Child Safety Seat / Vehicle To Vehicle Investigation
Dynamic Science, Inc. / Case Number: (DS07044)
2002 Ford Expedition
California
September 2007

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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.

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16. Abstract

This on-site investigation focused on child occupants involved in a two vehicle crash involving a 2002 Ford Explorer XLT and a 2002 Chevrolet Silverado K3500 pickup. The crash occurred within a four-leg intersection. The subject vehicle was being driven by a restrained 26-year-old female and there were three children seated in the second row. The second row left seat was occupied by a 5-year-old female seated in a forward facing booster seat. The second row middle seat was occupied by a 21-month-old male seated in a child safety seat. The second row right seat was occupied by a 3-year-old male reportedly seated in a child safety seat. The other vehicle was a 2002 Chevrolet Silverado pickup being driven by a 27-year-old male. The Ford was traveling north; the Chevrolet was traveling west. As the Ford traversed the intersection, its right side was impacted by the front end of the Chevrolet. Both vehicles came to rest in an orange tree orchard on the northwest corner of the intersection. The 21-month-old child and his child safety seat were ejected from the subject vehicle during the crash. He was pronounced dead at the scene. The 5-year-old female and 3-year-old male occupants remained in the subject vehicle and were pronounced dead at the scene. The driver of the subject vehicle was transported and hospitalized.

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Dynamic Science, Inc.
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BACKGROUND

This on-site investigation focused on child occupants involved in a two vehicle crash involving a 2002 Ford Explorer XLT (**Figures 1 - 2**) and a 2002 Chevrolet Silverado K3500 pickup. The crash occurred within a four-leg intersection. The subject vehicle was being driven by a restrained 26-year-old female and there were three children seated in the second row. The second row left seat was occupied by a 5-year-old female seated in a forward facing booster seat. The second row middle seat was occupied by a 21-month-old male seated in a child safety seat. The second row right seat was occupied by a 3-year-old male reportedly seated in a child safety seat. The Ford was traveling north; the Chevrolet was traveling west. As the Ford traversed the intersection, its right side was impacted by the front end of the Chevrolet. Both vehicles came to rest in an orange tree orchard on the northwest corner of the intersection. The 21-month-old child and his child safety seat were ejected from the subject vehicle during the crash.

Figure 1. 2002 Ford Expedition XLT

Figure 2. Exemplar Ford Expedition XLT

This child safety seat investigation was initiated in response to an online news article. On September 25, 2007, DSI was instructed to locate the subject vehicle and the child safety seats. The police report was obtained on October 31, 2007. The subject vehicle was being held in a tow facility, with one of the safety seats still inside. The ejected child safety seat was being held in evidence by local law enforcement. The third child safety seat was not located. DSI was assigned the case on November 26, 2007. The 2002 Ford Expedition and the two child safety seats were inspected on November 28 and 29, 2007. Efforts to interview the driver were unsuccessful due to attorney refusal.

Several attempts were made to locate the 2002 Chevrolet Silverado pickup; however, on November 27, 2007, DSI learned the vehicle had been sold to a private party on October 27, 2007. DSI obtained police photographs of the vehicle on November 15, 2007.

SUMMARY

Crash Site

This two-vehicle crash occurred at 1610 hours in September 2007. The crash occurred within a

four-way intersection. The intersection consisted of a north/south roadway and an east/west roadway. The north/south roadway was configured with one travel lane in each direction (**Figure 3**). The lanes were separated by a dashed and solid stripe pattern, which prohibited passing for vehicles approaching the intersection from the north. The lane widths for the north/south roadway were 4.4 m (14.5 ft) each. The east/west roadway was configured with one travel lane in each direction. The lanes were separated by a dashed and solid stripe pattern, which prohibited passing for vehicles approaching the intersection from the east. The lane widths for the east/west roadway were 3.4 m (11.0 ft) each. Both roadways were constructed with an asphalt surface and the grade was level (**Figure 4**). This intersection was controlled with posted stop signs and surface painted stop lines for east and westbound traffic. (Two months after this crash, posted double stop signs were installed for all traffic entering the intersection.) The crash occurred during daylight, and the temperature at the time of the crash was 22 degrees C (72 degrees F). Conditions were cloudy, with no precipitation, and the roadway was dry. The speed limit at this location was 89 km/h (55 mph). The roadways were bordered on all sides by generally level ground planted with rows of orange trees.

