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ON-SITE ROLLOVER INVESTIGATION

CASE NUMBER - IN10033
LOCATION - MISSOURI
VEHICLE - 2008 TOYOTA FJ CRUISER
CRASH DATE - August 2010

Submitted:

March 30, 2011

Contract Number: DTNH22-07-C-00044

Prepared for:

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Washington, D.C. 20590-0003

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

Technical Report Documentation Page

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16. *Abstract*

This on-site investigation focused on the rollover of a 2008 Toyota FJ Cruiser. The Toyota was occupied by a restrained 49-year-old male driver and a restrained 10-year-old male front right passenger. The vehicle was traveling south on a divided U.S. highway in the inside lane. According to a witness, the Toyota switched from lane to lane and changed speeds erratically for several miles prior to the crash. The vehicle traveled into the median and continued south for approximately 275 m (902 ft) where it tripped and rolled over, left side leading, 12 quarter turns. The Toyota came to final rest upright in the inside southbound lane, heading northwest. The Toyota was equipped with front seat-mounted side impact air bags and side impact Inflatable Curtain (IC) air bags. All of the side air bags deployed except the right seat-mounted air bag. The driver and front row right passenger were transported to a trauma center by air and ground ambulances, respectively. The driver was hospitalized for 39 days with severe injuries. The front right passenger sustained moderate injuries and was treated and released. The Toyota was towed from the crash scene due to damage.

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BACKGROUND

The focus of this on-site investigation was a 2008 Toyota FJ Cruiser (**Figure 1**), which rolled over after departing the roadway. This crash was brought to the National Highway Traffic Safety Administration's (NHTSA) attention on September 29, 2010 by the Transportation Research Center at Indiana University. This investigation was assigned on October 6, 2010. The crash involved only the Toyota and occurred in August, 2010, at 0718 hours, in Missouri and was investigated by the Missouri State Highway Patrol. The Toyota and crash scene were inspected on October 11, 2010. An interview with the driver's wife was completed on October 29, 2010. An interview with a witness was conducted on October 21, 2010. This report is based on the police crash report, case vehicle and exemplar vehicle inspections, crash scene inspection, interview information, occupant medical records, occupant kinematic principles, and evaluation of the evidence.

Figure 1: The damaged 2008 Toyota FJ Cruiser

CRASH CIRCUMSTANCES

Crash Environment: This crash occurred during daylight hours and clear weather conditions on a 5-lane, divided U.S. highway. The trafficway traversed in a north-south direction and was divided by a grass median 10.8 m (35.4 ft) in width. Both the north and south roadways had two through lanes while the southbound roadway had a left turn lane. Each travel lane was approximately 3.7 m (12.1 ft) in width. The roadway pavement markings consisted of broken white lane lines, a solid white outside edge line, and a solid yellow median edge line. The roadway surface was dry bituminous with a -3.3% grade, and was bounded by 1.4 m (4.6 ft) wide shoulders. The speed limit was 86 km/h (55 mph). Traffic density at the time of the crash was moderate and the site of the crash was rural. See the Crash Diagram on page 12 of this report.

Pre-Crash: The Toyota was occupied by a restrained 49-year-old male driver and a restrained 10-year-old male front right passenger. The vehicle was traveling south in the inside lane approaching a 3-leg intersection. Based on the SCI interview with a witness, the Toyota switched from lane to lane and changed speeds erratically for several miles prior to the scene of the crash. Medical records indicate the driver was intoxicated on benzodiazepines and marijuana. Eventually, the Toyota departed the left side of the roadway, into the crossover associated with the 3-leg intersection and continued into the median where the crash occurred.

Crash: The Toyota traveled into the median (**Figure 2**) and down a negative 5% grade, for approximately 275 m (902 ft) where it tripped and rolled over (event 1), left side leading, 12 quarter turns. The vehicle came to final rest on its wheels, in the inside southbound lane, heading northwest (**Figure 3**).

Post-Crash: Police and rescue personnel were notified at 0721 hours and arrived on the scene at 0726 hours. The front right passenger exited the vehicle through the right front door with some assistance from the witness. The witness observed that the driver was unconscious, restrained in the driver's seat. The driver was removed by rescue personnel. The driver was transported by air ambulance and the front right passenger by ground ambulance to a regional trauma center. The vehicle was towed from the crash scene due to damage.

