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Special Crash Investigations On-Site Small Overlap/Oblique Impact Investigation Vehicle: 2012 Ford Focus Location: Missouri Crash Date: July 2016

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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 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 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.

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16. Abstract

This report documents the on-site investigation of a small overlap/oblique impact to a 2012 Ford Focus and the injuries sustained by the driver. This crash occurred on a two-lane, rural roadway. The Ford was a four-door sedan equipped with multi-stage frontal air bags, front seat-mounted side impact air bags, and side impact inflatable curtain (IC) air bags. A belted 47-year-old male driver and belted 38-year-old female front row right passenger occupied the vehicle. The Ford was traveling south in the southbound lane approaching a right curve. A 2005 Pontiac Sunfire was traveling north in the northbound lane and the driver was negotiating a left curve. The Pontiac's right side wheels departed the right (east) side of the roadway as the vehicle exited the curve. The driver initiated a left steering maneuver and the vehicle began to rotate counterclockwise in a northwesterly direction. The Pontiac then entered the Ford's travel lane and the right plane of the vehicle struck the front plane left corner of the Ford (event 1). The impact resulted in deployment of both of the Ford's frontal air bags and the left IC air bag. The driver's and front passenger's safety belt pretensioners also actuated. The Ford departed the west side of the roadway and the right plane sideswiped a sign (event 2). The vehicle then came to final rest heading southwest. The Pontiac continued to rotate counterclockwise following the impact and departed the west side of the roadway where the driver was ejected through the driver's door. The vehicle then came to final rest in the west ditch heading northeast. The driver and front row passenger of the Ford sustained police-reported "A" (incapacitating) injuries and were transported by ambulance to a hospital where they were treated in the emergency room for moderate and minor severity injuries, respectively and released. An unbelted 24-year-old male driver and belted 30-year-old female front row right passenger occupied the Pontiac. They sustained police-reported "A" (incapacitating) injuries and were transported by ambulance to a hospital. Their injuries and level of treatment are not known. Both vehicles were towed from the crash scene due to damage.

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TRANSPORTATION RESEARCH CENTER
ON-SITE SMALL OVERLAP/OBLIQUE IMPACT INVESTIGATION
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LOCATION - MISSOURI
VEHICLE - 2012 FORD FOCUS
CRASH DATE - JULY 2016

BACKGROUND

This report documents the on-site investigation of a small overlap/oblique impact to a 2012 Ford Focus (**Figure 1**) and the injuries sustained by the driver. This crash investigation was initiated by the National Highway Traffic Safety Administration (NHTSA) in September 2016, after the crash was identified by the Special Crash Investigation team at the Indiana University Transportation Research Center through an online search of Missouri crash report abstracts. This investigation was assigned in September 2016, when permission for the vehicle inspection was obtained from the insurance company. The crash occurred in July 2016, at 1905 hours, in Missouri and was investigated by a local police agency. The crash involved the Ford and a 2005 Pontiac Sunfire. The Ford and crash scene were inspected in September 2016. The Pontiac was not inspected since it had been sold for salvage.

Figure 1: The damaged 2012 Ford Focus

This crash occurred on a two-lane, rural roadway. The Ford was a four-door sedan equipped with multi-stage frontal air bags, front seat-mounted side impact air bags, and side impact inflatable curtain (IC) air bags. A belted 47-year-old male driver and belted 38-year-old female front row right passenger occupied the vehicle. The Ford was traveling south in the southbound lane approaching a right curve. The Pontiac was traveling north in the northbound lane and the driver was negotiating a left curve. The Pontiac's right side wheels departed the right (east) side of the roadway as the vehicle exited the curve. The driver initiated a left steering maneuver and the vehicle began to rotate counterclockwise in a northwesterly direction. The Pontiac then entered the Ford's travel lane and the right plane of the vehicle struck the front plane left corner of the Ford (event 1). The impact resulted deployment of both of the Ford's frontal air bags and the left IC air bag. The driver's and front passenger's safety belt pretensioners also actuated. The Ford departed the west side of the roadway and the right plane sideswiped a sign (event 2). The vehicle then came to final rest heading southwest. The Pontiac continued to rotate counterclockwise following the impact and departed the west side of the roadway where the driver was ejected through the driver's door. The vehicle then came to final rest in the west ditch heading northeast. The driver and front row passenger of the Ford sustained police-reported "A" (incapacitating) injuries and were transported

by ambulance to a hospital where they were treated in the emergency room for moderate and minor severity injuries, respectively and released. An unbelted 24-year-old male driver and belted 30-year-old female front row right passenger occupied the Pontiac. They sustained police-reported "A" (incapacitating) injuries and were transported by ambulance to a hospital. Their injuries and level of treatment are not known. Both vehicles were towed from the crash scene due to damage.

Figure 2: Southbound approach of the Ford

Figure 3: Northbound approach of the Pontiac

Figure 4: Area where Pontiac departed right side of roadway, view north

CRASH SUMMARY

Crash Site

This crash occurred during day time hours on a two-lane rural roadway. The weather conditions were overcast with 16 kilometers (10 miles) visibility, west-southwest winds at 10 km/h (6 mph), a temperature of 20.6 °C (69 °F), and a dew point of 11.7 °C (53 °F), according to local weather reports. The roadway had one lane in each direction and was curved beginning approximately 22 m (72 ft) south of the crash location. The roadway was bordered on each side by a bituminous/grass shoulder and a ditch. The roadway surface was dry bituminous. The speed limit for each vehicle was 89 km/h (55 mph). The speed advisory for the curve was 64 km/h (40 mph). The crash diagram is included at the end of this report on page 12.

Pre-Crash

The Ford was traveling south in the southbound lane (**Figure 2**) at an EDR-reported speed of 93.7 km/h (58.2 mph) at -5.0 sec prior to Algorithm Enable (AE) and the driver intended to continue southbound. The Pontiac was traveling north in the northbound lane and the driver was negotiating a left curve (**Figure 3**). The Pontiac's right side wheels departed the right (east) side of the roadway as the vehicle was exiting the curve (**Figure 4**). The driver initiated a left steering maneuver and the vehicle to rotated counter-clockwise across the roadway in a northwest direction for approximately 38 m (124 ft) toward impact with the southbound Ford. The driver of the Ford initiated a right steering maneuver and applied the brakes in an attempt to avoid the crash. The Ford's EDR reported that the service brake was "On" beginning at -2.0 sec prior to AE

and remained on at 0.0 sec at which point the EDR-reported speed was 52.4 km/h (32.6 mph). The Ford's EDR-reported pre-crash speed, accelerator pedal position, service brake, engine RPM, and antilock brake system (ABS) activity are presented in the following table.

