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Special Crash Investigations: On-Site Ambulance Crash Investigation; Vehicle: 2016 Ford F-350 Type I Ambulance; Location: Oklahoma; Crash Date: August 2017

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Each crash represents a unique sequence of events, and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicles or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team on the date this report was published.

16. Abstract

This on-site investigation documents the single vehicle crash of a 2016 Ford F-350 Type I ambulance that occurred in an interchange on the east side of a four-lane, divided interstate highway. The Ford was a rear-wheel-drive, Super Duty chassis-cab equipped with dual-stage frontal air bags, rollover/side impact inflatable curtain (IC) air bags, and a Type I ambulance body manufactured by Frazer Ltd. A belted 33-year-old male drove the vehicle. An unbelted 28-year-old female paramedic and a 66-year-old female patient occupied the patient compartment. The patient was restrained on a Stryker Model 6506 Power Pro XT patient cot. The ambulance was traveling in a left curve in the right northbound lane. The vehicle departed the right side of the roadway in a counterclockwise yaw, and the front plane struck a crash attenuator (Event 1). The vehicle continued to yaw counterclockwise as it traversed a sloped roadside then rolled over (Event 2), right-side-leading, an estimated eight-quarter turns over a distance of approximately 32 m (105 ft). The patient compartment completely separated from the vehicle during the rollover and the patient and paramedic were ejected from the vehicle. The driver and paramedic sustained police-reported "B" (non-incapacitating) and "A" (incapacitating) injuries respectively, and were transported by another ambulance to a hospital. The driver was treated and released from the hospital. The paramedic was hospitalized for 12 days and then was transferred to a skilled nursing facility. The patient sustained fatal injuries and was pronounced deceased at the crash scene. The ambulance was towed from the crash scene due to damage.

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On-Site Ambulance Crash Investigation
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BACKGROUND

This report documents the on-site investigation of the single-vehicle crash of a 2016 Ford F-350 Type I Ambulance (**Figure 1**). This crash investigation was initiated by the National Highway Traffic Safety Administration in August 2017 through NHTSA's Emergency Medical Services (EMS) office and assigned to the Special Crash Investigations (SCI) team at the Indiana University Transportation Research Center. The crash occurred in Oklahoma in August 2017 during the evening hours and was investigated by a local police agency. The ambulance and crash scene were inspected in August 2017.

Figure 1. The damaged 2016 Ford F-350 Type I ambulance.

This report documents the on-site investigation of the single-vehicle crash of a 2016 Ford F-350 Type I ambulance that occurred in an interchange and the east side of a four-lane, divided interstate highway. The Ford was a rear-wheel-drive, Super Duty chassis-cab equipped with dual-stage frontal air bags, rollover/side impact inflatable curtain (IC) air bags, and a Type I ambulance body manufactured by Frazer, Ltd. (Houston, TX). A belted 33-year-old male drove the vehicle. An unbelted 28-year-old female paramedic and a 66-year-old female patient occupied the patient compartment. The patient was a non-emergent transfer from one medical facility to another. The patient was restrained on a Stryker Model 6506 Power Pro XT patient cot. The ambulance was traveling in a left curve in the right northbound lane. The vehicle departed the right side of the roadway in a counterclockwise yaw and the front plane struck a crash attenuator (Event 1). The vehicle continued to yaw counterclockwise as it traversed a sloped roadside then rolled over (Event 2), right-side-leading, an estimated eight-quarter turns over a distance of approximately 32 m (105 ft). The patient compartment completely separated from the vehicle during the rollover and the patient and paramedic were ejected from the vehicle. The driver and paramedic sustained police-reported "B" (non-incapacitating) and "A" (incapacitating) injuries respectively, and were transported by another ambulance to a hospital. The driver was treated and released from the hospital. The paramedic was hospitalized for 12 days and then was transferred to a skilled nursing facility. The patient sustained fatal injuries and was pronounced deceased at the crash scene. The ambulance was towed from the crash scene due to damage.

Ambulance Service, Personnel, and Driver Training: The ambulance company was involved in litigation regarding this crash, would not release any information regarding its staff, and refused requests for an interview.

SUMMARY

Crash Site

This crash occurred during the night in an interchange and the east side of a four-lane, divided interstate highway. The area of the crash was illuminated by artificial overhead lighting. The weather conditions were cloudy with clear visibility and south-southeast winds at 16 km/h (8.4 mph), a temperature of 22.8 °C (73 °F), and a dew point of 21.7 °C (71 °F), according to local weather reports. The roadway traversed a north/south direction and had two concrete northbound through lanes bordered by concrete shoulders. The travel lanes curved to the left with a measured radius of 300 m (984.2 ft) and had a positive grade of 2.5 percent. The right and left northbound through lanes were 3.7 m (12.1 ft) and 3.3 (10.8 ft) wide, respectively. The right and median shoulders were 2.8 m (9.2 ft) and 2.0 m (6.6 ft) wide, respectively. A Smart Cushion brand speed-dependent impact attenuator (Hill & Smith, Inc., Columbus, OH) that protected errant vehicles from the end of a concrete Jersey barrier was located on the east (right) side of the roadway adjacent to the shoulder. A grass embankment that transitioned to a drainage ditch was located east of the roadside barrier ditch. A woven wire right-of-way fence was located beyond the drainage ditch on the east side of the roadway. The speed limit was 97 km/h (60 mph). The crash diagram is included at the end of this report.

Figure 2. Northbound approach of the ambulance to the roadway departure.

Figure 3. Northeasterly view of the yaw marks on the shoulder and grass roadside.

Pre-Crash

The ambulance was traveling north in the right northbound lane (**Figure 2**) at an Event Data Recorder (EDR) reported speed of 136 km/h (85 mph) at -5.0 sec prior to algorithm enable (AE). The vehicle speed increased to 141 km/h (88 mph) at -2.0 sec and remained at that speed to -0.5 sec with no reported braking. The ambulance departed the right side of the roadway as it entered the left curve. The cause of the roadway departure was possibly due to the driver falling asleep. This factor was based on the paramedic's statements to the police investigators that the driver was unable to stay awake during the overnight shift. It was also reported that witnesses observed the ambulance swerving in the roadway prior to the crash and that the driver had been removed from duty several days prior to the crash for failing to stay awake on the job. The area of roadway departure was evidenced by yaw marks from the right front, right rear, and left rear tires on the shoulder (**Figure 3**) and on the grass roadside during the SCI crash scene inspection. Projecting the path of the yaw marks back along the approach path of the vehicle on the scaled cash diagram indicated that the area of roadway departure was located approximately 89 m

(292.0 ft) prior to the crash attenuator that was located at the end of a concrete Jersey barrier. The yaw marks indicated that the driver initiated a left steering maneuver in an attempt to return the vehicle to the roadway. The vehicle yawed counterclockwise 10 degrees as it approached impact with the Smart Cushion impact attenuator. The-EDR recorded-the service brakes as "On" at AE.

Figure 4. Damage to the left corner of the front bumper from impact with attenuator.

Crash

The front plane, left aspect of the ambulance (**Figure 4**) struck the right aspect of the impact attenuator **(Figure 5)**. The EDR reported the speed of the vehicle at AE as 125 km/h (78 mph). The force direction on the vehicle was in the 12 o'clock sector and the impact resulted in actuation of the front row retractor pretensioners and stage-one deployments to both the driver's and passenger's frontal air bags. The maximum longitudinal and lateral velocity changes were EDR reported as -7.26 km/h (-4.51 mph) and -2.13 km/h (-1.32 mph). The left aspect impact in conjunction with the pre-crash counterclockwise yaw and the slope of the roadside vehicle caused the ambulance to rotate an additional 50 degrees counterclockwise as it traveled 53.4 m (175.2 ft) down the negative 4 percent grade of a grass-covered embankment. The ambulance subsequently tripped into a right-side-leading rollover (**Figure 6**). As the patient compartment struck the ground during the rollover, the unit separated from the floor and the walls and roof collapsed and separated. The ambulance completed an estimated eight quarter turns across a distance of approximately 32 m (105.0 ft), coming to final rest on its wheels facing north.

Figure 5. Damage to attenuator from impact by the front plane of the ambulance, view north.

Figure 6. View northeast to the area where the ambulance tripped and rolled over, and the path of rollover to final rest by the fence.

The patient cot remained attached to the cot securement system on the floor of the patient compartment; however, the backrest fractured and separated from the cot and the patient's legs slid out from under the leg restraints. The patient was then ejected from the patient compartment while still strapped to the backrest (See the "Patient Cot Securement System and Damage" section of this report). The patient came to final rest approximately 26 m (85 ft) beyond the final

rest position of the ambulance. The paramedic was also ejected from the vehicle and came to final rest in an unknown location in the patient compartment debris field, which was located approximately 21 m (69 ft) beyond the final rest position of the chassis. Debris from the patient compartment contacted and deflected the wire fence at the crash site.

Post-Crash

The driver and paramedic sustained police-reported "B" (non-incapacitating) and "A" (incapacitating) injuries, respectively, and were transported by ambulance to a hospital. The driver was treated and released from the hospital. The paramedic was hospitalized for 12 days and then was transferred to a skilled nursing facility. The patient sustained fatal injuries and was pronounced deceased at the crash scene. The ambulance was towed from the crash scene due to damage.