Figure 2: View south in the area where the Toyota departed the roadway

Figure 3: Police on-scene photo looking south to the final rest position of the Toyota

CASE VEHICLE

The 2008 Toyota FJ Crusier was a 4-wheel drive, 4-door sport utility vehicle (VIN: JTEBU11F78K------), equipped with a 4.0-liter, V-6 gasoline engine and a 4 speed automatic transmission. The vehicle was also equipped with driver and front right passenger dual stage frontal air bags, side impact Inflatable Curtain (IC) air bags, and front seat-mounted side impact air bags. The front row was equipped with bucket seats, adjustable head restraints, and lap-and-shoulder safety belts. 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 Event 1: The rollover involved the left, right, and top planes of the vehicle. Direct damage on the left side plane began at the front of the left fender, 328 cm (129.1 in) forward of the left rear axle, and extended rearward 166 cm (65.3 in) on the fender, A-pillar, and roof side rail. The direct damage resumed at the door handle, 107 cm (42.1 in) forward of the left rear axle, and extended rearward 145 cm (57.1 in) on the doors, C-pillar, and left quarter panel (**Figure 4**).

Figure 4: Left side of damaged Toyota

Direct damage on the right side plane began at the front corner of the fender, 330 cm (129.9 in) forward of the right rear axle, and extended the length of the vehicle on the fender, A-pillar, roof side rail, doors, C-pillar, and quarter panel (**Figure 1**).

Direct damage to the top plane began at the front of the hood, 330 cm (129.9 in) forward of the right rear axle. Also directly damaged were both corners of the windshield header. Direct damage on the right side of the roof continued on the roof side rail, extending to the rear of the vehicle. Direct contact on the roof itself was limited to light scratching on the middle of the roof. The maximum lateral crush was located at the right roof side rail, 30 cm (11.8 in) rear of the right rear axle (**Figure 5**) and measured 25 cm (9.8 in). The maximum vertical crush was located at the right rear roof area, 30 cm (11.8 in) rear of the right rear axle (**Figure 6**) and measured 36 cm (14.1 in).

Figure 5: Lateral max crush on right roof rail

Figure 6: Max vertical crush to right rear roof area

Damage Classification Event 1: The Collision Deformation Classification (CDC) for the rollover was 00TDDO4. The WinSMASH program could not be used to calculate the Delta V for this event since rollovers are out of scope for the program. Based on the extent of the crush to the roof, the severity of the rollover damage was severe.

The vehicle manufacturer's recommended tire size was P265/70R17 and the vehicle was equipped with the recommended size tires. The Toyota's tire data are shown in the table below:

Tire	*Measured Pressure*		*Vehicle Manufacturer's Recommended Cold Tire Pressure*		*Tread Depth*		*Damage*	*Restricted*	*Deflated*
	kPa	psi	kPa	psi	milli-meters	32nd of an inch			
LF	Unk	Unk	221	32	Unk	Unk	No tire found	Unknown	Unk
LR	207	30	221	32	6	7	None	No	No
RR	Flat	Flat	221	32	4	5	None	No	Yes
RF	Flat	Flat	221	32	7	9	None	Yes	Yes

Vehicle Interior: The inspection of the Toyota's interior revealed a scuff on the roof above the driver's area (**Figure 7**), blood stains on the driver's frontal and seat-mounted side impact air bag, and a bent driver's head restraint (**Figure 8**). The roof and head restraint were contacted by the driver's head and the left side impact air bag and IC air bags were contacted by the driver's shoulder and head. There was no evidence of steering rim deformation or compression of the energy absorbing steering column.

Figure 7: Roof contact above driver area

Figure 8: Driver's deformed head restraint posts

All doors remained closed during the crash, though the front doors had been opened and would not close fully at the time of inspection. Prior to the crash, all of the window glazing was either closed or fixed. The windshield was in place and cracked from impact forces. Both front door and rear windows were disintegrated due to impact forces while the second row windows were intact.