Figure 3. Approach view north to intersection

Figure 4. Area of impact, view north

Pre-Crash

The subject vehicle was a 2002 Ford Expedition driven by a restrained 26-year-old female. There were three children seated in child safety seats occupying the second row left, middle and right seats. The second row left occupant was seated in a Cosco/Dorel booster seat. The second row middle occupant was seated in an Evenflo child safety seat. The second row right occupant was seated in an unknown child safety seat. The Ford Expedition was traveling northbound toward the intersection at a reported speed of 89 km/h (55 mph).

The other vehicle was a 2002 Chevrolet Silverado being driven by an unrestrained 27-year-old male. There were no other occupants in the vehicle. The Chevrolet was traveling westbound toward the intersection at a police reported speed of 89 km/h (55 mph) and was approaching the stop sign. There was no evidence indicating the Chevrolet braked or slowed prior to entering the intersection.

Crash

The two vehicles entered the intersection simultaneously. The front end of the Chevrolet Silverado contacted the right side of the Ford Expedition. Each vehicle initiated a clockwise rotation and traveled toward the northwest corner of the intersection (**Figure 5**).

The Ford traveled off the northwest corner of the roadway and impacted a tree with its right side (**Figure 6**). The vehicle continued traveling through several rows of orange trees. The Ford traveled approximately 39.6 m (130.0 ft) from the area of the first impact to the area of final rest. The vehicle came to final rest facing southeast. The second row middle occupant was ejected from the vehicle in the area of the roadside departure. The occupant was ejected while still restrained within the Evenflo child safety seat. The police report stated that the child was found on the west shoulder of the north/south roadway.

The Chevrolet traveled off the northwest corner of the roadway and contacted two trees before coming to final rest (**Figure 7**). The Chevrolet traveled approximately 38.1 m (125.0 ft) from the area of the first impact to the area of final rest. The vehicle came to final rest facing generally west. The unrestrained driver of the Chevrolet was ejected near area of the first tree impact. He was found in an orange tree by emergency personnel.

Figure 5. Point of impact; view showing gouge mark and path to northwest corner

Figure 6. Approach to impact with tree, 2002 Ford Expedition

Figure 7. Approach to impact with tree, 2002 Chevrolet Silverado

Post-Crash

The 26-year-old driver of the Ford sustained loss of consciousness and moderate injuries. She was transported by air ambulance to a regional medical center. The 5-year-old second row left occupant sustained major internal trauma and was pronounced deceased at the scene by emergency personnel. The 21-month-old second row middle seat occupant was ejected from the vehicle. He sustained major internal trauma and was pronounced deceased at the scene by emergency

personnel. The 3-year-old second row right seat occupant sustained major internal trauma and was pronounced deceased at the scene by emergency personnel. They were removed from the scene and transported to a local funeral chapel.

The 27-year-old driver of the Chevrolet was ejected from the vehicle. He sustained a laceration to the head, fractures to seven left ribs, fractures to two right ribs, a ruptured spleen, and bilateral pneumothoraces. He was transported by air to a regional medical center and admitted.

Both vehicles were towed from the scene and declared a total loss by their respective insurance companies.

VEHICLE DATA - 2002 Ford Expedition

The 2002 Ford Expedition was identified by the Vehicle Identification Number (VIN): 1FMRU15W32Lxxxxxx. The mileage was unavailable due to the electronic odometer and absence of power to the vehicle. The Ford was equipped with a 4.6 liter, 8 cylinder engine, an automatic transmission, rear wheel drive, and ABS brakes. The vehicle manufacturer's recommended tire size for the front and rear tires was P255/70R16 SL. The recommended tire pressure was 207 kPa (30 psi) for the front and 241 kPa (35 psi) for the rear. The Ford was configured with four Falken Ziex S/TZ 04 tires. The tire manufacturer's maximum tire pressure was 352 kPa (51 psi). The specific tire information is as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	255 kPa (37 psi)	10 mm (13/32 in)	No	None
LR	193 kPa (28 psi)	9 mm (11/32 in)	No	None
RR	Tire flat	9 mm (11/32 in)	Yes	Sidewall torn, holed; rim cracked, bent
RF	Tire flat	10 mm (13/32 in)	Yes	Unknown