Ford's EDR-Reported Pre-Crash Data

Time (sec)	Speed km/h (mph)	Accel Pedal % Full	Service Brake	Engine RPM	ABS Activity
-5.0	93.7 (58.2)	18.1	Off	2,482	Non-engaged
-4.5	93.1 (57.8)	8.3	Off	2,462	Non-engaged
-4.0	92.1 (57.2)	0.0	Off	2,432	Non-engaged
-3.5	91.0 (56.5)	0.0	Off	2,402	Non-engaged
-3.0	89.9 (55.9)	0.0	Off	2,372	Non-engaged
-2.5	88.7 (55.1)	0.0	Off	2,348	Non-engaged
-2.0	87.6 (54.4)	0.0	On	2,318	Non-engaged
-1.5	83.1 (51.6)	0.0	On	2,162	Non-engaged
-1.0	73.1 (45.4)	0.0	On	1,882	Non-engaged
-0.5	47.5 (29.5)	0.0	On	1,584	Engaged
0.0	52.4 (32.6)	0.0	On	1,532	Engaged

Crash

The right front corner of the Pontiac struck the front left corner of the Ford (**Figure 5**). The impact occurred 2.6 m (8.5 ft) into the Ford's travel lane (**Figure 6**). The force direction on the Ford was within the 11 o'clock sector and the impact resulted in actuation of the driver's and front row passenger's safety belt pretensioners, stage 2 deployment of both frontal air bags, and deployment of the left IC air bag. The Ford's EDR reported the maximum longitudinal and lateral velocity changes as -45.1 km/h (-28.0 mph) and 20.0 km/h (12.4 mph), respectively. The "Missing Vehicle" algorithm of the WinSMASH program calculated the Ford's total delta-V as 54 km/h (34 mph). The longitudinal and lateral velocity changes were -51 km/h (-32 mph) and 19 km/h (12 mph), respectively. WinSMASH calculated the total delta-V for the

Figure 5: Damage to the front plane of the Ford from the impact with the Pontiac

Pontiac as 64 km/h (40 mph). The longitudinal and lateral velocity changes were -22 km/h (-14 mph) and -60 km/h (-38 mph), respectively. The WinSMASH results should be considered borderline since the Pontiac was not inspected.

The impact caused the Ford to rotate slightly clockwise and it departed to the west edge of the roadway into a ditch where the right plane sustained a minor sideswipe impact with a curve warning sign post (event 2). The vehicle then came to final rest in the ditch heading south after traveling a total distance of 4.0 m (13.1 ft) from the initial impact. The Pontiac rotated counter-clockwise 265 degrees from the initial impact as it traveled 15.0 m (49.2 ft) coming to final rest in the ditch on the west side of the roadway heading north. The unbelted driver was ejected through the left front window following the initial impact according to the police crash report. He came to final rest in the ditch on the east side of the roadway.

Figure 6: View northeast to area of impact in the southbound lane

Post-Crash

The police were notified of the crash at 1910 hours and arrived on scene at 1926 hours. The driver and front row passenger in the Ford sustained police-reported "A" (incapacitating) injuries and was transported by ambulance to a hospital where they were treated in the emergency room for moderate and minor severity injuries, respectively and then released. The driver and front row right passenger of the Pontiac both sustained police-reported "A" (incapacitating) injuries and transported by ambulance to a hospital. Their injuries and level of treatment are not known. Both vehicles were towed from the crash scene due to damage.

2012 FORD FOCUS

DESCRIPTION

The Ford was a front wheel drive, five-occupant, four-door, sedan with VIN 1FAHP3E26CLxxxxxx, manufactured in April 2011. The vehicle was equipped with a 2.0-liter I-4 engine, five-speed manual transmission, four-wheel antilock brakes with electronic brake force distribution, traction control, and electronic stability control (ESC). The vehicle was also equipped with multi-stage frontal air bags, front seat-mounted side impact air bags, side impact IC air bags, and a tilt steering column that was adjusted between the middle and full-up positions. The specified wheelbase was 265 cm (104.3 in).

The vehicle manufacturer's recommended tire size was P195/65R15. The vehicle was equipped with Aplus A606 tires size P205/65R15. The vehicle manufacturer's recommended cold tire pressure for the front and rear tires was 241 kPa (35 psi). The tires were all in good condition prior to the crash.

The front row was equipped with driver and passenger cloth-covered bucket seats with adjustable head restraints. The second row was equipped with a cloth-covered bench seat with folding backs and adjustable head restraints in the outboard setting positions. The driver's seat track was adjusted

to the middle position and the seat back was reclined 23 degrees aft of vertical. The front row passenger's seat track was adjusted between the middle and full-rear positions and the seat back was reclined 28 degrees aft of vertical.

Exterior Damage

Exterior Damage Event 1: The entire front plane sustained direct and induced damage during the impact with the front plane of the Pontiac. The direct damage involved the Ford's bumper, hood, left headlamp/turn signal assembly, left fender, and left front wheel. The direct damage began at the left corner of the front bumper and extended 115 cm (45.3 in). The Field L was 126 cm (49.6 in) long and began at the same location. Crush measurements were taken on the bumper bar and the maximum residual crush was 64 cm (25.2 in) occurring at C_1. The crush values were: C_1 = 64 cm (25.2 in), C_2 = 50 cm (19.7.3 in), C_3 = 40 cm (15.7 in), C_4 = 23 cm (9.1 in), C_5 = 5 cm (2.0 in), C_6 = 0 cm.

Damage Classification Event 1: The Collision Deformation Classification (CDC) was 11FDEW3 (340 degrees).

Exterior Damage Event 2: The right quarter panel sustained direct and induced damage during the sideswipe impact with a curve warning sign post as the vehicle came to final rest. The quarter panel and right side of the tail lamp assembly were directly damaged. The direct damage began on the quarter panel above the right rear axle and extended rearward 56 cm (22.1 in). The Field L was also 56 cm (22.1 in) long and began at the same location. The maximum residual crush was 1 cm (0.4 in) occurring at C_2. The crush values were: C_1 = 0 cm, C_2 = 1 cm (0.4 in), C_3 = 0 cm, C_4 = 0 cm, C_5 = 0 cm, C_6 = 0 cm.

Damage Classification Event 2: The CDC was 12RBMS1 (0 degrees). The severity of the damage was minor.

Event Data Recorder

The Ford's EDR was imaged with version 17.0 of the Bosch Crash Data Retrieval software and reported with version 17.5.1. The vehicle was without power and the EDR was imaged via direct connection to the air bag control module (ACM). The EDR report is attached to the end of this report as Attachment A.

The EDR can store up to two deployment events. Data from a deployment event can not be overwritten. Data from an event that does not qualify as a deployment event can be overwritten by subsequent events. The EDR recorded a deployment event, which was identified as a "locked frontal event" and reported as the "First Record." The EDR also recorded a non-deployment event, which was reported as the "Second Record." A "Complete" file was recorded for each event. The driver's front passenger's safety belt status was reported as "Buckled" and the seat track position switch for each seat was reported as "Not Forward." The frontal air bag warning lamp was reported as "Off" on the "First Record" and "On" for the "Second Record" since the frontal air bags deployed during the first event. The ignition cycles at the crash and when the data were imaged for each event were reported as 8,821 and 8,822, respectively.

Deployment Event ("First Record"): This event was recorded during the frontal impact with the Pontiac. Deployment of both stages of both frontal air bags, the left IC air bag, and both pretensioners was reported. The times to first and second stage deployment for the driver's frontal air bag were 16.5 and 26.5 msec, respectively. The times to first and second stage deployments for the passenger's frontal air bag were 16.5 and 21.5 msec, respectively. The time to pretensioner deployment for the driver and passenger was 6.0 msec. The maximum longitudinal and lateral Delta Vs were reported as -45 km/h (-28.0 mph) and 20 km/h (12.4 mph), respectively occurring at 70 msec following AE.

Non-Deployment Event ("Second Record"): This event was recorded when the vehicle departed the roadway into a ditch following the frontal impact. The maximum longitudinal and lateral Delta Vs were reported as 3 km/h (1.9 mph) and -18 km/h (-11.2 mph), respectively, occurring at 180 and 200 msec, respectively. The time from the deployment event to this event was reported at 0.492 msec.

