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ON-SITE OTHER INFLATABLE OCCUPANT PROTECTION INVESTIGATION

CASE NUMBER - IN10031
LOCATION - MISSOURI
VEHICLE - 2008 FORD ESCAPE XLT
CRASH DATE - June 2010

Submitted:

January 28, 2011

Contract Number: DTNH22-07-C-00044

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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. *Supplementary Notes* On-site other inflatable occupant protection investigation involving a 2008 Ford XLT and a 1995 Dodge Caravan.			
16. *Abstract* This on-site investigation focused on the rollover/side impact inflatable curtain (IC) air bags and front seat-mounted side impact air bags of a 2008 Ford Escape XLT. Additional focus was on the sources of the injuries to the front row right passenger. The Ford was occupied by a restrained 31-year-old male driver and a restrained 59-year-old male front right passenger. The driver was traveling east on a 2-lane, undivided, state highway during daylight hours under cloudy and dry weather conditions. A 1995 Dodge Caravan was traveling north on a 2-lane rural roadway approaching the 4-leg intersection with the state highway. The Dodge's driver applied hard braking and skidded into the intersection where the front plane of the Dodge impacted the right plane of the Ford (event 1). The direction of force on the Ford was within the 1 o'clock sector and the impact triggered a stage 2 deployment of the driver's and front right passenger's frontal air bags. The left and right IC air bags and front right seat-mounted side impact air bag deployed. The Ford rotated clockwise and traversed in a northeast direction where it departed the roadway and rolled over (event 2), left side leading, 4 quarter turns. During the rollover, the vehicle impacted a wire fence with the left and right planes (events 3 and 4). The vehicle came to final rest in a field heading south. The driver's seat-mounted side impact air bag deployed during the rollover. The driver of the Ford was transported by ground ambulance to a trauma center where he was treated in the emergency room for minor injuries and released. The front right passenger sustained serious injuries and was transported by air ambulance to a trauma center and admitted. Both vehicles were towed from the crash scene due to damage.			
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This on-site investigation focused on the rollover/side impact inflatable curtain (IC) air bags and front seat-mounted side impact air bags of a 2008 Ford Escape XLT (**Figure 1**). Additional focus was on the sources of the injuries to the front row right passenger. The vehicle was equipped with that deployed as a result of the crash. This crash was brought to the attention of the National Highway Traffic Safety Administration (NHTSA) on July 6, 2010 by Special Crash Investigation Team 2. The investigation was assigned on August 31, 2010. This crash involved the Ford and a 1995 Dodge Caravan. The crash occurred in June, 2010, at 1112 hours in Missouri and was investigated by the Missouri State Highway Patrol. The Ford and crash scene were inspected on September 7-8, 2010. The driver and passenger of the Ford were interviewed on September 13, 2010. This report is based on the police crash report, scene and vehicle inspections, driver and passenger interviews, occupant medical records, occupant kinematic principles, and evaluation of the evidence.

Figure 1: The damaged 2008 Ford Escape XLT

CRASH CIRCUMSTANCES

Crash Environment: This crash occurred during daylight hours under cloudy and dry weather conditions at the 4-leg intersection of a 2-lane, undivided, bituminous state highway and a 2-lane, undivided, bituminous rural roadway. The state highway traversed in an east-west direction. Each travel lane was approximately 3.2 m (11 ft) in width and was bordered by bituminous shoulders 0.8 m (2.6 ft) in width. The grade for the eastbound travel lane was positive 3.3%. The rural roadway traversed in a north-south direction. On the south leg of the intersection each travel lane was approximately 3.2 m (11 ft) in width and bordered by grass shoulders 1 m (3.3 ft) in width. The roadway was controlled by a stop sign at the intersection. The grade for the northbound travel lane was positive 1.7%. The speed limit for the state highway was 97 km/h (60 mph). The speed limit for the county roadway was 89 km/h (55 mph). The site of the crash was rural. The Crash Diagram is on page 13 of this report.