The first row seating was configured with fabric-covered bucket seats for the outboard positions. There was a fold-down armrest between the two seats. The two outboard seats were equipped with integral head restraints. The second row seating was configured with a fabric-covered split bench seat with separate backs and adjustable head restraints for the two outboard seating positions. The second row middle seat had no head restraints. The third row seat was folded down in the stowed position. The third row area was filled with cargo and debris collected from the scene.

Vehicle Damage

Exterior Damage

The 2002 Ford Expedition sustained two impacts to the right passenger area. The first impact was a vehicle to vehicle impact; the second was a tree impact. The contact damage overlapped and could not be separated by the investigator. However, based on the damage profile, the majority of the damage occurred as a result of the impact with the Chevrolet. The vehicle sustained severe right side damage as a result of the two impacts.

The first row right side door was separated from its hinges during the crash (**Figure 8**). The door panel was found in the third row seating area. The upper hinge for this door was deformed but still intact (**Figure 9**). The lower hinge was broken off near the pin (**Figure 10**). There was also hinge damage to the second row right side door. The upper and lower hinges failed at the pin slots (**Figures 11, 12, 13**). This door was jammed in place and was still attached to the vehicle.

The direct damage to the right side measured 294 cm (116.0 in) in length. The damage began 30 cm (11.8 in) rearward of the rear axle and ended 22 cm (8.7 in) forward of the front axle. There was bowing to the vehicle as a result of the right side impacts.

Six crush measurements were taken at mid-door level as follows: C1 = 0 cm, C2 = 40 cm (15.7 in), C3 = 72 cm (28.4 in), C4 = 97 cm (38.2 in), C5 = 82 cm (32.3 in), C6 = 32 cm (12.6 in). Maximum crush at mid-door level was located between C4 and C5 and measured 110 cm (43.3 in).

Six crush measurements were taken at sill level as follows: C1 = 14 cm (5.5 in), C2 = 2 cm (0.7 in), C3 = 87 cm (34.3 in), C4 = 121 cm (47.6 in), C5 = 78 cm (30.7 in), C6 = 15 cm (5.9 in). Maximum crush at the sill level was located at C4 and measured 121 cm (47.6 in).

Figure 8. Subject vehicle, right side damage, middle

Figure 9. Upper hinge, first row right side door, subject vehicle

Figure 10. Lower hinge, first row right side door, subject vehicle

The average crush measurements for the upper and lower measurements were as follows:
C1 = 7 cm (2.8 in), C2 = 21 cm (8.3 in),
C3 = 80 cm (31.5 in), C4 = 106 cm (41.7 in), C5 = 78 cm, (30.7 in), C6 = 24 cm (9.5 in). The average maximum crush measurement was 114 cm (44.9 in). The Collision Deformation Classification (CDC) for the side impact was incremented for the frame shift to the right and was 62RDAW6.

The CDC-only vehicle routine of the Winsmash program computed a total delta V of 76 km/h (47.4 mph) for the impact with the Chevrolet. The longitudinal and lateral components were -49 km/h (-30.4 mph) and -58 km/h (-36.0 mph), respectively. This was a borderline reconstruction due to no crush profile available for the Chevrolet.

After the initial impact, the Ford traveled off the roadway and struck a tree with its right side. The crush to the vehicle was masked due to overlapping damage. The CDC for the tree impact was 03RYAN9.

