

# INDIANA UNIVERSITY

## TRANSPORTATION RESEARCH CENTER

School of Public and Environmental Affairs

### ON-SITE AMBULANCE CRASH INVESTIGATION

CASE NUMBER - IN13021

LOCATION - NEBRASKA

VEHICLE - 1990 FORD E-350 TYPE III AMBULANCE

CRASH DATE - June 2013

Submitted:

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

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

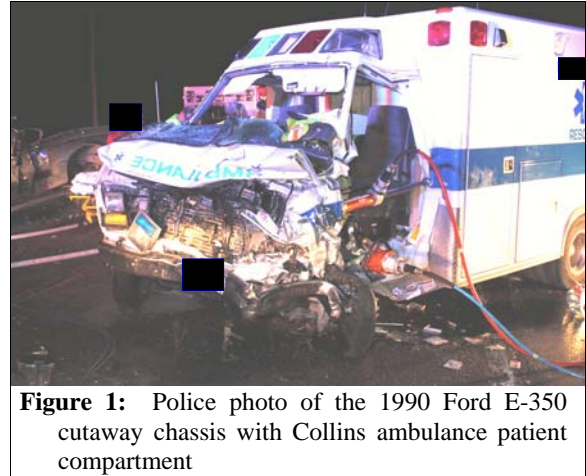
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16. <i>Abstract</i> The focus of this on-site investigation was the crash of a 1990 Ford E-350 Type III ambulance and the sources of the injuries to the occupants. This crash was an offset head-on frontal impact, which occurred on a rural, two-lane, undivided U.S. highway. The ambulance was equipped with a Type III patient compartment and was not equipped with any frontal air bags. The ambulance was occupied by an unrestrained 51-year-old male driver, an unrestrained 30-year-old female EMT, and an unrestrained 46-year-old male EMT trainee. Both EMTs were in the patient compartment attending to a 50-year-old male patient who was restrained on Stryker EMS Model 6082 MX-PRO patient cot. The patient was experiencing a post-operative infection and was being transported to a hospital. The patient and one of the EMTs were ejected from the patient compartment. The front plane of the ambulance was impacted by the front plane of the 2002 Ford Ranger. The driver of the ambulance and both EMTs were airlifted to a hospital. The driver expired from his injuries and the EMTs were hospitalized. The patient was also hospitalized. The Ranger was a rear wheel drive, four-door, supercab, standard bed pickup truck that was occupied by an unrestrained 24-year-old male driver. The Ranger's driver sustained fatal injuries and was pronounced dead at the crash scene. Both vehicles were towed from the crash scene due to damage.					
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VEHICLE - 1990 FORD E-350 TYPE III AMBULANCE  
CRASH DATE - June 2013

**BACKGROUND:** The focus of this on-site investigation was the crash of a 1990 Ford E-350 Type III ambulance (**Figure 1**) and the sources of the injuries to the occupants. This investigation was initiated by the National Highway Traffic Safety Administration (NHTSA) on June 12, 2013, through NHTSA's Emergency Medical Services (EMS) Office. This investigation was assigned on June 20, 2013. The crash involved the ambulance and a 2002 Ford Ranger supercab pickup truck. The crash occurred in June, 2013 at 2158 hours in Nebraska, and was investigated by two local police agencies. The ambulance, Ranger and crash scene were inspected on June 27, 2013. One of the Emergency Medical Technicians (EMT), who was seated in the patient compartment at the time of the crash, was interviewed on June 28, 2013, and a partial interview with the patient was completed on July 15, 2013.



**Figure 1:** Police photo of the 1990 Ford E-350 cutaway chassis with Collins ambulance patient compartment

This crash was an offset frontal impact, which occurred on a rural, two-lane, undivided U.S. highway. The ambulance was equipped with a Type III patient compartment and was not equipped with any frontal air bags. The ambulance was occupied by an unrestrained 51-year-old male driver, an unrestrained 30-year-old female EMT, and an unrestrained 46-year-old male EMT trainee. Both EMTs were in the patient compartment attending to a 50-year-old male patient who was lying supine on by a Stryker EMS Model 6082 MX-PRO patient cot and restrained by the cot straps at the chest, hips, and lower leg levels. The patient was experiencing a post-operative infection and was being transported from his home to a hospital. The patient and one of the EMTs were ejected from the patient compartment. The driver of the ambulance, and both EMTs were airlifted to a hospital. The patient was transported by ambulance to a hospital, where he was hospitalized. The driver expired from his injuries and the EMTs and patient were hospitalized. The Ranger was a rear wheel drive, four-door, supercab, standard bed pickup truck that was occupied by an unrestrained 24-year-old male driver. The Ranger's driver sustained fatal injuries and was pronounced dead at the crash scene. Both vehicles were towed from the crash scene due to damage.

The ambulance service provided 9-1-1 service to a portion of a Nebraska county. The ambulance service had a fleet of two ambulances and was part of a fire and rescue operation, staffed solely by volunteers. The volunteer rescue service provided its drivers with approximately two

hours of classroom training. On-the-job ambulance driving with an experienced driver was also part of the training. No further training or continuing education was provided.

The driver of the ambulance drove only for this ambulance service, and had been in this capacity for approximately eight months. He had over 20 years of experience as both an EMT and ambulance driver. The driver and EMTs were volunteers and were called to work on an as “as-needed” basis.

The female EMT was seated in position 7,<sup>1</sup> the inward facing single seat on the left side of the patient compartment. She had been with the ambulance service for three years. The male EMT was a trainee, and was seated in position 6<sup>1</sup>, at the front of the inward-facing bench, located along the right side of the ambulance.

### CRASH SUMMARY

**Crash Site:** This crash occurred during night hours and clear weather conditions. The Ambulance and Ford’s roadway had one lane in each direction and traversed in an east-west direction. Each lane was 3.6 m (11.9 ft) wide and the roadway markings consisted of solid white edge lines and a broken yellow center line. The roadway was bordered by 2.5 m (8.2 ft) wide bituminous shoulders. The roadway surface was also dry, level bituminous. The speed limit was 97 km/h (60 mph). The Crash Diagram is on included on page 18 of this report.

**Pre-Crash:** The ambulance was traveling west (**Figure 2**) and the driver intended to continue straight ahead. This was a 9-1-1 response and the ambulance was operating with emergency lights but no siren. The Ranger was eastbound (**Figure 3**) and the local police agency had received calls that the Ranger’s driver was driving erratically.



**Figure 2:** Westbound approach of ambulance, 50 m from impact



**Figure 3:** Ford's eastbound approach, 50 m from impact

<sup>1</sup> Example of Conventional Ambulance Seating Chart, Model Minimum Uniform Crash Criteria (MMUCC), 4<sup>th</sup> Edition, pg 134. <http://www-nrd.nhtsa.dot.gov/Pubs/811631.pdf>

The Ranger entered the ambulance's travel lane before the crash, and the driver of the ambulance braked with lockup in an attempt to avoid the crash.

**Crash:** The front plane of the ambulance (**Figure 4**) was impacted by the front plane of the Ranger (**Figure 5**). The damage algorithm of the WinSMASH program calculated the total Delta V for the ambulance as 32 km/h (19.9 mph). The longitudinal and lateral velocity changes were -32 km/h (-19.9 mph) and -6 km/h (3.7 mph), respectively. This result appeared low based on the damage. The ambulance continued forward 5 m (16.4 ft) and rotated 140 degrees counterclockwise, coming to final rest in the eastbound lane heading southeast. The male EMT was fully ejected from the patient compartment through the right side door, which had come open upon impact. The patient slid out of the restraints of the cot and was also fully ejected, also through the right side door. Both occupants came to final rest in close proximity to the right side of the ambulance. The Ford was redirected southwest 7.5 m (25.6 ft) and rotated clockwise 50 degrees, coming to final rest straddling the south fog line, heading southeast.