There were numerous intrusions to the passenger compartment. The most severe of these were lateral intrusions to the left C-pillar and right roof side rail, and a vertical intrusion to the right side roof area. These intrusions measured 33 cm (13 in), 32 cm (12.6 in), and 30 cm (11.8 in), respectively.

ROLLOVER DISCUSSION

The Toyota's rollover mitigation features consisted of Electronic Stability Control (ESC). The NHTSA has given the vehicle a three star rollover rating on a five star scale and a Static Stability Factor of 1.10[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 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

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1 www.safercar.gov,10/18/10

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

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).

Prior to the rollover, The Toyota was traveling in the median down a negative 5% grade over uneven grass and rock covered terrain. The path of travel of the vehicle indicated that the driver probably initiated a right steering maneuver. The left side wheels traveled into a depression and the vehicle tripped and rolled over left side leading. The vehicle rolled over 12 quarter turns, traversing a total distance of 67 m (220 ft) and came to final rest on its wheels on the inside southbound lane heading northwest.

EVENT DATA RECORDER

The Toyota's EDR was imaged using the manufacturer's EDR readout tool with software version 1.4.1.0. The EDR file was subsequently read and reported with software version 1.4.1.1. The EDR reported two frontal events and two side events. No rollover event was reported. The EDR reported the driver's and front right passenger's safety belt switch status as "Belted." The driver's seat position was reported as "RW," which is understood to indicate that the seat track was rearward of the switch point. Occupant detection for the front right passenger seat was reported as "Child." The time from the pre-crash trigger for the most recent frontal event was reported as "Invalid". The time from the pre-crash trigger for the next most recent frontal event was reported as 0 ms. The frontal air bag and pretensioner deployments were associated with the most recent frontal event. The deployment time was reported as 31 ms for the frontal air bag and pretensioners. The deployment stage for the driver's frontal air bag was reported as "Low," which is understood to indicate a first stage deployment. The deployment stage for the front right passenger was reported as "Not fired." The EDR reported 200 ms of longitudinal velocity change data for each frontal event. The maximum velocity change for the most recent frontal event was reported as 9.3 km/h (5.8 mph) occurring at 80 ms. The maximum velocity change for the next most recent frontal event was -0.6 km/h (-0.4 mph) occurring at 140 ms.

The two side events followed the frontal events. The time from the impact trigger to initial g for the driver side and passenger side was reported a 0 ms and 1 ms, respectively. The deployment time for the driver's side impact air bags was reported as 0 ms. The deployment time for the passenger side impact air bags was reported as "Not fired." Ninety six milliseconds of velocity change data were reported at the B-pillar, C-pillar, and floor for each side event. For the driver's side, the velocity change for each reported time increment was 0 km/h. For the passenger side, the maximum reported velocity change at the B-pillar was -1.4 km/h (-0.9 mph) occurring at 9 ms. At the C-pillar, the maximum reported velocity change was -1.1 km/h (-0.7 mph) occurring at 25 ms. For the floor, the maximum reported velocity change was -1.4 km/h (-0.9 mph) occurring at 5 ms.

Pre-crash data was associated with both the frontal and side events. In each case, the reported data for the speed, brake, accelerator, and engine speed was indicated as "NA."

The Toyota was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system that consisted of dual-stage driver and front right passenger air bags, driver seat position sensor, and both front seats had safety belt switch sensors. 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. The Toyota's frontal air bag satellite sensors were located in the driver and passenger side inner fenders.

The vehicle was also equipped with front seat-mounted side impact air bags and roof side rail-mounted rollover/side impact IC air bags. The vehicle's side impact sensors were located in the driver and passenger side front door sills and in the lower C-pillars.

The driver's frontal air bag was located within the steering wheel hub. The module cover was a three flap configuration constructed of pliable vinyl. An inspection of the cover flaps revealed that they opened at the designated tear points and were undamaged. The top cover flap was 13 cm (5.1 in) in width at its widest point and 8 cm (3.1 in) in height. Each of the bottom cover flaps were 7 cm (2.8 in) in width and 6 cm (2.4 in) in height. The deployed air bag was 62 cm (24.4 in) in diameter and had two 7 cm (2.8 in) diameter vent slits on the back of the air bag at the 11 and 1 o'clock positions. There were two 12 cm (4.7 in) wide internal tethers, which were sewn in a circular configuration to the center of the air bag. The air bag sustained no damage but blood stains were observed on the upper right portion.