Figure 11. Upper hinge, second row right side door, subject vehicle

Figure 12. Upper hinge, second row right side door, subject vehicle

Figure 13. Lower hinge, second row right side door, subject vehicle

Interior Damage - 2002 Ford Expedition

The 2002 Ford Expedition sustained severe interior damage as a result of passenger compartment intrusion. The specific passenger compartment intrusion is as follows:

Row	Position	Intruded Component	Magnitude of Intrusion	Direction
1	Right	Door panel	54 cm (21.3 in)	Lateral
2	Right	Door panel	54 cm (21.3 in)	Lateral
2	Right	Lower B pillar	54 cm (21.3 in)	Lateral
2	Right	Sill	54 cm (21.3 in)	Lateral
1	Right	Sill	54 cm (21.3 in)	Lateral
1	Right	Lower A pillar	54 cm (21.3 in)	Lateral
3	Right	Side panel	37 cm (14.6 in)	Lateral
1	Middle	Door panel	28 cm (11.0 in)	Lateral
1	Right	Roof side rail	27 cm (10.6 in)	Vertical
1	Middle	Sill	27 cm (10.6 in)	Lateral
1	Middle	Lower A pillar	25 cm (9.8 in)	Lateral
3	Right	Lower C pillar	23 cm (9.1 in)	Lateral
1	Right	Instrument panel	23 cm (9.1 in)	Longitudinal
1	Right	Windshield header	21 cm (8.3 in)	Vertical
2	Right	First row seat back	21 cm (8.3 in)	Longitudinal
1	Left	Center console	21 cm (8.3 in)	Lateral
2	Middle	Sill	20 cm (7.9 in)	Lateral
1	Middle	Instrument panel	19 cm (7.4 in)	Longitudinal
1	Left	Instrument panel	15 cm (5.9 in)	Longitudinal
2	Middle	Door panel	10 cm (3.9 in)	Lateral
2	Middle	Lower B pillar	6 cm (2.4 in)	Lateral

Manual Restraints

The 2002 Ford Expedition was equipped with 3-point manual lap and shoulder belts for the first row outboard seat positions. The belts were configured with adjustable D-rings. The driver side D-ring was in the full down position. The right passenger side was in the middle position. The first row safety belts were configured with sliding latch plates and Emergency Locking Retractors (ELR). The driver's safety belt webbing had a small puncture hole and stretch marks, which indicated the belt was loaded by the occupant during the crash (**Figure 14**). Damage to the right B pillar left the passenger belt retractor exposed. This belt remained in the stowed position.

Figure 14. Driver safety belt, subject vehicle

The second row outboard safety belts were configured with sliding latch plates and switchable Emergency Locking Retractors/Automatic Locking Retractors (ELR/ALR). They were configured with adjustable D-rings at the anchorages. The second row middle seat position was equipped with a retractable lap belt with a sewn-on latch plate.

Figure 15. Second row left safety belt, showing evidence of occupant loading

The back left safety belt latch plate showed signs of usage. The belt webbing was slightly frayed and stretched, which indicated the belt was loaded by the occupant during the crash (**Figure 15**). This belt was used to restrain a child seated in a booster seat.

The middle belt was found in its buckled position (**Figure 16**). This belt would not unbuckle. The buckle was examined and damage was noted. The plastic cover was cracked and the buckle mechanism was visible. The occupant in this seat position was ejected while seated in a child safety seat.

Figure 16. Second row middle lap belt, subject vehicle

The back right safety belt latch plate showed signs of usage. The webbing had stretch marks, which indicated the belt was loaded by the occupant during the crash (**Figure 17**).

The third row outboard safety belts were configured with sliding latch plates and ELR/ALR. They were mounted to the left and right D pillars and configured with non-adjustable anchorages. The middle seat had a lap belt. The third row seats were folded in the stowed position.

Figure 17. Second row right safety belt, showing evidence of occupant loading

Supplemental Restraint Systems

The 2002 Ford Expedition was equipped with first row frontal air bags for the driver and the front right occupant. The air bags deployed as a result of the longitudinal deceleration of the Ford during the impact with the Chevrolet (**Figure 18**).

The driver's air bag deployed from the center of the steering wheel hub through asymmetrical H-configuration module cover flaps. The top flap measured 20 cm (7.9 in) in height and 20 cm (7.9 in) in width. The bottom flap measured 8 cm (3.2 in) in height and 20 cm (7.9 in) in width. The cover flaps were made of two layers of material. The layers delaminated at some point, and separated from one another. The separation occurred on both the upper and lower flaps.

Figure 18. Driver air bag, showing suspected area of occupant contact

The deployed driver's air bag measured 58 cm (22.8 in) in diameter in its deflated state. There was a circular stitching pattern in the front center of the air bag that measured 17 cm (6.7 in) in diameter. There were two vent ports, one on either side near the top cover flap. There was a reddish/brown stain located near the bag's front center that appeared to be the result of occupant contact. The stained area measured 3 cm x 5 cm (1.2 x 2.0 in).

