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ON-SITE AMBULANCE CRASH INVESTIGATION

CASE NUMBER - IN10018
LOCATION - MINNESOTA
VEHICLE - 1999 FORD E350 TYPE II AMBULANCE
CRASH DATE - May 2010

Submitted:

October 21, 2010

Contract Number: DTNH22-07-C-00044

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
National Center for Statistics and Analysis
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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

1. *Report No.* IN10018	2. *Government Accession No.*	3. *Recipient's Catalog No.*	
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15. *Supplementary Notes* On-site ambulance crash investigation involving a 1999 Ford E350 Type II ambulance and a 2004 Jeep Grand Cherokee.			
16. *Abstract* This on-site investigation focused on the dynamics of the crash and the injury sources for the patient of a 1999 Ford E350 Type II Ambulance. The ambulance was traveling east on a 2-lane state highway during heavy snow conditions. The emergency lights and siren were activated and the vehicle was crossing a slush covered bridge. The ambulance was occupied by a restrained 48-year-old female driver, a restrained 26-year-old male paramedic, and a 71-year-old male patient that was restrained on a Ferno "PowerFlexx+" bariatric cot. A 2004 Grand Cherokee was traveling west and the 30-year-old male driver had stopped on the north shoulder in response to the approaching ambulance. The ambulance lost traction on the bridge. The SCI inspection of the ambulance revealed that the tread depth of the right and left rear tires was 0 mm and 1 mm (0.039 in), respectively and the front tires were significantly overinflated. The ambulance rotated counterclockwise onto the north shoulder where the left fender impacted the left quarter panel of the Jeep (event 1). The front plane of the ambulance then impacted a guardrail (event 2) and rolled over right side leading (event 3) onto the guardrail (event 4). The ambulance slid backward on its top plane down the guardrail destroying the fiberglass and plywood top of the patient compartment. The vehicle separated from the guardrail and came to final rest on its left side plane heading north on an embankment north of the guardrail. The driver and paramedic were transported by ambulance to a hospital where they were treated in the emergency room and released. The patient remained restrained on the patient cot throughout the crash and the cot remained secured in the vehicle. The patient sustained fatal injuries from contact with displaced roof structure components and was pronounced deceased at the crash scene.			
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IN10018

This on-site investigation focused on the dynamics of the crash and the injury sources for the patient of a 1999 Ford E350 Type II Ambulance (**Figure 1**). This crash was brought to our attention by the National Highway Traffic Safety Administration (NHTSA) on May 12, 2010 through an on-line news article. Permission from the insurance authority to inspect the vehicle was finalized in June and this investigation was assigned on June 25, 2010. The crash involved the ambulance and a 2004 Jeep Grand Cherokee. The crash occurred in May, 2010, at 1929 hours, in Minnesota and was investigated by the Minnesota State Patrol. The ambulance and the crash scene were inspected on July 7-8, 2010. The director of operations for the ambulance company was interviewed on August 2-3, 2010. This report is based on the police crash report, ambulance inspection, crash scene inspection, interview information, occupant kinematic principles, and evaluation of the evidence.

Figure 1: The damaged 1999 Ford E350 Type II Ambulance

AMBULANCE COMPANY AND PERSONNEL

The ambulance was operated by a private company that provided contract ambulance service to two northern Minnesota counties. The ambulance company had been in operation for 32 years and operated a fleet of 4 ambulances. Their area of operation covered 1,654 square kilometers (1,028 square miles). The ambulance company provided 9-1-1 emergency response and emergency transfer of patients. The company provided its driver's with ambulance driver training that included a "Coaching the Emergency Vehicle Operator" classroom course, a behind-the-wheel maneuvering course conducted every two years, and an annual peer driving evaluation.

The driver of the ambulance was a 48-year-old female. She was an Emergency Medical Technician (EMT) and part time employee of the ambulance company. She had been an employee for approximately 10 years and was also a part-time employee of a second ambulance company located in a neighboring city. She had approximately 10 years experience as an ambulance driver. On the day of the crash, she began work at 0900 hours. At the time of the crash, she was restrained by the lap-and-shoulder safety belt.

The paramedic was a 26-year-old male. He had been a paramedic for three years and had worked for the ambulance company for three years. He was not considered a full time employee since his schedule fell slightly short of full time status. He worked a rotating 24 hour shift and began work at 0900 hours the day of the crash. He was seated in the patient compartment in a rear-facing seat located directly behind the driver. He was restrained by a lap belt.

