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ON-SITE CHILD RESTRAINT SYSTEM INVESTIGATION

CASE NUMBER - IN10038
LOCATION - KANSAS
VEHICLE - 2005 DODGE DURANGO SLT
CRASH DATE - May,2010

Submitted:

May 10, 2011

Contract Number: DTNH22-07-C-00044

Prepared for:

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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 Child Restraint System investigation involving a 2005 Dodge Durango and a 2001 Peterbilt 6x4 tractor-trailer.

16. *Abstract*

This on-site investigation focused on the second row left and right passengers of a 2005 Dodge Durango SLT and the Dorel Safety 1st Designer 22 Child Restraint Systems (CRSs) in which they were seated. The crash occurred on a two-lane U.S. Highway and involved the Dodge and a 2001 Peterbilt 6x4 tractor-trailer. The Dodge was occupied by a restrained 24-year-old female driver, a restrained 49-year-old female front right passenger, a 10-month-old female second row left passenger, and a 10-month-old female second row right passenger. Both second row passengers were restrained in rear-facing CRSs. The Dodge was traveling south and the Peterbilt was traveling north. The Dodge crossed into the northbound lane of traffic and the Peterbilt driver steered to the left to avoid the crash. As the Dodge's driver steered the vehicle back to the right, the front of the Dodge impacted the right side of the Peterbilt. The impact triggered the deployment of the Dodge's frontal air bags. During the crash sequence, the second row left passenger's CRS became detached from the safety belt and the CRS and passenger were ejected through the right rear door. The driver of the Dodge and the second row passengers were transported by ambulance to medical facilities. The second row left passenger was transferred via helicopter to a level 1 trauma center and admitted. She was subsequently transferred to a children's hospital. The front right passenger was pronounced deceased at the crash scene. The Dodge's driver was treated in the emergency room and released, while the second row right passenger was hospitalized.

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BACKGROUND

The focus of this on-site investigation was the 2005 Dodge Durango SLT's second row left and right passengers (10-month-old, females) and the Dorel Safety 1st Child Restraint Systems (CRSs) in which they were seated. This crash was brought to the National Highway Traffic Safety Administration's (NHTSA) attention on October 19, 2010 by Special Crash Investigation Team 2. This on-site investigation was assigned on November 5, 2010. The crash involved the Dodge (**Figure 1**) and a 2001 Peterbilt 6x4 tractor semi-trailer. The crash occurred in May, 2010, at 1405 hours in Kansas and was investigated by the Kansas Highway Patrol. The Dodge was inspected on November 9, 2010 and the crash scene on November 10, 2010. The driver of the Dodge was interviewed on November 15, 2010. The Peterbilt could not be located and was not inspected. This report is based on the police crash report, crash scene, and Dodge inspection, exemplar vehicle inspection, driver interview, discussions with the investigating police officers, occupant kinematic principles, occupant medical records, and evaluation of the evidence.

Figure 1: The damaged 2005 Dodge Durango SLT

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which the Dodge and Peterbilt were traveling was a 2-lane, undivided, U.S. highway, traversing in a north-south direction. The roadway had one through lane in each direction and was bordered by bituminous shoulders. Each lane was 3.8 m (12.5 ft) in width and the shoulders were 3.4 m (11.2 ft) in width. The roadway pavement markings consisted of a broken yellow center line and solid white edge lines. The posted speed limit was 104 km/h (65 mph). At the time of the crash, the light condition was daylight and the atmospheric condition was clear. The roadway pavement was dry bituminous and the grade was level. The site of the crash was rural and the traffic density was moderate. The Crash Diagram is on page 14 of this report.

Pre-Crash: The Dodge was occupied by a restrained 24-year-old female driver, a restrained 49-year-old female front right passenger, a 10-month-old female second row left passenger, and a 10-month-old female second row right passenger. Both second row passengers were restrained in rear-facing CRSs. The Dodge was traveling south (**Figure 2**) and the driver intended to continue straight ahead. The Peterbilt's restrained 45-year-old male driver was traveling north, intending to continue straight ahead. The Dodge crossed into the northbound lane and the

Figure 2: Southbound approach of the Dodge to the impact area

drivers of two non-contact vehicles traveling in front of the Peterbilt steered right onto the shoulder to avoid the Dodge. The driver of the Peterbilt steered to the left to avoid the crash. The Dodge continued into the northbound lane and the driver steered right in an attempt to avoid the crash and return to her original lane of travel. The crash occurred in the northbound lane.

Crash: The front plane of the Dodge impacted the right side plane of the Peterbilt near the right front wheel (event 1). The direction of force on the Dodge was within the 11 clock sector and the impact force deployed both frontal air bags. After the impact, the Dodge rotated clockwise and was redirected to the northeast. The vehicle departed the roadway and traveled down an embankment where it came to final rest heading east 18 m (59 ft) northeast of the impact area. A minor fire occurred in the engine compartment of the Dodge (event 2), which was extinguished by a passerby. During the crash sequence, the second row left passenger's CRS became detached from the safety belt and the CRS and passenger were ejected through the right rear door. Following the impact, the Peterbilt departed the roadway to the northwest and traveled down a short embankment, where it came to final rest heading northwest, 91 m (298.5 ft) northwest of the point of impact.

Post-Crash: The police were notified of the crash at 1411 hours and arrived on scene at 1430 hours. Emergency rescue and medical personnel also responded to the crash scene. The driver's door of the Dodge was jammed, but the driver was able to exit through the top portion of the window frame, which was ajar. The driver removed the second row right passenger and rescue personnel extricated the front right passenger. The driver and second row passengers were transported by ambulance to medical facilities. The second row left passenger was transferred via helicopter to a level 1 trauma center and admitted. She was subsequently transferred to a children's hospital. The front right passenger was pronounced deceased at the crash scene. The Dodge's driver was treated in the emergency room and released, while the second row right passenger was hospitalized. The Peterbilt's driver was not injured and not transported to a hospital. Both vehicles were towed from the crash scene due to damage.