The front right passenger air bag deployed from a top-mount module with a rectangular cover flap that was hinged at the forward aspect. Intrusion and instrument panel damage prevented close inspection of the cover flap. There was a tear in the air bag which measured 17 cm (6.7 in) in length. The tear was located near the bag's right side stitching. This tear was likely a result of as sharp or deformed component associated with passenger compartment intrusion.

Child Safety Seats

Second row left booster seat

The second row left occupant was seated in a Cosco/Dorel Ambassador belt positioning booster seat. The seat was found on the second row left seat during the vehicle inspection (**Figure 19**). The model number was 22-297-FLP and the date of manufacture was January 21, 2006. Instruction labels found on the seat indicated the booster seat was to be used only with a combination lap and shoulder belt. This booster seat had no back and could only be used forward facing. It was equipped with a fabric padded seat cover and fixed armrests. The manufacturer recommended the seat be used by children more than one year of age, and weighing between 30 - 100 pounds (13.6 - 45.4 kg), and whose height is between 34 - 57 inches (85 - 145 cm).

Figure 19. Cosco/Dorel Ambassador CSS

The plastic seat shell was lightly scuffed and scratched in several areas. There were dried stains on the seat cover. No structural damage to the seat was observed.

Second row middle child safety seat

The second row middle occupant was seated in a child safety seat. It is probable the child seat was used forward facing. The child and the seat were ejected from the vehicle during the crash. The seat was an Evenflo Comfort Touch convertible seat, which could be used forward or rearward facing (**Figure 20-21**). The model number was 3591453 P1 and the date of manufacture was October 4, 2005. Instruction labels on the seat indicated the seat could be secured by routing the vehicle belt through two slots in the back of the frame when used forward facing. The vehicle's second row middle seat was equipped with a retractable lap belt.

Figure 20. Evenflo Comfort Touch CSS

The manufacturer recommended that the seat be used forward facing by children weighing between 20 - 40 pounds (9.1 -18.1 kg), and whose height is 40 inches (102 cm) or less. The seat could also be used rearward facing for occupants weighing under 20 pounds (9.1 kg).

The child seat was configured with urethane foam padding and a polyester fiber-filled cover. It was configured with a 5-point internal harness. The harness straps were routed through the middle set of slots. The seat was equipped with a top tether strap and two lower anchor straps.

This child seat separated from its base at some point, though this model was not configured with a detachable base. The seat was configured with a recline adjustment feature. The base fit into two channels located in the bottom of the seat frame (**Figures 22- 23**). There were cracks present on the seat bottom.

It is probable that the lap belt was buckled at the time of the crash. There were no indications that the belt was routed through the forward facing slots in the back of the child seat. It appeared that the lap belt was either not used at all or was routed around the child seat base. If it were routed around the base, the belt may have contributed to the separation of the seat from the base.

The child seat was inspected at the office of the investigating police agency. The child seat shell was dirty and scuffed. The base did not exhibit the same level of dirt and damage as the shell.

Second row right child safety seat

The second row right occupant reportedly was found in the subject vehicle seated in a child safety seat. Efforts to obtain this seat for inspection were unsuccessful.