The patient was a 71-year-old male that was suffering from gastrointestinal bleeding from a suspected perforated bowel following a colonoscopy and removal of polyps. He was being transported from a rural medical center to an urban trauma center. The sending facility initially requested an air ambulance for the transfer but the helicopter could not fly due to snowy weather conditions. The ground distance between the medical facilities was approximately 145 kilometers (90 miles). The crash occurred approximately 105 kilometers (65 miles) into the transfer. The patient was restrained on a Ferno "PowerFlexx+" bariatric cot. Oxygen, intravenous fluids, and blood were being administered to the patient by the paramedic during the transfer.

CRASH CIRCUMSTANCES

Crash Environment: This crash occurred on a 2-lane, undivided, state highway during daylight hours and heavy snow conditions. The roadway was straight and traversed in an east-west direction. Each travel lane was 3.7 m (12.1 ft) in width. The roadway was bordered by bituminous shoulders and blocked-out, W-beam, steel guardrails. The north shoulder was 3.7 m (12.1 ft) in width and the south shoulder was 4.2 m (13.8 ft) in width. The roadway surface was slush covered bituminous and the grade for the ambulance was negative 2.5%. The speed limit was 97 km/h (60 mph). The Crash Diagram is on page 14 of this report.

Pre-Crash: The ambulance was traveling east (**Figure 2**) with the emergency lights and siren activated and was crossing a slush covered bridge. The Jeep was traveling west and the 30-year-old male driver had stopped on the north shoulder in response to the approaching ambulance. The ambulance lost traction on the bridge and began to rotate counterclockwise and travel toward the north shoulder (**Figure 3**). The SCI inspection of the ambulance revealed that the tread depth of the right and left rear tires was 0 mm and 1 mm (0.039 in), respectively. The tread depth of each front tire was 10 mm (0.39 in) and they were significantly overinflated. The tire information table is on page 6 of this report.

Figure 2: Approach of the ambulance eastbound on the bridge; arrow shows the area of the crash

Figure 3: View northeast to the area of impact with the Jeep, which was stopped on the shoulder

Crash: As the ambulance rotated counterclockwise and entered the north shoulder, the left fender impacted the left quarter panel of the Jeep (event 1). The ambulance continued to rotate counterclockwise following the impact and traversed diagonally across the bituminous shoulder where the front plane (**Figure 4**) impacted a guardrail (event 2). The ambulance

continued to rotate counterclockwise and it rolled over with the right side leading onto the guardrail (events 3 and 4). The right side plane (**Figure 5**) and top plane (**Figure 6**) impacted the guardrail during the roll over. The ambulance slid backwards on its top plane on the guardrail, which destroyed the fiberglass and plywood top of the patient compartment and damaged the patient loading doors (**Figure 6**). The vehicle separated from the guardrail and came to final rest on the left side plane on the negative 29% grade of an embankment (**Figure 7**). The vehicle was located approximately 8 m (26.2 ft) north of the guardrail and was heading north.

Figure 4: Damage on the front bumper of the ambulance from the impact with the guardrail

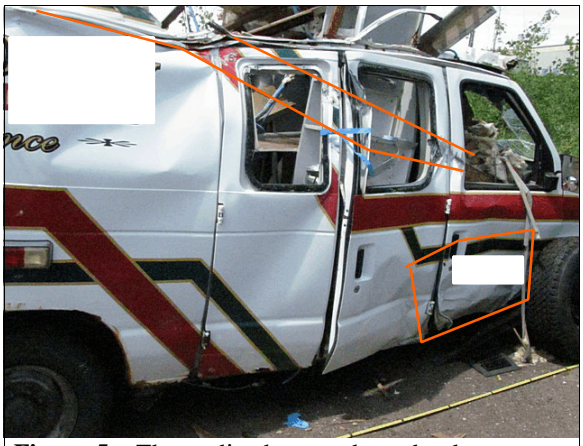


Figure 5: The outlined areas show the damage on the vehicle from rolling over onto the guardrail

Figure 6: The top of the patient compartment was destroyed and the patient loading doors were damaged during the rollover

Figure 7: View back to the roadway; highlighted area shows divot on ground at the final rest location of the ambulance

Post-Crash: The driver exited the vehicle through the disintegrated right front window. The paramedic exited through the open roof. The patient was removed from the patient cot by the paramedic and a passersby and attended to by responding emergency medical personnel. He was pronounced deceased at the crash scene. The driver and paramedic were transported by ambulance to a hospital where they were treated in the emergency room and released. The vehicle was towed from the crash scene due to damage.