2016 FORD F-350 TYPE I AMBULANCE

Description

The Ford F-350 Super Duty chassis cab was manufactured in December 2015 and is identified by the Vehicle Identification Number 1FDRF3GT8GExxxxxx. Manufactured as an incomplete vehicle, the chassis was powered by a 6.7-liter, V-8 diesel engine linked to a 6-speed automatic transmission with a column-mounted shift lever. The driveline was rear-wheel-drive with a dual-wheel rear axle. The service brakes were 4-wheel disc with antilock brakes. The chassis was manufactured with Ford's ambulance preparation package. Aftermarket exterior features to the chassis included a front bumper/grill guard and step bars that extended from the A- to the B-pillars below the level of the sill. The vehicle manufacturer's recommended tire size was LT245/75R17. The vehicle was equipped with Firestone Transforce HT tires of the recommended size on the left front, left rear (both), right front, and right rear inside tires. The outside right rear tire was a Michelin Defender TX D/S of the recommended size. The manufacturer's recommended cold tire pressure for the front and rear tires was 450 kPa (65 psi). The sidewall on the left front tire was punctured during the crash and the tire separated from the rim. The remaining tires were undamaged. The treads on the right rear tires were in poor condition, each at 3 mm (4/32 in) in depth. The remaining tires were in fair condition. Grass and dirt were entrapped in the beads of the right front and right rear tires

The interior of the Ford's cab was configured with two bucket seats with reclining seat backs and adjustable head restraints. The driver head restraint was adjusted approximately 6 cm (2.4 in) above the seat back while the front right was adjusted 3 cm (1.2 in) above the seat back. The driver's seat was power adjustable. The driver's seat track was adjusted to the between the middle and rear most track position and the seat back was reclined 30 degrees aft of vertical. Safety systems consisted of manual 3-point lap and shoulder seat belts with retractor pretensioners. The vehicle was also equipped with dual-stage frontal air bags, seat-mounted side impact air bags and rollover sensing /side impact IC air bags. The frontal air bags deployed and the retractor pretensioners actuated as a result of the Event 1 impact. Both IC air bags deployed during the rollover event (Event 2). The front right passenger seat was unoccupied at the time of the crash. An aftermarket console was mounted between the bucket seats and facilitated the vehicle radio communication system and the emergency lights. The console was constructed of formed sheet metal in a rectangular box shape.

Patient Compartment

The patient compartment was a Type 1 ambulance body manufactured by Frazer, Ltd., in June 2016. It was constructed of welded aluminum square tubing with a diameter of 5 cm (2.0 in) and covered with aluminum sheet metal welded to the tube frame. The interior walls were a combination of sheet aluminum and composite panels. The patient compartment was a wood-free construction according to the manufacturer's website. The patient compartment was configured with a right-side entry door, double rear doors for patient loading, multiple storage cabinets on both sides and front, and a horizontally mounted oxygen bottle located in a compartment in the front wall. A three-person, inward-facing bench seat equipped with lap-only seat belts was located on the right side. A single inward-facing CPR seat, equipped with a lap seat belt, was located on the left side. A swivel base-mounted bucket seat equipped with a four-point seat belt system was located at the front left of the patient compartment. The floor of the patient compartment was also constructed of aluminum and mounted on a frame of welded aluminum supports. The patient compartment was anchored to the vehicle frame rails via steel bolts and brackets.

Exterior Damage

<u>*Exterior Damage Event 1*</u>: The ambulance sustained damage to the front plane during the impact with the impact attenuator. A steel brush guard was mounted on the front of the vehicle and the direct damage began at the left corner of the brush guard and extended to the left corner of the front bumper, and involved the headlamp/turn signal assembly, left fender, and left front tire and wheel. The direct damage length on the bumper was 51 cm (20.1 in). The crush measurements were documented at the bumper level and the maximum residual crush from the attenuator impact was 34 cm (13.4 in) occurring at the left corner of the front bumper. The Field L was 173 cm (68.1 in). The crush values were: C_1 = 34 cm (13.4 in), C_2 = 1 cm (0.4 in), C_3 = 0 cm, C_4 = 0 cm, C_5 = 0 cm, and C_6 = 0 cm. The Collision Deformation Classification (CDC) was 12FLEW2 (10 degrees). The ambulance was out of scope for an analysis with WinSMASH program because the steel brush guard mounted on the front of the vehicle invalidated the vehicle's crush stiffness coefficients, as did its type and weight.

<u>*Exterior Damage Event 2*</u>: The entire length and width of the ambulance sustained direct and induced damage during the rollover. The walls, top, right side floor, and left rear side floor of the patient compartment separated from the vehicle. The aluminum tubing fractured at junctures and welds, causing the patient compartment to totally collapse. The roof of the cab was severely crushed. The maximum vertical crush was 47 cm (18.5 in) occurring to the windshield header adjacent to the right A-pillar. The maximum lateral crush was 17 cm (6.7 in) occurring at the top of the right A-pillar. The CDC was 00TDDO4. The severity of the damage was severe.

Event Data Recorder

The ambulance's EDR was imaged with version 17.4.2 of the Bosch Crash Data Retrieval software and reported with version 19.3.1. The vehicle was without power and the EDR was imaged by back powering the air bag control module via the fuse block. The EDR reported a "locked frontal event" and a "locked rollover event" on the "First Record." The EDR also reported an "unlocked event," which was reported on the "Second Record." A complete file was recorded for each event and the driver's seat belt status was reported as "Driver Buckled." The ignition cycles at the crash and when the data were imaged were 2,840 and 2,841, respectively. The EDR report is attached at the end of this report as **Appendix A**.

First Record, "Locked Frontal Event" and "Locked Rollover Event": The "locked frontal event" was recorded during the impact with the impact attenuator. The air bag warning lamp was reported as "Off." A first-stage deployment was reported for the driver's and passenger's frontal air bags at 305.0 msec following AE. The time to fire for the driver's seat belt pretensioner was 294.5 msec following AE. The maximum longitudinal and lateral delta Vs were reported as -7.26 km/h (-4.51 mpg) and -2.13 (-1.32 mph), respectively occurring at 300 and 276 msec, respectively. Both IC air bags were commanded to deploy during the rollover event at 1,871.5 msec following AE. No fault codes were reported on this record.

Second Record, "Unlocked Event": The time between this event and the previous event was reported as 2,000 msec. Fault code U2100-00 was reported indicating that the air bag warning lamp was illuminated consistent with air bag deployments reported on the first record. The maximum longitudinal and lateral delta Vs were reported as -0.53 km/h (-0.33 mph) and -7.12 km/h (-4.43 mph), respectively occurring at 300 msec.

Interior Damage

Interior Damage, Front Row: The front row sustained severe damage from intrusion. The most severe intrusions in the driver's seating position involved the windshield header and roof, which intruded vertically 24 cm (9.4 in) and 23 cm (9.1), respectively. The driver contacted his head on the intruded roof as evidenced by hair transfer on the roof above his seating position. The driver also loaded the manual seat belt evidenced by frictional abrasions on the latch plate and a transfer on the belt webbing. Both front doors were jammed shut. They were subsequently cut and removed from the vehicle during the police investigation. The left front, right front, and backlight glazing was disintegrated from impact forces. The windshield was cracked and partially separated from the right windshield frame.

Interior Damage, Patient Compartment: The patient compartment was totally destroyed during the rollover. The structure of the walls, top, right side floor, and left rear side floor fractured and separated from the vehicle. In the case of the floor separation, the aluminum welds on some of the vertical and lateral tubing separated and the tubing itself fractured at welded joints. An approximate 4 m x 3 m (13.1 x 9.8 ft) ground divot was located approximately 8 m (26.2 ft) beyond the area where the vehicle tripped and rolled over, indicating the patient compartment experienced a significant ground impact during the second-quarter turn of the rollover that probably initiated the destruction of the patient compartment.

Figure 7. The damaged Stryker model 6506 Power Pro XT patient cot.

The subsequent fracturing and separation of the patient compartment from the vehicle during the rollover exposed the patient cot and swivel base-mounted bucket seat to direct contact with the ground. Dirt deposits on and deformation to the

bucket seat and foot-end of the cot indicated that direct contact with the ground did in fact occur during the rollover. See the "Patient Cot Securement System and Damage" section of this report for specific discussion regarding the damage to the cot.

Manual Restraint Systems

The front row was equipped with driver and passenger lap and shoulder seat belts with sliding latch plates and adjustable upper anchors. The driver's upper anchor was adjusted to the full-down position. The driver's and passenger's seat belts were also equipped with retractor-mounted pretensioners that actuated during the crash. The inward-facing "squad" bench seat on the right side of the patient compartment and the single inward facing CPR seat on the left side of the patient compartment were equipped with lap belts. The swivel-mounted captain's seat in the forward portion of the patient compartment was equipped with a four-point lap and shoulder seat belt system.

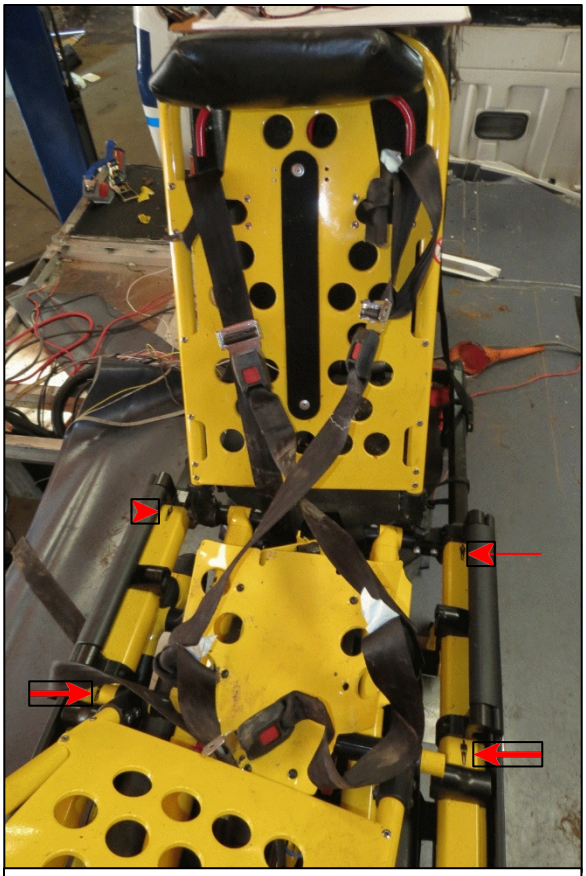


Figure 8. Shoulder/chest and waist restraints; arrows show icons for attachment locations on the frame.