Interior Damage

The interior of the Ford sustained minor damage from three intrusions into the driver's seating area. The forward lower quadrant of the left front door and the left instrument panel intruded 10 cm (3.9 in) and 4 cm (1.6 in) laterally, respectively. The toe pan intruded longitudinally 10 cm (3.9 in). Evidence of occupant contact consisted of a scuff mark on the right corner of the glove box door and a fractured air vent above the scuff from contact by the front passenger's right knee. The rear upper quadrant of the left front door and arm rest were deformed, probably from contact by the driver's left flank. There was no deformation of the steering wheel. The windshield glazing was cracked from impact forces and had been cut and removed from the vehicle. The left front glazing was disintegrated. The remaining glazing was undamaged. The left front door was jammed shut. The left rear, right rear, and right front doors remained closed and operational.

Manual Restraint Systems

The front and second rows were equipped with three-point lap and shoulder safety belts. The front row safety belts were equipped with adjustable upper anchors and retractor-mounted safety belt pretensioners. The driver's and front row passenger's upper anchors were each adjusted to the full-down position and each pretensioner actuated during the crash. The remaining seating positions were unoccupied at the time of the crash.

The driver was restrained by the lap and shoulder safety belt as evidence by a 12 cm (4.7 in) long scuff mark on the belt webbing from the D-ring located 172 cm (67.7 in) from the floor anchor. There also was a 3 cm (1.2 in) long scuff on the belt webbing from the latch plate belt guide located 92 cm (36.2 in) from the floor anchor. The vehicle's EDR also reported the status of the driver's safety belt buckle switch as "Buckled."

The front row passenger was also restrained by a lap and shoulder safety belt as evidenced by a 20 cm long scuff mark on the belt webbing from the latch plate belt guide located 187 cm (73.6 in) from the floor anchor. There also was an 8 cm (3.1 in) long scuff mark on the belt webbing from the latch plate belt guide located 103 cm (40.6 in) from the floor anchor. The vehicle's EDR also reported the status of the passenger's safety belt buckle switch as "Buckled."

Supplemental Restraint Systems

The Ford was equipped with multi-stage frontal air bags, front seat-mounted side impact air bags, and side impact IC air bags. Both frontal air bags and the left IC air bag deployed during the crash.

Figure 7: The Ford's driver's deployed frontal air bag, left IC, and left A-pillar

The driver's frontal air bag (**Figure 7**) was located within the steering wheel hub. The air bag module had two cover flaps constructed of pliable vinyl that were separated by a horizontal tear seam. The top flap was 5 cm (2.0 in) high and 13.5 cm (5.3 in) wide. The bottom flap was 13.5 cm (5.3 in) wide at the top, 7 cm (2.8 in) wide at the bottom, and 10 cm (3.9 in) high. The cover flaps opened at the designated tear seams and were undamaged. The deflated air bag was 54 cm (19.7 in) in diameter. Inspection of the air bag revealed no discernable evidence of occupant contact and no damage.

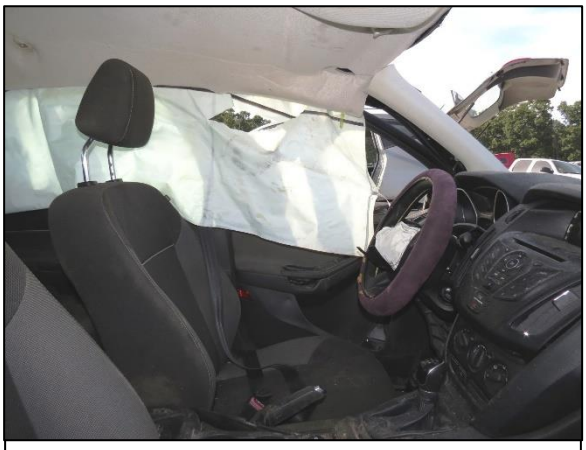


Figure 8: The Ford's deflated left IC air bag

The IC air bags were located along the roof side rail inside the headliner and extended from the A-pillar to the C-pillar. The deflated left IC (**Figure 8**) was 154 cm (60.1 in) wide and 35 cm (20.1 in) high. The IC extended 15 cm (5.9 in) below the beltline in the second row. The distance the IC extended below the beltline in the front row could not be accurately measured since the IC had been cut in the front row, probably by emergency responders. There was a triangular-shaped gap between the front of the left IC and the A-pillar that was 21 cm (8.3 in) wide at the beltline. There was no discernable evidence of occupant contact to the left IC and no damage.

The passenger's frontal air bag was located within the top of the instrument panel. The air bag module had a single cover flap that was 32 cm (12.6 in) long and 14 cm (5.5 in) high. The deflated air bag was 40 cm (15.7 in) wide and 50 cm (19.8 in) tall. A small spot of blood spatter was located on the top of the air bag. There was no discernable evidence of occupant contact marks on the air bag.

2012 FORD FOCUS OCCUPANTS

Driver Demographics

Age/Sex:	47 years/male
Height:	173 cm (68 in)
Weight:	99 kg (219 lbs)
Eyewear:	Unknown
Seat Type:	Bucket
Seat Track Position:	Middle
Manual Restraint Usage:	Lap and shoulder belt
Usage Source:	Vehicle inspection, EDR
Air Bags:	Driver's frontal and left ICs, deployed; seat-mounted side impact, not deployed.
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Unknown
Transport from Scene:	Ambulance
Medical Treatment:	Treated in hospital emergency room and released

Driver Injuries

Injury No.	Injury	AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Fracture left transverse process L_2, not further	650620.1	Lap portion of safety belt system and impact forces	Probable
2	Fracture, non-displaced, longitudinally through medial aspect of right distal tibia	854361.2	Floor, foot controls	Certain
3	Fracture, incomplete, transverse, of left proximal diaphysis (shaft) of 4th metatarsal with swelling dorsum of left foot	858153.2	Floor, including toe pan	Certain
4	Abrasion over left upper anterior chest, not further	410202.1	Torso portion of safety belt system	Certain
5 6	Contusions (bruising) abdomen involving right and left lower quadrants with seatbelt sign across abdomen, not further	510402.1 510402.1	Lap portion of safety belt system	Certain
7	Abrasion over left clavicle, not further specified	710202.1	Torso portion of safety belt system	Certain
8	Abrasion and swelling over left wrist, not further specified	710202.1	Left instrument panel	Probable
9	Contusion (ecchymosis) on left shin, not further specified	810402.1	Left lower instrument panel (includes knee bolster), left of	Probable

Source: Emergency Room Records and EMS Treatment Record. Injury Numbers 1 through 4 and 7 through 9 came only from Emergency Room Records. Injury Numbers 5 and 6 came from a combination of EMS Treatment and Emergency Room Records.

Driver Kinematics

The driver was restrained by the lap and shoulder safety belt. The seat track was adjusted to the middle position and the seat back was reclined 23 degrees aft of vertical. The top of the head restraint was located 30 cm (11.8 in) above the top of the seat back. The front plane impact to the Ford resulted in actuation of the driver's safety belt pretensioner and a stage two deployment of the driver's frontal air bag. The left IC air bag also deployed. The impact displaced the driver forward and to the left and he loaded the safety belt resulting in a fracture to the left transverse process of L_2, abrasions over the left clavicle and chest, and a contusion to the abdomen. His left hand contacted the left instrument panel abrading the wrist, and his left shin sustained a contusion from contact with the lower left instrument panel. The driver also sustained a non-displaced fracture of the right distal tibia from contact with the brake pedal. His left foot contacted the intruded toe pan resulting in a fracture of the 4th metatarsal. The driver rebounded and was redirected to the right when the vehicle departed the roadway into a ditch on the right side of the roadway. The driver was transported by ambulance to a hospital where he was treated in the emergency room and released.