The rollover of the ambulance was initiated by the impact with the guardrail and it rolled over with the right side leading onto the guardrail. The damage on the vehicle indicated that it rolled over 3 quarter turns. Based on the crash scene evidence, the distance the vehicle traversed as it rolled over onto the guardrail and traveled to final rest was estimated to be 39 m (128 ft). The NHTSA website, Safercar.gov, had no rollover rating information for this vehicle.

CASE VEHICLE

The 1999 Ford E350 was a rear wheel drive, 4-door, van (VIN: 1FDSS34F7XH------) equipped with a 7.3-liter, V-8 turbo diesel engine, automatic transmission, and anti-lock brakes. The vehicle was manufactured as an incomplete vehicle in June 1999 and was equipped with Ford's ambulance preparation package. The ambulance was manufactured by McCoy Miller Division of Warrick Indiana in August 1999. The front row was equipped with box-mounted seats, integral head restraints, lap-and-shoulder safety belts, and driver and front right passenger frontal air bags. The patient compartment had a typical layout with a box-mounted rear-facing paramedic seat behind the driver, a three passenger bench seat along the right side equipped with lap safety belts, a right side entry door, double rear doors for patient loading, and multiple cabinets along the left side and front for storage. The odometer reading at the SCI inspection was 676,798 kilometers (420,542 miles). The specified wheelbase was 351 cm (138 in).

CASE VEHICLE DAMAGE

Exterior Damage Event 1: There was overlapping damage on the left fender from the impact with the Jeep and the rollover. Crush measurements were taken to document the damage from both impacts. The direct damage was 71 cm (28 in) in length and began 453 cm (178 in) forward of the rear bumper. The crush measurements were taken at the mid-fender level and the maximum residual crush was 9 cm (3.5 in) occurring at C_3. The table below presents the left fender 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	71	9	88	0	2	9	3	2	0	152	163
in		28.0	3.5	34.6	0.0	0.8	3.5	1.2	0.8	0.0	59.8	64.2

Damage Classification Event 1: A Collision Damage Classification (CDC) of 11LFEW2 was assigned to describe the damage on the fender. The severity of the damage was minor based on the extent of the crush.

Exterior Damage Event 2: The ambulance sustained damage on the front bumper during the impact with the guardrail. The direct damage began at the front left bumper corner and extended 62 cm (24.4 in) across the bumper. Crush measurements were taken on the bumper and the

maximum residual crush was 8 cm (3.1 in) occurring at C_6. The left front wheel engaged the guardrail during this impact, which severed the wheel from the hub. The right front wheel was also displaced rearward 31 cm (12.2 in). The table below presents the front plane 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	2	62	8	174	6	4	3	3	4	8	-61	0
in		24.4	3.2	68.5	2.4	1.6	1.2	1.2	1.6	3.2	-24.0	0.0

Damage Classification Event 2: The CDC for the front bumper impact was 12FYLW1. The WinSMASH program could not be used to determine a Delta V since impacts with yielding objects are out of scope for the program. The severity of the damage was minor based on the damage on the bumper.

Exterior Damage Events 3 and 4: During the rollover, the ambulance sustained damage on the right side plane and top plane from impacts with the guardrail. The direct damage on the top plane extended 410 cm (161.4 in) forward from the backlight header to the windshield header and involved the full width of the top, 146 cm (57.4 in). The top of the patient compartment was constructed of fiberglass and plywood and was supported by a metal frame. This structure was torn off the vehicle with the exception of the front metal frame members. The top of the patient loading doors was crushed forward 89 cm (35 in). The maximum vertical crush of the top structure was 88 cm (34.6 in) and occurred at the backlight header of the left patient loading door. It included the crush and displacement of the fiberglass and plywood top and its metal frame. The maximum lateral crush of the top structure was 20 cm (7.9 in) and occurred at the left C-pillar.

The direct damage on the right side plane began on the roof side rail above the right rear axle and extended 70 cm (27.6 in) forward along the roof side rail. The damage then extended diagonally downward to the B-pillar ending 117 cm (46 in) above the ground. The total length of this damaged area along the right side plane was 240 cm (94.5 in). The maximum crush was 12 cm (4.7 in) and occurred on the roof side rail immediately rear of the patient compartment entry doors. There was also direct damage on the lower portion of the right front door and patient compartment entry door that began 185 cm (72.8 in) forward of the right rear axle and extended 115 cm (45.3 in) forward.