The driver was belted at the time of the crash as evidenced by load marks from the belt webbing on the latch plate that was located 79 cm (31.1 in) above the floor anchor. The belt webbing was entrapped in the forward corner of the D-ring from loading. The vehicle's EDR also reported that the driver's seat belt was buckled. The paramedic was unrestrained and ejected from the vehicle. She was likely seated in the swivel-mounted captain's seat at the forward end of the cot.

Figure 9. Shoulder/chest restraint straps attached to the backrest.

Patient Cot

The patient was restrained on the Stryker Model 6506 Power Pro XT cot (**Figure 7**) that was manufactured in March of 2016. The cot was an X-frame design and the manufacturer's specifications stated the maximum and minimum length were 206 cm (81.1 in) and 160 (63.0 in), respectively. The width was 58 cm (22.8 in), and the height was adjustable from 36 cm (14.2 in) to 105 cm (41.3 in). The weight of the cot with one battery and without the mattress and restraints was 57 kg (125 lb). The cot was powered by an electric motor and a 24-volt NiCad battery. The maximum load capacity of the cot was 318 kg

(700 lbs). The backrest articulation range was 0 - 73 degrees.

The cot was designed to be equipped with shoulder/chest, waist (**Figure 8**), knee, and foot restraint straps. The instructions in the cot operation and maintenance manual described and illustrated how and where the restraint straps were to be attached to the cot. Icons were present on the frame of the cot showing the attachment locations for the shoulder/chest and waist restraint straps and on the frame of the footrest for the attachment locations for the knee and foot restraint straps. The SCI inspection of the cot revealed that the shoulder/chest and waist restraint straps were not attached to the cot frame at the specified locations (**Figure 8**). The shoulder/chest restraint straps were attached to the backrest and the waist restraint straps were attached to the mid-section plate of the cot (**Figures 9** and **10**). The foot restraint straps were attached to the footrest frame at the proper location. The knee restraint straps were missing. It is not known if they were present at the time of the crash. It is possible that they became separated from the footrest frame since each side of the frame was fractured and separated (**Figure 11**) making it possible for the foot restraint straps to slide off the frame. The shoulder/chest restraints were cut by emergency responders to remove the patient from the backrest.

Patient Cot Securement System and Damage

The cot was secured to the floor of the ambulance by a Stryker Power-Load cot fastener system. The Power-Load system lifts and lowers the cot into and out of the patient compartment and secures the cot to the floor of the patient compartment. The Power Load system met the dynamic crash test standards according to the manufacturer's documentation.

The cot remained secured to the Power-Load system throughout the crash. However, the backrest separated from the cot along with the patient and both were ejected from the vehicle

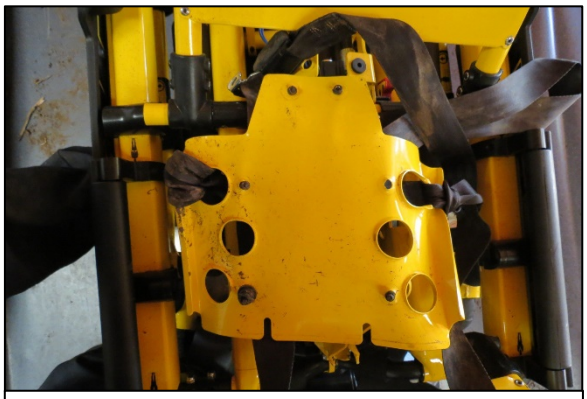


Figure 10. Waist restraint straps attached to the mid-section plate.

Figure 11. Footrest and restraint straps attachment locations; arrows show icons for the knee restraint straps attachment location.

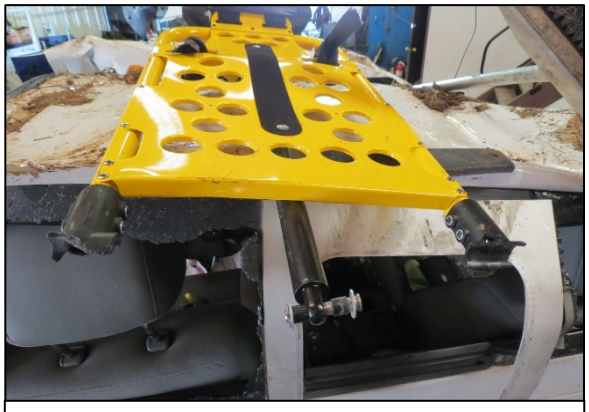


Figure 12. Fractured hinges on the backrest and pneumatic lift cylinder that separated from the yoke.

during the rollover. The backrest separated from the cot as a result of the fracture and separation of the following three components. Both plastic back rest hinges fractured. The yoke for the bottom pivot pin of the backrest pneumatic lift cylinder fractured and the cylinder separated from the yoke (**Figures 12** and **13**). The mid-section plate, on which the waist restraint straps were improperly secured, separated when the six button head cap screws that secured the plate to the cot separated (**Figure 10**). The foot end of the cot made direct contact with the ground during the roller as evidenced by grass and dirt adhering to the cot. The contact fractured the foot end frame.

Figure 13. Fractured yoke for the backrest pneumatic lift cylinder pivot pin.

Supplemental Restraint Systems

The Ford was equipped with dual-stage frontal air bags, seat-mounted side impact air bags, and rollover/side impact IC air bags. The first stage of both frontal air bags deployed as a result of the Event 1 crash and both IC air bags deployed during the rollover. There was no discernable evidence of driver contact to his frontal or the left IC air bags. None of the air bags sustained any damage during the crash.

2016 FORD F-350 TYPE I AMBULANCE OCCUPANTS

Driver Demographics

Age/sex:	33 years/male
Height:	193 cm (76 in)
Weight:	122 kg (270 lb)
Eyewear:	Unknown
Seat type:	Bucket seat
Seat track position:	Mid to rear position
Restraint usage:	Lap and shoulder belt
Usage source:	Vehicle inspection, EDR
Air bags:	Frontal and both IC air bags deployed
Alcohol/drug data:	Test given, results unknown
Egress from vehicle:	Assisted by rescue personnel
Transport from scene:	Ambulance
Medical treatment:	Treated and released

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Scalp abrasion to front/top of scalp	110202.1	Isolated Roof - Roof or convertible top	Certain

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
2	Skin/subcutaneous/muscle abrasion, Left Forearm	710202.1	Isolated Front - Left instrument panel	Possible
3	Skin/subcutaneous/muscle abrasion, Right Hand	710202.1	Isolated Front - Center instrument panel	Possible
4	Skin/subcutaneous/muscle abrasion, Right Knee	810202.1	Isolated Front - Left lower instrument panel (includes knee bolster)	Certain

Source: emergency room records.

Driver Kinematics

The driver was seated with the seat track adjusted to the rear-most position with the seat back reclined 30 degrees aft of vertical. The head restraint was adjusted 6 cm (2.5 in) above the seat back. He was wearing the manual seat belt at the time of the crash evidenced by frictional loading abrasions on the latch plate. The front plane impact to the impact attenuator resulted in a stage-one deployment of the driver's frontal air bag and actuation of his seat belt pretensioner. The driver was displaced forward and loaded the seat belt and his face and chest probably loaded the frontal air bag. The driver was redirected to the right in his seat belt when the ambulance rotated counterclockwise and decelerated as it approached the trip point for the rollover. The driver was then redirected toward the roof and in multiple directions in his belted position during the rollover. He contacted his head on the roof as evidenced by hair transfer on the roof above his seating position resulting in a scalp abrasion. He sustained upper extremity abrasions from possible contact with the instrument panel and a right knee abrasion from contact to the lower left instrument panel. Following the crash, the driver's door was removed from the vehicle by the first responders and he was assisted from the cab of the ambulance. He was transported by another ambulance to a local hospital where he was treated and released.

Paramedic Demographics

Age/sex:	28 years/female
Height:	178 cm (70 in)
Weight:	94 kg (207 lb)
Eyewear:	Unknown
Seat type:	Swivel base captain's chair
Seat track position:	Full-rear track
Restraint usage:	None
Usage source:	Vehicle inspection/occupant ejection
Air bags:	None
Alcohol/drug data:	None
Egress from vehicle:	Ejected from patient compartment
Transport from scene:	Ambulance
Medical treatment:	Hospitalized for 12 days; transferred to a skilled nursing facility

Paramedic Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Tibia fracture Distal tibia fracture malleolus; pilon fracture]-> open NFS, Left No Further Specificity	854332.3	Isolated IPC Other Vehicle or Object - Ground	Probable
2	Right occipital condyle fracture	150200.3	Isolated IPC Other Vehicle or Object - Ground	Probable
3	Fibula [malleoli] fracture through joint (transsyndesmotic); Weber B-> open, Left No Further Specificity	854462.2	Isolated IPC Other Vehicle or Object - Ground	Probable
4	Fibula [malleoli] fracture through joint (transsyndesmotic); Weber B, Right No Further Specificity	854461.2	Isolated IPC Other Vehicle or Object - Ground	Probable
5	Clavicle fracture Distal (lateral end) clavicle fracture-> extra-articular, Left No Further Specificity	750751.2	Isolated Other Vehicle or Object - Ground	Probable
6	20 cm laceration to right cheek, down to muscle	210604.2	Isolated IPC Interior - Other interior object(s) (specify): Separated components of the patient compartment	Probable
7	Dental fracture to right upper incisor	251404.1	Isolated Interior - Other interior object(s) (specify): Separated components of the patient compartment	Probable
8	2 cm laceration to lower lip	210602.1	Isolated Interior - Other interior object(s) (specify): Separated components of the patient compartment	Probable
9	5 cm laceration to right forehead	210602.1	Isolated Interior - Other interior object(s) (specify): Separated components of the patient compartment	Probable

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
10	Carpal (wrist) joint dislocation [distal radioulnar], Right No Further Specificity	772230.1	Isolated Other Vehicle or Object - Ground	Probable
11	Large hematoma along left parietal and temporal scalp	110402.1	Isolated Other Vehicle or Object - Ground	Probable
12	Abrasion from thoracic to lumbar spine	410202.1	Isolated Other Vehicle or Object - Ground	Probable
13	1 cm right wrist laceration (puncture wound)	710602.1	Isolated Interior - Other interior object(s) (specify): Separated components of the patient compartment	Probable
14	Contusion to right clavicle	710402.1	Isolated Other Vehicle or Object - Ground	Probable
15	Skin/subcutaneous/muscle contusion; hematoma, Left Arm	710402.1	Isolated Other Vehicle or Object - Ground	Probable
16	Skin/subcutaneous/muscle abrasion, Right Leg	810202.1	Isolated Other Vehicle or Object - Ground	Probable
17	Skin/subcutaneous/muscle abrasion, Left Leg	810202.1	Isolated Other Vehicle or Object - Ground	Probable

Source: hospital records.