Figure 2: View east to the approach of the Ford to the intersection; arrow shows approach of the Dodge

Pre-Crash: The Ford was occupied by a restrained 31-year-old male driver and a restrained 59-year-old male front right passenger. The driver was traveling east approaching the intersection (**Figure 2**) and intended to continue eastbound. He estimated his travel speed during the SCI interview at approximately 89 km/h (55

mph). The 55-year-old male driver of the Dodge was traveling north approaching the intersection. He told the investigating police officer that he looked down for a moment and when he looked back at the roadway, he saw the stop sign but was unable to stop. He applied hard braking and skidded into the intersection. The driver of the Ford initiated a left steering maneuver and applied the brakes in an attempt to avoid the crash.

Figure 3: Damage on the right plane of the Ford from the impact by the front plane of the Dodge

Figure 4: View northeast to area of road departure of the Ford and path of rollover toward the fence

The Ford's Event Data Recorder (EDR) reported 5 seconds of pre-crash data. The vehicle's speed was reported as 92.85 km/h (57.69 mph) at 5 sec prior to algorithm enable (AE) decelerating to 91.7 km/h (56.98 mph) at 1 sec prior to AE. "Brake Depressed" was reported as "No" at 5, 4, 3, and 2 sec prior to AE and "Yes" at 1 sec prior to AE.

Crash: The front plane of the Dodge impacted the right plane of the Ford (**Figure 3**, event 1). The direction of force on the Ford was within the 1 o'clock sector and the impact force triggered a stage 2 deployment of the driver's and front right passenger's frontal air bags. The left and right IC air bags and front right seat-mounted side impact air bag also deployed. The Ford rotated clockwise and traversed in a northeast direction across the roadway. The vehicle departed the north side of the roadway (**Figure 4**) and rolled over (event 2), left side leading, 4 quarter turns. During the rollover, the vehicle impacted a wire fence with the left and right planes (events 3 and 4). The driver's seat-mounted side impact air bag deployed during the rollover. The Ford came to final rest in a field headed south 31 m (101.7 ft) northeast of the area of the initial impact. The Dodge rotated clockwise in a northeast direction and came to final rest in a ditch headed southwest 14 m (45.9 ft) northeast of the area of initial impact.

Post-Crash: The police were notified of the crash at 1127 hours and arrived on-scene at 1140 hours. A ground ambulance, air ambulance, and rescue personnel also responded to the crash scene. The driver of the Ford exited the vehicle without assistance through the left front door. He was transported by ground ambulance to a hospital. Rescue personnel mechanically opened the right front door and extricated the unconscious front right passenger. He was transported by air ambulance to a regional trauma center. The driver of the Dodge was not transported. Both vehicles were towed from the crash scene due to damage.

The Ford was equipped with a rollover sensor and electronic stability control. The NHTSA has given this vehicle model a three star rollover rating on a five star scale and a Static Stability Factor of 1.17[1]. A three star rating indicates that the vehicle has a 20%-30% chance of a rollover when involved in a single vehicle crash. The chance of rollover for this vehicle model was rated at 20%. The Static Stability Factor (SSF) is a calculation based on the vehicle's track width and height of its center of gravity. The result of the calculation is a measure of a vehicle's resistence to rollover. A higher SSF indicates a more stable vehicle. The majority of passenger vehicles have an SSF of 1.30 to 1.50[2]. This vehicle model also did not tip-up in the dynamic steering maneuver test in which the test vehicle is put through a fish-hook shaped steering maneuver (i.e., hard left and hard right steer) at a speed of between 56 km/h-80km/h (35-50 mph).

The rollover of the Ford was initiated following the impact with the Dodge when the Ford departed the roadside in a clockwise rotation. As the vehicle traveled into the ditch, the left side tires furrowed into the ground. The lateral force on the left side wheels was sufficient to trip the vehicle and it rolled over left side leading, 4 quarter turns, across a distance of approximately 16 m (52.5 ft).

CASE VEHICLE

The 2008 Ford Escape XLT was an all wheel drive,5-passenger, 4-door sport utility vehicle (VIN: 1FMCU93168K-------) equipped with a 3.0-liter, V6 engine, automatic transmission, 4-wheel anti-lock brakes with electronic brake force distribution, traction control, electronic stability control, and a rollover sensing. The front row was equipped with bucket seats, adjustable head restraints, manual lap-and-shoulder safety belts, dual stage driver and front passenger frontal air bags, front seat-mounted side impact air bags, and rollover/side impact IC air bags that provided protection for the front and second row outboard seat positions. The second row was equipped with a split bench seat with folding backs, lap-and-shoulder seat safety belts, adjustable head restraints, and Lower Anchors and Tethers for Children (LATCH) in outboard seating positions. During the SCI interview, the driver estimated the vehicle's mileage as 46,327 kilometers (35,000 miles). The specified wheelbase was 262 cm (103.1 in).