Damage Classification Events 3 and 4: The CDC for the rollover onto the guardrail was 00TZDO4. The CDC for the right side plane damage that occurred during the rollover was 00RPHW3. The WinSMASH program could not be used since a rollover and a non-horizontal impact are out of scope for the program. The severity of the damage for the rollover was severe based on the extent of the crush on the top plane. The severity of the damage on the right side plane was moderate based on the crush on the right roof side rail.

The vehicle manufacturer's recommended tire size was LT245/75R16. The vehicle was equipped with the recommended size tires. The ambulance'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	517	75	379	55	10	12	None on tire, wheel broken off at hub	No	No
LR	524	76	552	80	1	1	None	No	No
RR	531	77	552	80	0	0	None	No	No
RF	538	78	379	55	10	12	None	Yes	No

Vehicle Interior: The inspection of the front row revealed a tissue transfer on the left spoke of the steering wheel, probably from contact by the driver's left hand. There was no other discernable evidence of occupant contact in the front row. There was no deformation of the steering wheel or compression of the energy absorbing steering column.

The left front door remained closed and operational, while the right front door was jammed shut. The left front and right front windows were closed prior to the crash and both were disintegrated from impact forces. The windshield was in place and holed from impact forces.

AUTOMATIC RESTRAINT SYSTEM

The front row was equipped with driver and front right passenger frontal air bags. The driver's air bag was located within the steering wheel hub and the front right passenger air bag was located within the top of the right instrument panel. Neither air bag deployed during this crash.

MANUAL RESTRAINT SYSTEM

The front row was equipped with driver and front right passenger lap-and-shoulder safety belts. The driver's safety belt was equipped with continuous loop belt webbing, an adjustable upper anchor that was in the full up position, a sliding latch plate, and an Emergency Locking Retractor (ELR). The front right safety belt was similarly equipped but had an ELR/Automatic Locking Retractor (ALR).

The inspection of the driver's safety belt assembly revealed historic usage scratches on the latch plate. The belt webbing was stiff and appeared stretched consistent with loading by the

driver during the crash. There were no load marks on the D-ring or latch plate belt guide. The front right seat position was unoccupied.

PATIENT COMPARTMENT

The patient compartment was configured with a storage cabinet on the left side and front right. The left side storage cabinet was equipped with plexiglass sliding doors and was stocked with medical supplies. This cabinet was undamaged and the sliding doors remained closed. The front right storage cabinet was equipped with plexiglass hinged doors and lower shelves. This cabinet (**Figure 8**) was displaced rearward 14 cm (5.5 in) and the doors were broken off the hinges. A fold-up patient cot was stored on the back left side and was secured by a nylon strap. The cot remained secured and was not damaged. An M-size oxygen cylinder was located within a cabinet located at the right rear of the patient compartment. The oxygen cylinder was undamaged and remained secured within the cabinet. The oxygen lines external to the oxygen cylinder cabinet were displaced and broken during the crash as was the electrical wiring system. **Figure 9** shows a top view of the patient loading doors. They were jammed shut and the window glazings were disintegrated. The tops of the loading doors intruded longitudinally into the patient compartment 89 cm (35 in) and vertically 26 cm (10.2 in). The roof rail over the loading doors intruded longitudinally 92 cm (36.2 in). The window glazings on the right side entry doors were disintegrated.

Figure 8: Damage and displacement of the front storage cabinet

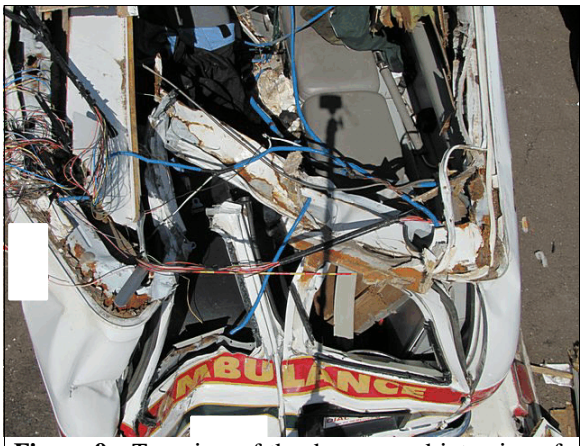


Figure 9: Top view of the damage and intrusion of the patient loading doors

The paramedic seat was located on the forward left side of the patient compartment immediately behind the driver's seat. It was a box-mounted rear-facing seat with a fixed track, and was equipped with a lap safety belt The safety belt was equipped with retractable webbing and a sewn latch plate. The retractor type could not be determined since it spooled freely and would not lock. The inspection of the safety belt revealed historic usage scratches on the latch plate. There was no evidence of loading on the lap belt. The police reconstructionist reported that the paramedic was restrained.