Front Row Right Occupant Demographics

Age/Sex:	38 years/female
Height:	163 cm (64 in)
Weight:	104 kg (230 lbs)
Eyewear:	Unknown
Seat Type:	Bucket
Seat Track Position:	Between middle and rear-most
Manual Restraint Usage:	Lap and shoulder belt
Usage Source:	Vehicle inspection, EDR
Air Bags:	Frontal air bag, deployed; seat-mounted side impact and right IC, not deployed.
Alcohol/Drug Involvement:	Not reported
Egress from Vehicle:	Unknown
Transport from Scene:	Ambulance
Medical Treatment:	Treated in hospital emergency room and released

Front Row Right Occupant Injuries

Injury No.	Injury	AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1 2	Contusion (ecchymosis), mild, right upper anterior chest and on left breast, not further	410402.1 410402.1	Torso portion of safety belt system	Certain
3	Contusion (bruising) over left scapula, not further specified	410402.1	Seat back, front right passenger's	Probable
4 5	Contusions (bruising), suprapubic, over right and left lower quadrants of abdominal wall, not further specified	510402.1 510402.1	Lap portion of safety belt system	Certain
6	Abrasions all over extremities, not further specified	910202.1	Unknown physical components	Unknown
7 8	Abrasions on posterior (back of) thighs, not further specified	810202.1 810202.1	Seat cushion, front right passenger's	Probable
9 10	Contusions (ecchymosis) medial bilateral knees, not further	810402.1 810402.1	Occupant's left medial knee Occupant's right medial knee	Probable
11 12	Contusions (bruising) all over her legs, not further specified	810402.1 810402.1	Unknown physical components	Unknown
13	Laceration, superficial, right lower leg, not further specified	810602.1	Right lower instrument panel (includes knee bolster)	Probable

Source: Emergency Room Records and EMS Treatment Record. Injury Numbers 1, 2, 4, 5, 9, 10, and 13 came only from Emergency Room Records. Injury Numbers 3, 6 through 8, 11, and 12 came only from EMS Treatment Record.

Front Row Right Kinematics

The front row right occupant was restrained by the lap and shoulder safety belt. The seat track was adjusted to the middle position and the seat back was reclined 28 degrees aft of vertical. The top of the head restraint was located 26 cm (10.2 in) above the top of the seat back. The front plane impact to the Ford resulted in a stage two deployment of the passenger's frontal air bag and actuation of the safety belt pretensioner. The occupant was displaced forward and to the left and she loaded the safety belt resulting in contusions to her chest and abdomen. Her right leg contacted the lower instrument panel causing a contusion to her right lower leg. She also sustained contusions on the medial aspect of each knee from the two knees contacting each other. The occupant then rebounded into her seat sustaining abrasions to the back of her thighs and a contusion over the left scapula from contacting the seat cushion and seat back, respectively. She also sustained abrasions all over her extremities, and contusions over her legs from unknown contact sources. The occupant was then redirected to the right when the vehicle departed the right side of the roadway into a ditch. The front row right occupant was transported by ambulance to a hospital where she was treated in the emergency room and released.

2005 PONTIAC SUNFIRE
DESCRIPTION

The Pontiac was a front wheel drive, five occupant, two-door coupe with VIN: 3G2JB12F05Sxxxxxx, equipped with a 2.2-liter I-4 engine and a five-speed manual transmission. The vehicle was also equipped with dual-stage frontal air bags.

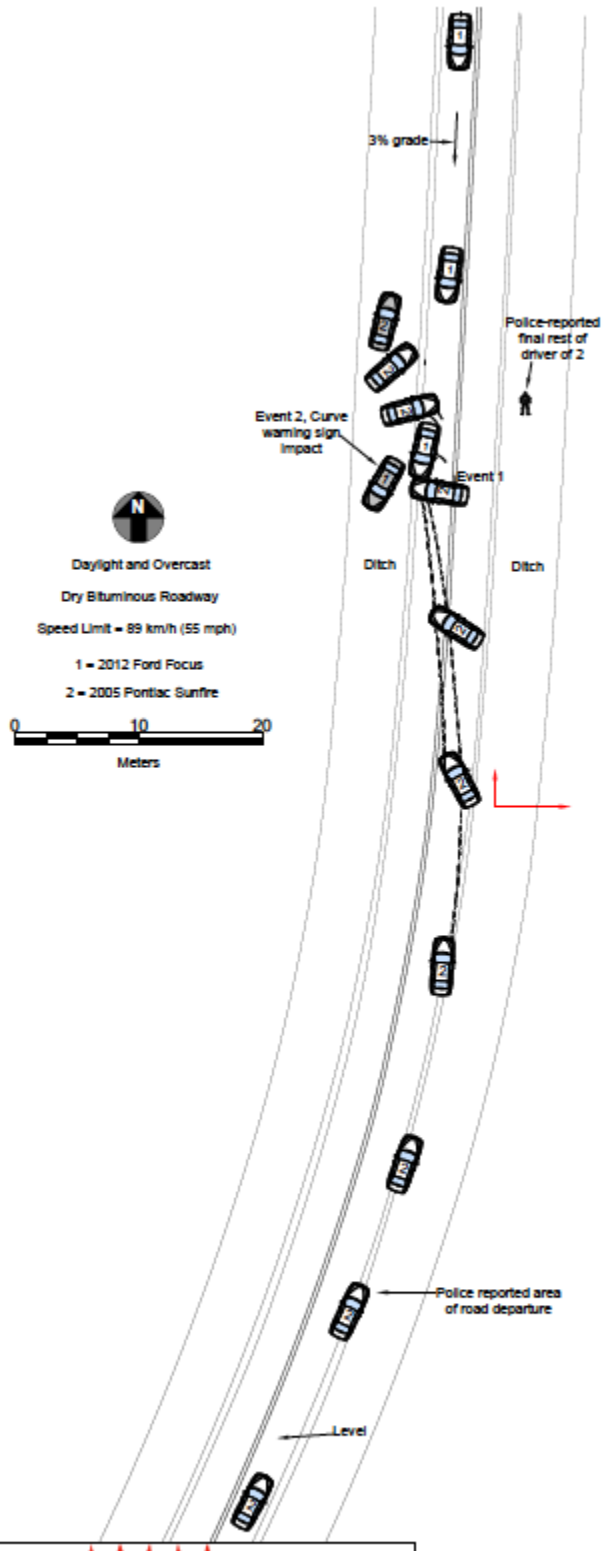
Exterior Damage

The Pontiac was not inspected since it had been sold for salvage. The vehicle sustained direct damage to the right plane during the impact with the front plane of the Ford according to the police crash report.

Occupant Data

The driver (24-year-old male) was not restrained by a lap and shoulder safety belt and was ejected from the vehicle through the left front window during the crash, according to the police crash report. He sustained police-reported "A" (incapacitating) injuries and was transported by ambulance to a hospital. His injuries and level of treatment are not known. The front row passenger (30-year-old female) was restrained by a lap and shoulder safety belt according to the police crash report. She sustained police-reported "A" (incapacitating) injuries and was transported by ambulance to a hospital. Her injuries and level of treatment are not known.