CASE VEHICLE DAMAGE

Exterior Damage Event 1: The Ford sustained damage on the right plane during the impact with the front plane of the Dodge. The right fender, right front wheel, and both right side doors were directly damaged. The direct damage began 30 cm (11.8 in) forward of the right rear axle and extended 318 cm (125.2 in) forward along the right side. The crush measurements were taken at the mid-door level and the residual maximum crush was 19 cm (7.5 in) occurring at C_3. The vehicle's sill height was 55 cm (21.7 in) and the height of the maximum crush was 83 cm (32.7

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[1] www.safercar.gov, 9/23/10

[2] "Trends in the Static Stability Factor of Passenger Cars, Light Trucks, and Vans", NHTSA Technical Report, DOT HS 809 868, June 2005

in). The Door Sill Differential was 0 cm. The right side wheelbase was reduced 20 cm (7.9 in), while the left side wheelbase was extended 1 cm (0.4 in). The induced damage involved the right fender and quarter panel. The table below presents the vehicle's right side 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	318	19	318	1	13	19	15	9	0	40	40
in		125.2	7.5	125.2	0.4	5.1	7.5	5.9	3.5	0.0	15.7	15.7

Damage Classification Event 1. The Collision Deformation Classification (CDC) for the right plane impact was 01RYEW3 (30 degrees). The missing vehicle algorithm of the WinSMASH program calculated the Delta V as 18 km/h (11.2 mph). The longitudinal and lateral velocity changes were -16 km/h (-9.9 mph) and -9 km/h (-5.5 mph), respectively. Based on the damage, the results appeared reasonable.

Exterior Damage Event 2: The Ford sustained damage on the both side planes and the top plane during the rollover. The direct damage on the left plane (**Figures 5** and **6**) began 15 cm (5.9 in) forward of the left front axle and extended 233 cm (91 in) along the fender, both doors, and the roof side rail. The direct damage on the right plane began 90 cm (35.4 in) forward of the right front axle and extended along the fender, onto the A-pillar, roof side rail, and overlapped the damage from the side impact. The direct damage on the top plane (**Figure 7**) resided on the roof and was intermittent involving the roof, luggage racks, and the roof side rails. There was no discernable damage from the rollover on the hood. The maximum vertical crush was 4 cm (1.6 in) and occurred at the right front corner of the sunroof 142 cm (55.9 in) forward of the right rear axle. The maximum lateral crush was 2 cm (0.8 in) and occurred at the top of the right C-pillar.

Figure 5: Damage from the rollover on the left plane of the Ford

Figure 6: Damage from the rollover on the left plane of the Ford

Damage Classification Event 2. The CDC for the rollover was 00TPDO2. The WinSMASH program could not be used since rollovers are out of scope for the program. Based on the extent of the top plane crush, the severity of the rollover damage was minor.

Exterior Damage Events 3 and 4 : The vehicle sustained damage on both the right and left planes during the rollover from a wire fence. The damage on the right plane began 129 cm (51 in) forward of the right rear axle and extended forward 23 cm (9.1 in) on the top of the right front window frame and roof side rail. The damage on the left plane began 49 cm (19.3 in) forward of the left rear axle and extended 54 cm (21.3 in) rearward along the roof side rail, C-pillar, and quarter panel. The damage from both impacts consisted of scratches and shallow dents.

Figure 7: Damage on the top plane of the Ford from the rollover

Damage Classification Events 3 and 4. The CDCs for the fence impacts on the left and right planes were 00LZHW2 and 00RYGN2. The WinSMASH program could not be used since non-horizontal impacts and impacts with a yielding object are out of scope for the program. The severity of the damage for both impacts was minor.