Figure 21. Evenflo Comfort Touch CSS, shown placed on base

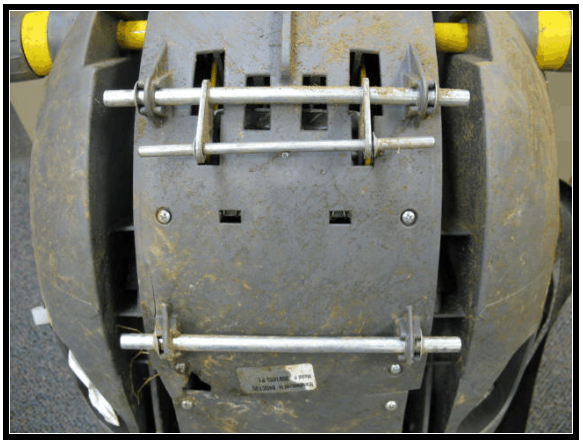

Figure 22. Evenflo Comfort Touch CSS, bottom view

Figure 23. Evenflo Comfort Touch CSS, detached base

VEHICLE DATA - 2002 Chevrolet Silverado

The 2002 Chevrolet Silverado was identified by the VIN: 1GCJK33182Fxxxxxx. The Chevrolet was a 4x4 crew cab pickup equipped with a 6.6 liter, eight cylinder diesel engine and an automatic transmission. The vehicle was configured with dual rear wheels. The vehicle manufacturer's recommended tire size for front and rear was LT215/85R16. The recommended tire pressure was 483 kPa (70 psi) for the front and 448 kPa (65 psi) for the rear. The Chevrolet was configured with six Hankook Dynamic RF04 tires. The tire manufacturer's maximum tire pressure was 552 kPa (80 psi). The specific tire information is as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	Tire flat	6 mm (7/32 in)	Unknown	Sidewall cut, tread cut and gouged, rim bent
LROB	414 kPa (60 psi)	7 mm (9/32 in)	No	None
LRIB	427 kPa (62 psi)	6 mm (8/32 in)	No	None
RRIB	427 kPa (62 psi)	8 mm (10/32 in)	No	None
RROB	414 kPa (60 psi)	7 mm (9/32 in)	No	None
RF	Tire flat	7 mm (9/32 in)	Unknown	Tire leaked from bead when inflated

Vehicle Damage

Exterior Damage

The 2002 Chevrolet Silverado sustained moderate front end damage as a result of the impact with the Ford Explorer (**Figure 24**).

The direct damage was distributed across the front end from bumper corner to bumper corner.

Figure 24. 2002 Chevrolet Silverado, front/left oblique view

The steel bumper and fascia were partially detached from the vehicle. The front left wheel was detached from the axle and the front tires were flattened. The left engine mount and rear transmission mount were separated from the frame, and the engine and transmission were displaced rearward. The rear drive shaft U-joint cups were broken and partially missing. Based on police images, the estimated CDC for the end impact was 71FDEW3. The CDC for this impact was incremented for the frame shift to the right (**Figure 25**).

Figure 25. 2002 Chevrolet Silverado, front view

The CDC-only vehicle routine of the Winsmash program computed a total delta V of 59 km/h (36.7mph) for the impact with the Ford. The longitudinal and lateral components were -45 km/h (-27.9 mph) and 38 km/h (23.6 mph), respectively. This was a borderline reconstruction.

The Chevrolet contacted a tree in a second impact. The tree impact was to the right side rear passenger compartment and cargo bed (**Figure 26**). The estimated CDC for the tree impact was 02RZEW3.

Figure 26. 2002 Chevrolet Silverado, back/right oblique view

A possible third event for this vehicle occurred. The police report indicated that a second tree was damaged by this vehicle on its path to final rest. The contact damage for this impact was believed to be masked by the front end damage. The estimated CDC for this impact is 99FLEN9.

Interior Damage, **Manual Restraint Systems and Supplemental Restraint Systems**

Only limited information was known about the interior damage, restraint systems and air bag systems inside the Chevrolet Silverado. It appeared that the interior sustained moderate damage as a result of the impact with the Ford. The frontal air bags did deploy due to the longitudinal deceleration of the Chevrolet during the initial impact with the Ford.

OCCUPANT DEMOGRAPHICS

Occupant Demographics - 2002 Ford Expedition

	Driver	Second Row Left Occupant
Age/Sex:	26 years / Female	5 years / Female
Seated Position:	First row left	Second row left
Seat Type:	Bucket	Bench
Height:	157 cm / 62 in	122 cm / 48 in
Weight:	48.5 kg / 107 lb	22.7 kg / 50 lb
Pre-existing Medical Condition:	Unknown	Unknown
Alcohol/Drug Involvement:	None	N/A
Driving Experience:	Unknown	N/A
Body Posture:	Unknown	Unknown
Hand Position:	Unknown	Unknown
Foot Position:	Unknown	Unknown
Restraint Usage:	3-point manual belt used	Seated in a booster seat, manual lap and shoulder belt used
Air bag:	Steering wheel mounted, deployed	None available