The front passenger frontal air bag was located on the top of the instrument panel. The Toyota's EDR reported that the front right occupant weight sensor determined the passenger's status as a "Child." The deployment of the front right passenger's air bag was suppressed for this reason.

The driver's seat-mounted side impact air bag was located in the outboard side of the front seat. The air bag measured 30 cm (11.8 in) in width and 34 cm (13.4 in) in height. The air bag was not damaged but a large blood stain was noted on the upper right portion. The driver contacted this air bag during the rollover. The front right passenger's seat-mounted side impact air bag did not deploy.

The Toyota's side impact IC air bags were located along the roof side rails inside the headliner, and extended from the A-pillar to aft of the C-pillar. The deployed left IC air bag was 183 cm (76 in) in width. Adjacent to the driver's seat, the air bag was 57 cm (22.4 in) in height. Aft of the driver's seat, the air bag measured 46 cm (18.1 in) in height. The bottom edge was 21 cm (8.26 in) below the beltline at the driver's area. At the second row left seating position, the air bag measured 10 cm (3.9 in) below the belt line. The air bag was tethered to the A-pillar with a 15 cm (5.9 in) piece of nylon webbing. The air bag was tethered to the D-pillar with a 23 cm (9.1 in) piece of nylon webbing. There was no space between the front of the air bag and the A-pillar. The air bag was designed with inflation chambers adjacent to the front and second row outboard seat positions. The front portion of the right IC air bag was cut by rescue personnel. No contacts or damage were noted on both inboard and outboard sides of the driver's IC air bag.

The Toyota was equipped with lap-and-shoulder safety belts in the front and second rows. The driver's safety belt was equipped with continuous loop belt webbing, an adjustable upper anchor that was located in the full down position, a retractor mounted pretensioner, sliding latch plate, and an Emergency Locking Retractor (ELR). The front right safety belt was similarly equipped but had a switchable ELR/Automatic Locking Retractor (ALR) and an adjustable upper anchor that was located in the full up position. The second row safety belts were similar to the front right safety belt but had fixed upper anchors and were not equipped with pretensioners.

The inspection of the driver's safety belt assembly revealed historical usage scratches on the latch plate. Load marks were noted on the latch plate belt guide. Load marks were also observed on the belt webbing, beginning 135 cm (41.7 in) from the stop button, extending 30 cm (11.8 in). The safety belt extended and retracted within the B-pillar. While the Toyota's EDR reported pretensioner actuation, actuation of the driver's pretensioner could not be determined. Based on the load mark evidence on the driver's safety belt, he was restrained at the time of the crash. The vehicle's EDR also reported the driver's safety belt switch status as "Belted."

Inspection of the front right passenger's safety belt assembly revealed slight historical usage scratches on the latch plate. Light load marks were also noted on the latch plate belt guide. Load marks were found on the belt webbing, beginning 120 cm (47.2 in) from the stop button, extending 15 cm (5.9 in). The safety belt extended and retracted within the B-pillar. While the EDR reported pretensioner actuation, actuation of the passenger's pretensioner could not be determined. Based on the load mark evidence on the passenger's safety belt, he was restrained at the time of the crash. The vehicle's EDR also reported the front right passenger's safety belt switch status as "Belted."

CASE VEHICLE DRIVER KINEMATICS

The Toyota's driver [49-year-old male, 180 cm (71 in)and 122 kg (268 lbs) was seated in an unknown posture prior to the crash. The seat track was between the middle and rear positions and the seat back was slightly reclined. The tilt steering column was located in its full up position.