The vehicle manufacturer's recommended tire size was P235/70R16. The Ford was equipped with the recommended size tires. The vehicle's tire data are presented 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	32nd of an inch			
LF	Flat	Flat	221	32	7	9	Debeaded	No	Yes
LR	Flat	Flat	221	32	9	11	None	No	Yes
RR	Flat	Flat	221	32	8	10	None	No	Yes
RF	152	22	221	32	6	7	None	Yes	No

Vehicle Interior: The interior inspection of the Ford revealed a scuff mark on the forward upper quadrant of the right front door (**Figure 8**) at the beltline from contact by the front right passengers right forearm. The right front door armrest pad and center console were displaced from contact by the passenger's right flank and left hip, respectively. The right instrument panel was scuffed from contact by the passenger's knees. The turn signal lever was broken from contact by the driver's left arm. There was no deformation of the steering wheel and no compression of the energy absorbing steering column.

The right front and right rear doors were jammed shut, while the other doors remained closed and operational. Prior to the crash, all the adjustable windows were closed. The second left rear window glazing was disintegrated and the windshield was in place and cracked by impact forces. The remaining glazing was undamaged.

Figure 8: Yellow tape and displaced armrest cushion shows area of occupant contact on the right front door

The vehicle sustained 9 intrusions of the passenger compartment. The most severe intrusions occurred at the right B-pillar, right front door, and right rear door. The right B-pillar and forward lower quadrant of the right rear door both intruded laterally 12 cm (4.7 in). The forward upper quadrant of the right front door intruded laterally 10 cm (3.9 in).

EVENT DATA RECORDER

The Ford's Restraint Control Module (RCM), which contains the EDR was harvested from the vehicle and sent to NHTSA headquarters for submission to the manufacturer and imaging of the EDR. The EDR data provided by the manufacturer reported that the driver's and front right passenger's safety belts were buckled. The driver's seat track position was reported as "Normal" and the front right passenger occupant classification was reported as "Small Adult." The EDR report contained three event records. Event records 1 and 2 were reported together as a front and a side event. The following data was reported: Stage 1 of the driver's and front right passenger's frontal air bags were commanded to deploy at 44 ms following AE, while stage 2 was commanded to deploy at 144 ms following AE. The left IC air bag was commanded to deploy at 45 ms following AE. The right IC air bag was commanded to deploy at 46 ms following AE. The front right passenger's seat-mounted side impact air bag was commanded to deploy at 45 ms following AE. The driver's retractor and buckle-mounted pretensioners actuated at 44 ms following AE. The front right passenger's retractor and buckle-mounted pretensioners actuated at 49 ms following AE. The time between"key-on" and AE for event records 1 and 2 was reported as 13.17 minutes. The deployment of the driver's seat-mounted side impact air bag was reported under event record 3 and deployed at 11 ms following AE. The time between"key-on" and AE for event record 3 was reported as 13.25 minutes. The maximum longitudinal Delta V for the right plane impact was -19.1 km/h (-11.9 mph) occurring at 238 ms, which was the limit of the recording. The lateral Delta V reached -10.3 km/h (-6.4 mph) and was still increasing at 58 ms, which was the limit of the lateral Delta V recording. The pre-crash data was discussed under the pre-crash section on page 1 of this report.

AUTOMATIC RESTRAINT SYSTEM

The Ford was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system that consisted of dual stage driver and front right passenger frontal air bags, front right passenger weight sensor, and buckle-mounted pretensioners. The frontal air bag satellite sensor

was located on the center radiator support. The manufacturer has certified that the vehicle is compliant to the Advanced Air Bag portion of the Federal Motor Vehicle Safety Standard (FMVSS) No. 208. Both frontal air bags deployed in this crash.

The Ford was also equipped with a side impact air bag system that consisted of roof rail-mounted rollover/side impact IC air bags and front seat-mounted side impact air bags. The side impact sensors were located within the right and left lower B-pillars and mid C-pillars. Both front seat-mounted side impact air bags and IC air bags deployed in this crash.