CASE VEHICLE

The 2005 Dodge Durango SLT was a 4-wheel-drive, 4-door sport utility vehicle (VIN: 1D4HB48D25F------) equipped with a 5.7-liter, V-8 engine, 5-speed automatic transmission, and 4-wheel anti-lock brakes with electronic brake force distribution. The front row was equipped with bucket seats, adjustable head restraints, lap-and-shoulder safety belts with pretensioners, and driver and front right passenger frontal air bags. The second row was equipped with a split bench seat with folding backs, lap-and-shoulder safety belts, adjustable head restraints, and Lower Anchors and Tethers for Children (LATCH) in the outboard seating positions.

CASE VEHICLE DAMAGE

Exterior Damage: The Dodge sustained frontal plane damage during the impact with the Peterbilt. The front bumper, grille, hood, both fenders, right A-pillar, windshield header, windshield, and roof were directly damaged. The direct damage extended the length of the frontal plane, 170 cm (66.9 in). The front bumper was torn off the vehicle during the crash so the crush measurements

were taken at the lower radiator support. The maximum residual crush was 69 cm (27.2 in) occurring at C_6. The left front suspension was displaced during the crash and the left wheelbase was reduced 51 cm (20 in). The right side wheelbase was reduced 32 cm (12. 6 in). Indirect damage was found on the left fender, right side glazing, and roof.

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	170	69	64	18	27	38	45	59	69	0	0
in		66.9	27.2	25.2	7.1	10.6	15.0	17.7	23.2	27.2	0.0	0.0

A minor fire occurred in the engine compartment, which was extinguished by a passer-by. The origin of the fire could not be determined.

Damage Classification: The Dodge's Collision Deformation Classification was 11FDEW4 (340 degrees). The WinSMASH program could not be used to calculate the Dodge's Delta V since an impact with a heavy truck is out of scope for program. The Damage Algorithm of WinSMASH was used to calculate a Barrier Equivalent Speed (BES). The calculated BES was 57 km/h (35.4 mph).

The manufacturer's recommended tire size was P245/70R17. The Dodge was equipped tires size P265/70R17. The valve stem for the vehicle's left front tire was not accessable and the right front tire was missing. The remainder of the 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	32nd of an inch			
LF	Unk	Unk	228	33	5	6	None	Yes	No
LR	262	38	228	33	6	7	None	No	No
RR	262	38	228	33	6	7	None	No	No
RF	Unk	Unk	228	33	Unk	Unk	Unknown	No	No

Vehicle Interior: The inspection of Dodge's interior revealed evidence of occupant contacts. The glove box door was deformed from contact by the front right passenger's right knee. There was also a large blood transfer on the front right passenger's frontal air bag. A transfer of makeup was on the front of the driver's air bag from contact by the driver's face. There were scuff marks and scratches on the back of the front right passenger's seat, right B-pillar, and right rear door from contact by the displaced second row left passenger's CRS.

The front doors were jammed shut, with the right front door mechanically forced open by rescue personnel. The left rear door remained closed and operational. The right rear door panel was displaced and deformed (**Figure 3**) by impact from the displaced second row left CRS. The right rear door came open during the crash. This was probably caused by indirect damage to the door structure and door frame from the initial impact with the Peterbilt and the subsequent contact by the CRS.

Figure 3: Right rear door damage from ejected second seat left passenger's CRS

Prior to the crash, all glazing was either closed for adjustable windows or fixed for the others. The windshield was missing at the time of inspection. The left front glazing, which was laminated, was cracked and in place. The right front glazing was missing. The remainder of the left side glazing was intact while the remainder of the right side glazing and backlight were disintegrated.

The vehicle's passenger compartment sustained several intrusions due to the frontal impact. The most severe intrusions into the front right passenger's occupant space involved the right toe pan and right instrument panel, which intruded longitudinally 40 cm (15.7 in) and 21 cm (8.3 in), respectively.

EVENT DATA RECORDER

The Event Data Recorder (EDR) was imaged using version 3.5.1 of the Bosch Crash Data Retrieval software via direct connection to the air bag control module (ACM). The EDR file was subsequently read and reported with verison 3.7. The EDR report indicated that no events were recovered. The data limitations section of the EDR report stated that if power is lost during the event, all or part of the event data may not be recorded. The EDR report is attached at the end of this report[1]

AUTOMATIC RESTRAINT SYSTEM

The Dodge was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system that was certified by the manufacturer to be compliant to the Advanced Air Bag portion of the Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The frontal air bag system consisted of dual stage driver and front right passenger frontal air bags and retractor mounted pretensioners. Both of the frontal air bags deployed in this crash.

The driver's frontal air bag was located within the steering wheel hub and the cover flap was a two-flap configuration with a vertical center seam and constructed of pliable vinyl. Each cover

[1] Please note that pages 5-8 have been deleted for confidentiality purposes

flap was 7 cm (2.8 in) in width and 13 cm (5.1 in) in height. Both cover flaps opened at the designated tear seams. The air bag was 63 cm (24.8 in) in diameter. There were two 6 cm (2.4 in) wide tethers and two "X" shaped vent ports, located at the 1 and 11 o'clock positions on the back of the air bag. There were makeup transfers on the front center of the air bag from the driver's face. The air bag was not damaged.

The front right passenger frontal air bag was located at the top of the instrument panel and the module cover was a single flap configuration, constructed of sturdy vinyl. The module cover was 26 cm (10.2 in) in width and 17 cm (6.7 in) in height. The deployed air bag was 43 cm (16.9 in) in width and 58 cm (22.8 in) in height. The air bag was not tethered and there was a vent port on each side of the air bag, near the bottom. There was a large tear that started at the lower front right corner and extended upward 45 cm (17.7 in). The tear continued across the top of the air bag, extending 40 cm (15.7 in) from the right side. This damage was likely caused by windshield intrusion. The air bag was also holed in several locations on the front and right side, with holes measuring <1 cm (0.4 in) -3 cm (1.2 in) in diameter. There was a large blood stain on the back of the air bag near the bottom.