The cot that was used to transport the patient was a Ferno PowerFlex+ (**Figure 10**), which was designed for bariatric transport. The model number and serial number could not be determined since moving the cot was not allowed. The cot was constructed of steel tubing and was equipped with a 24 volt DC power pak with hydraulic actuator and dual lifting cylinders. The unassisted lift capacity was 318 kg (700 lb). The load capacity of the cot in the lowest position was 454 kg (1000 lb). The patient's weight 127 kg (280 lbs). The lower frame of the cot was a scissor design, which allowed for a height adjustment range of 33-104 cm (13-41 in). The maximum specified loading height was 86 cm (34 in) The specified maximum length of the cot was 211 cm (83 in). The minimum length was 61 cm (24 in) and the width was 61 cm (24 in).

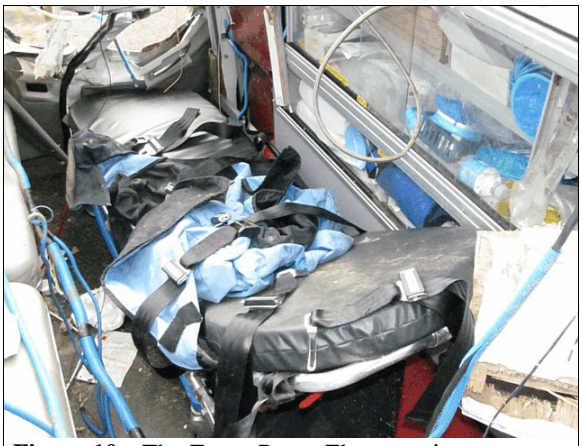


Figure 10: The Ferno PowerFlex+ patient cot

The cot was configured with a shoulder harness, two torso restraints, and a leg restraint. The leg and lower torso restraint each consisted of a non-adjustable buckle portion and an adjustable length locking latch plate portion. The buckle and locking latch plate portions of the upper torso restraint were both adjustable. The shoulder harness belts were adjustable length and equipped with locking latch plates. Each section of belt webbing for the leg and torso restraints were tied to the cushion support frame (**Figure 11**). The shoulder harness belts were tied to the back rest frame. Inspection of the belts revealed historical usage evidence. The upper torso belt appeared slightly stretched. Based on the SCI interview with the director of operations of the ambulance company, all the restraints were used to secure the patient, and they were all positioned snugly on the patient.

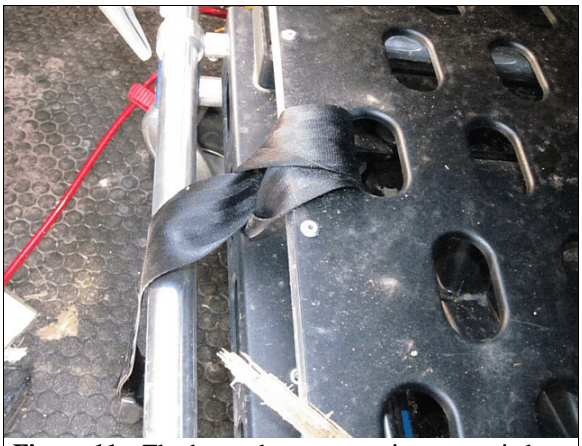


Figure 11: The leg and torso restraints were tied to the cushion support frame

Figure 12: The intruded left patient loading door was in contact with, but did not deform the patient cot

The cot was secured by the ambulance's antler bracket and rail clamp. The antler bracket secures the head of the cot by restraining the undercarriage using the wheel frames as anchor points. The rail clamp secured the frame of the cot. The cot remained secured throughout the crash. There was no deformation of the antler

bracket or the cot's framework. The lower portion of the back left patient loading door intruded longitudinally 41 cm (16.1 in) and was contacting the bottom end the cot (**Figure 12**). The cot was not damaged by the intruded loading door. The back rest of the patient cot was elevated 37 degrees. There was no deformation of the back rest.