Paramedic Kinematics

The 28-year-old female paramedic was most likely seated in the forward-facing swivel-base captain's chair at the forward portion of the patient compartment seat located at the head-end of the patient cot (Model Minimum Uniform Crash Criteria (MMUCC) seating position 3). The paramedic was displaced forward when the front plane of the vehicle struck the impact attenuator. Due to the severity of damage to the patient compartment, no specific points of contact could be identified, or specific injuries assigned from this event. She was then redirected to the right when the vehicle rotated counterclockwise and decelerated. The paramedic was then redirected toward the roof and in multiple directions during the rollover and contacted the interior of the patient compartment before the compartment totally collapsed and separated from the chassis. The paramedic sustained facial lacerations and a dental fracture that were probably attributed to contact with the patient compartment prior to its complete separation and her

complete ejection from the compartment. She was completely ejected from the ambulance at some point between rollover initiation and final rest. She came to final rest in the patient compartment debris field, the center of which was located approximately 21 m (68.9 ft) beyond the final rest position of the ambulance. Her contact with the ground during her ejection was the probable source of multiple extremity fractures and soft tissue abrasions. The paramedic was transported by ambulance to a local hospital where she was admitted for 12 days for treatment of her injuries. She was transferred to skilled nursing facility where she admitted for additional recovery and rehabilitation.

Patient Demographics

Age/sex:	66 years/female
Height:	163 cm (64 in)
Weight:	79 kg (174 lb)
Eyewear:	Unknown
Seat type:	Stryker Model 6506 Power Pro XT patient cot
Seat track position:	Not applicable
Restraint usage:	Secured by nylon patient restraint straps
Usage source:	Vehicle inspection
Air bags:	None
Alcohol/drug data:	None
Egress from vehicle:	Complete ejection
Transport from scene:	Medical examiner to a medical examiner's office
Medical treatment:	Pronounced deceased at crash scene

Patient Injuries

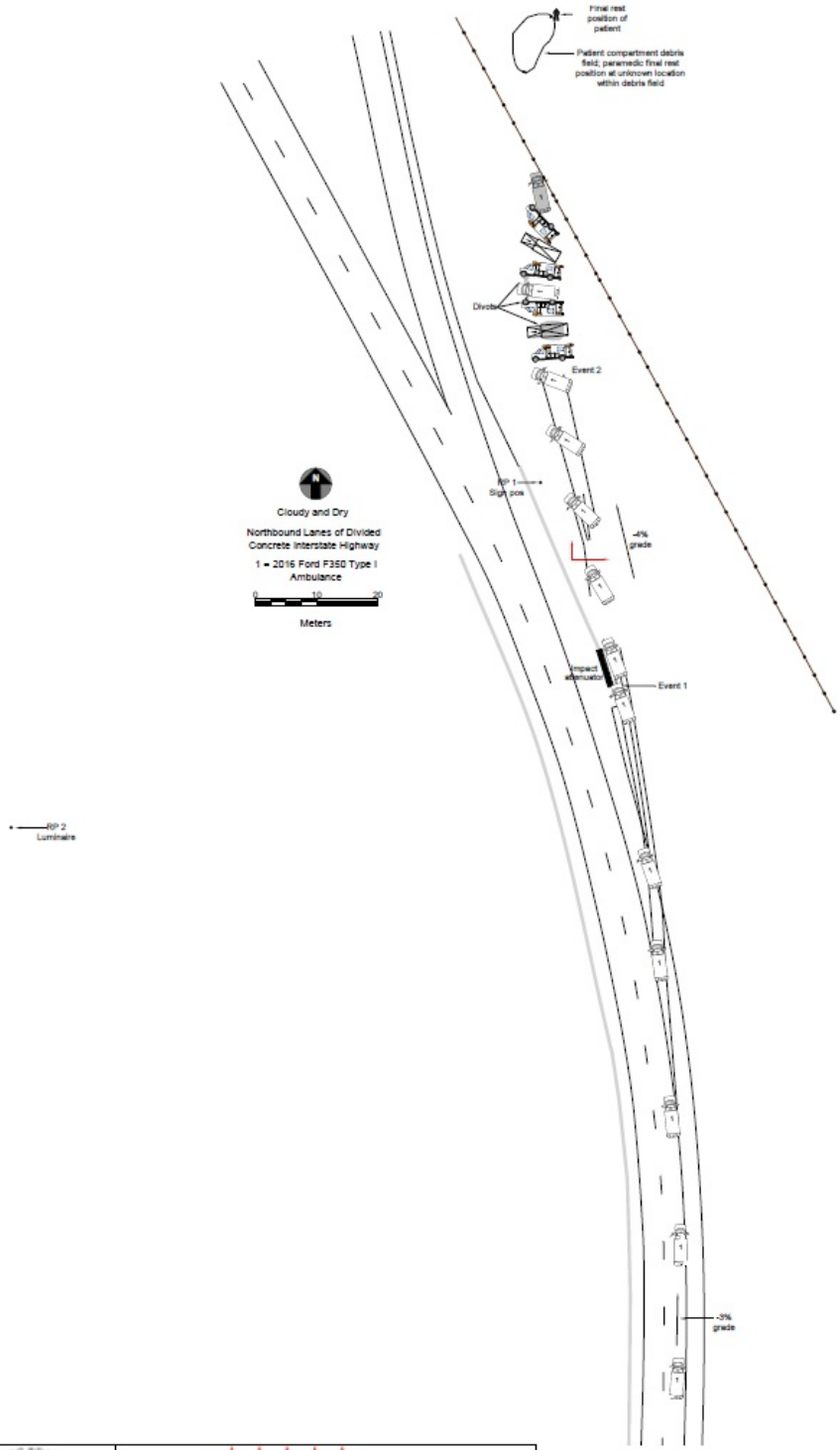
Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Large left hemothorax	442200.3	Isolated IPC Other Vehicle or Object - Ground	Probable
2	Rib Cage multiple rib fractures NFS, Left No Further Specificity	450210.2	Isolated IPC Other Vehicle or Object - Ground	Probable
3	Forearm fracture NFS [includes wrist fracture NFS], Right No Further Specificity	751900.2	Isolated IPC Other Vehicle or Object - Ground	Probable
4	Skin/subcutaneous/muscle laceration, Multiple No Further Specificity	910600.1	Isolated Interior - Other interior object(s) (specify): Separated components of the patient compartment	Probable
5	Skin/subcutaneous/muscle abrasion, Multiple No Further Specificity	910200.1	Isolated Other Vehicle or Object - Ground	Probable

Source: medical examiner's report (external).