MANUAL RESTRAINT SYSTEM

The Dodge was equipped with lap-and-shoulder safety belts for the front and second row seating positions. The driver's safety belt consisted of continuous loop belt webbing, an Emergency Locking Retractor (ELR), a sliding latch plate, and an adjustable upper anchor that was in the full-down position. The front right safety belt consisted of continuous loop belt webbing, a locking latch plate, and an adjustable upper anchor that was located in the full-down position. The safety belt was jammed and the retractor type could not be determined. The safety belts were also equipped with retractor-mounted pretensioners, which actuated in the crash. The second row and third row safety belts were also equipped with continuous loop belt webbing and locking latch plates, but had fixed upper anchors. The second and third rows were equipped with ELRs. The second row was equipped with a Lower Anchors and Tethers for Children (LATCH) system.

The inspection of the driver's safety belt assembly revealed load marks on the top and bottom of the latch plate guide. Based on this evidence, the driver was restrained during the crash.

The inspection of the front right passenger's safety belt revealed that the webbing was cut by rescue personnel. Friction burns from loading on the D-ring were observed on the safety belt webbing. Load marks from the belt webbing were also noted on the top and bottom of the latch plate belt guide. Based on this evidence, the front right passenger was restrained during the crash.

The inspection of the second row left safety belt assembly revealed load marks on the belt webbing and latch plate belt guide. The police crash report stated that this safety belt was found buckled and extended out of the retractor immediately following the crash. No locking clip was used with the safety belt. The SCI inspection of the CRS revealed no evidence or loading on either safety belt path. This evidence suggested that the safety belt was used to secure the CRS but the safety belt was not routed through the CRS's rear facing belt paths. The CRS was ejected

from the vehicle through the right rear door during the crash.

The inspection of the second row right safety belt assembly revealed load marks on the belt webbing and latch plate belt guide. The SCI inspection of the CRS revealed that the guide tab on the left safety belt path was displaced outward, away from the CRS, but not broken off. Stress marks were also noted on the guide tab. Based on this evidence, the safety belt was used to secure the CRS. The police crash report stated that no locking clip was with the safety belt.

Figure 4: Second row left CRS

CHILD RESTRAINT SYSTEM

The Dodge's second row left passenger [10-month-old, female; 51 cm and 8 kg (20 in, 18 lbs)] was seated in a Dorel Safety 1st Designer 22 rear facing infant seat (**Figure 4**). The CRS was manufactured on March 3, 2009 and the model number was 22303-ADA. The CRS was equipped with a 5-point harness and a harness retainer clip that was positioned above the armpit level. The CRS was designed for only rear facing use and was for children who weigh between 2.3 and 10 kg (5 and 22 lbs) and were between 48 and 74 cm (19 and 29 in) in height.

The CRS was constructed of a one-piece plastic shell with a detachable base. The seat back of the CRS was cushioned with a 1 cm (0.4 in) thick styrofoam pad. The 5-point harness had four slot adjustments and at the time of the crash, the third highest slot was used. This infant seat can be used with or without the detachable base; the base was not used in the crash. In accordance with FMVSS 213/225, the base for this model contains lower anchor attachments that can be secured to the lower anchor bars in the vehicle. Since the CRS was used without the base, the only means of securing it was by using the vehicle's lap and shoulder safety belt. The safety belt was used to secure the CRS but was not routed through the rear-facing belt path. This was evidenced by the fractured plastic flange located between the left rear-facing belt path and the carry handle pivot (**Figure 5**). The fractured plastic flange suggested that the safety belt had been routed through the space in front of the carry handle pivot and the plastic was fractured when it was loaded by the safety belt during the crash.

Figure 5: Second row left CRS with damaged left flange

Inspection of the CRS revealed minor scratch marks on the right side, likely caused during the ejection and some blood drops on the left armrest. On the bottom of the CRS, the right harness anchor was pulled through the seat bottom, causing a 10 cm (3.9 in) "S"-shaped crack (**Figure 6**). On the left side of the CRS, the plastic tab behind the belt guide was fractured (Figure 5).

Figure 6: Cracked bottom of second row left CRS

The second row right passenger [10-month-old, female; 51 cm and 8 kg (20 in, 17 lbs)] was seated in a Dorel Safety 1st Designer 22 (**Figure 7**) that was identical to the one in the second row left position. It was also manufactured on March 3, 2009 and the model number was 22303-ADA. The CRS was equipped with a 5-point harness and a harness retainer clip that was positioned above the armpit level. The CRS was designed for only rear facing use and was for children who weigh between 2.3 and 10 kg (5 and 22 lbs) and were between 48 and 74 cm (19 and 29 in) in height. The base for the CRS was not in use at the time of the crash. The shoulder straps were also threaded through the third highest set of slots.

Figure 7: Second row right passenger's CRS

Inspection of this CRS revealed a moderate size blood stain at the top left and dried blood on the harness retainer clip. The left side belt guide path was deformed (**Figure 8**) due to loading by the vehicle's safety belt during the initial impact. The remainder of the CRS was unremarkable.

CASE VEHICLE DRIVER KINEMATICS

The restrained driver of the Dodge [24-year-old, female; 163 cm and 77 kg (64 in, 170 lbs)] was seated in an upright posture with her back against the seat back. She stated she had both hands on the steering wheel and her feet on the floor or foot controls. The seat track was adjusted to the middle position, the seat back was upright, and the steering wheel was adjusted between the middle and full down positions.

Figure 8: Deformed left belt guide on second row right CRS

The Dodge's frontal impact with the right side of the Peterbilt displaced the driver forward and left, opposite the 11 o'clock direction of force. She loaded the safety belt and frontal air bag. The safety belt caused abrasions on the left side of the driver's neck and a contusion on her chest. She sustained a laceration on her left lower leg and an abrasion on her right shin from contact with the left lower instrument panel and center instrument panel, respectively. She also sustained lacerations on her left arm and abrasions on her right forearm from flying glass fragments. The driver remained restrained in her seat throughout the crash.