CASE VEHICLE DRIVER KINEMATICS

The driver (48-year-old female, unknown height and weight) of the ambulance was seated in an unknown posture restrained by the lap-and-shoulder safety belt. The driver's seat track was located in the rear position at the time of the SCI vehicle inspection. The seat back was in a slightly reclined position. The tilt steering column was positioned one detent below the full up position.

The impact with the Jeep displaced the driver forward and left within the safety belt. The front plane impact with the guardrail displaced the driver forward and she loaded the safety belt. She was redirected to the right and toward the roof within the safety belt when the vehicle rotated counterclockwise and rolled over, right side leading. A tissue transfer on the steering wheel indicated that the driver probably contacted one of her hands on the steering wheel during the crash. There was no other discernable evidence of occupant contact. The driver remained restrained in her seat throughout the crash. She exited the vehicle through the disintegrated right front window glazing.

CASE VEHICLE DRIVER INJURIES

The driver was transported by ambulance to a hospital where she was treated in the emergency room and released. The nature and extent of the driver's injuries are not known Our Health Insurance Portability and Accountability Act (HIPPA) request for the driver's medical records was denied by the treating hospital.

Figure 13: The rear-facing paramedic seat

CASE VEHICLE OTHER ROW PASSENGER, PARAMEDIC KINEMATICS

The paramedic [26-year-old male, unknown height and weight) was seated in an unknown posture restrained by the lap safety belt. He was attending to the patient and was monitoring the oxygen, IV fluids, and blood the patient was receiving.

The impact with the Jeep displaced the paramedic to the right and into the back of the rear-facing seat. When the front plane impacted

the guardrail, the paramedic loaded the seat back. There was no evidence of deformation on the seat back, which was reinforced by the bulkhead behind the seat (**Figure 13**). As the vehicle rotated counterclockwise and rolled over right side leading, the paramedic was redirected to the right and toward the roof within his lap belt. He remained restrained in the seat throughout the rollover sequence. He sustained a fractured arm. The aspect and injury source are not known. Following the crash, he exited the vehicle through the open roof structure. A passerby assisted him in the removal of the patient from the cot.

CASE VEHICLE OTHER ROW PASSENGER, PARAMEDIC INJURIES

The paramedic was transported by ambulance to a hospital where he was treated in the emergency room and released. The table below presents the paramedic's injury, which was reported by the medical examiner in his investigation report. Our HIPPA request for medical records was denied by the treating hospital.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
1	Fractured arm, not further specified	moderate 751800.2,9	Unknown injury source	Unknown	Other: ME report of investigation

CASE VEHICLE OTHER ROW PASSENGER, PATIENT KINEMATICS

The patient [71-year-old male, 175 cm (69 in) and 127 kg (280 lbs)] was restrained supine on the patient cot by the shoulder harness, two torso restraints, and leg restraint. His head was positioned toward the front of the ambulance and the backrest was elevated 37 degrees. The restraints were positioned snugly on the patient.

The patient loaded the restraints during the crash and remained restrained on the cot throughout the crash sequence. Displaced roof structure components (**Figure 8**) contacted him during the rollover as the roof was crushed and broken by the guardrail. He sustained bilateral rib fractures, a massive bilateral pneumothorax, a lacerated left lower lung, a contusion of the epicardium, a compound fracture of the right femur, and multiple lacerations and contusions. He was removed from the vehicle by the paramedic and passersby and attended to by responding emergency medical personnel.