**Post-Crash:** The police were notified of the crash at 2158 hours. Emergency medical, including air ambulances and rescue services also responded to the crash scene. Rescue personnel mechanically opened and removed the Ambulance's driver's door using pneumatic shears and spreading devices. The ambulance driver and both EMTs were medevaced to a hospital for medical treatment. The patient was transported by ambulance to a hospital. The driver of the Ranger sustained fatal injuries and was pronounced dead at the crash scene. No citations were issued according to the police crash report.

## 1990 FORD TYPE III AMBULANCE

### DESCRIPTION

The Ambulance was a rear-wheel drive, two-passenger, two-door, E-350 RV cutaway (VIN: 1FDKE30M4LHxxxxxx) manufactured in March, 1990. The patient compartment was manufactured in June 1990 by Collins Ambulance. The vehicle was equipped with a 7.3-liter, IDI non-turbo, V-8 diesel engine, and four-speed automatic transmission. The ambulance was not equipped with anti-lock brakes, air bags, or an Event Data Recorder (EDR). The steering column was non-adjustable and was displaced from the intrusion of the instrument panel. The patient compartment was configured with a right side entry door, double rear doors for patient loading, and



**Figure 4:** Ambulance frontal damage



**Figure 5:** Police photo of Ranger at crash scene



multiple storage cabinets along the front and left side. A class M oxygen cylinder was located in a storage compartment at the front left side of the patient compartment. A smaller class M oxygen cylinder was found on the ambulance floor. Its position at the time of the crash is unknown. The windshield glazing was AS1 laminated. The left front and right front glazing were AS2 tempered. No AS labels were present on any of the right side and backlight glazing of the patient compartment, though there was post market tinting applied to all glazing panels. Prior to the crash, all of the glazing was either closed or fixed. The original wheelbase was 351 cm (138 in).

The vehicle manufacturer's recommended tire size was LT215/85R16 for the front and rear tires. The vehicle was equipped with tires of the recommended size. The vehicle manufacturer's recommended cold tire pressure was 400 kPa (58 psi) for all tires. Tire pressure for the ambulance's rear tires could not be measured since the valve stems not were accessible.

<i>Position</i>	<i>Measured Pressure</i>	<i>Measured Tread Depth</i>	<i>Restricted</i>	<i>Damage</i>
LF	Flat	11 mm ( 14/32 in)	Yes	Large sidewall cut
LR Outside	Not measurable	9 mm ( 11/32 in)	No	None
LR Inside	Not measurable	9 mm ( 11/32 in)	No	None
RR Inside	Not measurable	7 mm ( 9/32 in)	No	None
RR Outside	Not measurable	8 mm ( 10/32 in)	No	None
RF	414 kPa ( 60 psi)	11 mm ( 14/32 in)	No	None

The front row was equipped with cloth covered, box-mounted seats and integral head restraints. The driver's seat back was in the upright position. The patient compartment was configured with a vinyl covered, rear-facing, box-mounted seat located behind the driver. A three passenger, vinyl covered, bench seat was located along the right side of patient compartment and a vinyl covered, single seat on the left side of the patient compartment.

## EXTERIOR DAMAGE

**Exterior Damage, Event 1:** The ambulance sustained front plane damage during the impact with the Ford. The front bumper, grille, hood, left head lamp/turn signal assembly, left fender, and left front wheel were directly damaged. The direct damage began at the front left bumper corner and extended 160 cm (63 in) along the front plane. The Field L was 138 cm (54.3 in). The crush measurements were taken at the front bumper level and maximum residual crush was 111 cm (43.7 in) occurring at C1. The crush values were: C<sub>1</sub> = 111 cm (43.7 in), C<sub>2</sub> = 63 cm (24.8 in), C<sub>3</sub> = 57 cm (22.4 in), C<sub>4</sub> = 37 cm (14.6 in), C<sub>5</sub> = 14 cm (5.5 in), C<sub>6</sub> = 0 cm.



**Damage Classification:** The Collision Deformation Classification (CDC) was 12FDEW6 (10 degrees). The Damage algorithm of the WinSMASH program calculated the total Delta V as 32 km/h (19.9 mph). The longitudinal and lateral velocity changes were -32 km/h (-19.9 mph) and -6 km/h (3.7 mph). The results should be considered for informational purposes only since the ambulance was an altered vehicle and an accurate weight of the vehicle could not be determined.

## INTERIOR DAMAGE

**Front Row:** The inspection of the front row revealed blood on the deformed lower left instrument panel from contact by the driver's knee. The upper half of the steering wheel rim (**Figure 6**) was deformed forward approximately 3 cm (1.2 in) from contact by the driver's chest, and the steering assembly was displaced upward.

The left front door was jammed shut and had been mechanically opened with pneumatic shears and spreading devices. The right front door was also mechanically cut open with pneumatic shears. The windshield was in place and cracked by impact forces and the left front glazing was disintegrated from impact forces. The remainder of the vehicle's glazing was undamaged.

There were seven intrusions in the front row. The most severe intrusions into the driver's space involved the left instrument panel and A-pillar, which intruded longitudinally approximately 30 cm (11.8 in) and 24 cm (9.4 in), respectively, and the steering assembly, which intruded vertically 30-46 cm (11.8-18.1 in).

**Patient Compartment:** Inspection of the patient compartment revealed significant deformation of the supply cabinet located in the front right (**Figure 7**). There were scuff marks also present below the cabinet. The deformation and scuff marks were from contact by the male EMT, who was seated in position 6 at the front of the inward-facing bench seat, and from the patient at position 8<sup>1</sup>, who was supine on the cot. The class M oxygen cylinder located in the left front cabinet was undamaged and remained secured within the cabinet. A smaller class M oxygen cylinder found in the ambulance was also undamaged. Its location at the time of the crash is unknown. There was no damage to the visible oxygen lines. The upper left front wall intruded approximately 5 cm (2 in) into the patient compartment.



**Figure 6:** The ambulance's deformed steering wheel rim



**Figure 7:** Damaged cabinet at front right of patient compartment

The right side door to the patient compartment came open during the crash and the right side EMT and patient were ejected. SCI inspection of the right side entry door and rear patient loading doors revealed these to be closed and operational, with no evidence of any door malfunction. Impact forces probably caused dynamic flexion of the patient compartment and door frame causing the latch to separate from the striker and the door to open.

**Patient Cot:** The cot that was used to transport the patient was a Stryker EMS Model 6082 MX-PRO (Figure 8), serial number 050640318. It was an X-frame design, and could carry a maximum of 295 kg (650 lbs). It was 205 cm (80.5 in) in length and 58 cm (22.8 in) in width and could be set to seven different height positions. The back rest could be adjusted from 2-73 degrees from horizontal. The cot was equipped with torso, thigh, and lower leg restraints, all of which were tied to the frame of the cot. No discernable damage or contacts were noted on any of the restraints during SCI inspection. There were no shoulder restraints. There was a small oxygen tank secured to the cot at the head end. The tank was undamaged and there was no tubing or accessories attached at the time of SCI inspection.