The driver's frontal air bag was located within the steering wheel hub and the module cover was a two-flap configuration constructed of pliable vinyl. Each cover flap was 6 cm (2.4 in) in width at the top, 5 cm (2 in) in width at the bottom and 12 cm (4.7 in) in height. There was a vertical tear seam on the cover flap and the flaps opened at the tear seam. The deployed air bag was 54 cm (21.2 in) in diameter. There were two 12 cm (4.7 in) wide internal tethers and two 2.5 cm (1 in) diameter vent ports located at the 1 and 11 o'clock positions on the back of the air bag. No discernable evidence of occupant contact or damage were noted on the air bag.

The front passenger frontal air bag was located within the middle of the instrument panel and the module cover was a two-flap configuration constructed of sturdy vinyl. Each cover flap was 23 cm (9.1 in) in width and 6 cm (2.4 in) in height. Both cover flaps opened at the designated tear seams. The deployed air bag was 40 cm (15.7 in) in width and 65 cm (25.6 in) in height. The air bag was not tethered and there was a 6 cm (2.4 in) diameter vent port on each side of the air bag at the 3 and 9 o'clock positions. There was no discernable evidence of occupant contact on the air bag and no damage.

Figure 9: The Ford's right IC air bag

The IC air bags were located along the roof side rails inside the headliner and extended from the A-pillar to the C-pillar. There were no external vent ports. The deployed right IC air bag (**Figure 9**) was 140 cm (55.1 in) in width and 48 cm (18.9 in) in height. It was attached to the A-pillar by a 40 cm (15.7 in) nylon cord. The gap between the front of the IC air bag and the window frame was 30 cm (11.8 in) midway between the beltline and the top of the window. There was no gap between the back of the IC air bag and the C-pillar. The bottom of the air bag was attached to the C-pillar by a 9 cm (3.5 in) nylon cord. The distance the IC air bag extended vertically below the beltline was 13 cm (5.1 in).

Figure 10: The Ford's front right seat-mounted side impact air bag

The dimensions and features of the left IC air bag were the same as the right. There was no discernable evidence of occupant contact or damage on either IC air bag.

The front seat-mounted side impact air bags (**Figure 10**) were triangular in shape and measured 30 cm (11.8 in) in width and 25 cm (9.8 in) in height at the base. There was no discernable evidence of occupant contact or damage on either air bag.

MANUAL RESTRAINT SYSTEM

The Ford was equipped with lap-and-shoulder safety belts in all seating positions. The driver's safety 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-up position. The front right passenger safety belt was similarly equipped but had an ELR/Automatic Locking Retractor (ALR). The adjustable upper anchor was located in the full-up position. Both safety belts were equipped with retractor-mounted and buckle-mounted pretensioners, which actuated during the crash. The second row safety belts consisted of continuous loop belt webbing with switchable ELR/Automatic Locking Retractors (ALR), sliding latch plates, and fixed upper anchors.

Inspection of the driver's safety belt assembly revealed heavy historical usage scratches on the latch plate. No load marks were present on the safety belt webbing, latch plate belt guide, or D-ring. The driver stated during the SCI interview that he was restrained at the time of the crash. The vehicle's EDR reported the driver's safety belt as buckled.

Inspection of the front right passenger's safety belt assembly revealed historical usage scratches on the latch plate. The belt webbing was folded over on itself and entrapped in the sliding latch plate. There were also load abrasions on the belt webbing and latch plate belt guide. This evidence indicated that the front right passenger was restrained at the time of the crash. The vehicle's EDR reported the driver's safety belt as buckled.

CASE VEHICLE DRIVER KINEMATICS

Based on the SCI interview, the restrained driver of the Ford [31-year-old male, 188 cm (74 in) and 84 kg (185 lbs)] was seated in an upright posture with his back against the seat back. He had both hands on the steering wheel and the right foot on the accelerator pedal. The seat track was adjusted between the rear and middle position and the seat back was slightly reclined. The driver was not wearing glasses or contact lenses.

The right side impact on the Ford displaced the driver to the right and forward opposite the 1 o'clock direction of force and he loaded the safety belt. The driver sustained an abrasion and contusion on his left shoulder and a contusion on the lower abdomen from contact with the safety belt. As the vehicle rolled over left side leading, the driver was displaced to the left and toward the roof. While there was no discernable evidence of occupant contact on the left seat-mounted side impact and IC air bags, the driver probably contacted these air bags during the rollover. The

driver sustained multiple lacerations, abrasions, and contusions during the rollover. He exited the vehicle through the left front door without assistance.