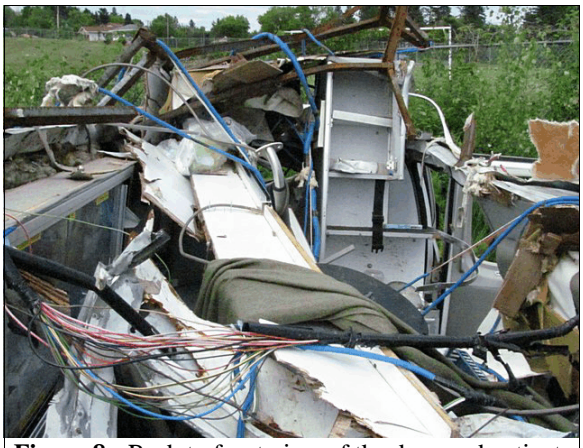


Figure 8: Back to front view of the damaged patient compartment

The patient was pronounced deceased at the crash scene 1 hour and 16 minutes following the crash. The patient's injuries and injury sources are presented in the following table.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
1	Pneumothorax, massive, bilateral, tension	critical 442204.5,3	Other interior loose object: displaced roof components	Probable	Autopsy
2	Fractured ribs, extensive, bilateral, not further specified with flail chest both sides	critical 450214.5,3	Other interior loose object: displaced roof components	Probable	Autopsy
3	Lacerated left lower lung, posteriorly, by protruding rib at approximate location of 6th rib Laceration (perforation), anterior surface of right upper lobe lung	severe 441451.4,3	Other interior loose object: displaced roof components	Probable	Autopsy
4	Contusion (hemorrhage) anterior surface of epicardium at right coronary artery	moderate 441699.2,4	Other interior loose object: displaced roof components	Probable	Autopsy
5	Fracture, transverse, sternum at approximate location of 4th rib	moderate 450804.2,4	Other interior loose object: displaced roof components	Probable	Autopsy
6	Fracture, compound, right femur above knee with bone protruding 10 cm (3.9 in) above knee	serious 853222.3.1	Other interior loose object: displaced roof components	Probable	Autopsy
7	Lacerations, severe, scalp and posterior scalp, not further specified	minor 110600,1,0	Other interior loose object: displaced roof components	Probable	Autopsy
8	Contusion (hemorrhages) near scalp lacerations, not further specified	minor 110402.1,0	Other interior loose object: displaced roof components	Probable	Autopsy
9	Lacerations, severe, face, not further specified	minor 210600.1,9	Other interior loose object: displaced roof components	Probable	Autopsy