The driver was transported by ambulance to a local hospital where she was treated and released. She missed 75 days of work as she cared for the injured second row left passenger. The table below presents the driver's injuries and injury sources.

CASE VEHICLE DRIVER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
1	Abrasion (friction burn), 10.2-12.7 cm (4-5 in) on left side of neck	minor 310202.1,2	Torso portion of safety belt system	Probable	Interviewee (same person)
2	Contusion chest, not further specified	minor 410402.1,4	Torso portion of safety belt system	Probable	Emergency room records
3	Lacerations (cuts) on left arm, not further specified	minor 710602.1,2	Noncontact injury: flying glass, left front glazing	Probable	Interviewee (same person)
4	Abrasion posterior right forearm and hand, not further specified	minor 710202.1,2	Noncontact injury: flying glass, left front glazing	Probable	Emergency room records
5	Abrasion, 17.8 cm (7 in) on right shin	minor 810202.1,1	Center lower instrument panel	Probable	Emergency room records
6	Laceration, 2 cm (0.8 in), transverse, anterior left leg	minor 810602.1,2	Left lower instrument panel (includes knee bolster)	Probable	Emergency room records

CASE VEHICLE FRONT ROW RIGHT PASSENGER KINEMATICS

The front right passenger [49-year-old, female; 165 cm and 91 kg (65 in, 200 lbs)] was seated in an upright posture with her back against the seat. Her feet were on the floor, her hands were in her lap, and she was sleeping prior to the crash. Her seat track was adjusted to the middle position and her seat back was upright.

The Dodge's frontal impact with the right side of the Peterbilt displaced the front right passenger forward and to the left within the safety belt. The Peterbilt engaged the windshield,

windshield header, and roof and this occupant's head probably loaded through the deployed frontal air bag and contacted the Peterbilt causing a blunt head trauma. She rebounded back into her seat and remained restrained throughout the crash.

The front right passenger was pronounced deceased at the crash scene and was transported to a funeral home. The table below presents the front right passenger's injury and injury source.

CASE VEHICLE FRONT ROW RIGHT PASSENGER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
1	Blunt head trauma, specifics unknown	unknown 100999.9,0	Exterior of other motor vehicle	Probable	Interviewee (driver)

CASE VEHICLE SECOND ROW LEFT PASSENGER KINEMATICS

The second row left passenger [10-month-old, female; 64 cm and 8 kg (25 in, 18 lbs)] was seated in a rear-facing CRS in a supine posture. She was restrained in the CRS by the 5-point harness. The vehicle's lap-and-shoulder safety belt was not routed through the rear-facing belt paths. The evidence as described in the Child Restraint System section on page 6 of this report suggested that the safety belt was routed through the space in front of the carry handle pivots.

The Dodge's frontal impact with the right side of the Peterbilt displaced the second row left passenger forward and to the left within the CRS. As the CRS was displaced forward, the safety belt webbing engaged the plastic located between the left carrying handle pivot and rear-facing belt guide. The plastic flange fractured and as the CRS was displaced forward, it separated from the safety belt. During the post impact clockwise rotation, the CRS was redirected to the right and contacted the front right passenger's seat back, right B-pillar, and right rear door. The induced damage to the right rear door frame and door caused by the impact with the Peterbilt and the subsequent contact by the CRS caused the door to open and the CRS was ejected from the vehicle. During the contact with the B-pillar, the passenger's head possibly contacted the B-pillar, which caused a basilar skull fracture, fracture of the vault in the left posterior parietal bone, and multiple brain injuries. The passenger sustained a fractured left femur, probably from contacting the right rear door. The passenger also sustained multiple contusions and abrasions. The passenger remained in the CRS and was moved from the final rest position by a passerby. The passenger was transported to a local hospital by ambulance and transferred by helicopter to a level 1 trauma center where she was hospitalized for 11 days. She was transferred to a children's hospital that was also a level 1 trauma center and hospitalized for an additional 12 days. The table below presents the passenger'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	Axonal injury, diffuse; unconscious for over 23 days, no purposeful movements in any extremity, multiple neurologic deficits; Ranchos Los Amigos 1	critical 161013.5,0	B-pillar right	Possible	Hospitalization records
	unresponsive at scene; PEA[2] and agonal[1] respirations on EMS arrival at scene; GCS=3, initially; unresponsive to painful stimuli on ER arrival; GCS=4 on transfer with spontaneous movement				Emergency room records
	unresponsive at transferred facilities; decerebrating posture upper extremities; anoxic[1] brain injury				Hospitalization records
2	Edema, cerebral, diffuse with effacement of sulci[3] as well as portions of basilar cisterns[2]; ventricles quite compressed but no midline shift or herniation; increasing supratentorial edema	severe 140672.4,9	B-pillar right	Possible	Hospitalization records
3	Contusion, cerebrum, left middle fossa (medial temporal lobe) with parenchyma bleed noted	serious 140604.3,2	B-pillar right	Possible	Hospitalization records

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[2] The following terms are defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:
agonal (ag′a-nal): pertaining to or occurring at the time just before death.
anoxic (a-nok′sik): pertaining to or characterized by anoxia.
anoxia (a-nok′se-a): a total lack of oxygen; often used interchangeably with ***hypoxia*** to mean a reduced supply of oxygen to the tissues.
PEA: pulseless electrical activity
pulseless electrical activity: continued electrical rhythmicity of the heart in the absence of effective mechanical function; it may be due to uncoupling of ventricular muscle contraction from electrical activity or may be secondary to cardiac damage with respiratory failure and cessation of cardiac venous return. Called also *electromechanical dissociation*.