Patient Kinematics

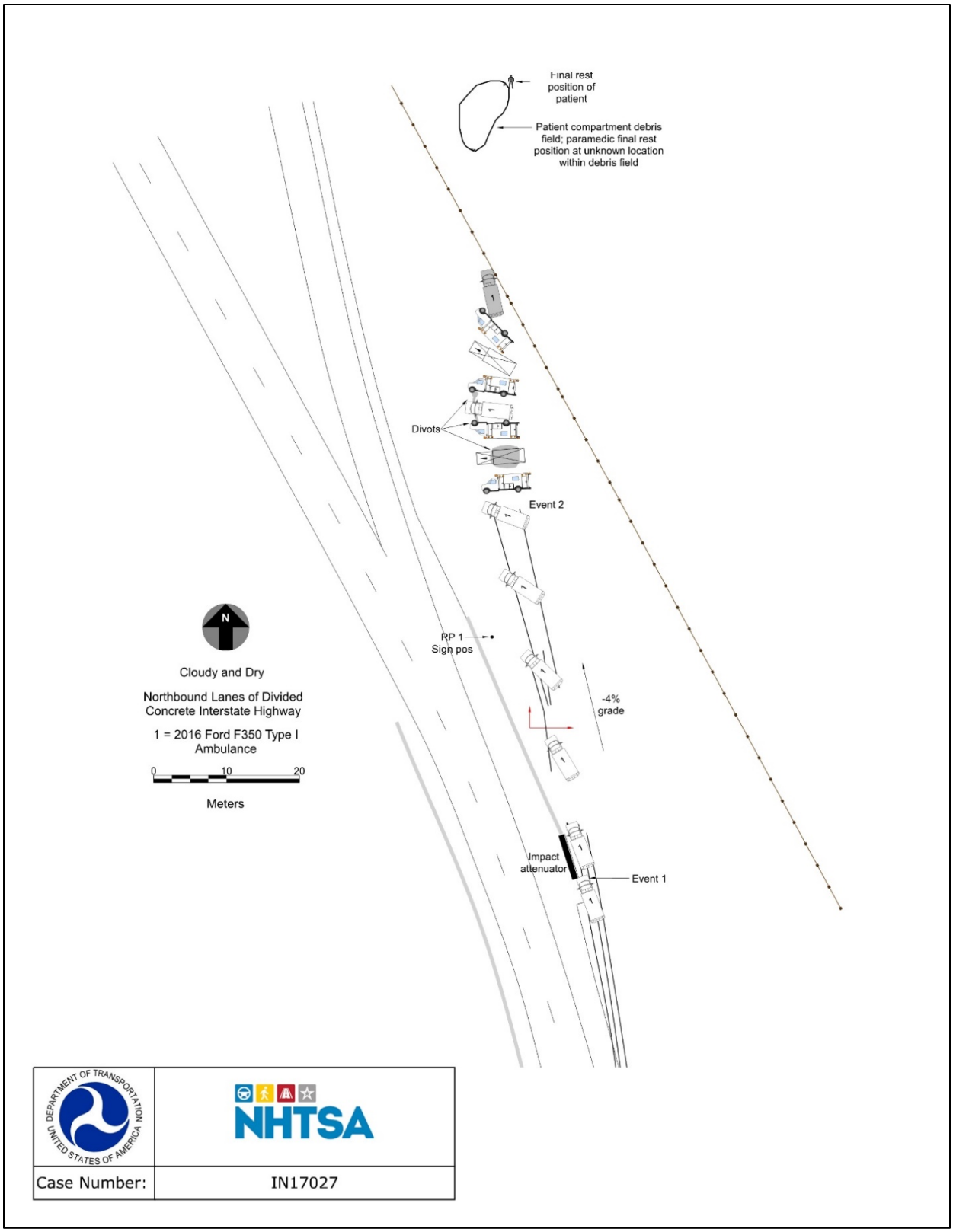
The patient was restrained on a Stryker model 6506 Power Pro XT patient cot located in MMUCC seating position 8. The patient was displaced forward in the cot's restraint straps during the front plane impact with the impact attenuator. During the rollover, the patient components of the cot fractured, and the patient was ejected from the cot and due to the collapse of the patient compartment, completely ejected from the unit. She came to final rest approximately 26 m (85.3 ft) beyond the final rest position of the ambulance located at the northeast end of the ambulance compartment debris field. An external-only autopsy was performed. Based on the limited medical data, she sustained left rib fractures and a large left hemothorax, a right forearm fracture, and multiple abrasions, probably contributory to her contact with the ground during the ejection. The report also listed multiple lacerations that probably resulted from contact with the patient compartment during the rollover both pre-and post-body panel separation. The patient was pronounced deceased at the crash scene.

CRASH DIAGRAM



	NHTSA www.nhtsa.gov
Case Number:	IN17027

CRASH DIAGRAM: A DETAILED VIEW



APPENDIX A: 2016 Ford F-350 Type I Ambulance Event Data Recorder Report[1]

[1] The EDR report contained in this technical report was imaged using the version of the Bosch CDR software current at the time of the vehicle inspection. The CDR report contained in the associated Crash Viewer application may differ relative to this report.

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	1FDRF3GT8GE******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	201750S2IN17027_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.4.2
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 19.3.1
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	No
Event(s) recovered	locked frontal event locked rollover event unlocked event

Comments

No comments entered.

The retrieval of this data has been authorized by the vehicle's owner, or other legal authority such as a court order or search warrant, as indicated by the CDR tool user on .

Data Limitations

Restraints Control Module Recorded Crash Events:
Deployment Events cannot be overwritten or cleared from the Restraints Control Module (RCM). Once the RCM has deployed any airbag device, the RCM must be replaced. The data from events which did not qualify as deployable events can be overwritten by subsequent events. The RCM can store up to two deployment events.

Airbag Module Data Limitations:

- Restraints Control Module Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced from the point of algorithm wake up. It is not the speed the vehicle was traveling before the event. Note that the vehicle speed is recorded separately five seconds prior to algorithm wake up. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle forward velocity change.
- Event Recording Complete will indicate if data from the recorded event has been fully written to the RCM memory or if it has been interrupted and not fully written.
- If power to the Airbag Module is lost during a crash event, all or part of the crash record may not be recorded.
- For 2011 Ford Mustangs, the Steering Wheel Angle parameter indicates the change in steering wheel angle from the previously recorded sample value and does not represent the actual steering wheel position.

Airbag Module Data Sources:

- Event recorded data are collected either INTERNALLY or EXTERNALLY to the RCM.

  - INTERNAL DATA is measured, calculated, and stored internally, sensors external to the RCM include the following:
    > The Driver and Passenger Belt Switch Circuits are wired directly to the RCM.
    > The Driver's Seat Track Position Switch Circuit is wired directly to the RCM.
    > The Side Impact Sensors (if equipped) are located on the side of vehicle and are wired directly to the RCM.
    > The Occupant Classification Sensor is located in the front passenger seat and transmits data directly to the RCM on high-speed CAN bus.
    > Front Impact Sensors (right and left) are located at the front of vehicle and are wire directly to the RCM.

  - EXTERNAL DATA recorded by the RCM are data collected from the vehicle communication network from various sources such as Powertrain Control Module, Brake Module, etc.

02007_RCM-RC6_r002

System Status at Time of Retrieval

VIN as programmed into RCM at factory	1FDRF3GT8GE******
Current VIN from PCM	1FDRF3GT8GE******
Ignition cycle, download (first record)	2,841
Ignition cycle, download (second record)	2,841
Restraints Control Module Part Number	DC3T-14B321-BB
Restraints Control Module Serial Number	9001419100000000
Restraints Control Module Software Part Number (Version)	CT43-14C028-AB
Left/Center Frontal Restraints Sensor Serial Number	1C2DEF8C
Left Side Restraint Sensor 1 Serial Number	48664100
Left Side Restraint Sensor 2 Serial Number	00000000
Right Frontal Restraints Sensor Serial Number	00000000
Right Side Restraint Sensor 1 Serial Number	F7721BF3
Right Side Restraints Sensor 2 Serial Number	00000000

System Status at Event (First Record)

Recording Status	Locked Record
Complete file recorded (yes,no)	Yes
Multi-event, number of events (1,2)	1
Time from event 1 to 2 (msec)	N/A
Lifetime Operating Timer at event time zero (seconds)	21,460,280
Key-on Timer at event time zero (seconds)	8,620
Vehicle voltage at time zero (Volts)	13.446
Energy Reserve Mode entered during event (Y/N)	No

Faults Present at Start of Event (First Record)

No Faults Recorded

Deployment Data (First Record)

Frontal airbag deployment, time to first stage deployment, driver (msec)	305.0
Side curtain airbag deployment, time to deploy, driver side (msec)	1,871.5
Pretensioner (retractor) deployment, time to fire, driver (msec)	294.5
Frontal airbag deployment, time to first stage deployment, front passenger (msec)	305.0
Side curtain airbag deployment, time to deploy, right side (msec)	1,871.5
Pretensioner (retractor) deployment, time to fire, right front passenger (msec)	294.5
Maximum delta-V, longitudinal (MPH [km/h])	-4.51 [-7.26]
Time, maximum delta-V longitudinal (msec)	300
Maximum delta-V, lateral (MPH [km/h])	-1.32 [-2.13]
Time, maximum delta-V lateral (msec)	276
Left or center front, satellite Sensor discriminating deployment	Yes
Left or center, front satellite Sensor safing	Yes
Right, front satellite sensor discriminating deployment	Yes
RCM, front sensor discriminating deployment	Yes
RCM, front sensor safing	Yes
RCM, rollover sensor discriminating deployment	Yes
RCM, vertical sensor safing	Yes
Longitudinal Delta-V Time Zero Offset	2.5 ms
Lateral Delta-V Time Zero Offset	2.5 ms
Roll Angle Time Zero Offset	52.5 ms

Pre-Crash Data -1 sec (First Record)

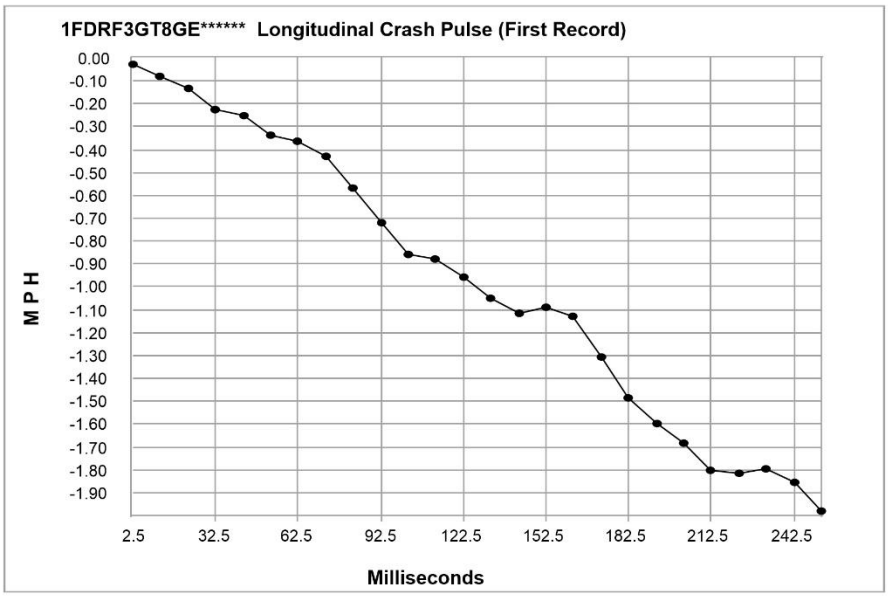
Ignition cycle, crash	2,840
Frontal air bag warning lamp, on/off	Off
Frontal air bag suppression switch status, front passenger	Not Active
Safety belt status, driver	Driver Buckled
Brake Telltale	Off
ABS Telltale	Off
Powertrain Wrench Telltale	Off
Speed Control Telltale	Off
MIL Telltale	Off

Pre-Crash Data -5 to 0 sec [2 samples/sec] (First Record)