The cot was secured by the ambulance's antler bracket and rail clamp (Figures 9 and 10). The antler bracket secures the head of the cot by restraining the undercarriage using the wheel frames as anchor points. The rail clamp (Stryker Serial No. 050640756) secured the frame of the cot. Neither the antler bracket nor rail clamp were damaged. The cot was still secured to the antler bracket and rail clamp following the crash based on the SCI interview with an emergency responder. The cot was also undamaged with the exception of a broken plastic left arm rail, which was possibly contacted by the patient left arm, since he sustained left elbow and hand abrasions. The patient stated during the SCI interview that he was supine on the cot, fully reclined. He was secured by the restraints at the chest, hip, and lower legs, but no shoulder restraints were used. He also stated the hip restraint was somewhat loose since he was



**Figure 8:** Stryker EMS Model 6082 MX PRO patient cot



**Figure 9:** Antler bracket mounted to floor of ambulance



**Figure 10:** Rail clamp on floor of ambulance

experiencing pain in that area. He slid out of the cot restraints and was ejected from the ambulance through the right door and was found on the ground, in close proximity to the ambulance.

## **MANUAL RESTRAINT SYSTEMS**

The front row was equipped with driver and front right passenger lap and shoulder safety belts. Neither safety belt was equipped with a pretensioner.

Inspection of the driver's safety belt assembly revealed no load marks to the belt webbing, latch plate, or D-ring and the belt moved freely in and out from the retractor. This evidence indicated that the driver was not restrained at the time of the crash.

The patient compartment was equipped with a rear-facing seat which was equipped with a lap belt. The safety belt's latch plate was sewn and the buckle was tucked into the bight of the seat. There were three lap safety belts for the bench seat mounted to the right side of the patient compartment wall. All were equipped with sewn latch plates. The single seat on the left side of the patient compartment was also equipped with a lap safety belt with a sewn latch plate.

The female EMT was seated unrestrained in the single seat on the left side of the patient compartment. Inspection of the lap safety belt revealed no evidence of usage. The male EMT was seated unrestrained on the bench seat on the right side of the patient compartment. Inspection of the lap safety belt revealed no evidence of usage. This was confirmed by the male EMT during the SCI interview

## **SUPPLEMENTAL RESTRAINT SYSTEMS**

The ambulance was not equipped with air bags.

## **1990 FORD E350 TYPE III AMBULANCE OCCUPANTS**

### **DRIVER DEMOGRAPHICS**

Age/Sex:	51 years/male
Height:	196 cm (77 in)
Weight:	104 kg (221 lbs)
Eyewear:	Glasses
Seat Type:	Box mounted bucket
Seat Track Position:	Unknown
Manual Restraint Usage:	None
Usage Source:	Vehicle inspection
Air Bags	Not equipped
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Extricated by emergency personnel through left front door
Transport from Scene:	Medevaced to hospital
Medical Treatment:	Expired prior to admission

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
1	Laceration (extravasation <sup>2</sup> of contrast from) right internal iliac artery with extensive, large, retroperitoneal hematoma	520608.4,1	Left lower instrument panel (includes knee bolster) (Indirect Injury)	Probable
2	Hemopneumothorax <sup>3</sup> , left, anterior pleural gap 10 mm, not further specified	442205.3,2	Steering wheel hub and/or spokes and rim	Certain
3	Pneumothorax, tiny, right, not further specified	442202.2,1	Steering wheel hub and/or spokes and rim	Certain
4	Fractured ribs: posterior right 7 <sup>th</sup> through 11 <sup>th</sup> and left 9 <sup>th</sup> rib laterally	450203.3,3	Steering wheel hub and/or spokes and rim	Certain
5	Fracture, non-displaced, left medial spine of scapula, not further specified	750951.2,2	Seat back, driver's	Probable
6	Pelvic ring fractures with incomplete disruption of posterior arch; fractures include: right inferior and superior pubic rami, diastasis of pubic symphysis, and bilateral diastasis of sacral iliac joints	856161.3,4	Left lower instrument panel (includes knee bolster) (Indirect Injury)	Certain
7	Fracture, comminuted, anterior and posterior columns of left acetabulum	856271.2,2	Left lower instrument panel (includes knee bolster), left of steering column (Indirect Injury)	Certain
8	Dislocation of left femoral head, posteriorly, from acetabulum	873030.2,2	Left lower instrument panel (includes knee bolster), left of steering column (Indirect Injury)	Certain

<sup>2</sup> The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:  
**extravasation (ek-strav''e-sa'shen)**: 1. a discharge or escape, as of blood, from a vessel into the tissues. 2. the process of being extravasated. 3. blood or other substance which has been extravasated.

<sup>3</sup> Needle decompression left thorax perform en route to hospital because of patient's difficulty breathing after extrication from vehicle.

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
9	Subluxation, laterally, of right patella indicating medial retinaculum injury <sup>4</sup>	874020.1,1	Left lower instrument panel (includes knee bolster), right of steering column	Certain
10	Fracture, comminuted, open, right anterior medial tibial plateau	854162.3,1	Left lower instrument panel (includes knee bolster), right of steering column	Certain
11	Fracture, chip, small, superior margin of left patella with soft tissue injury around knee, not further specified	840405.2,2	Left lower instrument panel (includes knee bolster), left of steering column	Certain
12	Contusion (bruising) and crepitus over left chest, not further specified	410402.1,2	Steering wheel hub and/or spokes and rim	Probable
13 14	Abrasions and contusions (bruising) noted over left abdomen, not further specified	510202.1,2 510402.1,2	Steering wheel rim	Probable
15	Contusions (bruising) and crepitus over left shoulder, not further specified	710402.1,2	Seat back, driver's	Probable
16	Abrasions/scrapes, small, noted on left and right upper extremities, not further specified	710202.1,3	Left lower instrument panel (includes knee bolster)	Probable
17	Laceration, open, left arm just above elbow, not further specified	710602.1,2	Left instrument panel	Probable
18	Laceration, complex, 15.2 cm (6 in), horizontally oriented across just below right knee exposing bone with moderate to large joint effusion	874089.1,1	Left lower instrument panel (includes knee bolster), right of steering column	Certain
19	Laceration, complex, 15.2 cm (6 in), horizontally oriented across left knee exposing bone with air in joint space; foreign body present	874089.1,2	Left lower instrument panel (includes knee bolster), left of steering column	Certain

Sources: *Emergency Room Records* and *EMS treatment Record*. Injury Numbers 12 through 16 came only from the **EMS treatment Record**. Injury Numbers 1, 3 through 11, and 17 came only from **Emergency Room Records**. Injury Numbers 2, 18 and 19 came from a combination of **EMS Treatment** and **Emergency Room Records**.

<sup>4</sup> Medial and lateral retinacula of the knee:

The medial (inner aspect) and lateral (outer aspect side) retinacula are the bands of fibrous tissue that help to support the patella in its position in relation to the femur bone below (underneath) it.

Laterally and medially to the patellar ligament, the lateral and medial patellar retinacula connect fibers from the vastus lateralis and medialis muscles to the tibia. Some fibers from the iliotibial tract radiate into the lateral retinaculum, and the medial retinaculum receives some transverse fibers arising on the medial femoral epicondyle.