[3] The following term(s) {is | are} defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:
cistern (sis′tern): a closed space serving as a reservoir for fluid; see also *cisterna*.
cisterna (sis-ter′na) **pl.** ***cister′nae***: a cistern -- a closed space serving as a reservoir for lymph or other body fluid, especially one of the enlarged subarachnoid spaces containing cerebrospinal fluid.
fissure (fish′ar): any cleft or groove, normal or otherwise; especially a deep fold in the cerebral cortex which involves the entire thickness of the brain wall. Compare *sulcus*.
sylvian f., f. of Sylvius: sulcus lateralis cerebri.
sulcus (sul′kas) pl. ***sul′ci (sul′si)***: a groove, trench, or furrow; a general term for such a depression, especially one of those on the surface of the brain, separating the gyri. Compare *fissure*.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
	Hemorrhage, subarachnoid, two small areas in proximity to left sylvian fissure[2]	not coded	B-pillar right	Possible	Hospitalization records
4	Hemorrhage (hyper density), punctate[4], small, right cerebellum, not further specified	moderate 140416.2,6	B-pillar right	Possible	Hospitalization records
5	Fracture basilar skull including mastoid air cells on right with mild diastasis parietomastoid suture, 3 mm (0.1 in) and occipital bone on both sides (of foramen magnum), extending obliquely through left occipital bone; adjacent to hematoma	severe 150206.4,8	B-pillar right	Possible	Hospitalization records
6	Fracture vault, in left posterior parietal bone, extending from apex and joining occipital area; slightly depressed with small fragments	serious 150404.3,2	B-pillar right	Possible	Hospitalization records
7	Cephalohematomas[5] at base of skull at fracture site, with bogginess[3] posteriorly and bilaterally around base of occiput	minor 110402.1,6	B-pillar right	Possible	Emergency room records
8	Contusion right lower lobe of lung, superior segment	moderate 441407.2,1	Child safety seat harness straps	Probable	Emergency room records
9	Contusion (hematoma), large, subgaleal, posterior on right, with swelling, not further specified	minor 110402.1,1	B-pillar right	Possible	Hospitalization records
10	Contusion (hematoma), subgaleal, left lateral scalp, not further specified	minor 110402.1,2	B-pillar right	Possible	Hospitalization records

[4] The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:
punctate (punk′tat): resembling or marked with points or dots.

[5] The following terms are defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:
cephalhematoma (sef"al-he"ma-to′ma) **[cephal-+hematoma]**: a subperiosteal hemorrhage limited to the surface of one cranial bone, a usually benign condition seen frequently in the newborn as a result of bone trauma. Called also *cephalohematoma*.
cephalohematoma (sef"a-lo-he"ma-to′ma): cephalhematoma.
According to the RANDOM HOUSE WEBSTER'S UNABRIDGED DICTIONARY, this term is defined as follows:
boggy (bog′ee): 1. Containing or full of bogs. 2. wet and spongy; *The ground is boggy under foot*.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
11 12	Abrasions (scrapes), couple, in her hairline and in her forehead	minor 110202.1,5 210202.1,7	Ground	Possible	Emergency room records
13	Contusion (bruise) right forehead, not further specified	minor 210402.1,7	Ground	Possible	Emergency room records
14	Contusion right cheek, not further specified	minor 210402.1,1	Ground	Possible	Hospitalization records
15	Abrasion under neck on left side that ran underneath chin	minor 310202.1,2	Child safety seat harness straps	Certain	Emergency room records
16	Abrasions, linear, left shoulder, not further specified	minor 710202.1,2	Child safety seat harness straps	Certain	Hospitalization records
17	Contusion (bruise) right shoulder, not further specified	minor 710402.1,1	Child safety seat harness straps	Certain	Emergency room records
18	Contusions (bruises) on proximal anterior thighs, bilaterally	minor 810402.1,3	Child safety seat harness straps	Certain	Emergency room records
19	Fracture, horizontal, left femur, proximal shaft with mild lateral displacement of distal fragment	moderate 853251.3,2	Right rear door panel, forward upper quadrant	Probable	Hospitalization records

CASE VEHICLE SECOND ROW RIGHT PASSENGER KINEMATICS

The second row right passenger [10-month-old, female; 51 cm and 8 kg (20 in, 18 lbs)] was seated in a rear-facing CRS in a supine position. She was restrained in the CRS by the 5-point harness. The vehicle's lap-and-shoulder belt was routed through the rear-facing belt paths.

The Dodge's frontal impact with the right side of the Peterbilt displaced the second row right passenger forward and to the left within the CRS. During the post-impact clockwise rotation of the vehicle, the CRS passenger's head was probably contacted by the displaced second row left CRS, which caused a skull fracture and brain edema. The child remained in the CRS in the seating position. The second row right passenger was transported by ambulance to a hospital where she was hospitalized for one day. The table below presents the second row right passenger's injuries and injury sources.