Times (sec)	Speed vehicle indicated MPH [km/h]	Accelerator pedal, % full	Service brake, on/off	Engine RPM	ABS activity (engaged, non-engaged)	Brake Powertrain Torque Request	Driver Gear Selection
- 5.0	85 [136]	57.3	Off	2,592	non-engaged	No	Drive
- 4.5	85 [137]	57.2	Off	2,598	non-engaged	No	Drive
- 4.0	85 [137]	57.2	Off	2,618	non-engaged	No	Drive
- 3.5	86 [138]	57.5	Off	2,638	non-engaged	No	Drive
- 3.0	86 [139]	58.4	Off	2,652	non-engaged	No	Drive
- 2.5	87 [140]	57.2	Off	2,666	non-engaged	No	Drive
- 2.0	88 [141]	57.5	Off	2,678	non-engaged	No	Drive
- 1.5	88 [141]	57.2	Off	2,696	non-engaged	No	Drive
- 1.0	88 [142]	31.0	Off	2,694	non-engaged	No	Drive
- 0.5	88 [142]	0.0	Off	2,682	non-engaged	No	Drive
0.0	78 [125]	0.0	On	2,592	engaged	No	Drive

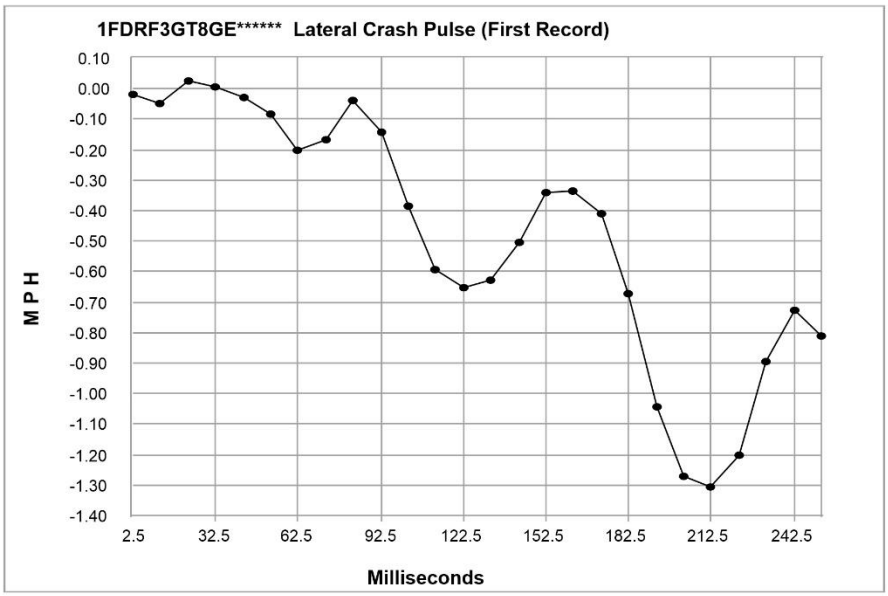
Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record)

Times (sec)	Steering Wheel Angle (degrees)
- 5.0	0.0
- 4.9	0.0
- 4.8	0.0
- 4.7	0.0
- 4.6	0.0
- 4.5	0.0
- 4.4	0.0
- 4.3	0.0
- 4.2	0.0
- 4.1	0.0
- 4.0	0.0
- 3.9	0.0
- 3.8	0.0
- 3.7	0.0
- 3.6	0.0
- 3.5	0.0
- 3.4	0.0
- 3.3	0.0
- 3.2	0.0
- 3.1	0.0
- 3.0	0.0
- 2.9	0.0
- 2.8	0.0
- 2.7	0.0
- 2.6	0.0
- 2.5	0.0
- 2.4	0.0
- 2.3	0.0
- 2.2	0.0
- 2.1	0.0
- 2.0	0.0
- 1.9	0.0
- 1.8	0.0
- 1.7	0.0
- 1.6	0.0
- 1.5	0.0
- 1.4	0.0
- 1.3	0.0
- 1.2	0.0
- 1.1	0.0
- 1.0	0.0
- 0.9	0.0
- 0.8	0.0
- 0.7	0.0
- 0.6	0.0
- 0.5	0.0
- 0.4	0.0
- 0.3	0.0
- 0.2	0.0
- 0.1	0.0
0.0	0.0



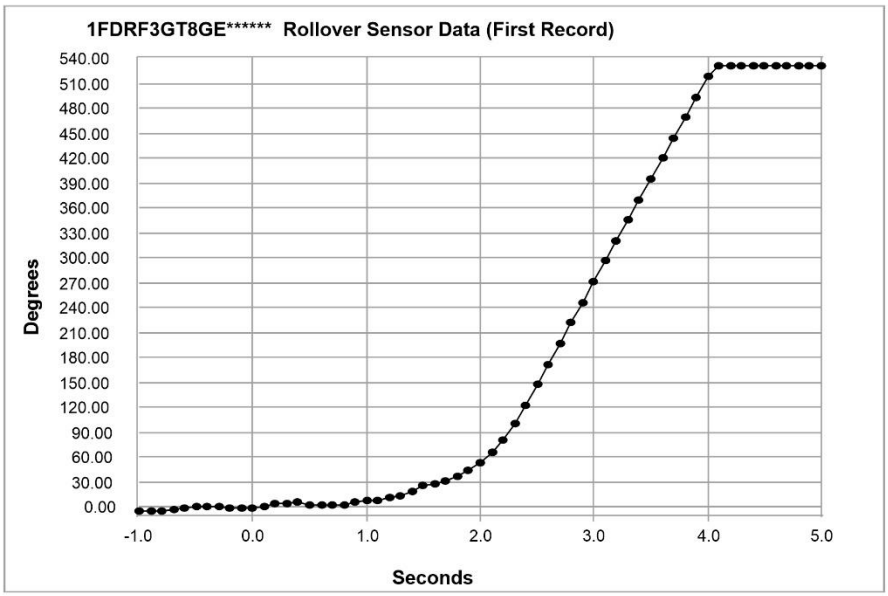
Longitudinal Crash Pulse (First Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
2.5	-0.03	-0.05
12.5	-0.08	-0.13
22.5	-0.13	-0.21
32.5	-0.22	-0.36
42.5	-0.25	-0.40
52.5	-0.33	-0.54
62.5	-0.36	-0.58
72.5	-0.43	-0.69
82.5	-0.57	-0.92
92.5	-0.72	-1.16
102.5	-0.86	-1.38
112.5	-0.88	-1.42
122.5	-0.96	-1.54
132.5	-1.05	-1.69
142.5	-1.12	-1.79
152.5	-1.09	-1.76
162.5	-1.13	-1.81
172.5	-1.31	-2.11
182.5	-1.48	-2.39
192.5	-1.60	-2.58
202.5	-1.68	-2.71
212.5	-1.80	-2.90
222.5	-1.81	-2.92
232.5	-1.79	-2.89
242.5	-1.86	-2.99
252.5	-1.98	-3.18



Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
2.5	-0.02	-0.03
12.5	-0.05	-0.08
22.5	0.03	0.04
32.5	0.01	0.01
42.5	-0.03	-0.05
52.5	-0.08	-0.13
62.5	-0.20	-0.33
72.5	-0.17	-0.27
82.5	-0.04	-0.06
92.5	-0.14	-0.23
102.5	-0.38	-0.62
112.5	-0.59	-0.95
122.5	-0.65	-1.05
132.5	-0.63	-1.01
142.5	-0.50	-0.81
152.5	-0.34	-0.55
162.5	-0.34	-0.54
172.5	-0.41	-0.66
182.5	-0.67	-1.08
192.5	-1.05	-1.68
202.5	-1.27	-2.04
212.5	-1.31	-2.10
222.5	-1.20	-1.94
232.5	-0.90	-1.44
242.5	-0.72	-1.17
252.5	-0.81	-1.31



Rollover Sensor Data (First Record)

Time (sec)	Vehicle roll angle (degrees)
-1.0	-5.32
-0.9	-4.72
-0.8	-3.73
-0.7	-2.71
-0.6	-1.1
-0.5	0.2
-0.4	1.43
-0.3	0.62
-0.2	-0.6
-0.1	-1.57
0.0	-0.84
0.1	1.45
0.2	3.96
0.3	4.62
0.4	5.79
0.5	2.57
0.6	2.09
0.7	3.48
0.8	2.54
0.9	6.32
1.0	7.4

Time (sec)	Vehicle roll angle (degrees)
1.1	7.41
1.2	11.53
1.3	14.09
1.4	19.5
1.5	26.57
1.6	28.31
1.7	32.37
1.8	37.2
1.9	43.97
2.0	53.59
2.1	66.42
2.2	81.44
2.3	100.23
2.4	122.7
2.5	147.32
2.6	172.09
2.7	196.85
2.8	221.61
2.9	246.37
3.0	271.13
3.1	295.89

Time (sec)	Vehicle roll angle (degrees)
3.2	320.65
3.3	345.41
3.4	370.18
3.5	394.94
3.6	419.7
3.7	444.16
3.8	468.92
3.9	493.68
4.0	518.44
4.1	531.32
4.2	531.32
4.3	531.32
4.4	531.32
4.5	531.32
4.6	531.32
4.7	531.32
4.8	531.32
4.9	531.32
5.0	531.32

System Status at Event (Second Record)

Recording Status	Unlocked Record
Complete file recorded (yes,no)	Yes
Multi-event, number of events (1,2)	2
Time from event 1 to 2 (msec)	2,000
Lifetime Operating Timer at event time zero (seconds)	21,460,285
Key-on Timer at event time zero (seconds)	8,625
Vehicle voltage at time zero (Volts)	13.689
Energy Reserve Mode entered during event (Y/N)	No

Faults Present at Start of Event (Second Record)

U2100-00

Deployment Data (Second Record)