<http://www.orthopaedicsone.com/display/Main/Medial+and+lateral+retinacula+of+the+knee>

The impact with the Ranger displaced the unrestrained driver forward opposite the 12 o'clock direction of force. The driver's knees contacted the lower instrument panel and his chest impacted and deformed the steering wheel. The contact with the lower instrument panel resulted in a pelvic ring fracture, a laceration of his right internal iliac artery, and dislocation of left femoral head. The contact with the lower left instrument panel also caused a fractured left acetabulum, a comminuted fracture of the right tibia, a chip fracture of the left patella and a subluxation of the right patella, and 15 cm (6 in) lacerations to both knees. The contact with the instrument caused abrasions to both upper extremities and a laceration to the left upper arm. The contact with the steering wheel resulted in a left hemopneumothorax, a right pneumothorax, fractures of right posterior ribs 7-11 and the 9<sup>th</sup> left rib, contusion and crepitus of the left chest, and abrasions and contusions about the left abdomen. Rescue personnel mechanically extricated the driver using pneumatic shears and spreading devices to remove the door and widen the left door opening. He was medevaced to a hospital, where he expired prior to admission.

#### LEFT INWARD FACING SINGLE SEAT (POSITION 7) PASSENGER DEMOGRAPHICS

Age/Sex: 30 years/female  
 Height: 183 cm (72 in)  
 Weight: 153 kg (338 lb)  
 Eyewear: Unknown  
 Seat Type: Inward-facing single seat  
 Seat Track Position: Fixed  
 Manual Restraint Usage: None  
 Usage Source: Vehicle inspection/interview  
 Air Bags: None available  
 Alcohol/Drug Involvement: None reported  
 Egress from Vehicle: Exited patient loading doors under own power  
 Transport from Scene: Medevaced to hospital  
 Medical Treatment: Admitted to hospital for two days

#### LEFT INWARD FACING SINGLE SEAT (POSITION 7) PASSENGER INJURIES

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
1	Concussion with loss of consciousness of less than 30 minutes	161004.2,0	Other interior object: ambulance padded overhead supply cabinet over countertop and paperwork area	Probable
2	Fracture, comminuted, closed, left olecranon process of ulna with rotation and displacement – ORIF <sup>5</sup>	752173.2,2	Other interior object: ambulance vertical storage panel that supported the countertop and paperwork area	Certain

<sup>5</sup> ORIF (Open Reduction and Internal Fixation); prosthetic radial head implanted.



Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
3	Fracture, comminuted, closed, proximal left radial head with ...	752171.2,2	Other interior object: ambulance vertical storage panel that supported the countertop and paperwork area	Certain
4	Dislocation (subluxation), medially, of radius and ulna with respect to distal humerus	772032.1,2		
5	Dislocation (grade 1 spondylolisthesis) with bilateral L <sub>5</sub> spondylolysis <sup>6</sup>	650604.2,8	Other interior object: ambulance vertical storage panel that supported the countertop and paperwork area	Certain
6	Contusion (hematoma) left tempoparietal scalp with swelling	110402.1,2	Other interior object: ambulance padded overhead supply cabinet over countertop and paperwork area	Probable
7	Abrasion, superficial, right temporal scalp, not further specified	110202.1,1	Other interior object: ambulance partition behind the driver's seat	Probable
8	Contusion (hematoma), large, medial left elbow with joint effusion	710402.1,2	Other interior object: ambulance vertical storage panel that supported the countertop and paperwork area	Certain
9	Contusion, large, right triceps, not further specified	710402.1,1	Other interior object: ambulance rear-facing seat attached to partition behind driver's seat	Probable
10 11	Abrasion and contusion right medial forearm, not further specified	710202.1,1 710402.1,1	Other interior object: ambulance rear-facing seat attached to partition behind the driver's seat	Probable
12	Abrasion right thigh, not further specified	810202.1,1	Other interior object: ambulance patient cot	Possible
13	Contusion right lateral thigh with swelling and a seroma <sup>7</sup> collection in posterior right thigh requiring some drainage	810402.1,1	Other interior object: ambulance patient cot	Possible

<sup>6</sup> The following terms are defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:

**spondylolisthesis** (*spon''da-lo-lis-the/sis*): forward displacement (olisthy) of one vertebra over another, usually of the fifth lumbar over the body of the sacrum, or of the fourth lumbar over the fifth, usually due to a developmental defect in the pars interarticularis.

**spondylosis** (*spon''da-lo/sis*): degenerative spinal changes due to osteoarthritis.

<sup>7</sup> The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:

**seroma** (*se-ro/ma*): a tumorlike collection of serum in the tissues.

The seromas were diagnosed and drained during follow-up visits to the hospital.



Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
14	Contusion left distal medial thigh with large seroma collection in posterior left thigh requiring multiple episodes of drainage	810402.1,2	Other interior object: ambulance vertical storage panel that supported the countertop and paperwork area	Probable

Sources: *Emergency Room Records, Hospitalization Records, and EMS treatment Record.* Injury Numbers 7 through 12 came only from Emergency Room Records. Injury Numbers 1 through 6, 13, and 14 came from a combination of Emergency Room and Hospital Records.

#### LEFT INWARD FACING SINGLE SEAT (POSITION 7) PASSENGER KINEMATICS

The passenger was an EMT, seated in position 7, the inward-facing single seat on the left side of the patient compartment. Emergency room documents state that she had begun to stand up immediately prior to impact with the Ford. The braking and impact displaced the EMT forward, toward the front of the patient compartment. She contacted a vertical panel to her immediate left, that supported a counter top and work station causing a comminuted, closed fracture of the left ulna, a dislocated left elbow, dislocation of L<sub>5</sub>, a left elbow contusion, and a contusion of the left medial thigh. The rear of the ambulance pitched upward and displacing the passenger upward, and she contacted a padded overhead supply cabinet with her head causing a concussion and a contusion to the left temporal scalp. Her body rotated counterclockwise around the work station and she contacted the patient cot, sustaining an abrasion and a contusion on the right lateral thigh. She continued forward, toward the front of the patient compartment, and contacted the partition behind the driver's seat, sustaining an abrasion to her right temporal scalp. She also contacted the rear facing, unoccupied EMT's seat, sustaining a contusion to her right triceps as well as an abrasion and contusion to her right medial forearm. The passenger exited the vehicle without assistance through the patient loading doors and was medevaced to a hospital where she was hospitalized for two days.

