	Certain	Autopsy

<sup>2</sup> The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:  
**ventral (ven'tral)**: 1. pertaining to the abdomen or to any venter. 2. denoting a position more toward the belly surface than some other object of reference; same as *anterior* in human anatomy.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
4	Lacerations x 2, lower (ileal) mesentery, largest 8 cm (3.1 in)	moderate 542020.2,8	Steering wheel hub and/or spokes and rim	Certain	Autopsy
5	Contusions, multiple, small, distal jejunum and ileum	moderate 541410.2,8	Steering wheel rim	Certain	Autopsy
6	Contusion mid-penile shaft	minor 543010.1,8	Steering wheel rim	Certain	Autopsy
7	Laceration left scrotum, not further specified	minor 544020.1,8	Steering wheel rim	Certain	Autopsy
8	Contusions, bilateral, testicular, not further specified	minor 544610.1,8	Steering wheel rim	Certain	Autopsy
9	Lacerations left intercostal spaces: 2 <sup>nd</sup> through 6 <sup>th</sup> , and 8 <sup>th</sup>	minor 490602.1,2	Steering wheel hub and/or spokes and rim	Certain	Autopsy
10	Fracture, displaced, right mid-humerus, not further specified	serious 752604.3,1	Center instrument panel	Probable	Autopsy
11 12	Fracture, compound left mid-radius and ulna, not further specified	serious 752804.3,2 753204.3,2	Center instrument panel	Probable	Autopsy
13	Fracture-separation symphysis pubis, not further specified	serious 853000.3,5	Steering wheel rim	Certain	Autopsy
14	Fracture-separation left and right sacroiliac joints	serious 852800.3,6	Steering wheel rim	Certain	Autopsy
15	Fracture, displaced, left mid-femur, not further specified	serious 851814.3,2	Left lower instrument panel, left of steering column {Indirect injury}	Probable	Autopsy
16 17	Fracture with displacement, distal right fibula and tibia	moderate 851606.2,1 serious 853405.3,1	Floor, foot controls {Indirect injury}	Probable	Autopsy
18	Contusion, subgaleal, superiorly, not further specified	minor 190402.1,9	Front (windshield) header, driver's	Possible	Autopsy
19 20	Abrasion right upper eyelid and right zygomatic area	minor 297202.1,1 290202.1,1	Air bag, driver's	Certain	Autopsy
21 22	Contusion and laceration to tip of tongue	minor 243099.1,8 243402.1,8	Air bag, driver's	Certain	Autopsy

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
23	Contusion, deep, xiphoid area, not further specified	minor 490402.1,4	Steering wheel hub and/or spokes and rim	Certain	Autopsy
24	Contusion, deep, right anterior iliac crest area	minor 590402.1,1	Steering wheel rim	Certain	Autopsy
25	Abrasions right distal forearm, ulnar area	minor 790202.1,1	Center instrument panel	Probable	Autopsy
26	Lacerations, ventral <sup>1</sup> surface left forearm, ulnar area, and "L"-shaped, dorsal <sup>3</sup> left forearm	minor 790600.1,2	Left instrument panel	Probable	Autopsy
27	Laceration dorsal <sup>2</sup> surface left small finger	minor 790602.1,2	Front left windshield's glazing	Possible	Autopsy
28 29	Abrasions and/or contusions medial, ventral <sup>1</sup> , right thigh	minor 890202.1,1 890402.1,1	Steering wheel rim	Probable	Autopsy
30 31	Abrasions and/or contusions anterior tibial areas, bilaterally	minor 890202.1,3 890402.1,3	Left lower instrument panel	Probable	Autopsy
32 33	Abrasions and/or contusions medial left distal lower leg through foot	minor 890202.1,2 890402.1,2	Left lower instrument panel, left of steering column	Probable	Autopsy
34 35	Abrasions and/or contusions dorsal <sup>2</sup> left lower leg	minor 890202.1,2 890402.1,2	Floor, foot controls	Possible	Autopsy
36	Abrasion right dorsal <sup>2</sup> ankle, not further specified	minor 890202.1,1	Floor, foot controls	Possible	Autopsy