CRASH DIAGRAM



	NHTSA www.nhtsa.gov
Case Number:	IN16023

Appendix: 2012 Ford Focus, Event Data Recorder Report[1]

[1] *The Event Data Recorder (EDR) report published as part of this technical report and the CDR report contained within the associated Crash Viewer application differed. The CDRx file is provided in the Crash Viewer and reader can run the CDRx file with the latest software version of the Bosch CDR tool reader (https://www.boschdiagnostics.com/cdr/software-downloads).*

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	1FAHP3E26CL******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	IN116023_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.0
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 17.5.1
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	Yes
Event(s) recovered	locked frontal 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.

02012_RCM-AB10_r001

System Status at Time of Retrieval

VIN As Programmed into RCM at Factory	1FAHP3E26CL******
Current VIN from PCM	1FAHP3E26CL******
Ignition Cycle, Download (First Record)	8,822
Ignition Cycle, Download (Second Record)	8,822
Restraints Control Module Part Number	CM5T-14B321-AE
Restraints Control Module Serial Number	000292294541
Restraints Control Module Software Part Number (Version)	CM5T-14C028-AE
Driver Side/Center Frontal Restraints Sensor Serial Number	BD03965F101E
Driver, Row 1, Side Restraint Sensor 1 Serial Number	A503D5672F3F
Driver, Row 2, Side Restraint Sensor 2 Serial Number	B703A431173E
Passenger Frontal Restraints Sensor Serial Number	C103965F3932
Passenger, Row 1, Side Restraint Sensor 1 Serial Number	BD03965F3C16
Passenger, Row 2, Side Restraint Sensor 2 Serial Number	BF03A431071E

System Status at Event (First Record)

Complete File Recorded (Yes,No)	Yes
Multi-Event, Number of Events	1
Time From Event 1 to 2 (msec)	N/A
Lifetime Operating Timer at Event Time Zero (sec)	10,894,820
Key-On Timer at Event Time Zero (sec)	205
Vehicle Voltage at Time Zero (V)	13.92
Energy Reserve Mode Entered During Event (Yes, No)	No
Time Driver Side/Center Frontal Restraints Sensor Lost Relative to Time Zero (msec)	13

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)	16.5
Frontal Airbag Deployment, Time to 2nd Stage, Driver (msec)	26.5
Belt tensioner deployment, time to 1st stage, driver (msec)	6.0
Curtain airbag deployment, time to 1st stage, driver (msec)	16.5
Frontal airbag deployment, time to 1st stage deployment, front passenger (msec)	16.5
Frontal airbag deployment, time to 2nd stage, front passenger (msec)	21.5
Belt tensioner deployment, time to 1st stage, front passenger (msec)	6.0
Maximum Delta-V, Longitudinal (MPH [km/h])	-28.0 [-45]
Time, Maximum Delta-V Longitudinal (msec)	70
RCM, Side Driver (Lateral), Safing	Yes
RCM Side Passenger (Lateral), Safing	Yes
Driver or Center, Front Satellite Sensor, Safing	Yes
Passenger, Front Satellite Sensor, Safing	Yes
RCM Front (Longitudinal), Discriminating Deployment	Yes
RCM Front(Longitudinal), Safing	Yes

Pre-Crash Data -1 sec (First Record)

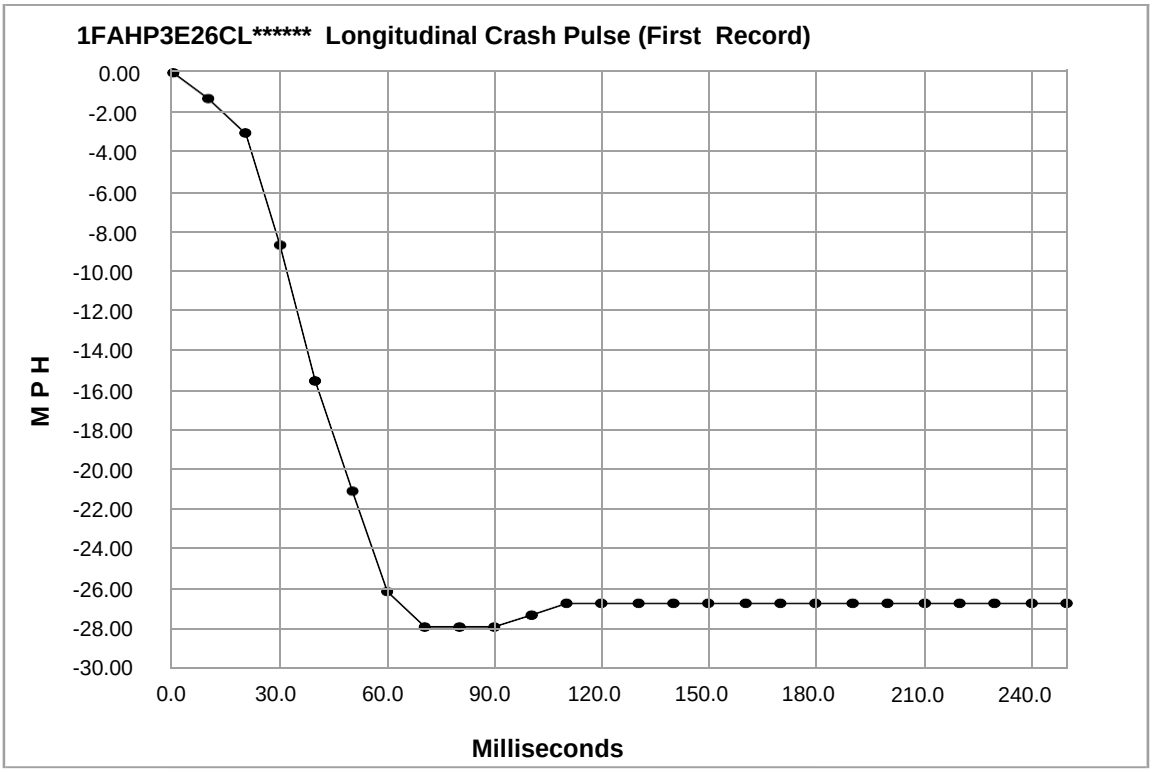
Ignition cycle, Crash	8,821
Frontal Air Bag Warning Lamp, On/Off	Off
Occupant Size Classification, Front Passenger (Child size Yes/No [Hex value])	No [$02]
Safety Belt Status, Driver	Buckled
Seat Track Position Switch, Foremost, Status, Driver	Not Forward
Seat Track Position Switch, Foremost, Status, Front Passenger	Not Forward
Safety Belt Status, Front Passenger	Buckled
Brake Telltale	Off
ABS Telltale	Off
ESC/TC Telltale	Off
ESC/TC Off Telltale	Off
Speed Control Telltale	Off
Powertrain Wrench Telltale	Off
Powertrain Malfunction Indicator Lamp (MIL) Telltale	Off