CASE VEHICLE DRIVER INJURIES

The driver was transported by ambulance to a trauma center where he was treated in the emergency room and released. He did not miss any work days as a result of the crash. The table below presents the driver's injuries and injury sources.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
1	Lacerations, small, miscellaneous, small, upper torso, not further specified	minor 410600.1,0	Noncontact injury: flying glass, left rear glazing	Probable	Interviewee (same person)
2	Contusion (bruise), light, across lower abdomen	minor 510402.1,8	Lap portion of safety belt system	Certain	Emergency room records
3	Abrasion atop left shoulder, not further specified	minor 710202.1,2	Torso portion of safety belt system	Certain	Emergency room records
4	Abrasion atop right shoulder, not further specified	minor 710202.1,1	Noncontact injury: flying glass, left rear glazing	Probable	Emergency room records
5	Contusion right shoulder, not further specified	minor 710402.1,1	Interior, center console first row	Possible	Emergency room records
6	Contusion (bruise), small, 20.3 cm (8 in), straight line, left anterior shoulder toward chest	minor 710402.1,2	Torso portion of safety belt system	Certain	Emergency room records
7	Abrasion (scrape), small, vertical, right anterior leg below knee	minor 810202.1,1	Center lower instrument panel	Probable	Emergency room records
8	Contusion (bruising) right lower leg, not further specified	minor 810402.1,1	Center lower instrument panel	Probable	Emergency room records
9	Laceration (cut), 10.2 cm (4 in) superficial, right lower leg, on shin near knee	minor 810602.1,1	Center lower instrument panel	Probable	Emergency room records

CASE VEHICLE FRONT ROW RIGHT PASSENGER KINEMATICS

The restrained front row right passenger of the Chevrolet [59-year-old male, 185 cm (73 in) and 98 kg (215 lb)] was seated in an upright posture with his back against the seat. Both feet were on the floor. The seat track was adjusted to the rear position and the seat back was slightly reclined. The passenger was wearing glasses.

The right side impact on the Ford displaced the passenger to the right and forward opposite the 1 o'clock direction of force and he loaded the safety belt and contacted the right front door. He sustained bilateral rib fractures, a thoracic cavity injury, multiple fractures of the pelvis, and a burst fracture of T_8 from contacting the right front door. As the vehicle rolled over left side leading, the passenger was displaced to the left and toward the roof within the safety belt. He sustained a spleen laceration and contusion from contacting the center console and a concussion from loading through the right IC air bag and contacting the right B-pillar. The passenger also sustained multiple abrasions and lacerations. Passers-by forced open the right front door and emergency responders removed the passenger from the vehicle while he was unconscious.

CASE VEHICLE FRONT ROW RIGHT PASSENGER INJURIES

The front right passenger was transported by air ambulance to a trauma center where he was hospitalized for 16 days. He was transferred to a recovery facility where he spent and additional 33 days. He had not returned to work at the time of the SCI interview.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
1	Concussion with brief loss of consciousness at scene of unknown duration and amnesia (no memory) of event	moderate 161002.2,0	B pillar (loaded through right IC air bag)	Probable	Hospitalization records
2	Fractured ribs: bilaterally[3], medially, anteriorly and posteriorly, not further specified	serious 450203.3,3	Right front door panel, rear upper quadrant	Certain	Hospitalization records
3	Thoracic cavity injury with bilateral pleural effusions resulting in respiratory failure; thoracentesis low right lower lobe returned dark bloody fluid[4]	serious 442200.3,1	Right front door panel, rear upper quadrant	Certain	Hospitalization records
4	Fracture, burst, T_8, comminuted with minimal loss of body height	moderate 650432.2,7	Right front door panel, rear upper quadrant	Certain	Hospitalization records

[3] CT scans of the chest and abdomen indicate the following. On image 55 there is a displaced anterior left rib fracture. On image 62 there appears to be a fracture of a left rib posteriorly. There is an additional rib fracture involving a medial left rib on image 58. There is another left rib fracture on image 84. There is a deformity of an anterior left rib on image 98. There is a fracture of the medial right rib on image 112; it is the 11th rib. Additional anterior rib deformities are present involving the inferior right hemithorax.