#### RIGHT INWARD FACING BENCH SEAT (POSITION 6) PASSENGER DEMOGRAPHICS

Age/Sex:	46 years/male
Height:	173 cm (68 in)
Weight:	95 kg (209 lbs)
Eyewear:	None
Seat Type:	Inward facing bench
Seat Track Position:	Fixed
Manual Restraint Usage:	None
Usage Source:	Inspection/interview
Air Bags	None available
Alcohol/Drug Involvement:	None reported
Egress from Vehicle:	Completely ejected
Transport from Scene:	Medevaced to hospital
Medical Treatment:	Hospitalized two days

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
1	Concussion with brief or no loss of consciousness <sup>8</sup> but emesis, dizziness, headache and post-concussive symptoms	161002.2,0	Other interior object: ambulance cabinet door <sup>9</sup>	Certain
2	Fracture, closed, non-displaced, of tuberculum <sup>10</sup> of trapezium left hand within carpal tunnel	752461.2,2	Other interior object: ambulance cabinet door <sup>8</sup>	Certain
3	Laceration, between 4 and 7.6 cm (1.6 - 3 in), complex, right posterior scalp requiring surgical repair	110602.1,1	Other interior object: ambulance cabinet door <sup>8</sup>	Certain
4	Contusion (hematoma) right posterior parieto-occipital scalp	110402.1,1	Other interior object: ambulance cabinet door <sup>8</sup>	Certain
5 6	Abrasions, superficial, throughout face and scalp, not further specified	110202.1,0 210202.1,0	Other interior object: ambulance cabinet door <sup>8</sup>	Certain
7	Contusions (ecchymoses) right peri-orbital and preauricular <sup>11</sup> right ear with tenderness	210402.1,1	Other interior object: ambulance cabinet door <sup>8</sup>	Certain
8	Abrasion right flank, not further specified	510202.1,1	Other interior object: ambulance cabinet door <sup>8</sup>	Certain
9	Abrasion, large, right posterior shoulder, not further specified	710202.1,1	Other interior object: ambulance cabinet door <sup>8</sup>	Certain
10	Abrasions, multiple, left upper extremity, not further specified	710202.1,2	Other interior object: ambulance cabinet door <sup>8</sup>	Certain
11	Abrasion on knuckle of left hand	710202.1,2	Other interior object: ambulance cabinet door <sup>8</sup>	Certain
12	Contusion (ecchymosis), volar <sup>12</sup> aspect of left 3 <sup>rd</sup> digit	710402.1,2	Other interior object: ambulance cabinet door <sup>8</sup>	Certain

<sup>8</sup> Loss of consciousness or no loss of consciousness depending on which medical record is read, but concussion was diagnosed.

<sup>9</sup> Cabinet was attached to partition behind front right passenger's seat.

<sup>10</sup> The following terms are defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:  
**tubercle** (*too'ber-kel*): 1. a nodule or small eminence; in official nomenclature called **tuberculum**.  
**tuberculum** (*too-bur'ku-lem*): **tubercle**; anatomical nomenclature for a nodule, or small eminence, such as a rough, rounded eminence on a bone; similar structures may be called *tubers* or *tuberosities*.  
**tubercle of trapezium, tuberculum ossis trapezii**: a prominent ridge on the palmar surface of the trapezium bone, forming the lateral margin of the groove that transmits the tendon of the flexor carpi radialis muscle.  
Treated with a left thumb spica splint.

<sup>11</sup> The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:  
**preauricular** (*pre''aw-rik'u-ler*): anterior to the auricle of the ear.

<sup>12</sup> The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:  
**volar** (*vo'ler*): pertaining to the palm or sole; plantar; indicating the flexor surface of the forearm, wrist, or hand.

Sources: Emergency Room Records, Hospitalization Records, and EMS treatment Record. Injury Numbers 2 and 10 through 12 came only from Hospitalization Records. Injury Numbers 1 and 4 through 9 came from a combination of Emergency Room and Hospitalization Records. Injury Number 3 came from a combination of all sources.

### RIGHT INWARD FACING BENCH SEAT (POSITION 6) PASSENGER KINEMATICS

The passenger was an EMT, seated unrestrained at position 6, the forward position of the bench seat on the right side of the patient compartment. He was leaning forward attending to the patient. The impact with the Ranger displaced him forward, toward the front of the patient compartment. He contacted the door of the cabinet at the front right panel of the patient compartment. This impact caused heavy damage to the cabinet door. The EMT sustained a fractured left thumb, an 8 cm (3 in) vertical laceration to the back of his head requiring 8 staples, a concussion, and contusions to the right side of the head, right orbital bone, and ear. He also sustained multiple abrasions throughout the face and scalp, right shoulder and flank, as well as abrasions on his left upper arm and left knuckles, and a contusion of his left third finger. The EMT was completely ejected from the ambulance through the right door as the vehicle came to final rest. He was medevaced to a hospital, where he was hospitalized for two days.

### OTHER ROW PASSENGER (POSITION 8), PATIENT DEMOGRAPHICS

Age/Sex: 50 years/male  
 Height: 168 cm (66 in)  
 Weight: 82 kg (181 lbs)  
 Eyewear: None  
 Seat Type: Patient cot  
 Seat Track Position: N/A  
 Manual Restraint Usage: Chest, hip, and lower leg straps  
 Usage Source: Interview  
 Air Bags: None available  
 Alcohol/Drug Involvement: None reported  
 Egress from Vehicle: Completely ejected  
 Transport from Scene: Ambulance to hospital  
 Medical Treatment: Hospitalized two days

### OTHER ROW PASSENGER (POSITION 8), PATIENT INJURIES

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
1	Fractures, closed, non-displaced, left lateral 4 <sup>th</sup> through 7 <sup>th</sup> ribs	450203.3,2	Other interior object: ambulance cabinet door <sup>8</sup>	Probable
2	Fracture, closed, comminuted, left distal clavicle with normal glenohumeral joint	750751.2,2	Other interior object: ambulance cabinet door <sup>8</sup>	Probable
3	Abrasion on nose, not further specified	210202.1,4	Other interior object: ambulance cabinet door <sup>8</sup>	Probable

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
4	Abrasions left elbow and left hand, not further specified	710202.1,2	Other interior object: ambulance cabinet door <sup>8</sup>	Probable
5	Laceration (scratch) inner left thigh, not further specified	810602.1,2	Other interior object: ambulance patient cot	Probable
6	Abrasion left knee, not further specified	810202.1,2	Ground	Possible
7	Abrasion, small, right knee, not further specified	810202.1,1	Ground	Possible
8	Abrasion right outer lower leg, not further specified	810202.1,1	Other interior object: ambulance restraint straps on patient cot	Possible
9	Abrasions dorsum (top) feet, bilaterally	810202.1,3	Other interior object: ambulance restraint straps on patient cot	Possible

Sources: *Emergency Room Records and Hospitalization Records.* Injury Numbers 3 and 6 came only from **Emergency Room Records**. Injury Numbers 4, 5, 8, and 9 came only from **Hospitalization Records**. Injury Numbers 1, 2, and 7 came from a combination of **Emergency Room** and **Hospitalization Records**.

#### **OTHER ROW PASSENGER (POSITION 8), PATIENT KINEMATICS**

The patient was situated in position 8, supine in the cot, and was receiving oxygen. The cot was secured by the antler bracket and rail clamp. The front plane impact displaced the patient forward and he slid out of the restraints and was displaced from the cot. He contacted and broke the left arm rail of the cot and sustained abrasions to his left elbow and hand. He continued forward and contacted the cabinet door at the front of the patient compartment, causing fractures to his left lateral 4<sup>th</sup> through 7<sup>th</sup> ribs, and a comminuted fracture of his left clavicle. He also sustained a laceration to his left inner thigh from contact with the patient cot, and abrasions to his right lower leg and tops of feet from the cot restraint straps. He was then completely ejected from the ambulance through the right door as the vehicle came to final rest. He sustained abrasions to both knees and his nose from contact to the ground. He was transported by ambulance and was hospitalized for four days.