	Second Row Middle Occupant	Second Row Right Occupant
Age/Sex:	21 months / Male	3 years / Male
Seated Position:	Second row middle	Second row right
Seat Type:	Bench	Bench
Height:	91 cm / 36 in	102 cm / 40 in
Weight:	11.8 kg / 36 lb	15.9 kg / 35 lb
Pre-existing Medical Condition:	Unknown	Unknown
Alcohol/Drug Involvement:	N/A	N/A
Driving Experience:	N/A	N/A
Body Posture:	Unknown	Unknown
Hand Position:	Unknown	Unknown
Foot Position:	Unknown	Unknown
Restraint Usage:	Seated in a child seat, manual lap belt available, usage unknown	Reportedly seated in a child seat, manual 3-point belt, used
Air bag:	None available	None available

Occupant Demographics - 2002 Chevrolet Silverado

	Driver
Age/Sex:	27/Male
Seated Position:	First row left
Seat Type:	Bucket
Height:	183 cm (72 in)
Weight:	90.8 kg (200 lb)
Pre-existing Medical Condition:	Unknown
Alcohol/Drug Involvement:	None reported
Driving Experience:	Unknown
Body Posture:	Unknown
Hand Position:	Unknown
Foot Position:	Unknown
Restraint Usage:	Unknown
Air bag:	Steering wheel mounted, deployed

OCCUPANT KINEMATICS

Occupant Kinematics - 2002 Ford Expedition

Driver

The subject vehicle was traveling northbound at approximately 89 km/h (55 mph). The 26-year-old female driver occupied a bucket seat and was restrained by the 3-point manual lap and shoulder belt. The driver stated to police that she was talking to the children seated in the second row prior to the impact with the Chevrolet. During the impact, both frontal air bags deployed, and the driver initiated a forward and right trajectory. Her lower legs contacted the knee bolster and she sustained abrasions to both lower legs. She loaded the safety belt and the frontal air bag. She sustained a laceration to the lip that was consistent with the body fluid transfers found on the air bag. She sustained chest contusions consistent with seat belt loading. She loaded the seat back, which resulted in abrasions to her back. The left side door hardware was displaced, which indicated her left arm likely contacted this component. Her right pelvis and thigh contacted the middle console, which intruded laterally into the left seat area.

After the initial impact, the vehicle initiated a clockwise rotation and traveled toward the northwest corner of the intersection. The vehicle crossed the north and southbound lanes and departed the roadway onto somewhat level ground. The vehicle had rotated approximately 180 degrees and was heading south, when it contacted a mature orange tree with its right side. The driver was displaced to the right. The vehicle then began tracking again on soft ground. The vehicle rolled backward approximately 23.0 m (75.5 ft) before coming to final rest. The driver reportedly sustained loss of consciousness (LOC) at the scene. The length of LOC was not specified in the police report or her medical records. Reportedly, she was found outside of the vehicle by emergency personnel. She was transported by air ambulance to a regional medical center and was admitted for three days.

Second Row Left Occupant

The 5-year-old female child was seated in a Cosco/Doral belt positioning booster seat and was restrained by the 3-point manual lap and shoulder belt. The booster seat was placed on a split bench seat with a folding back.

During the impact with the Chevrolet, the child was displaced forward and to the right. The child sustained a fracture and dislocation to the cervical spine. The child also likely contacted the second row middle occupant and his child safety seat. The child sustained an abrasion to the right side of the neck, an abrasion to the right shoulder/upper back and a fracture to the proximal shaft of the right humerus. After the first impact, the vehicle initiated a clockwise rotation and contacted a tree with its right side. During this sequence, the child was displaced first to the left, then to the right. She sustained a fracture to the proximal shaft of the left femur. The booster seat remained generally in place during the crash. She was reportedly found post crash sitting in the booster seat by emergency personnel. She sustained major internal trauma and was pronounced deceased at the scene.

Second Row Middle Occupant

The 21-month-old male child was seated in an Evenflo Comfort Touch convertible child safety seat. The child was restrained by the seat's 5-point harness. The CSS was placed on a split bench seat with a folding back. Instructions found on the child seat indicated the seat should be secured by routing a vehicle belt through two slots located in the back of the frame when used forward facing. The second row middle seat was equipped with a switchable ELR/ALR retractable lap belt.