[4] Ultrasound reported 550 ml removed during the thoracentesis while the laboratory record indicated 800 ml fluid sent for analysis. The following term is defined in Dorland's Illustrated Medical Dictionary as follows:
thoracentesis (thor-sen-te/sis): paracentesis of the thoracic cavity for aspiration of fluids; called also pleuracentesis, pleurocentesis, and thoracocentesis.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
5	Fractures, multiple, pelvis, nondisplaced, involving right sacral ala anteriorly; left superior pubic ramus, and bilateral inferior pubic rami	moderate 856151.2	Right front door panel, rear lower quadrant	Certain	Hospitalization records
6 7	Laceration, small, spleen, incomplete, posteriorly and inferiorly with splenic contusion and hemoperitoneum	moderate 544210.2,2 544222.2,2	Interior, center console first row	Probable	Hospitalization records
8	Abrasion left posterolateral scalp, not further specified	minor 110202.1,2	Noncontact injury: flying glass, left rear glazing	Probable	Emergency room records
9	Laceration, 5 cm (2 in) on left posterolateral scalp with swelling; closed with staples	minor 110602.1,2	Noncontact injury: flying glass, left rear glazing	Probable	Hospitalization records
10	Laceration, 1 cm (0.4 in) left periorbital (eye)	minor 210600.1,2	Air bag, front right passenger's and eyewear	Certain	Hospitalization records
11 12	Abrasion and contusion (bruise) left cheek, not further specified	minor 210202.1,2 210402.1,2	Air bag, front right passenger's	Possible	Hospitalization records
13 14	Abrasion and contusion (bruise) right forehead, not further specified	minor 210202.1,7 210402.1,7	Air bag, front right passenger's side inflatable curtain	Probable	Hospitalization records
15	Contusion (bruise) left chest wall, not further specified	minor 410402.1,2	Interior, center console first row	Probable	Emergency room records
16 17	Abrasions over right and left anterior, superior, iliac spine of both pelves	minor 510202.1,1 510202.1,2	Lap portion of safety belt system	Certain	Emergency room records
18	Abrasion right upper arm over medial (inner) biceps	minor 710202.1,1	Air bag, front right passenger's side impact	Probable	Emergency room records
19	Abrasion over left triceps	minor 710202.1,2	Floor, center console	Probable	Emergency room records
20 21	Abrasion and contusion left forearm, not further specified	minor 710202.1,2 710402.1,2	Floor, center console	Probable	Hospitalization records