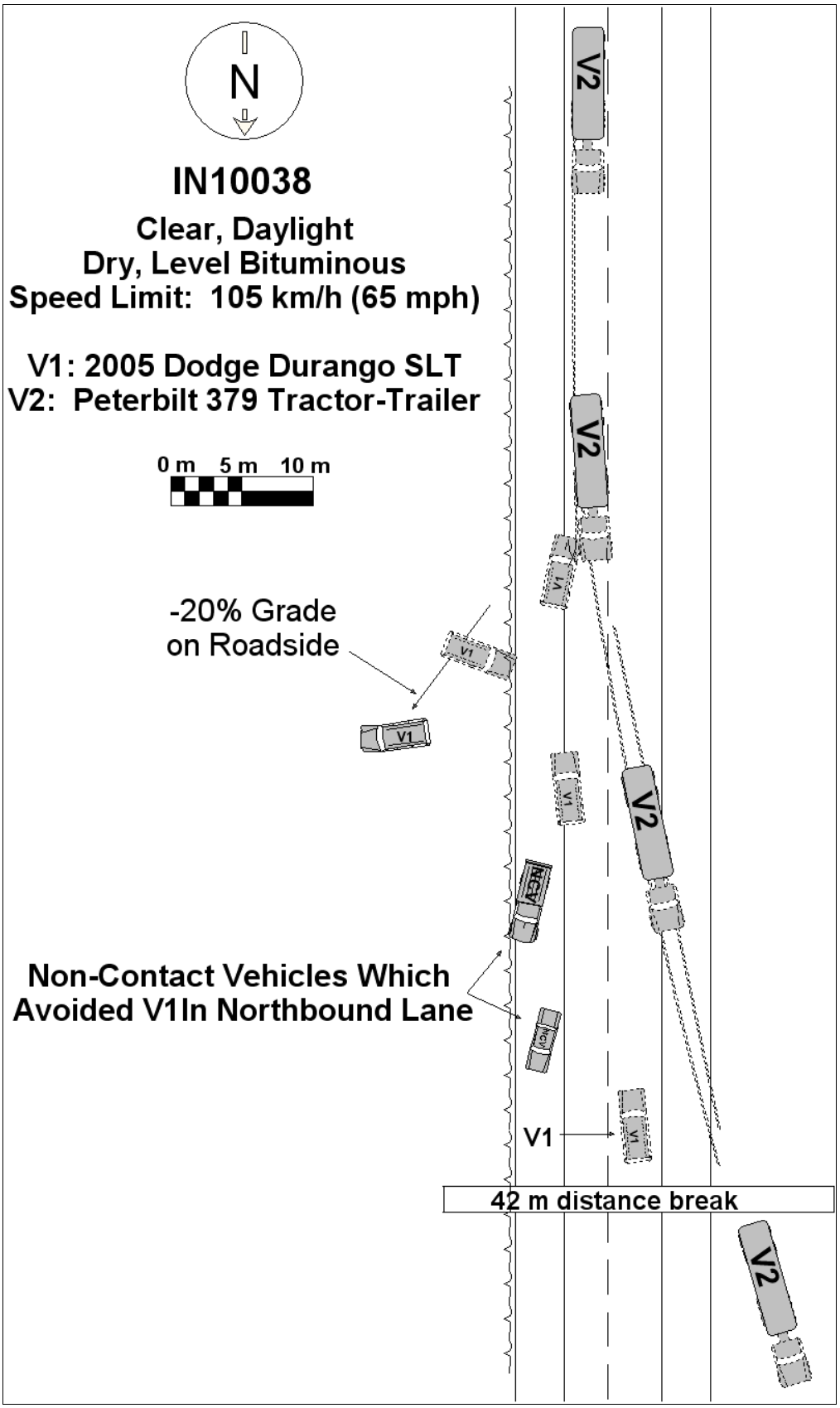
Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
1	Edema, very subtle, on posterior part of right parietal area which demonstrates effacement of sulci; no midline shift	serious 140668.3.1	Other interior loose object: CRS of second row left occupant	Probable	Hospitalization records
2	Fracture right anterior parietal skull at convexity; no depression	moderate 150402.2,1	Other interior loose object: CRS of second row left occupant	Probable	Hospitalization records
3	Contusion (subcutaneous hematoma) along right frontoparietal side of head	minor 110402.1,1	Other interior loose object: CRS of second row left occupant	Probable	Hospitalization records
4	Abrasion on top of head, not further specified	minor 110202.1,5	Other interior loose object: CRS of second row left occupant	Probable	Emergency room records
5	Laceration (cut), 5.1 cm (2 in), small, on forehead, not further specified	minor 210602.1,7	Other interior loose object: CRS of second row left occupant	Probable	Interviewee (driver)

OTHER VEHICLE

The 2001 Peterbilt 379 was 4-wheel drive, 6x4, 2-passenger, 2-door truck-tractor (VIN: 1XP5DB9X91D------), equipped with a Caterpillar 3406 15.3-liter engine. The Peterbilt was hauling a 2000 Polar tank-type semi-trailer (VIN:1PMSS14329Y1------).

Exterior Damage: The vehicle was not inspected since it could not be located.

Other Vehicle's Occupants: According to the police crash report, the Peterbilt's driver (45-year-old, male) was restrained by the lap-and-shoulder belt. He sustained no police-reported injuries and was not transported to a hospital.


N
IN10038
Clear, Daylight
Dry, Level Bituminous
Speed Limit: 105 km/h (65 mph)
V1: 2005 Dodge Durango SLT
V2: Peterbilt 379 Tractor-Trailer
0 m 5 m 10 m
-20% Grade
on Roadside
Non-Contact Vehicles Which
Avoided V1In Northbound Lane
V1
42 m distance break
V2

Event Data Recorder Report 2005 Dodge Durango SLT

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	1D4HB48D25F******
User	
Case Number	
EDR Data Imaging Date	11/09/2010
Crash Date	
Filename	10038NO VIN.CDRX
Saved on	Tuesday, November 9 2010 at 11:10:23
Collected with CDR version	Crash Data Retrieval Tool 3.5.1
Reported with CDR version	Crash Data Retrieval Tool 4.1
EDR Device Type	Airbag Control Module
Event(s) recovered	None

Comments

No comments entered.

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

GENERAL INFORMATION:

CAUTION: During Bench top imaging, make sure the ACM is not moved, tilted or turned over while connected to and powered by the CDR Interface Module. Also, after a CDR imaging process, wait 2 minutes after power is removed from the ACM before attempting to move the module. Not following these general ACM guidelines for bench top imaging could cause new events to be recorded in the ACM.

The ACM current fault status will be altered if the ACM is powered-up without having all of the other vehicle inputs connected (e.g., bench top imaging). This situation will occur when the CDR tool is connected directly to the ACM. This will not affect the stored fault data information in any of the Event Records. Always make a note in the CDR case comments section when an ACM bench top imaging process is being performed.

The recorded Event will contain Pre-Crash data.

- T0 (where '0' is subscript) (-0.1 sec.) is defined as either:
  - The last sample point in the vehicle data buffer when the ACM commanded a deployment
  - The algorithm wakeup.
  - Please note that the algorithm wakeup may be different for front, side, and roll-over events and their associated parameters.
- The VIN is captured by the ACM and then recorded as the Original VIN after 10 consecutive ignition cycles of capturing the same number. Once it has been recorded, this number can not be modified.