Maximum delta-V, longitudinal (MPH [km/h])	-0.33 [-0.53]
Time, maximum delta-V longitudinal (msec)	300
Maximum delta-V, lateral (MPH [km/h])	-4.43 [-7.12]
Time, maximum delta-V lateral (msec)	300
RCM, rollover sensor discriminating deployment	Yes
RCM, vertical sensor safing	Yes
Longitudinal Delta-V Time Zero Offset	0.5 ms
Lateral Delta-V Time Zero Offset	0.5 ms
Roll Angle Time Zero Offset	50.5 ms

Pre-Crash Data -1 sec (Second Record)

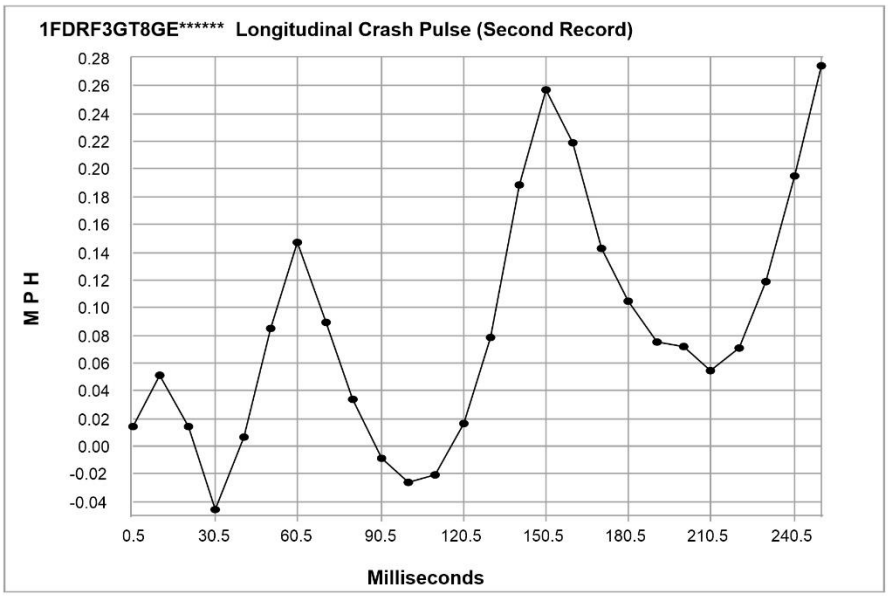
Ignition cycle, crash	2,840
Frontal air bag warning lamp, on/off	On
Frontal air bag suppression switch status, front passenger	Not Active
Safety belt status, driver	Driver Buckled
Brake Telltale	Off
ABS Telltale	On
Powertrain Wrench Telltale	Off
Speed Control Telltale	Off
MIL Telltale	Off

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Second Record)

Times (sec)	Speed vehicle indicated MPH [km/h]	Accelerator pedal, % full	Service brake, on/off	Engine RPM	ABS activity (engaged, non-engaged)	Brake Powertrain Torque Request	Driver Gear Selection
- 5.0	86 [139]	58.4	Off	2,652	non-engaged	No	Drive
- 4.5	87 [140]	57.2	Off	2,666	non-engaged	No	Drive
- 4.0	88 [141]	57.5	Off	2,678	non-engaged	No	Drive
- 3.5	88 [141]	57.2	Off	2,696	non-engaged	No	Drive
- 3.0	88 [142]	31.0	Off	2,694	non-engaged	No	Drive
- 2.5	88 [142]	0.0	Off	2,682	non-engaged	No	Drive
- 2.0	78 [125]	0.0	On	2,592	engaged	No	Drive
- 1.5	76 [123]	0.0	On	2,128	engaged	No	Drive
- 1.0	68 [110]	0.0	On	1,880	engaged	No	Neutral
- 0.5	64 [103]	44.0	On	1,288	engaged	No	Neutral
0.0	49 [79]	31.0	On	858	engaged	No	Neutral

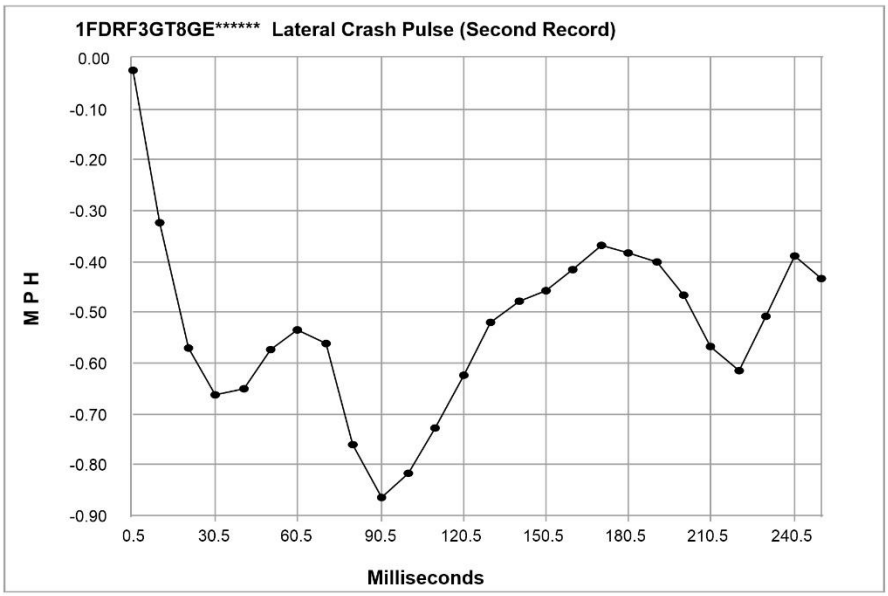
Pre-Crash Data -5 to 0 sec [10 samples/sec] (Second Record)

Times (sec)	Steering Wheel Angle (degrees)
- 5.0	0.0
- 4.9	0.0
- 4.8	0.0
- 4.7	0.0
- 4.6	0.0
- 4.5	0.0
- 4.4	0.0
- 4.3	0.0
- 4.2	0.0
- 4.1	0.0
- 4.0	0.0
- 3.9	0.0
- 3.8	0.0
- 3.7	0.0
- 3.6	0.0
- 3.5	0.0
- 3.4	0.0
- 3.3	0.0
- 3.2	0.0
- 3.1	0.0
- 3.0	0.0
- 2.9	0.0
- 2.8	0.0
- 2.7	0.0
- 2.6	0.0
- 2.5	0.0
- 2.4	0.0
- 2.3	0.0
- 2.2	0.0
- 2.1	0.0
- 2.0	0.0
- 1.9	0.0
- 1.8	0.0
- 1.7	0.0
- 1.6	0.0
- 1.5	0.0
- 1.4	0.0
- 1.3	0.0
- 1.2	0.0
- 1.1	0.0
- 1.0	0.0
- 0.9	0.0
- 0.8	0.0
- 0.7	0.0
- 0.6	0.0
- 0.5	0.0
- 0.4	0.0
- 0.3	0.0
- 0.2	0.0
- 0.1	0.0
0.0	0.0



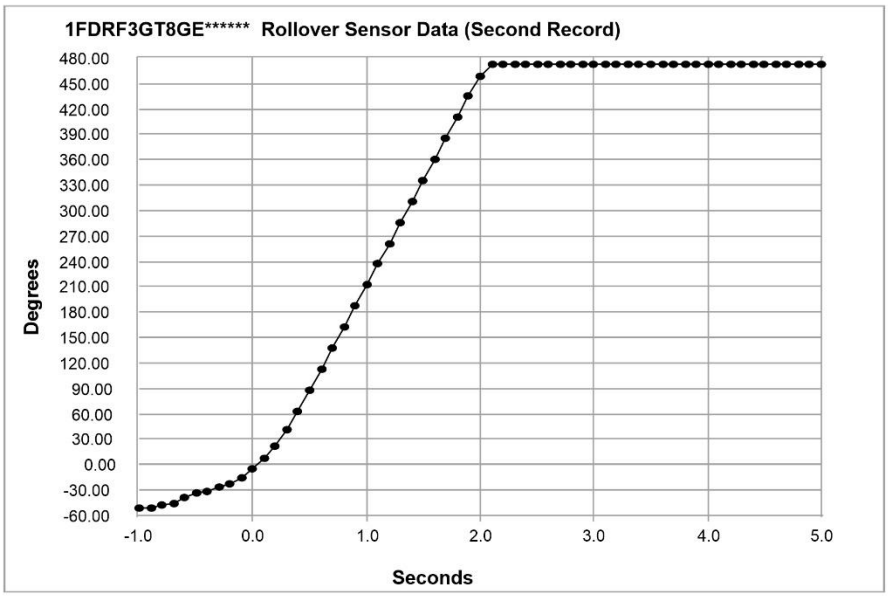
Longitudinal Crash Pulse (Second Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
0.5	0.01	0.02
10.5	0.05	0.08
20.5	0.01	0.02
30.5	-0.05	-0.07
40.5	0.01	0.01
50.5	0.09	0.14
60.5	0.15	0.24
70.5	0.09	0.14
80.5	0.03	0.05
90.5	-0.01	-0.01
100.5	-0.03	-0.04
110.5	-0.02	-0.03
120.5	0.02	0.03
130.5	0.08	0.13
140.5	0.19	0.30
150.5	0.26	0.41
160.5	0.22	0.35
170.5	0.14	0.23
180.5	0.10	0.17
190.5	0.08	0.12
200.5	0.07	0.12
210.5	0.06	0.09
220.5	0.07	0.11
230.5	0.12	0.19
240.5	0.20	0.31
250.5	0.27	0.44