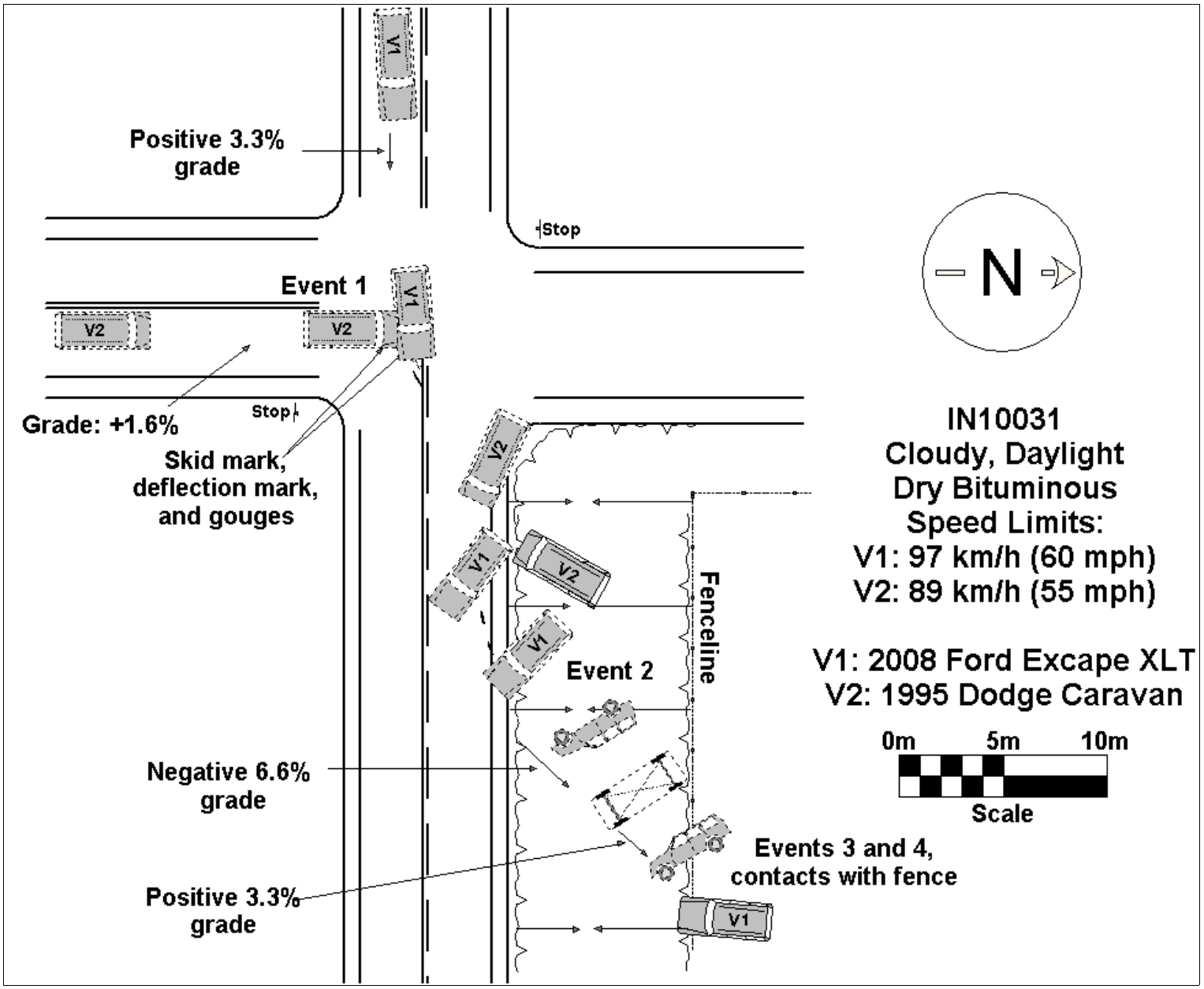
Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
22	Abrasions right knee and right anterior tibial area	minor 810202.1,1	Right lower instrument panel (includes knee bolster)	Probable	Emergency room records
23 24	Abrasion over left knee and abrasion and contusion over left shin, vertically oriented	minor 810202.1,2 810402.1,2	Right lower instrument panel (includes knee bolster)	Probable	Hospitalization records
25	Fracture, pelvis, non-displaced, involving anterior column right acetabulum	moderate 856251.2	Right front door panel, rear lower quadrant	Certain	Hospitalization records

OTHER VEHICLE

The 1995 Dodge Caravan was a front-wheel drive, 5-passenger , 3-door mini van (VIN: 2B4GH2534SR------) equipped with a 3.0-liter, V-6 engine.

Exterior Damage: The vehicle was not inspected since it could not be located. The missing vehicle algorithm of the WinSMASH program calculated the Delta V for the frontal impact with the right plane of the Ford (event 1) as 20 km/h (12.4 mph). The longitudinal and lateral velocity changes were –10 km/h (6.2 mph) and 17 km/h (10.6 mph), respectively. The results should be considered borderline since they are based only on the crush on the Ford.

Other Vehicle's Occupants: The police crash report indicated that the driver of the Dodge (55-year-old male) was restrained by his lap-and-shoulder safety belt. The driver sustained a B (non-incapacitating) injury and was not transported.


Positive 3.3% grade
Stop
Event 1
V1
V2
V2
Grade: +1.6%
Stop
Skid mark, deflection mark, and gouges
V2
V1
V2
V1
Event 2
Fenceline
Negative 6.6% grade
Events 3 and 4, contacts with fence
Positive 3.3% grade
V1
N
IN10031
Cloudy, Daylight
Dry Bituminous
Speed Limits:
V1: 97 km/h (60 mph)
V2: 89 km/h (55 mph)
V1: 2008 Ford Excape XLT
V2: 1995 Dodge Caravan
0m 5m 10m
Scale