CDR FILE INFORMATION:

Event(s) Recovered definitions:

- None - There are no stored events in the Airbag Control Module (ACM)
- Not Retrievable - Event Data may be stored in the ACM but is not retrievable by the CDR tool.
- For Continental ACMs:
  - Event Record 1 - Data from an event is stored in the ACM (not necessarily in chronological order)
  - Event Record 2 - Data from another event is stored in the ACM (not necessarily in chronological order)
  - Event Record 3 - Data from another event is stored in the ACM (not necessarily in chronological order) (for modules with 3 stored events)
- For all other ACMs:
  - Most Recent Event - Data of the most recent event is displayed in the report
  - 1st Prior Event - Two events are stored in the ACM, Data displayed is of the first prior event.
  - 2nd Prior Event - Three events are stored in the ACM, Data displayed is of the second prior event.
  - Etc., (for modules with 3 to 5 stored events)

CDR RECORD INFORMATION:

- If power to the ACM is lost during an event, all or part of the event data record may not be recorded. Two scenarios may be recorded under this condition:
  - "None" may be displayed in the "Event(s) Recovered" section of the report indicating no pre-crash vehicle data.
  - An event may be displayed in the "Event(s) Recovered" section of the report and "Interrupted" will be displayed for Vehicle Event Recorder Status.
  - Note: For the 2010-2012 MY Dodge Journey, Dodge Grand Caravan, Chrysler Town and Country, and Chrysler Grand Voyager, "interrupted" in Vehicle Event Recorder Status/Event Recorder Status indicates either be a non-deployment event or an interrupted deployment event.
- For ACMs that store non-deployment events, the minimum delta V required to store an event is a delta V of 5 mph (8 km/h) within a 150 ms interval.
- The Airbag Control Module Configuration indicates the inputs and outputs that the ACM for a particular vehicle monitors and/or controls.
- "Event Number" in the System Status at Event section of the report:
  - Indicates the event number per vehicle ignition cycle for:
    - 2010 - 2012 Sebring, Avenger, Caliber, Nitro, Compass, Liberty, Patriot, Wrangler, and Ram
  - Indicates the overall order of the events for all other applicable vehicles.
- "Total Number of Events Recorded" in the System Status at Event section of the report:
  - Stops incrementing when each event record is recorded by the ACM for:
    - 2010 - 2012 Sebring, Avenger, Caliber, Nitro, Compass, Liberty, Patriot, Wrangler, and Ram
  - Indicates the total number of events that the ACM has recorded for all other applicable vehicles.
- "Operation System Time at Event (min)" in the System Status at Event section of the report is a lifetime timer for the ACM. It indicates the amount of time, over the ACM's lifetime that the ACM has been powered up.
- "Time from Event 1 to 2 (sec)" in the System Status at Event section of the report indicates the time from t0 of the first event to t0 of the second event. If the value is greater than 5 seconds, ">5" will be displayed.
- Active Head Restraint (AHR) - This refers to the active head restraint systems that are electronically controlled by the ACM.
- For applicable vehicles, a "Yes" for a particular item in the Deployment Command Data section of the report indicates that the ACM commanded the deployment of the associated device. Note: For 2010 MY vehicles equipped with AHR, the AHR deployment will not be recorded in the EDR.
- Vehicle Data (Pre-Crash) is transmitted to the Airbag Control Module, by various vehicle control modules, via the vehicle's communication network.
- On 2006-2009 Ram 2500/3500, the Engine RPM recorded is limited to a maximum of 4080 RPM. On the 2008 - 2010 Dodge Grand Caravan, 2008-2010 Chrysler Town and Country and 2009-2010 Dodge Journey, the engine RPM resolution is 256 rpm. On all other vehicles, the resolution is 32 rpm.
- If a recorded event has Engine RPM equal to SNA and Speed, Vehicle Indicated equals SNA for each time stamp, then the data is default data and the event stored in the ACM is not valid.
  - The accuracy of the recorded Speed, Vehicle Indicated will be affected if the vehicle had the tire size or the final drive axle ratio changed from the factory build specifications.
  - Speed, Vehicle Indicated is reported as an average of the drive wheels.
- On the 2008 - 2009 Dodge Grand Caravan, 2008-2009 Chrysler Town and Country and 2009 Dodge Journey, the vehicle speed resolution is 2 kph. On all other vehicles, the resolution is 1 kph.
- The MIL (Malfunction Indicator Lamp) Status for the various recorded systems indicates the state of the applicable malfunction indicator lamp at the time that the data was captured. Note: Some fault codes could be stored due to component/system damage from the accident.
- For correct polarity of Maximum Delta-V Longitudinal or Maximum Delta-V Lateral, reference the graph and the table of Delta-V values.
- On vehicles equipped with ETC, "Accelerator Pedal, % Full" and "Engine Throttle, % Full" are relative values - relative pedal position and relative engine throttle. These parameters may record values of less than 100% when the pedal/throttle is actually at its maximum.

NOTE: The appropriate diagnostic tool should be used to read any stored Diagnostic Trouble Codes (DTC's) in the various electronic modules (ACM, PCM, ABS, TCM, etc., where applicable) for use in interpretation of some vehicle specific recorded data.