The left side leading rollover displaced the driver left and toward the roof. Though the driver remained restrained in his seat by his safety belt, he contacted the roof, head restraint, and side impact air bag as the vehicle rolled over 12 quarter turns. He sustained a concussive brain injury, subdural hematoma, subarachnoid hemorrhage, extraaxial hemorrhage, as well as fractures to the cervical vertebrae at C_2 and thoracic vertebrae at T_2 from contact with the roof. The driver sustained fractures to the lower thoracic vertebrae and lumbar vertebrae probably from contacting the seat when the bottom plane of the vehicle impacted the ground during the rollover. The driver probably contacted the rear upper quadrant of the left front door, which caused a left pneumothorax, bilateral lung contusions, and left anterior rib fractures. He also sustained a laceration (rupture) of the intraperitoneal bladder from loading the lap belt. While there was no discernable occupant contact evidence on the driver's IC air bag, occupant kinematic principles suggest that the left side of his torso loaded the air bag. The driver's head and left arm also probably contacted the IC air bag.

The driver was transported by ambulance to a regional trauma center where he was admitted for treatment of his injuries. He was hospitalized for 39 days and released to a rehabilitation facility. He was not working prior to 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
	Concussive brain injury with loss of consciousness for unknown length of time[3]; unresponsive CGS=3	Not coded	Roof	Probable	Hospitalization records
1	Hematoma, subdural, on left extending to vertex with minimal mass effect; 6 mm (0.24 in) maximum thickness, mostly frontal	severe 140652.4,2	Roof	Probable	Hospitalization records
2 3	Hemorrhage, subarachnoid on left and in right parietal region near vertex; no midline shift	moderate 140694.2,1 140694.2,2	Roof	Probable	Hospitalization records
4 5	Hemorrhage (fluid collection), extraaxial, hypodense, overlying frontal convexities bilaterally; right 11 mm (0.43 in), left 9 mm (0.35 in) with mass effect on frontal lobe but no midline shift	serious 140629.3,1 140629.3,2	Roof	Probable	Hospitalization records
6	Fracture C_2 (Hangman's[4]) posterior body extending to lateral masses and left and right vertebral foramen (pedicles); mildly displaced without canal stenosis	moderate 650226.2,6	Roof (indirect injury)	Certain	Hospitalization records
7	Pneumothorax, large, left, with mild displacement of mediastinum to right	moderate 442202.2,2	Left front door panel, rear upper quadrant	Probable	Hospitalization records
8	Contusions bilateral lungs including right upper lobe, not further specified	serious 441410.3,3	Left front door panel, rear upper quadrant	Probable	Hospitalization records

[3] The length of unconsciousness was not reported. Patient was unconscious at scene and upon arrival in ER. Patient was intubated in ER, then taken to surgery while still unconscious for an exploratory laporatomy.

[4] The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:
fracture (frak′cher): 1. the breaking of a part, especially a bone. 2. a break or rupture in a bone.
hangman's f.: fracture through the pedicles of the axis (C_2) with or without subluxation of the second cervical vertebra on the third.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
9	Fractures left anterior ribs: 3rd through 6th associated with left pneumothorax	serious 450203.3,2	Left front door panel, rear upper quadrant	Probable	Hospitalization records
10	Fracture T_2[5] vertebral body involving anterior and middle columns extending from mid anterior cortex to mid inferior endplate	moderate 650430.2,7	Roof (indirect injury)	Probable	Hospitalization records
11	Laceration (rupture) intraperitoneal bladder with approximately 500-800 ml of serosanguineous fluid drained from abdomen	serious 540625.3,8	Lap portion of safety belt system	Probable	Hospitalization records
12	Fracture, compression, T_{12} superior endplate with mild endplate concavity	moderate 650432.2,7	Seat cushion, driver's (indirect injury)	Probable	Hospitalization records
13	Strain lower thoracic upper lumbar with probable, minimal, epidural hemorrhage ventrally T_{12}-L_2; lumbar spondylosis	minor 640478.1,7	Lap portion of safety belt system	Probable	Hospitalization records
14	Fracture L_1 body, anterior-superior, with mild displacement of superior corpus extending from anterior cortex to mid superior endplate	moderate 650630.2,8	Seat cushion, driver's (indirect injury)	Probable	Hospitalization records
15 16 17 18	Fracture transverse processes: L_1 to L_3 on right and L_5 on left, non-displaced	moderate 650620.2,8 650620.2,8 650620.2,8 650620.2,8	Seat cushion, driver's (indirect injury)	Possible	Hospitalization records
19	Fracture/deformity dorsal surface left distal forearm and/or wrist, not further specified	moderate 751900.2,2	Left front door panel, rear upper quadrant	Probable	EMS treatment record
20 21 22	Injury (wound) forehead and right and left eyes, not further specified	minor 210402.1,7 210402.1,1 210402.1,2	Air bag, driver's	Probable	Emergency room records
23	Contusion (bruising) over left face, not further specified	minor 210402.1,2	Air bag, driver's	Probable	Hospitalization records