Lateral Crash Pulse (Second Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
0.5	-0.02	-0.04
10.5	-0.32	-0.52
20.5	-0.57	-0.92
30.5	-0.66	-1.07
40.5	-0.65	-1.05
50.5	-0.57	-0.92
60.5	-0.53	-0.86
70.5	-0.56	-0.91
80.5	-0.76	-1.23
90.5	-0.86	-1.39
100.5	-0.82	-1.31
110.5	-0.73	-1.17
120.5	-0.62	-1.00
130.5	-0.52	-0.84
140.5	-0.48	-0.77
150.5	-0.46	-0.73
160.5	-0.41	-0.67
170.5	-0.37	-0.59
180.5	-0.38	-0.62
190.5	-0.40	-0.64
200.5	-0.47	-0.75
210.5	-0.57	-0.91
220.5	-0.62	-0.99
230.5	-0.51	-0.82
240.5	-0.39	-0.63
250.5	-0.43	-0.70



Rollover Sensor Data (Second Record)

Time (sec)	Vehicle roll angle (degrees)
-1.0	-51.57
-0.9	-51.57
-0.8	-47.45
-0.7	-44.89
-0.6	-39.48
-0.5	-32.41
-0.4	-30.67
-0.3	-26.61
-0.2	-21.78
-0.1	-15.0
0.0	-5.39
0.1	7.44
0.2	22.47
0.3	41.25
0.4	63.72
0.5	88.35
0.6	113.11
0.7	137.87
0.8	162.63
0.9	187.39
1.0	212.15

Time (sec)	Vehicle roll angle (degrees)
1.1	236.91
1.2	261.67
1.3	286.44
1.4	311.2
1.5	335.96
1.6	360.72
1.7	385.18
1.8	409.94
1.9	434.7
2.0	459.47
2.1	472.34
2.2	472.34
2.3	472.34
2.4	472.34
2.5	472.34
2.6	472.34
2.7	472.34
2.8	472.34
2.9	472.34
3.0	472.34
3.1	472.34

Time (sec)	Vehicle roll angle (degrees)
3.2	472.34
3.3	472.34
3.4	472.34
3.5	472.34
3.6	472.34
3.7	472.34
3.8	472.34
3.9	472.34
4.0	472.34
4.1	472.34
4.2	472.34
4.3	472.34
4.4	472.34
4.5	472.34
4.6	472.34
4.7	472.34
4.8	472.34
4.9	472.34
5.0	472.34

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.

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Event Record 1

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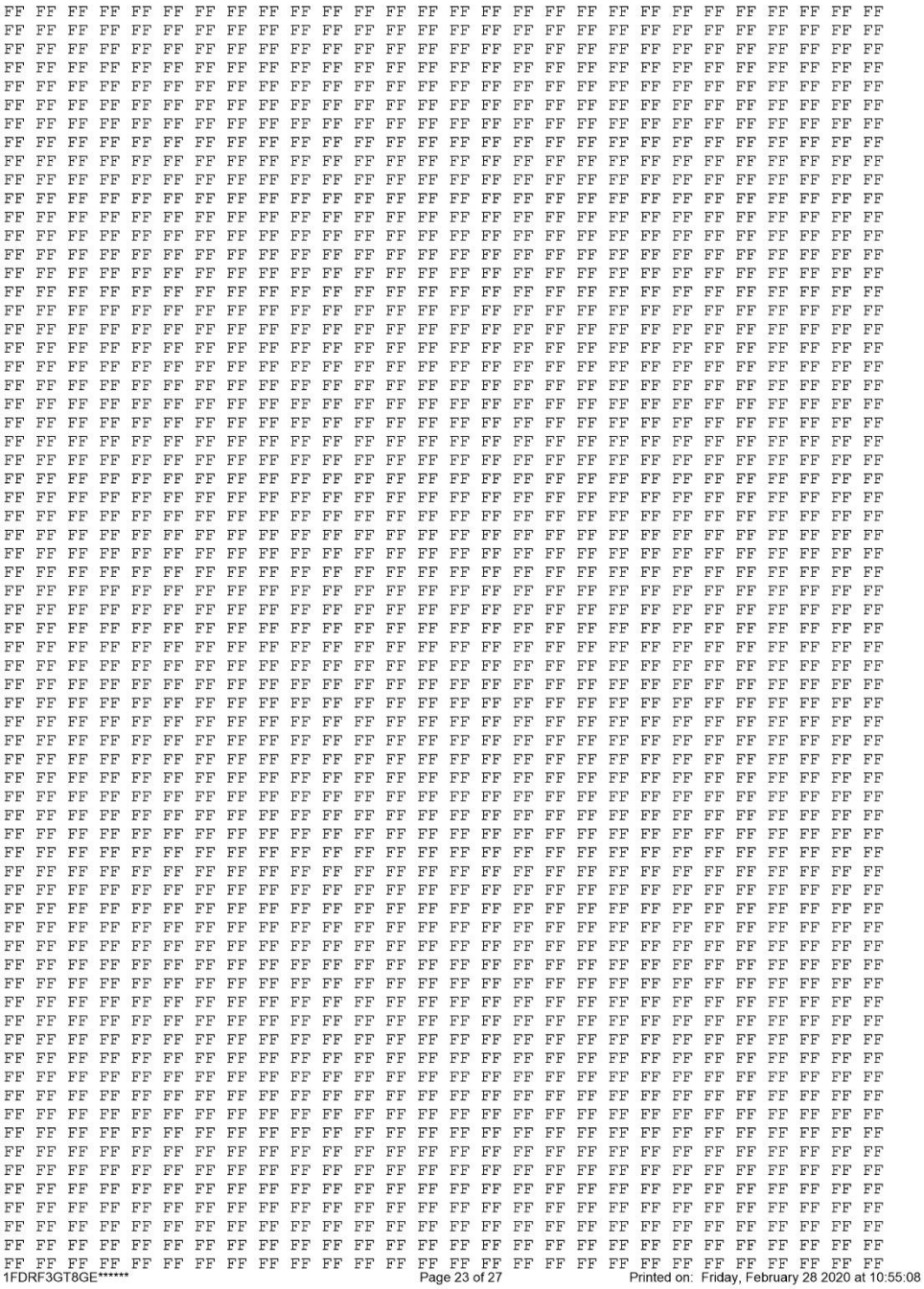

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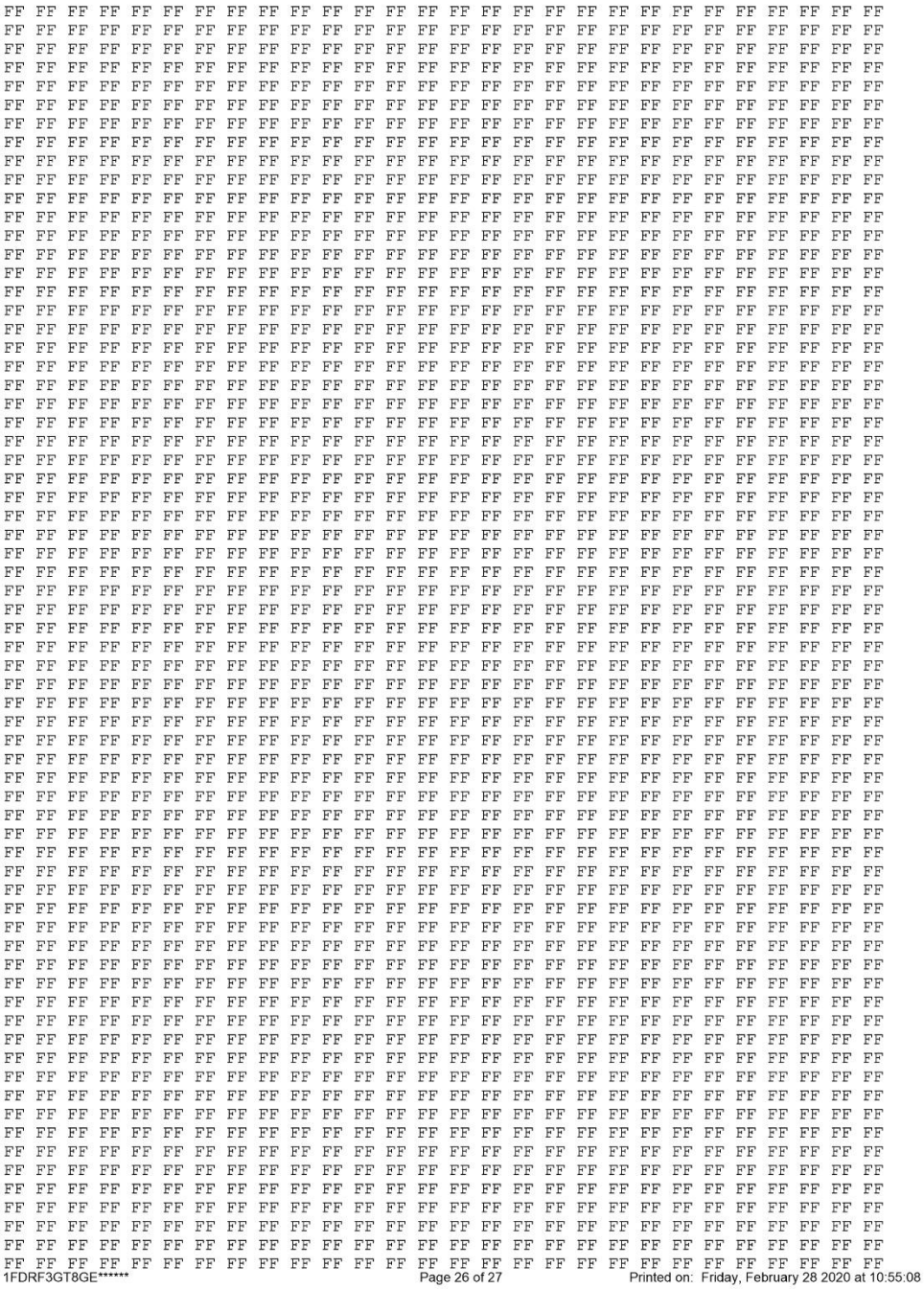

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DOT HS 812 943
May 2021

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

14799-052121-v4