VEHICLE DATA DEFINITIONS:

Vehicle Event Recorder Status definitions:

- For additional definitions, please refer to the CDR Help File Glossary
- ABS MIL (if equip.) - This indicates the ABS fault indicator lamp status. It will only be "On" when there is a fault in the ABS system. The Electronic brake module DTC's should be read and recorded for final system interpretation.
- ESP MIL (if equip.) - This indicates the ESP/BAS fault indicator lamp status. It will only be "On" when there is a fault or thermal model shutdown in the ESP system. The ESP module DTC's should be read and recorded for final system interpretation.
- ESP Lamp (if equip.) - This is the status of the ESP symbol - "car with squiggly lines" indicator lamp. "On" indicates ESP has been turned off by the driver or has reduced performance and is not an indication of a fault in the system.
- ESP Lamp Flashing Requested (if equip.) - If "Yes", then an ESP, Traction Control or Trailer Sway Control (if equipped) event was active at the time of data capture.
- ESP Disabled (if equip.)- "Yes" indicates that ABS & ESP have been disabled by the driver or due to system performance.
- ESP Functional/Active (if equip.)- "YES" indicates that the ESP system is functional and has no faults.
- Panic Brake Assist Active (if equip.)- "Yes" indicates that all four of the brake circuits are under going ABS control.
- Steering Input (deg) (if equip.):
  - Steering Input polarity is positive for right turns on:
    - 2006 - 2007 Grand Cherokee

    - 2006 - 2007 Commander
    - 2005 - 2010 300, Magnum, and Charger
    - 2008 - 2010 Challenger
  - Steering Input polarity is negative for right turns on:
    - All other vehicles and model years not specified above
- Yaw Rate (deg/sec) (if equip.): All vehicles have negative yaw rate when making a right turn.
- ETC Lamp - Lamp “ON “indicates there is an active Electronic Throttle DTC.
- ETC Lamp Flashing - If “Yes”, then the ETC is in the limp-in mode.
- Engine Torque Applied - If “No”, then no engine torque output was applied (as in Park/Neutral for Automatic transmissions or clutch depressed on manual or during an ESP/Traction Control event). If “Yes”, then engine torque output was applied.
- Tire 1 (2) Location (if equip.)- This indicates the location of the tire pressure sensor data. Default is used to indicate that the location of the tire pressure sensor is unknown or there is no tire pressure sensor in the wheel. Vehicles with Base Tire Pressure Monitoring systems will display SNA for both Tire Locations as these vehicles do not send actual pressure values across the communication bus.
- Tire 1 (2) Pressure Status (if equip.)- This indicates the actual pressure status of the Tire Location defined in the previous column. Possible values are LOW, NORMAL, HIGH, or SNA for this parameter. Vehicles with Base Tire Pressure Monitoring systems will display NORMAL even though these vehicles do not send actual pressure values across the communication bus.
- Tire 1 (2) Pressure (psi) (if equip.)- This indicates the actual tire pressure value of the Tire Location defined. Vehicles with Base Tire Pressure Monitoring systems will display N/A for this parameter as these vehicles do not send actual pressure values across the communication bus.
- Cruise Control System - “On” indicates that the Cruise Control system is turned on.
  Cruise Control Active - “Yes” indicates the Cruise Control system is actively controlling vehicle speed. “No” indicates the system is NOT controlling vehicle speed.
- (if equip.) - If a parameter name is followed by the words (if equip.), then the parameter is only valid for vehicles equipped with the associated parameter/vehicle system.

APPLICATION INFORMATION:

- 2005 - 2009 Durango’s equipped with side airbags have EDR data that can be imaged by the CDR tool. Durango’s not equipped with side airbags have EDR Data that might be imaged by the CDR tool and can always be imaged by the supplier.
- For 2005 & 2006 MY, some Chrysler 300, Dodge Magnum, Dodge Charger, Jeep Grand Cherokee, and Jeep Commander models may contain EDR data that can not be imaged by the CDR tool.
- For 2006 & 2007 MY, some PT Cruiser models may contain EDR data that can not be imaged by the CDR tool.
- EDR Data is only recorded for frontal deployments in the following vehicles:
  - 2005-2007 Durango
  - 2006-2007 Ram 1500
  - 2006-2009 Ram 2500/3500 Heavy Duty
  - 2007 Aspen, Caliber, Compass, Patriot, Nitro, Sebring, Wrangler

03001_Chrysler_r011

System Status at Retrieval

Original VIN	1D4HB48D25F******
Airbag Control Module Part Number	56043319AB
Airbag Control Module Serial Number	TQLME1894L1019
Airbag Control Module Supplier	TRW

System Configuration at Retrieval

Configured for Driver Seatbelt Switch	No
Configured for Front Center Seatbelt Switch	No
Configured for Front Passenger Seatbelt Switch	No
Configured for 2nd Row Left Seatbelt Switch	No
Configured for 2nd Row Center Seatbelt Switch	No
Configured for 2nd Row Right Seatbelt Switch	No
Configured for 3rd Row Left Seatbelt Switch	No
Configured for 3rd Row Center Seatbelt Switch	No
Configured for 3rd Row Right Seatbelt Switch	No
Configured for Driver Knee Airbag	No
Configured for Left Curtain #1	No
Configured for Right Curtain #1	No
Configured for Left Curtain #2	No
Configured for Right Curtain #2	No
Configured for Front Driver Seatbelt Pretensioner	Yes
Configured for Front Center Seatbelt Pretensioner	No
Configured for Front Passenger Seatbelt Pretensioner	Yes
Configured for 2nd Row Left Seatbelt Pretensioner	No
Configured for 2nd Row Center Seatbelt Pretensioner	No
Configured for 2nd Row Right Seatbelt Pretensioner	No
Configured for 3rd Row Left Seatbelt Pretensioner	No
Configured for 3rd Row Center Seatbelt Pretensioner	No
Configured for 3rd Row Right Seatbelt Pretensioner	No
Configured for Left Side Sensor #1	No
Configured for Left Side Sensor #2	No
Configured for Left Side Sensor #3	No
Configured for Right Side Sensor #1	No
Configured for Right Side Sensor #2	No
Configured for Right Side Sensor #3	No
Configured for Left Up Front Sensor	Yes
Configured for Right Up Front Sensor	Yes
Configured for Front Driver Digressive Load Limiter	No
Configured for Front Passenger Digressive Load Limiter	No
Configured for Driver Seat Track Position Sensor	No
Configured for Front Passenger Seat Track Position Sensor	No
Configured for Passenger Airbag Disable Switch	No
Configured for Front Passenger Occupant Classification System	Yes