[5] Or T_3 depending on which medical record one relies upon. The Discharge Summary, Consultation Record, and X-rays indicated T_2. The MRI indicates that the vertebrae was T_3. There is no indication that both vertebra were involved.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
24	Contusion (ecchymosis) chest, not further specified	minor 410402.1,4	Torso portion of safety belt system	Probable	Emergency room records
25 26	Abrasions over right and left hips, not further specified	minor 510202.1,1 510202.1,2	Lap portion of safety belt system	Certain	Emergency room records
27	Contusions over right and left lower quadrants of abdomen	minor 510402.1,8	Lap portion of safety belt system	Certain	Emergency room records
28 39	Abrasions and contusions left upper arm, not further specified	minor 710202.1,2 710402.1,2	Left front door panel, rear upper quadrant	Probable	EMS treatment record
30	Contusion left lower arm, not further specified	minor 710402.1,2	Left front door panel, rear upper quadrant	Probable	EMS treatment record
31	Abrasion left lower leg, not further specified	minor 810202.1,2	Left lower instrument panel (includes knee bolster), left of steering column	Possible	EMS treatment record
32	Abrasion with deformity anterior right ankle, not further specified	minor 810202.1,1	Floor, foot controls	Probable	Emergency room records

CASE VEHICLE FRONT ROW RIGHT PASSENGER KINEMATICS

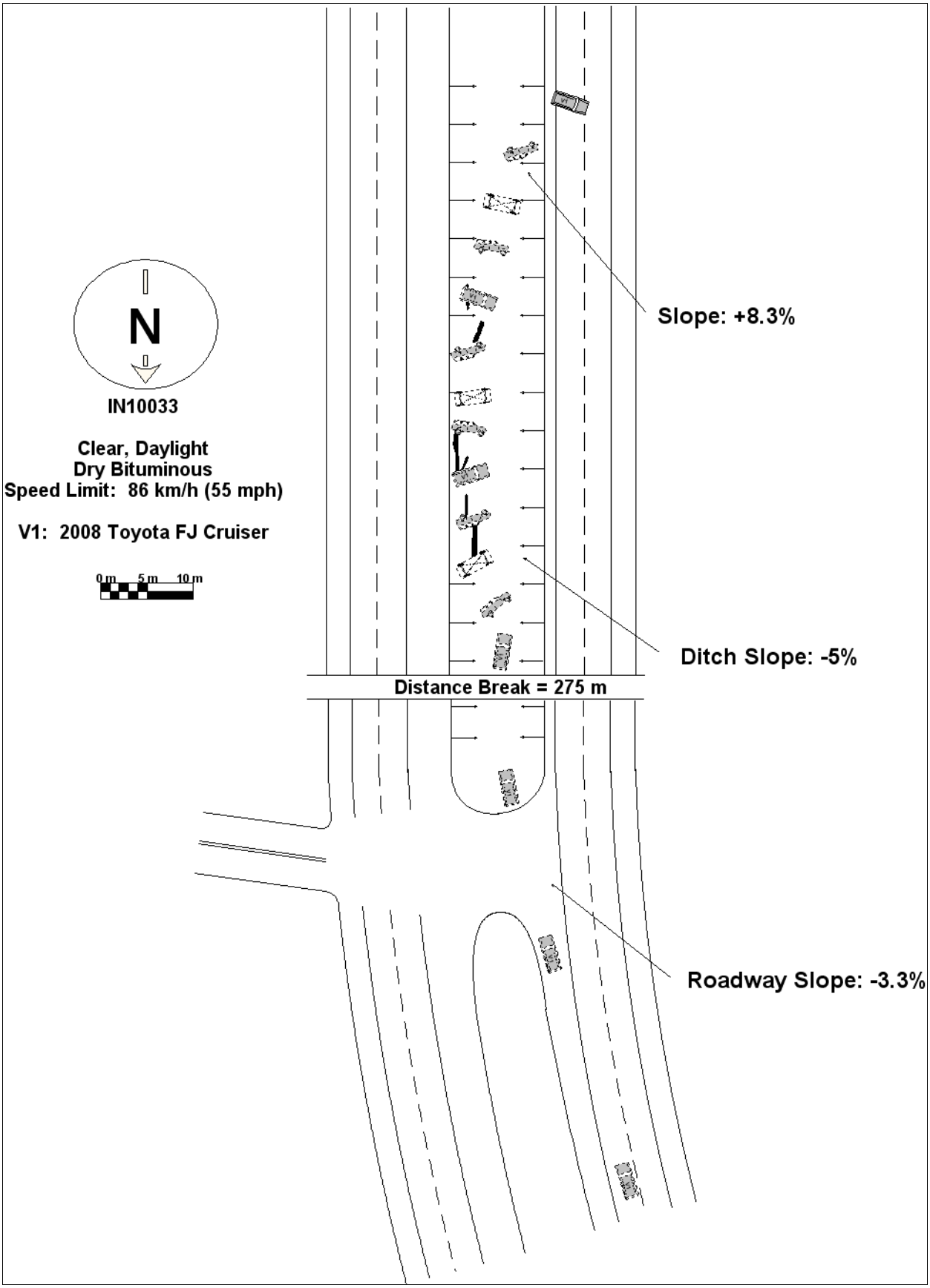
The Toyota's front right passenger [10-year-old male, 145 cm (57 in) and 35 kg (78 lbs)] was seated in an unknown posture prior to the crash. His seat track was between the middle and rear positions and his seat back was slightly reclined.