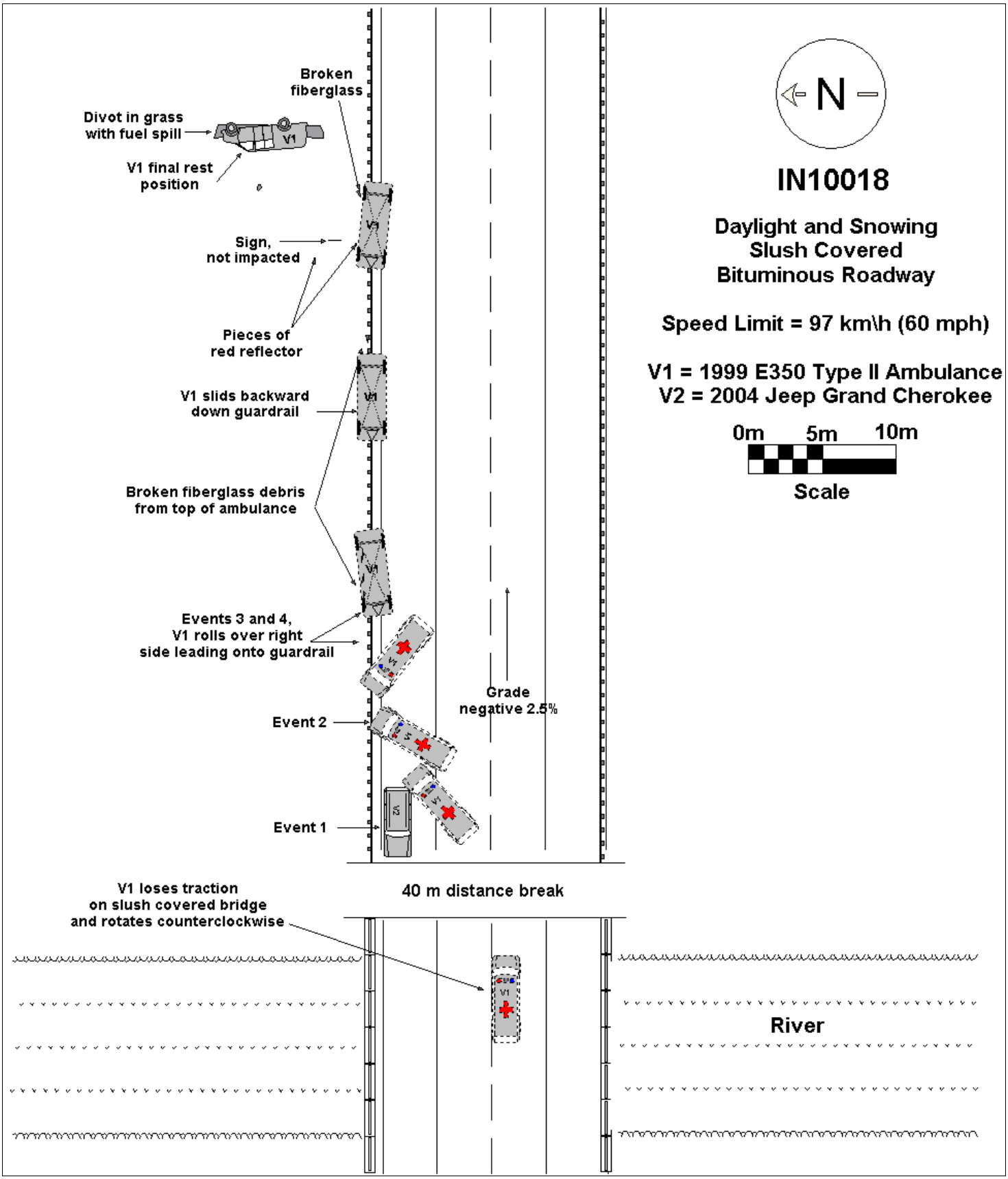
Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 2005	Injury Source	Source Confidence	Source of Injury Data
10 11	Hemorrhage into both sclarae[1], not further specified	minor 241299.1,1 241299.1,2	Other interior loose object: displaced roof components	Probable	Autopsy
12 13	Contusions (ecchymoses) bilateral orbits, not further specified	minor 210402.1,1 210402.1,2	Other interior loose object: displaced roof components	Probable	Autopsy
14	Lacerations both lips	minor 210602.1,8	Other interior loose object: displaced roof components	Probable	Autopsy
15	Contusions (ecchymotic hemorrhages) scattered anterior chest, not further specified	minor 410402.1,0	Other interior loose object: displaced roof components	Probable	Autopsy
16	Contusions (ecchymotic hemorrhages) scattered anterior abdomen, not further specified	minor 510402.1,0	Other interior loose object: displaced roof components	Probable	Autopsy
17	Contusions (deep purple hemorrhages) on skin in diaper (inguinal) area	minor 510402.1,8	Other interior loose object: displaced roof components	Probable	Autopsy
18	Contusions (hemorrhage), extensive, both arms: to below biceps on left and to below elbow on right; skin is sloughed[2] from a large area of the arms	minor 710402.1,3	Other interior loose object: displaced roof components	Probable	Autopsy
19 20	Laceration, deep, dorsum left hand with contusion (hemorrhage) into tissue	minor 710600.1,2 710402.1,2	Other interior loose object: displaced roof components	Probable	Autopsy

[1] The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:
sclera (skle/rah): the tough white outer coat of the eyeball, covering approximately the posterior five-sixths of its surface, and continuous anteriorly with the cornea and posteriorly with the external sheath of the optic nerve.

[2] According to the RANDOM HOUSE WEBSTER'S UNABRIDGED DICTIONARY, this term is defined as follows: to be or become shed or cast off, as the slough of a snake.

The 2004 Jeep Grand Cherokee was a 4-wheel drive, 5-passenger, 4-door sport utility vehicle (unknown VIN). The specified standard equipment included a 4.7-liter, V8 engine, a 5-speed automatic transmission, and 4-wheel anti-lock disc brakes with electronic brake force distribution. This vehicle was not inspected.

Other Vehicle's Driver: According to the police crash report, the driver of the Jeep (30-year-old, male) was restrained by the lap-and-shoulder belt. He sustained no police-reported injuries and was not transported to a hospital.


Broken fiberglass
Divot in grass with fuel spill
V1
V1 final rest position
Sign, not impacted
Pieces of red reflector
V1 slids backward down guardrail
Broken fiberglass debris from top of ambulance
Events 3 and 4, V1 rolls over right side leading onto guardrail
Grade negative 2.5%
Event 2
Event 1
V1 loses traction on slush covered bridge and rotates counterclockwise
40 m distance break
River
N
IN10018
Daylight and Snowing
Slush Covered
Bituminous Roadway
Speed Limit = 97 km\h (60 mph)
V1 = 1999 E350 Type II Ambulance
V2 = 2004 Jeep Grand Cherokee
0m 5m 10m
Scale