During the impact with the Chevrolet, the child was displaced forward and to the right, and loaded the child safety seat harness and frame. He sustained a fracture and dislocation to the cervical spine He also sustained an abrasion to the right upper chest, lateral to the neck. This abrasion was described by the coroner as being consistent with a seat belt abrasion. It is possible this occupant contacted the second row left and right seat occupants. He also sustained a fracture and dislocation to the right shoulder. During this first impact sequence, the child was ejected through the second row right window. Due to the ejection, he sustained abrasions to the left forehead, the left side of the face, and the chin. The child was found on the west shoulder of the north/south roadway still seated in the child seat.

Second Row Right Occupant

The 3-year-old male child was reportedly seated in a child safety seat and used the 3-point manual safety belt. The belt was examined and signs of loading were noted. The child seat was placed on a split bench seat with a folding back. During the impact with the Chevrolet, the child was displaced forward and to the right, and contacted the second row right side door panel, which intruded laterally into the right seat position. He sustained a fracture and dislocation to the cervical spine at approximately the level of C3. He also sustained abrasions to the right forehead, and to the right side and back of the head. He sustained a fracture to the proximal shaft of the right humerus. After the initial impact, the vehicle rotated in a clockwise direction and contacted a tree with its right side. The police report stated the child was found post-crash sitting in the child seat by emergency personnel.

OCCUPANT INJURIES

Occupant Injuries - 2002 Ford Expedition

Driver

Injury	OIC Code	Injury Mechanism	Confidence Level
Awake on Admission or Initial Observation at Scene (GCS 15), with prior unconsciousness, length of time NFS	160406.2,0	Unknown	Unknown
Laceration NFS, lip	290600.1,8	Air Bag	Possible
Contusion, chest	490402.1,9	Seat belt webbing	Probable
Abrasion, back	690202.1,1	Seat, back support	Possible
Abrasions, bilateral, lower legs	890202.1,3	Lower instrument panel	Probable

Second Row Left Occupant

Injury	OIC Code	Injury Mechanism	Confidence Level
Fracture, cervical spine with dislocation NFS	650216.2,6	Unknown	Unknown
Fracture, humerus, proximal shaft, right	752600.2,1	Other occupant, CSS	Possible
Fracture, femur, proximal shaft, left	8518143,2	Door panel	Possible
Abrasion, neck, right side	390202.1,1	Other occupant, CSS	Possible
Abrasion, shoulder extending to upper back, right side	690202.1,1	Other occupant, CSS	Possible

Second Row Middle Occupant

Injury	OIC Code	Injury Mechanism	Confidence Level
Fracture, cervical spine with dislocation NFS	650216.2,6	Unknown	Unknown
Abrasion, forehead	290202.1,7	Ground	Possible
Abrasion, face, right side	290202.1,1	Ground	Possible
Abrasion, chin	290202.1,8	Ground	Possible
Abrasion, upper chest, right side	490202.1,1	CSS harness, webbing	Possible
Fracture, clavicle (shoulder), right side	752200.2,1	Unknown	Unknown

Second Row Right Occupant

Injury	OIC Code	Injury Mechanism	Confidence Level
Fracture, cervical spine NFS	650216.2,6	Unknown	Unknown
Abrasion, forehead	290202.1,7	Door panel	Possible
Abrasion, scalp, right side	190202.1,1	Door panel	Possible
Abrasion, scalp, posterior	190202.1,6	Door panel	Possible
Fracture, humerus, right side NFS	752600.2,1	Door panel	Possible

Occupant Injuries - 2002 Chevrolet Silverado

Driver

Injury	OIC Code	Injury Mechanism	Confidence Level
Laceration, spleen, major (>3 cm deep)	544226.4,2	Left door panel	Possible
Multiple fractures, ribs, bilateral (R1, R2, L2, L3, L4, L5, L8, L9, L10), with pneumothorax	450230.3,3	Left door panel	Possible
Laceration NFS, scalp	190600.1,6	Unknown	Unknown

Attachment 1. Scene Diagram