As the vehicle rolled over left side leading the passenger was displaced toward the roof and loaded the safety belt, which caused abrasions on the right shoulder, contusions on the abdomen, and abrasions on the left and right lower quadrants. He sustained multiple abrasions, lacerations, and contusions including an abrasion on the right cheek from loading the right IC air bag. He also fractured his right thumb from contacting the rear upper quadrant of the right front door.

CASE VEHICLE FRONT ROW RIGHT PASSENGER INJURIES

The front row right passenger was transported by ground ambulance to a regional trauma center where he was treated in the emergency room and released. He was not in school at the time of the crash and had no follow-up visits to a medical facility. 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	Abrasion right cheek, not further specified	minor 210202.1,1	Air bag, front right passenger's side inflatable curtain	Probable	Emergency room records
2	Abrasion left lower anterior neck	minor 310202.1,2	Air bag, front right passenger's side inflatable curtain	Possible	Emergency room records
3 4	Abrasions, small, left and right lower quadrants, not further specified	minor 510202.1,1 510202.1,2	Lap portion of safety belt system	Probable	Emergency room records
5	Contusion and ecchymosis abdominal wall, with mild tenderness all four abdominal quadrants, not further specified	minor 510402.1,0	Torso portion of safety belt system	Probable	Emergency room records
6	Abrasion right shoulder, not further specified	minor 710202.1,1	Torso portion of safety belt system	Probable	Interviewee (relative)
7	Lacerations (scratches) right arm, all over, not further specified	minor 710602.1,1	Noncontact injury: flying glass, right front glazing	Probable	Interviewee (relative)
8	Abrasion dorsal left forearm, not further specified	minor 710202.1,2	Floor-mounted transmission selector lever	Possible	Emergency room records
9	Fracture right thumb, not further specified	minor 752511.2,1	Right front door panel, rear upper quadrant	Probable	Interviewee (relative)
10	Abrasions and contusions left hands, not further specified	minor 710402.1,2	Right front door panel, rear upper quadrant	Probable	Emergency room records
11	Abrasions and contusions right hands, not further specified	minor 710202.1,1	Right front door panel, rear upper quadrant	Possible	Emergency room records


N
IN10033
Clear, Daylight
Dry Bituminous
Speed Limit: 86 km/h (55 mph)
V1: 2008 Toyota FJ Cruiser
0 m 5 m 10 m
Slope: +8.3%
Ditch Slope: -5%
Distance Break = 275 m
Roadway Slope: -3.3%