#### **2002 FORD RANGER SUPERCAB**

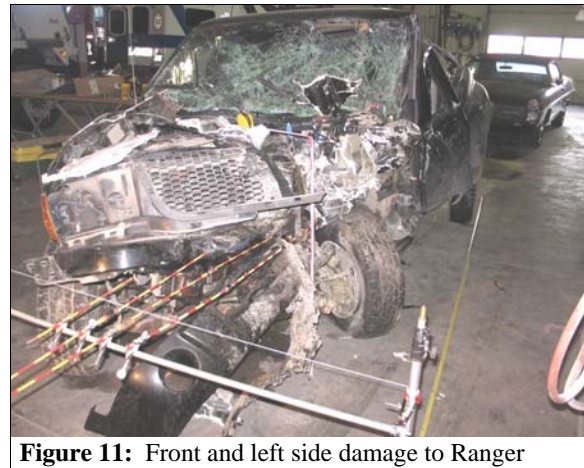
##### **DESCRIPTION**

The Ranger was a rear wheel drive, four-passenger, two-door compact pickup truck (VIN: 1FTYR44UX2Pxxxxxx), equipped with a 3.0-liter V-6 engine and an automatic transmission. The Ranger was also equipped with 4-wheel anti-lock brakes, frontal air bags and an Event Data Recorder (EDR).

The vehicle manufacturer's recommended tire size was P235/70R16. The vehicle was equipped with tires of the recommended size, except for the right rear tire which was size P235/75R15. The recommended cold tire pressure for the front and rear tires was 207 kPa (30 psi).

## EXTERIOR DAMAGE

**Exterior Damage:** The Ranger sustained front plane damage during the impact with the ambulance. The front bumper, grille, hood, left head lamp/turn signal assembly, left fender, and left front wheel were directly damaged (**Figure 11**). The direct damage on the front plane began at the front left bumper corner and extended 140 cm (55.1 in) along the front plane. The Field L was 23 cm (9.1 in). Crush measurements were taken at the front bumper level and maximum residual crush was 160 cm (63 in) occurring at  $C_1$ . The vehicle's left side wheelbase was shortened 81 cm (31.8 in), while the right side wheelbase was extended 13 cm (5.1 in). The crush values were:  $C_1=160$  cm (63 in),  $C_2=97$  cm (38.2 in),  $C_3=48$  cm (18.9 in),  $C_4=8$  cm (3.1 in).



**Figure 11:** Front and left side damage to Ranger

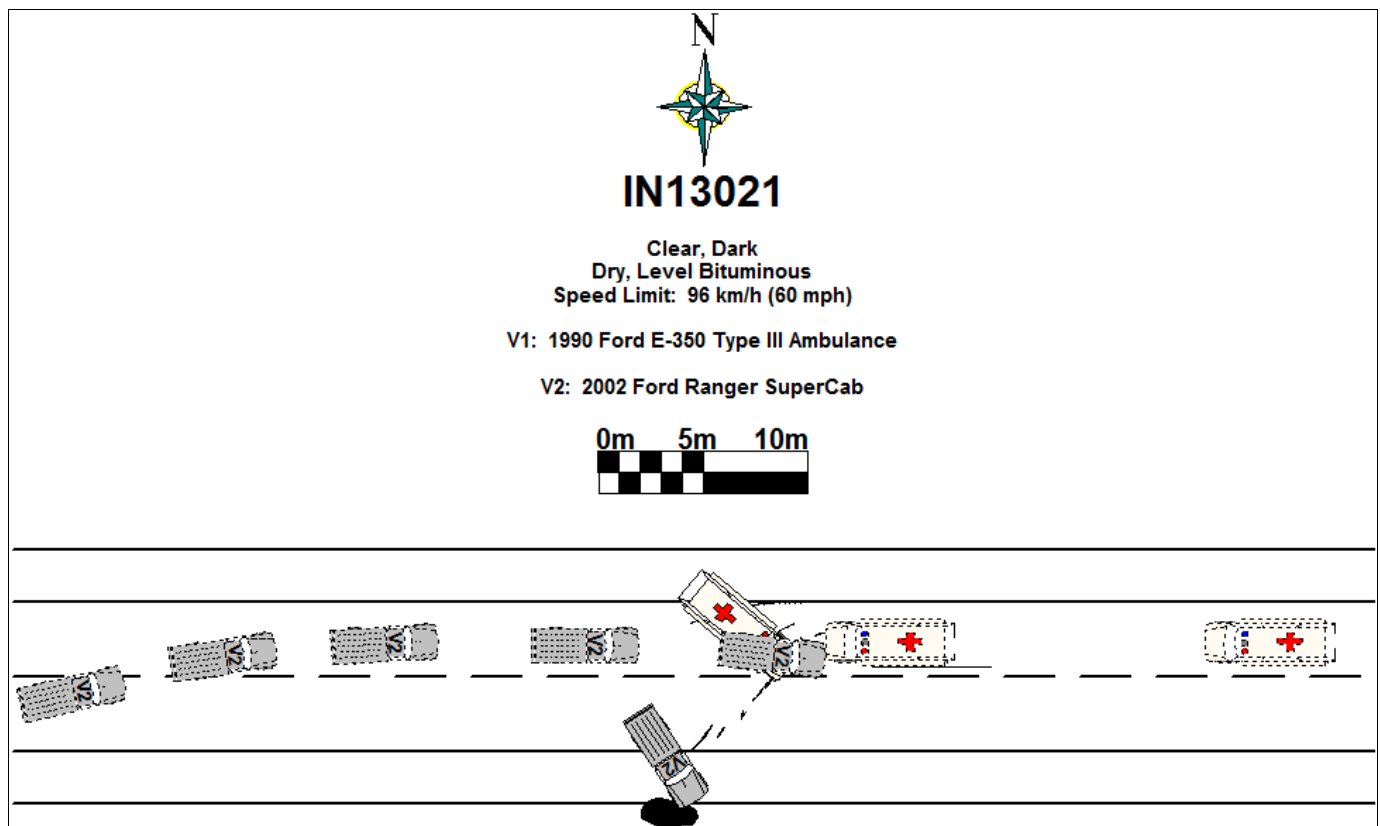
**Damage Classification:** Collision Deformation Classification (CDC) for the impact with the ambulance was 12FDEW6 (0 degrees). The Damage algorithm of the WinSMASH program calculated the total Delta V as 110 km/h (68.4 mph). The longitudinal and lateral velocity changes were -110 km/h (-68.4 mph) and 0 km/h. The results should be considered for informational purposes only since the ambulance was an altered vehicle and an accurate weight of the vehicle could not be determined. Guidance from NHTSA indicates that WinSMASH generally over-estimates Delta V above 80 km/h (50 mph).

## EVENT DATA RECORDER

The Ranger's Air Bag Control Module (ACM), which contains the EDR, was removed by the police, who imaged the EDR using version 10.1 of the Bosch Crash Data Retrieval. The EDR file was obtained during the SCI investigation and reported with version 12.1. The EDR reported one deployment event. No diagnostic codes were active at the time of the event. The driver's frontal air bag and safety belt pretensioner deployed 11.25 msec after Algorithm Enable (AE). The maximum longitudinal cumulative velocity change was reported as -37.93 km/h (-23.57 mph) and occurred 43 msec after AE. Results appear low based on the severity of the damage to the vehicle.

## OCCUPANT DATA

The driver of the Ranger (24-year-old male) was not restrained by the lap-and-shoulder safety belt, according to the police crash report. A forensic toxicology report of the driver indicated the presence of Amphetamine, <5 ng/mL and the presence of Methamphetamine, at 5 ng/mL. The driver sustained a fatal injury and was pronounced dead at the scene.