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

Time (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	Traction Control via Brakes	Wheel Torque (N-m)	Driver Gear Select (Auto Trans)
- 5.0	58.2 [93.7]	18.1	Off	2482	non-engaged	No	non-engaged	224	Park or Manual
- 4.5	57.8 [93.1]	8.3	Off	2462	non-engaged	No	non-engaged	72	Park or Manual
- 4.0	57.2 [92.1]	0.0	Off	2432	non-engaged	No	non-engaged	-4	Park or Manual
- 3.5	56.5 [91.0]	0.0	Off	2402	non-engaged	No	non-engaged	-84	Park or Manual
- 3.0	55.9 [89.9]	0.0	Off	2372	non-engaged	No	non-engaged	-80	Park or Manual
- 2.5	55.1 [88.7]	0.0	Off	2348	non-engaged	No	non-engaged	-80	Park or Manual
- 2.0	54.4 [87.6]	0.0	On	2318	non-engaged	No	non-engaged	-80	Park or Manual
- 1.5	51.6 [83.1]	0.0	On	2162	non-engaged	No	non-engaged	-84	Park or Manual
- 1.0	45.4 [73.1]	0.0	On	1882	non-engaged	No	non-engaged	-80	Park or Manual
- 0.5	29.5 [47.5]	0.0	On	1584	engaged	No	non-engaged	-32	Park or Manual
0.0	32.6 [52.4]	0.0	On	1532	engaged	No	non-engaged	-40	Park or Manual

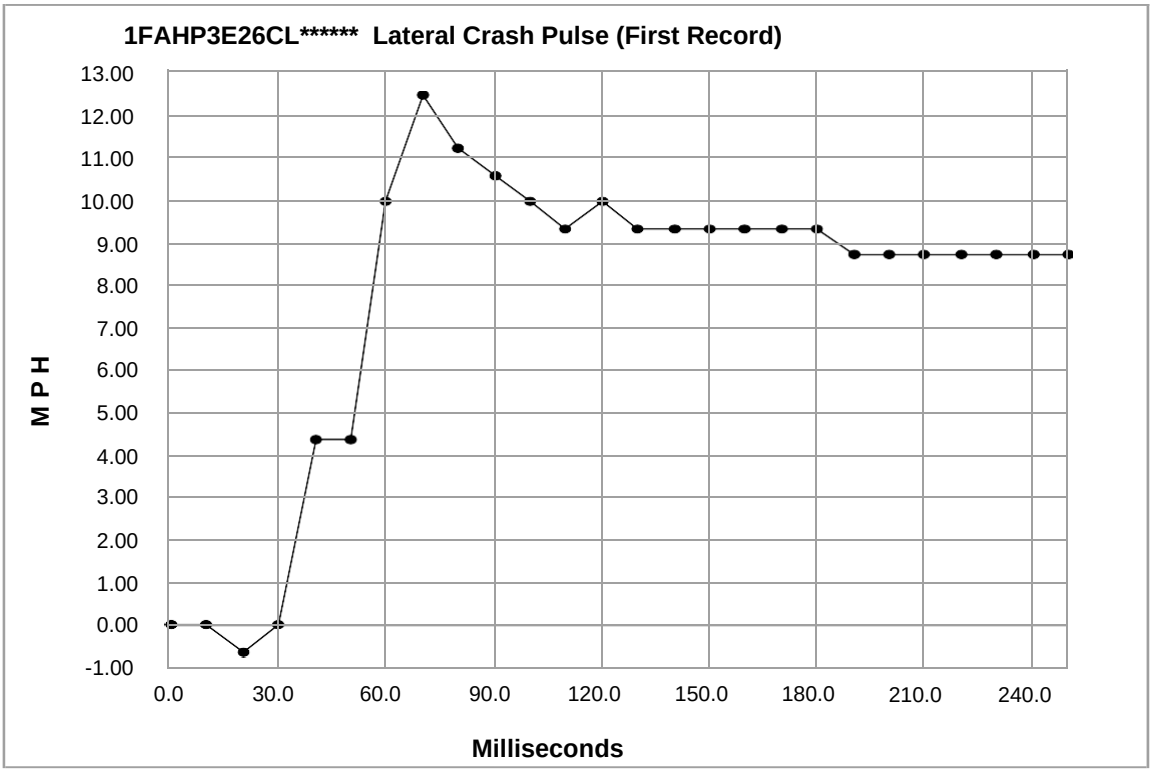
Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record)

Time (sec)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)
- 5.0	0.03	0.03	-0.07
- 4.9	-0.01	-0.01	0.08
- 4.8	0.04	0.01	0.00
- 4.7	0.03	0.04	0.00
- 4.6	0.00	-0.01	0.14
- 4.5	0.03	0.01	-0.02
- 4.4	0.02	0.02	0.01
- 4.3	0.02	-0.02	0.00
- 4.2	0.03	0.00	-0.02
- 4.1	0.02	0.02	0.00
- 4.0	0.00	-0.03	0.00
- 3.9	0.02	-0.01	-0.09
- 3.8	0.02	0.01	-0.09
- 3.7	0.00	-0.03	-0.08
- 3.6	0.02	-0.03	-0.41
- 3.5	0.02	0.01	-0.03
- 3.4	0.01	-0.03	0.03
- 3.3	0.02	-0.04	0.00
- 3.2	0.05	-0.01	0.00
- 3.1	0.01	-0.02	0.17
- 3.0	0.02	-0.05	0.02
- 2.9	0.05	-0.01	0.00
- 2.8	0.02	0.00	0.15
- 2.7	0.01	-0.05	0.40
- 2.6	0.03	-0.03	0.14
- 2.5	0.05	0.00	0.25
- 2.4	0.02	-0.04	0.22
- 2.3	0.02	-0.05	0.08
- 2.2	0.03	-0.01	0.02
- 2.1	0.02	0.00	0.05
- 2.0	0.02	-0.03	0.08
- 1.9	0.02	-0.04	0.00
- 1.8	0.01	-0.02	-0.35
- 1.7	-0.05	-0.04	-1.42
- 1.6	-0.06	-0.16	-2.40
- 1.5	-0.06	-0.19	-2.55
- 1.4	-0.10	-0.21	-3.38
- 1.3	-0.13	-0.20	-5.15
- 1.2	-0.16	-0.26	-6.09
- 1.1	-0.07	-0.36	-5.11
- 1.0	-0.06	-0.42	-2.04
- 0.9	-0.09	-0.41	-0.47
- 0.8	-0.08	-0.43	-1.38
- 0.7	-0.05	-0.48	-2.41
- 0.6	-0.05	-0.53	-2.68
- 0.5	-0.13	-0.54	-3.90
- 0.4	-0.11	-0.48	-6.54
- 0.3	-0.09	-0.43	-5.26
- 0.2	-0.14	-0.45	-2.64
- 0.1	-0.06	-0.32	-1.11
0.0	-0.07	-0.35	-1.62



Longitudinal Crash Pulse (First Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
0	0.0	0
10	-1.2	-2
20	-3.1	-5
30	-8.7	-14
40	-15.5	-25
50	-21.1	-34
60	-26.1	-42
70	-28.0	-45
80	-28.0	-45
90	-28.0	-45
100	-27.3	-44
110	-26.7	-43
120	-26.7	-43
130	-26.7	-43
140	-26.7	-43
150	-26.7	-43
160	-26.7	-43
170	-26.7	-43
180	-26.7	-43
190	-26.7	-43
200	-26.7	-43
210	-26.7	-43
220	-26.7	-43
230	-26.7	-43
240	-26.7	-43
250	-26.7	-43



Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
0	0.0	0
10	0.0	0
20	-0.6	-1
30	0.0	0
40	4.3	7
50	4.3	7
60	9.9	16
70	12.4	20
80	11.2	18
90	10.6	17
100	9.9	16
110	9.3	15
120	9.9	16
130	9.3	15
140	9.3	15
150	9.3	15
160	9.3	15
170	9.3	15
180	9.3	15
190	8.7	14
200	8.7	14
210	8.7	14
220	8.7	14
230	8.7	14
240	8.7	14
250	8.7	14

System Status at Event (Second Record)

Complete File Recorded (Yes,No)	Yes
Multi-Event, Number of Events	1
Time From Event 1 to 2 (msec)	492
Lifetime Operating Timer at Event Time Zero (sec)	10,894,821
Key-On Timer at Event Time Zero (sec)	206
Vehicle Voltage at Time Zero (V)	0.05
Energy Reserve Mode Entered During Event (Yes, No)	Yes

Faults Present at Start of Event (Second Record)

B0090-81
B1193-00
B0001-13
B0010-11
B0002-13
B0011-11
B1211-13
B1214-11

Deployment Data (Second Record)

Maximum Delta-V, Longitudinal (MPH [km/h])	2.5 [4]
Time, Maximum Delta-V Longitudinal (msec)	280
RCM, Side Driver (Lateral), Safing	Yes
RCM Side Passenger (Lateral), Safing	Yes

Pre-Crash Data -1 sec (Second Record)

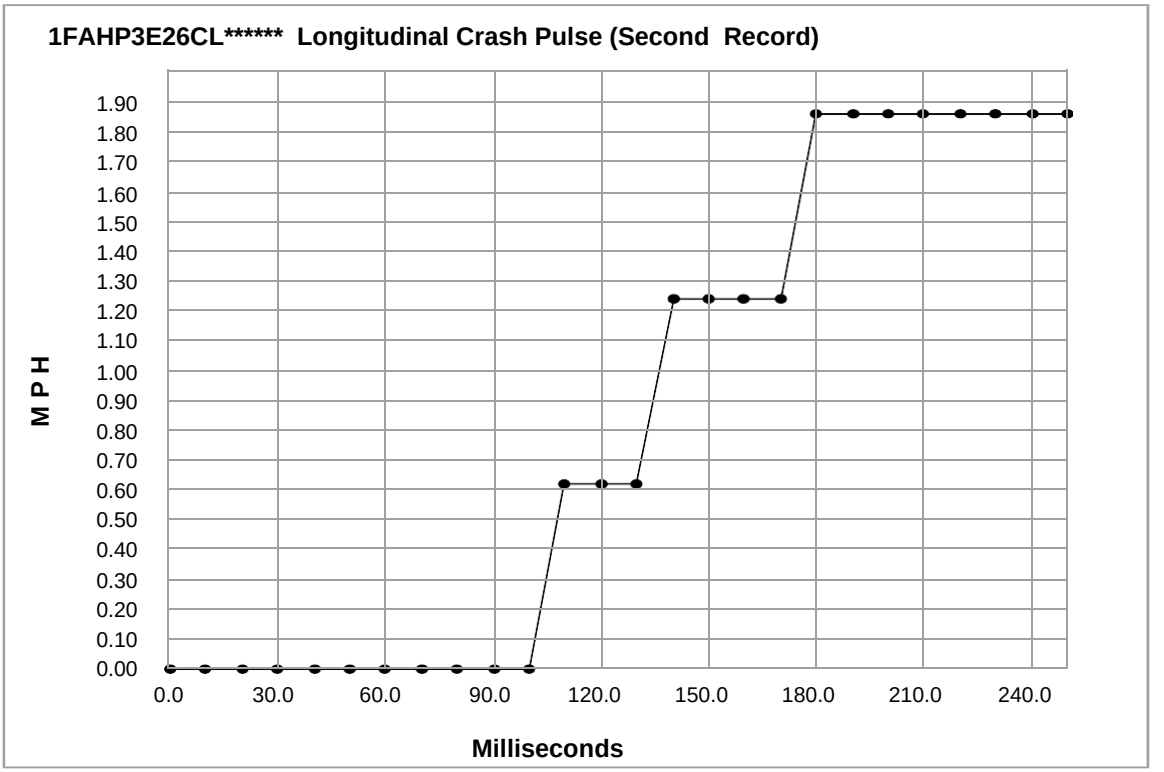
Ignition cycle, Crash	8,821
Frontal Air Bag Warning Lamp, On/Off	On
Occupant Size Classification, Front Passenger (Child size Yes/No [Hex value])	No [$02]
Safety Belt Status, Driver	Buckled
Seat Track Position Switch, Foremost, Status, Driver	Not Forward
Seat Track Position Switch, Foremost, Status, Front Passenger	Not Forward
Safety Belt Status, Front Passenger	Buckled
Brake Telltale	On
ABS Telltale	On
ESC/TC Telltale	On
ESC/TC Off Telltale	Off
Speed Control Telltale	Off
Powertrain Wrench Telltale	Off
Powertrain Malfunction Indicator Lamp (MIL) Telltale	Off

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

Time (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	Traction Control via Brakes	Wheel Torque (N-m)	Driver Gear Select (Auto Trans)
- 5.0	55.9 [89.9]	0.0	Off	2372	non-engaged	No	non-engaged	-80	Park or Manual
- 4.5	55.1 [88.7]	0.0	Off	2348	non-engaged	No	non-engaged	-80	Park or Manual
- 4.0	54.4 [87.6]	0.0	On	2318	non-engaged	No	non-engaged	-80	Park or Manual
- 3.5	51.6 [83.1]	0.0	On	2162	non-engaged	No	non-engaged	-84	Park or Manual
- 3.0	45.4 [73.1]	0.0	On	1882	non-engaged	No	non-engaged	-80	Park or Manual
- 2.5	29.5 [47.5]	0.0	On	1584	engaged	No	non-engaged	-32	Park or Manual
- 2.0	32.6 [52.4]	0.0	On	1532	engaged	No	non-engaged	-40	Park or Manual
- 1.5	32.8 [52.8]	0.0	On	1516	engaged	No	non-engaged	-40	Park or Manual
- 1.0	32.8 [52.8]	0.0	On	1516	engaged	No	non-engaged	-40	Park or Manual
- 0.5	32.8 [52.8]	0.0	On	1516	non-engaged	No	non-engaged	-131,072	Park or Manual
0.0	32.8 [52.8]	0.0	On	1516	non-engaged	No	non-engaged	-131,072	Park or Manual