### CASE VEHICLE FRONT ROW RIGHT PASSENGER KINEMATICS

The front row right passenger [27-year-old, female; 160 cm and 98 kg (63 in, 216 lbs)] was seated in an unknown posture. At the time of the vehicle inspection, the seat track was adjusted

<sup>3</sup> The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:

**dorsal (dor'sal):** 1. pertaining to the back or to any dorsum. 2. denoting a position more toward the back surface than some other object or reference; same as posterior in human anatomy....

**dorsum (dor'sem):** 1. the back. 2. the aspect of an anatomical part or structure corresponding in position to the back; posterior, in the human.

**d. of foot:** d. pedis.

**d. of hand:** d. manus.

**d. ma'nus:** the back of the hand; the surface opposite the palm.

**d. pe'dis:** the upper surface of the foot; the surface opposite the sole.

to between the middle and rear most positions. The recline position of the seat back could not be determined. It is not known if she was wearing glasses or contact lenses at the time of the crash.

The Chrysler’s front impact with the Ford displaced the front row right passenger forward opposite the 12 o’clock direction of force. While there was no discernable occupant contact evidence, occupant kinematic principles indicate that the unrestrained passenger loaded the deployed air bag and was probably redirected upward as she rode down the air bag and her head struck the windshield header. As a result, she sustained a pontomedullary laceration, laceration of the spinal cord at the medulla oblongata with fractured dens and fracture of C<sub>1</sub>, subarachnoid hemorrhage in the basal area, subarachnoid hemorrhage in the cerebellum, and brain swelling. The passenger also sustained a laceration of the hepatic capsule due to loading the instrument panel and multiple contusions and abrasions. The passenger rebounded back into the front right seat where she remained until removed from the vehicle by emergency responders.

**CASE VEHICLE FRONT RIGHT PASSENGER INJURIES**

The front row right passenger was pronounced deceased at the crash scene by the county coroner. The table below shows the passenger’s injuries and injury sources..

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Laceration {rent} pontomedullary involving 60% of diameter of pontomedullary junction with surrounding hemorrhage	maximum 140212.6,8	Front (windshield) header, front right passenger’s	Probable	Autopsy
2	Laceration junction spinal cord and medulla oblongata–where C <sub>1</sub> -C <sub>2</sub> overlap, with separation of C <sub>1</sub> -C <sub>2</sub> , fracture dens (C <sub>2</sub> ), and palpable fracture of C <sub>1</sub> on right	maximum 640276.6,6	Front (windshield) header, front right passenger’s	Probable	Autopsy
3	Hemorrhage, subarachnoid, basal area	serious 140684.3,9	Front (windshield) header, front right passenger’s	Probable	Autopsy
4 5	Brain swelling with mildly compressed ventricles	serious 140662.3,1 140662.3,2	Front (windshield) header, front right passenger’s	Probable	Autopsy
6	Hemorrhage, subarachnoid, cerebellum	serious 140466.3,6	Front (windshield) header, front right passenger’s	Possible	Autopsy
7	Laceration, superficial, hepatic capsule and also deep but not further specified	moderate 541820.2,1	Right instrument panel	Probable	Autopsy

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
8	Contusion of tongue on each side where tongue was clenched between teeth	minor 243099.1,8	Air bag, front right passenger's	Certain	Autopsy
9	Abrasion left side of chest caudal to breast	minor 490202.1,2	Air bag, front right passenger's	Certain	Autopsy
10	Contusion entire left breast	minor 490402.1,2	Right instrument panel	Probable	Autopsy
11	Abrasions dorsal <sup>2</sup> surface mid-trunk and midline lower trunk	minor 690202.1,8	Seat back, front right passenger's	Possible	Autopsy
12	Abrasions ventral <sup>1</sup> surface of knees and thighs, left more than right	minor 890202.1,3	Right lower instrument panel	Probable	Autopsy
13	Contusions ventral surface of knees and thighs, left more than right	minor 890402.1,3	Right lower instrument panel	Probable	Autopsy
14	Contusion lateral right lower leg, not further specified	minor 890402.1,1	Right side interior surface forward of right A-pillar	Possible	Autopsy

#### CASE VEHICLE SECOND ROW LEFT PASSENGER KINEMATICS

The second row left passenger [3-year-old, female; 84 cm and 12 kg (33 in, 26 lbs)] was seated in the CSS in an unknown posture. She was restrained by the lap-and-shoulder belt.