Attachment A  
Event Data Recorder (EDR) Report  
2002 Ford Ranger



**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	1FTYR44UX2P*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	IN13021_V1_CDR.CDRX
Saved on	
Collected with CDR version	Crash Data Retrieval Tool 10.1
Reported with CDR version	Crash Data Retrieval Tool 12.1
EDR Device Type	Airbag Control Module
Event(s) recovered	Deployment

## Comments

.

## Data Limitations

### Important Limitations on Bosch Crash Data Retrieval (CDR) Tool Capabilities.

Disclaimer: This Restraint Control Module (RCM) records longitudinal deceleration data for the purpose of understanding the input data the Restraint Control Module used to determine whether or not to deploy restraint devices. This module does not record vehicle speed, throttle position, brake on-off, and other data, which may be recorded in some 1999 model year and later General Motors modules. The deceleration data recorded by Ford's module during a crash can subsequently be mathematically integrated into a longitudinal Delta-V. Delta-V is the change in velocity during the recording time and is NOT the speed the vehicle was travelling before the accident, and is also not the Barrier Equivalent Velocity. The Bosch CDR Tool will read and interpret both acceleration in G's and Delta-V in mph. RCM's in Ford vehicles that can be read by the Bosch CDR tool are listed in the Bosch Help Files.

### Important

If there is any question that the restraint system did not perform as it was designed to perform, please read the system only through the diagnostic link connector. The Bosch CDR kit provides an RCM interface cable to plug directly into the restraint control module. The Bosch CDR RCM Interface Cable connects only power, ground, and memory read pins to the relevant vehicle restraint control module. The other RCM pins normally connect to inputs, such as sensors, and outputs, such as airbags, are not connected when you use the RCM Interface Cable to plug directly into the module. Since the vehicle restraint control module is constantly monitoring airbag system readiness (when powered), it will detect that the sensors and airbags are not connected. The restraint control module may record a new diagnostic trouble code into memory for each device that is not connected. These new diagnostic trouble codes may record over previously written diagnostic trouble codes present prior to the accident and spoil evidence necessary to determine if the restraint system performed in the accident as it was designed to perform. Not only could this prevent Ford from being able to determine if the system performed as it was designed to perform, but, regardless of innocent inadvertence, you could raise issues of evidence spoliation in any litigation that may arise out of the accident. If you cannot read the module via the diagnostic link connector, and if you suspect improper system performance, contact Ford Motor Company and request their assistance to read the module with a proper vehicle simulator attached.

While data stored in RCM's is accurate, accident reconstructionists must be aware of the limitations of the data recorded in Ford's control modules and should compare the recorded data with the physical evidence at the accident scene using professional accident reconstruction techniques (i.e. vehicle crush characteristics, skid marks, etc) before making any assumptions about the import and validity of the data recorded in the module with respect to the crash event being analyzed. The following describes specific limitations that must be considered when analyzing recorded data. Investigators should obtain permission of the vehicle owner or have sufficient legal authority prior to reading any data.

1. There may be no deceleration data recorded in the module.

Loss of power (cut wires, damaged battery, crushed fuse box) to the module during or immediately after the crash may prevent the crash data from being recorded. A backup power supply within the module has sufficient power to continue to analyze the deceleration data and deploy restraint devices if needed, but there is no backup power for recording.

If the deceleration input does not create a vehicle longitudinal Delta-V above 4 mph within 100 milliseconds, there may not be any data recorded.

2. In unusual circumstances, deceleration data stored in the module may be from a crash other than the one you are currently analyzing.

The module will record data from some non-deploy events. If, after the module has recorded data from a non-deploy event, and there is a subsequent event in which there is a loss of power and no new recording is made for that subsequent event, the deceleration data in the module's memory may be from the prior event. If the new, subsequent event is a deploy event and recording has occurred, the deployment times should be recorded. If there are no deployment times recorded, but airbags or other restraint devices are observed to have deployed, the recorded data that you read are most likely from a prior event.

Once an airbag or other restraint device has been commanded to deploy, the data recorded in connection with that deployment are "locked", and subsequent crashes cannot be recorded.

If a vehicle is being repaired, the RCM should be replaced after any crash in which restraint devices deploy. Early printed shop manuals refer to re-using modules by clearing the "crash data memory full" code, but this is no longer true and the latest on-line electronic shop manual directs that modules be replaced.

Crashes that involve multiple impacts will record only one of the impacts. If there is a deployment, the deployment event will be recorded and locked. If no restraint device is commanded to deploy, the recorded data are not "locked", and subsequent impacts may record over any previous recorded data. Further analysis will be required to determine which of the events was actually recorded.

3. The computed longitudinal Delta-V may understate the total Delta-V

Many real-world crashes can last longer than the memory has the capacity to record. Therefore, the actual Delta-V of the event may be higher than the Delta-V calculated and displayed by the Bosch CDR System output. Review the end of the longitudinal acceleration/deceleration pulse - if it has not settled to zero G's by the end of the recording, the vehicle longitudinal Delta-V is most likely understated. If there is a clear decaying trend line you may choose, at your own risk, to estimate the total Delta-V by extrapolating the decay trend to zero and to calculate the additional Delta-V not captured.

Under some circumstances where power is interrupted, during the recording of data, or the module re-sets during the recording of data, a partial recording may occur. This will be shown as "no data" in the data table and will not be plotted on the graph of acceleration. When some portion of the acceleration data is not recorded, the Delta-V during that time cannot be calculated. A Delta-V will be calculated for the points that are valid, but the user must be aware that the partial Delta-V calculated will further underestimate the actual event total Delta-V.

4. This module records only longitudinal acceleration/deceleration of the vehicle. You must compute lateral or resultant total acceleration based on your estimated Principal Direction of Force (PDOF).

5. Vertical acceleration/decelerations are not recorded. Vehicle spin about a point not centered on the Restraints Control Module sensor may add or subtract from bulk vehicle motion.

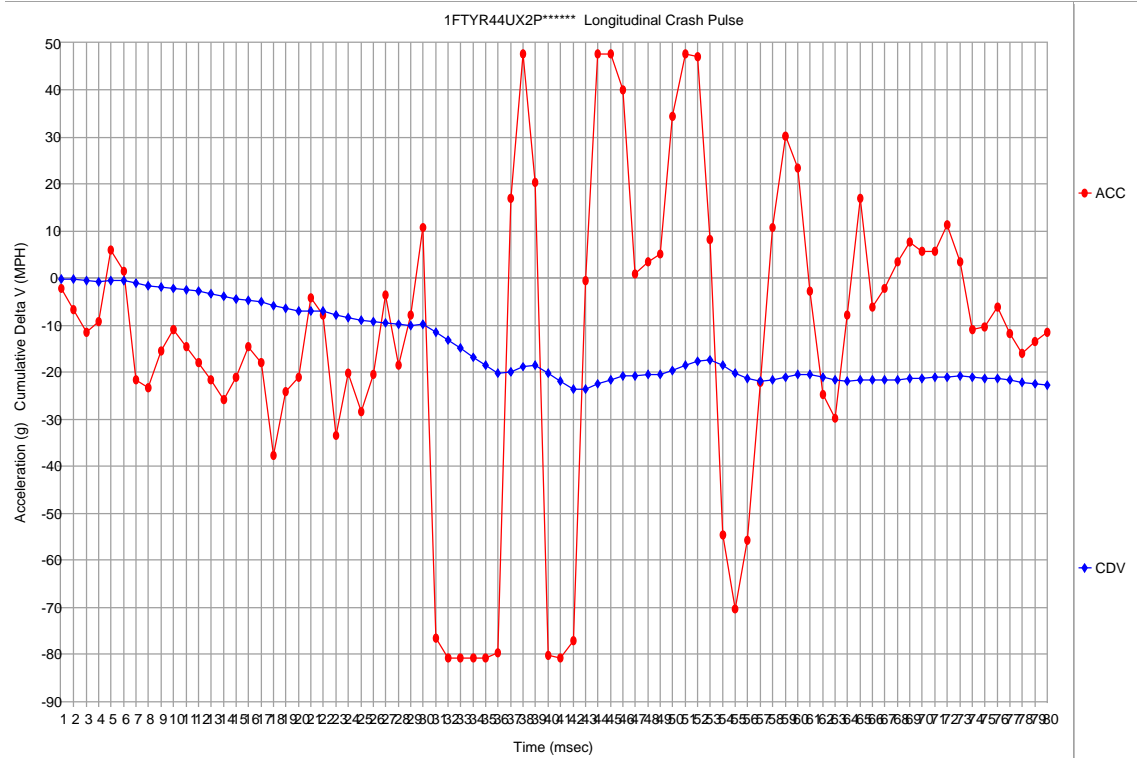
6. This module is not intended to record acceleration/deceleration in a side-impact event. If the side impact generates a longitudinal deceleration component sufficient to wake up the frontal deployment algorithm, there may be a recording of longitudinal deceleration in a side impact event.