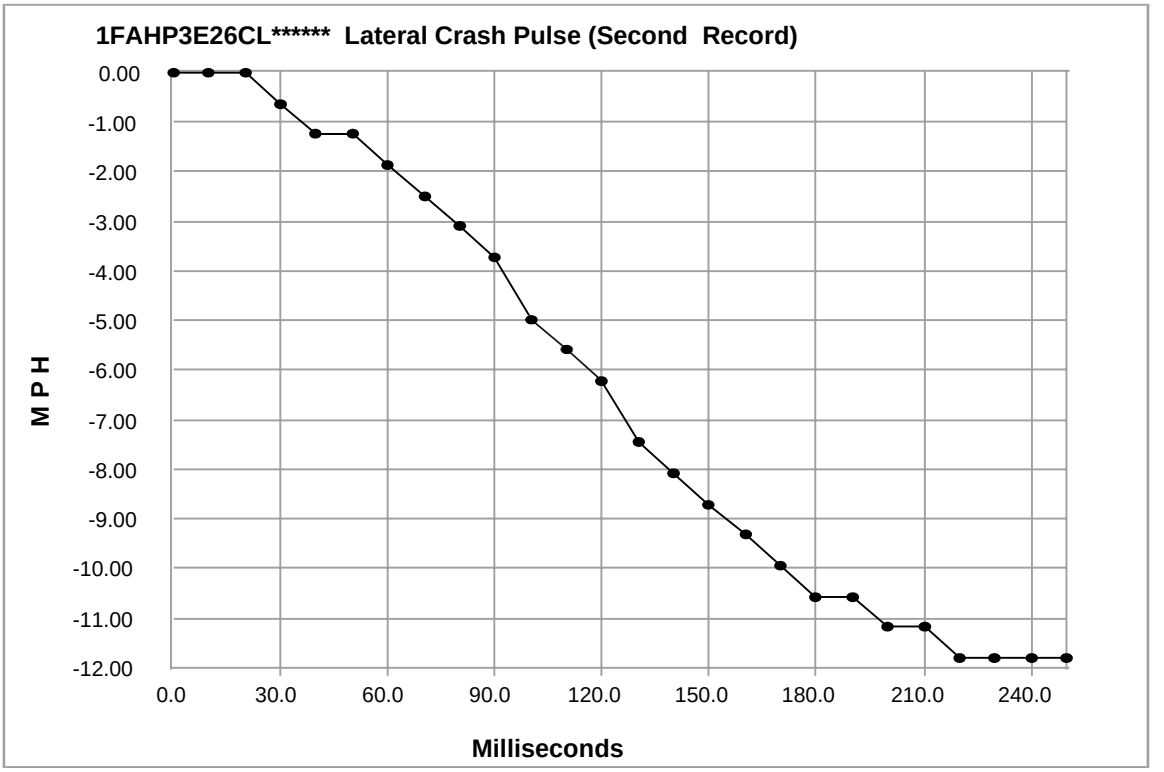
Pre-Crash Data -5 to 0 sec [10 samples/sec] (Second Record)

Time (sec)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)
- 5.0	0.03	0.00	-0.02
- 4.9	0.02	0.02	0.00
- 4.8	0.00	-0.03	0.00
- 4.7	0.02	-0.01	-0.09
- 4.6	0.02	0.01	-0.09
- 4.5	0.00	-0.03	-0.08
- 4.4	0.02	-0.03	-0.41
- 4.3	0.02	0.01	-0.03
- 4.2	0.01	-0.03	0.03
- 4.1	0.02	-0.04	0.00
- 4.0	0.05	-0.01	0.00
- 3.9	0.01	-0.02	0.17
- 3.8	0.02	-0.05	0.02
- 3.7	0.05	-0.01	0.00
- 3.6	0.02	0.00	0.15
- 3.5	0.01	-0.05	0.40
- 3.4	0.03	-0.03	0.14
- 3.3	0.05	0.00	0.25
- 3.2	0.02	-0.04	0.22
- 3.1	0.02	-0.05	0.08
- 3.0	0.03	-0.01	0.02
- 2.9	0.02	0.00	0.05
- 2.8	0.02	-0.03	0.08
- 2.7	0.02	-0.04	0.00
- 2.6	0.01	-0.02	-0.35
- 2.5	-0.05	-0.04	-1.42
- 2.4	-0.06	-0.16	-2.40
- 2.3	-0.06	-0.19	-2.55
- 2.2	-0.10	-0.21	-3.38
- 2.1	-0.13	-0.20	-5.15
- 2.0	-0.16	-0.26	-6.09
- 1.9	-0.07	-0.36	-5.11
- 1.8	-0.06	-0.42	-2.04
- 1.7	-0.09	-0.41	-0.47
- 1.6	-0.08	-0.43	-1.38
- 1.5	-0.05	-0.48	-2.41
- 1.4	-0.05	-0.53	-2.68
- 1.3	-0.13	-0.54	-3.90
- 1.2	-0.11	-0.48	-6.54
- 1.1	-0.09	-0.43	-5.26
- 1.0	-0.14	-0.45	-2.64
- 0.9	-0.06	-0.32	-1.11
- 0.8	-0.07	-0.35	-1.62
- 0.7	0.12	-1.30	0.03
- 0.6	2.56	0.75	56.20
- 0.5	0.58	-0.40	56.81
- 0.4	-0.42	-0.66	57.63
- 0.3	0.03	-0.08	64.97
- 0.2	-0.13	-0.30	71.78
- 0.1	-0.08	-0.14	67.40
0.0	0.18	-0.21	68.10



Longitudinal Crash Pulse (Second Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
0	0.0	0
10	0.0	0
20	0.0	0
30	0.0	0
40	0.0	0
50	0.0	0
60	0.0	0
70	0.0	0
80	0.0	0
90	0.0	0
100	0.0	0
110	0.6	1
120	0.6	1
130	0.6	1
140	1.2	2
150	1.2	2
160	1.2	2
170	1.2	2
180	1.9	3
190	1.9	3
200	1.9	3
210	1.9	3
220	1.9	3
230	1.9	3
240	1.9	3
250	1.9	3



Lateral Crash Pulse (Second Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
0	0.0	0
10	0.0	0
20	0.0	0
30	-0.6	-1
40	-1.2	-2
50	-1.2	-2
60	-1.9	-3
70	-2.5	-4
80	-3.1	-5
90	-3.7	-6
100	-5.0	-8
110	-5.6	-9
120	-6.2	-10
130	-7.5	-12
140	-8.1	-13
150	-8.7	-14
160	-9.3	-15
170	-9.9	-16
180	-10.6	-17
190	-10.6	-17
200	-11.2	-18
210	-11.2	-18
220	-11.8	-19
230	-11.8	-19
240	-11.8	-19
250	-11.8	-19

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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02 00 00 00

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30 30 30 32 39 32 32 39 34 35 34 31 00 00 00 00

43 4D 35 54 2D 31 34 43 30 32 38 2D 41 45 00 00 00 00 00 00 00 00 00 00

42 44 30 33 39 36 35 46 31 30 31 45 00 00 00 00

41 35 30 33 44 35 36 37 32 46 33 46 00 00 00 00

42 37 30 33 41 34 33 31 31 37 33 45 00 00 00 00

43 31 30 33 39 36 35 46 33 39 33 32 00 00 00 00

42 44 30 33 39 36 35 46 33 43 31 36 00 00 00 00

42 46 30 33 41 34 33 31 30 37 31 45 00 00 00 00

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Event Record 1

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13 FF F7 00 00 00 22 FF F6 00 00 00 13 FF F5 00 00 00 07 FF F4 00 00 00 F4 FF F3 00
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E0 00 07 00 F8 FF DF 00 06 00 FE FF DE 00 07 00 FC FF DD 00 09 00 F4 FF DC 00 0A 00
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7F EB 04 B1 00 00 00 00 00 00 23 1D 00 00 00 00 7F EC 04 A2 00 00 00 00 00 00 22 A4
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00 AB FF 2C 00 00 00 5D FF DC 01 3B 00 00 00 5B 00 E4 00 5B FF EE 00 5B 00 B7 FF 84
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Event Record 2

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60 59 60 5F 60 69 60 6F 60 79 60 7F 00 00 00 00 00 00 00 00 00 00 00 05 07 3A 01 01
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