The Chrysler's front impact with the Ford displaced the second row left passenger forward opposite the 12 o'clock direction of force and she loaded the lap-and-shoulder belt. She sustained a contusion on the left chest, an abrasion and contusion over the medial left clavicle, and a small contusion just below the left hip due to loading the seat belt. She also sustained an abrasion on right frontal scalp and contusions on the right forehead and above the left eye, probably due to loading the driver's seat back. She remained in the CSS as the vehicle rotated counterclockwise to its final rest position. According to her medical records, she was removed from the vehicle by one of the other second row passengers prior to the arrival of emergency responders.

#### CASE VEHICLE SECOND ROW LEFT PASSENGER INJURIES

The second row left passenger sustained minor injuries and was transported to a children's hospital by helicopter. She was treated in the emergency room and released. The table below shows the passenger's injuries and injury sources.



Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Abrasion, small, right frontal scalp, not further specified	minor 190202.1,5	Seat back, driver's	Probable	Emergency room records
2	Contusions, small, right forehead and above left eyebrow	minor 290402.1,7	Seat back, driver's	Probable	Emergency room records
3	Contusion, extending down left chest wall to breast	minor 490402.1,2	Torso portion of safety belt system	Certain	Emergency room records
4 5	Abrasion and contusion over medial left clavicle	minor 790202.1,2 790402.1,2	Torso portion of safety belt system	Certain	Emergency room records
6	Contusion {bruising} over ulnar aspect right wrist	minor 790402.1,1	Seat back, driver's	Probable	Emergency room records
7	Contusion {bruise}, small, just below left hip	minor 890402.1,2	Torso portion of safety belt system	Certain	Emergency room records

#### CASE VEHICLE SECOND ROW CENTER PASSENGER KINEMATICS

The second row center passenger [6-year-old, male; 114 cm and 18 kg (45 in, 39 lbs)] was seated in an unknown posture. He was restrained by the lap belt.

The Chrysler's front impact with the Ford displaced the second row center passenger forward opposite the 12 o'clock direction of force and he loaded the lap belt. Based on SCI experience, his upper torso hyper-flexed over the lap belt and he loaded his head on the back portion of the front center floor console. As a result of this contact, he sustained a closed head injury, fracture of right mandibular condyle, fracture of the medial wall of the right orbit, and contusions and abrasions on the forehead and face. The passenger also sustained a laceration and contusion of the mesentery due to loading the seat belt. The passenger remained restrained within his seat position as the vehicle rotated counterclockwise to final rest.