Any Longitudinal Delta-V determined by using data read from the air bag module should be verified with physical evidence from the crash (such as vehicle crush, skid marks) and assumed accident sequence. Multiple impacts, angular collisions, side impacts, vehicle spin, etc should be considered in addition to the data read from the air bag module.

02001\_RCM-1\_r002

**System Status At Deployment**

Diagnostic codes active when event occurred	0
Passenger Airbag Switch Position During Event	Activated
Time From Side Safing Decision to Left (Driver) Side Bag Deployment (msec)	Not Deployed
Frontal and Pretensioner Fire time (ms)	11.25



### Crash Pulse Data

Milliseconds	Long. Acceleration (Gs)	Long. Cumulative Delta V (MPH)
1	-2.06	-0.05
2	-6.68	-0.19
3	-11.31	-0.44
4	-9.25	-0.64
5	6.17	-0.51
6	1.54	-0.47
7	-21.59	-0.95
8	-23.13	-1.46
9	-15.42	-1.79
10	-10.79	-2.03
11	-14.39	-2.35
12	-17.99	-2.74
13	-21.59	-3.22
14	-25.70	-3.78
15	-21.07	-4.24
16	-14.39	-4.56
17	-17.99	-4.95
18	-37.52	-5.78
19	-24.16	-6.31
20	-21.07	-6.77
21	-4.11	-6.86
22	-7.71	-7.03
23	-33.41	-7.76
24	-20.05	-8.20
25	-28.27	-8.82
26	-20.56	-9.28
27	-3.60	-9.36
28	-18.50	-9.76
29	-7.71	-9.93
30	10.79	-9.69
31	-76.59	-11.38
32	-80.70	-13.15
33	-80.70	-14.92
34	-80.70	-16.69
35	-80.70	-18.46
36	-79.67	-20.21
37	16.96	-19.84
38	47.80	-18.79
39	20.56	-18.34
40	-80.18	-20.10
41	-80.70	-21.87
42	-77.10	-23.56
43	-0.51	-23.57
44	47.80	-22.52
45	47.80	-21.48
46	40.09	-20.59
47	1.03	-20.57
48	3.60	-20.49
49	5.14	-20.38
50	34.44	-19.62

Milliseconds	Long. Acceleration (Gs)	Long. Cumulative Delta V (MPH)
51	47.80	-18.57
52	47.29	-17.54
53	8.22	-17.36
54	-54.48	-18.55
55	-70.42	-20.10
56	-55.51	-21.32
57	-22.10	-21.80
58	10.79	-21.57
59	30.33	-20.90
60	23.64	-20.38
61	-2.57	-20.44
62	-24.67	-20.98
63	-29.81	-21.63
64	-7.71	-21.80
65	16.96	-21.43
66	-6.17	-21.57
67	-2.06	-21.61
68	3.60	-21.53
69	7.71	-21.36
70	5.65	-21.24
71	5.65	-21.11
72	11.31	-20.87
73	3.60	-20.79
74	-10.79	-21.02
75	-10.28	-21.25
76	-6.17	-21.38
77	-11.82	-21.64
78	-15.93	-21.99
79	-13.36	-22.29
80	-11.31	-22.54

## Hexadecimal Data

Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR system.

```
0800: AD 42 40 5F 14 A2 58 2D 0D 23 0F 2D 38 57 C8 FF
0810: 10 FF F6 13 3C 78 32 9E 08 A2 F9 EF 19 99 52 49
0820: 2D 03 5F 0F 1E 0A F5 0A A1 5E 03 0E 1D 1E 00 25
0830: 0A 3C 80 28 05 28 56 0A 28 0A 0B 36 03 84 B7 03
0840: 03 09 11 09 92 35 44 07 D0 00 82 00 E3 13 88 00
0850: C8 00 C8 61 A8 02 BC 03 21 04 CE 00 2D 00 A1 0B
0860: 0E 20 D0 02 20 00 00 00 F5 00 74 00 0A 07 37 7D
0870: 00 00 25 00 27 61 A8 0D 48 02 58 00 96 04 28 01
0880: DC 00 0D 00 99 00 88 00 FA 03 2A 00 42 00 00 1E
0890: 00 78 15 FF 64 64 3B 32 2B 4B 02 18 10 01 FF F3
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08C0: 04 FF FF FF FF FF 17 13 64 31 4C 35 41 00 03 0C
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0910: FF 13 01 29 30 22 01 29 30 29 31 74 63 74 FF FD
0920: 9A 91 88 8C AA A1 74 71 80 89 82 7B 74 6C 75 82
0930: 7B 55 6F 75 96 8F 5D 77 67 76 97 7A 8F B3 09 01
0940: 01 01 01 03 BF FB C6 02 01 08 9D FB FB EC A0 A5
0950: A8 E1 FB FA AE 34 15 32 73 B3 D9 CC 99 6E 64 8F
0960: BF 92 9A A5 AD A9 A9 B4 A5 89 8A 92 87 7F 84 88
0970: 00 1B 00 00 00 00 00 00 1B 07 D0 07 D0 01 40 00 08
0980: 00 08 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0990: 00 00 00 00 9E 88 00 00 F0 7F 00 2B 00 00 00 00
09A0: 00 A0 00 7C 00 21 00 00 00 2D 00 4A 00 00 00 08
09B0: 00 65 00 00 00 2D 00 96 01 41 00 00 00 00 00 00
09C0: 00 00 2D FF 00 FF FF 07 4B 00 FF FF FF FF FF FF
09D0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
09E0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
09F0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
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## Disclaimer of Liability

The users of the CDR product and reviewers of the CDR reports and exported data shall ensure that data and information supplied is applicable to the vehicle, vehicle's system(s) and the vehicle ECU. Robert Bosch LLC and all its directors, officers, employees and members shall not be liable for damages arising out of or related to incorrect, incomplete or misinterpreted software and/or data. Robert Bosch LLC expressly excludes all liability for incidental, consequential, special or punitive damages arising from or related to the CDR data, CDR software or use thereof.