#### CASE VEHICLE SECOND ROW CENTER PASSENGER INJURIES

The second row center passenger was transported by helicopter to a children's hospital. He was hospitalized one day for treatment of his injuries. The table below shows the passenger's injuries and injury sources.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Closed head injury with no documented loss of consciousness, awake, alert, but confused on arrival and with intermittent drowsiness and confusion; GCS=13 to 15	unknown 115099.7,0	Interior, center console first row	Probable	Emergency room records
2	Laceration {tear, rent} mesentery near level of sigmoid colon	moderate 542022.2,8	Lap safety belt	Certain	Hospitalization records
3	Contusion {hematoma}, mild, mesentery, not further specified	moderate 542010.2,8	Lap safety belt	Certain	Hospitalization records
4	Fracture, small, right mandibular condyle	minor 250600.1,1	Interior, center console first row	Probable	Hospitalization records
5	Fracture medial wall right orbit	moderate 251202.2,1	Interior, center console first row	Probable	Hospitalization records
6	Fracture right 1 <sup>st</sup> metacarpal, with swelling	moderate 752002.1,1	Seat back, front right passenger's	Possible	Hospitalization records
7	Contusion forehead, not further specified	minor 290402.1,7	Interior, center console first row	Probable	Emergency room records
8	Abrasions forehead, including above right eye and mid-to-left forehead	minor 290202.1,7	Interior, center console first row	Probable	Hospitalization records
9 10	Abrasion left eyelid and contusion left eye with edema to eye	minor 297202.1,2 297402.1,2	Interior, center console first row	Probable	Hospitalization records
11	Abrasion right cheek, not further specified	minor 290202.1,1	Interior, center console first row	Probable	Emergency room records
12 13	Abrasion and contusion {seat belt sign} across lower abdomen	minor 590202.1,8 590402.1,8	Lap safety belt	Certain	Hospitalization records
14	Abrasion right hip, not further specified	minor 590202.1,1	Lap safety belt	Certain	Emergency room records

#### CASE VEHICLE SECOND ROW RIGHT PASSENGER KINEMATICS

The second row right passenger [7-year-old, female; 122 cm and 19 kg (48 in, 42 lbs)] was seated in an unknown posture. The passenger's medical records reported that she was restrained by just the lap portion of the lap-and-shoulder belt. The injuries that she sustained as indicated below also supported usage of only the lap belt.

The Chrysler’s front impact with the Ford displaced the second row right passenger forward opposite the 12 o’clock direction of force and she loaded the lap belt. She sustained contusions on both hips and an abrasion on the right abdomen and hip due to loading the lap belt. She also sustained a contusion and abrasion on the forehead, probably from loading the back of the front right seat. She remained restrained in her seat position as the vehicle rotated counterclockwise to final rest.

**CASE VEHICLE SECOND ROW RIGHT PASSENGER INJURIES**

The second row right passenger was transported by helicopter to a children’s hospital. She was hospitalized one day for the treatment of her injuries.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Contusion left hip joint	minor 850602.1,2	Lap portion of safety belt system	Probable	Hospitalization records
2 3	Abrasion and contusion over left forehead	minor 290202.1,7 290402.1,7	Seat back, front right passenger’s	Probable	Emergency room records
4 5	Abrasion right lower quadrant abdomen/hip; abrasion over left anterior superior iliac spine (hip)	minor 590202.1,1 590202.1,2	Lap portion of safety belt system	Certain	Hospitalization records
6 7	Contusions {bruising} on left and right hips	minor 590402.1,1 590402.1,2	Lap portion of safety belt system	Certain	Hospitalization records

**OTHER VEHICLE**

The 2001 Ford Focus SE was a front wheel drive, 4-door, sedan (VIN: 1FAFP34331W-----) equipped with a 4-cylinder, 2.0-liter engine, redesigned frontal air bags and driver and front right passenger seat belt pretensioners.

**Damage Classification:** The CDCs for the Ford based on the police photographs were:

- **12-FDEW-5** for the front impact with the Chrysler (event 1)
- **10-F999-9** for the front impact with a mailbox (event 2)
- **10-F999-9** and **10-F999-9** for the two newspaper box impacts (events 3 and 4)
- **00-TYDO-1** for the rollover (event 5)
- **00-RBEN-1** for the mailbox impact during the rollover (event 6)

The Missing Vehicle algorithm of the WinSMASH program calculated the Ford’s total Delta V as 55 km/h (34 mph). The longitudinal and lateral velocity changes were -55 km/h (-34 mph)

and 0.0 km/h (0.0 mph), respectively. The results were based only on the Chrysler's crush profile and should be considered as a borderline reconstruction of the Ford's Delta V.

***Other Vehicle's Driver:*** According to the police crash report, the Ford's driver (18-year-old, female) was not restrained by the lap-and-shoulder seat belt. She sustained fatal injuries.

