INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER
School of Public and Environmental Affairs

ON-SITE SIDE IMPACT INFLATABLE OCCUPANT PROTECTION INVESTIGATION

CASE NUMBER - IN11002
LOCATION - MISSOURI
VEHICLE - 2008 HYUNDAI ELANTRA SE
CRASH DATE - November 2010

Submitted:

July 20, 2011

Contract Number: DTNH22-07-C-00044

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

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

Technical Report Documentation Page

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16. *Abstract* The focus of this on-site investigation was the side impact air bag system of a 2008 Hyundai Elantra SE and the sources of the front right passenger's injuries. The Hyundai was occupied by a restrained 63-year-old male driver and a restrained 60-year-old female front right passenger. The Hyundai was traveling west in the left turn lane of a divided state highway and the driver initiated a left turn at a 3-leg intersection. The front plane of an eastbound 2003 Ford Mustang impacted the right side plane of the Hyundai. The force direction on the Hyundai was within the 2 o'clock sector and the impact deployed the front right seat-mounted side impact air bag and right inflatable curtain (IC) air bag. The Hyundai came to final rest in the southwest leg of the intersection heading south. The Ford came to final rest in the east leg of the intersection heading east. The front right passenger of the Hyundai sustained a fractured right 7th rib and a contusion on the right forearm from loading through the deployed seat-mounted side impact air bag and contacting the rear upper quadrant of the right front door. She was transported by ground ambulance to a hospital where she was treated in the emergency room and released. The driver of the Hyundai was not injured.			
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ON-SITE SIDE IMPACT INFLATABLE OCCUPANT PROTECTION INVESTIGATION

CASE NUMBER - IN11002

LOCATION - MISSOURI

VEHICLE - 2008 HYUNDAI ELANTRA SE

CRASH DATE - November 2010

BACKGROUND

The focus of this on-site investigation was the side impact air bag system of a 2008 Hyundai Elantra SE (**Figure 1**) and the sources of the front right passenger's injuries. This crash was brought to the attention of the National Highway Traffic Safety Administration (NHTSA) on January 19, 2011 by Special Crash Investigation Team 2 through an internet search of Missouri crash report abstracts. This investigation was assigned on January 25, 2011. The crash occurred in November, 2010, at 1707 hours, in Missouri and was investigated by the highway patrol. This crash involved the Hyundai and a 2003 Ford Mustang. The crash scene and driver interview were completed on January 31, 2011. The Hyundai and Ford were inspected on February 2, 2011.

Figure 1: The damaged 2008 Hyundai Elantra SE

The Hyundai was a 4-door sedan equipped with front seat-mounted side impact air bags, side impact Inflatable Curtain (IC) air bags, and driver and front right passenger frontal air bags. The vehicle was involved in a right plane impact with the front plane of the Ford. The Hyundai's front right seat-mounted side impact air bag and right IC air bag deployed in this crash. The Hyundai was occupied by a restrained 63-year-old male driver and a restrained 60-year-old female front right passenger. The front right passenger sustained moderate injuries and was transported to a hospital where she was treated in the emergency room and released. The driver was not injured. The Ford was occupied by a 29-year-old female driver.

CRASH SUMMARY

Crash Site: This crash occurred during daylight hours and clear weather conditions within the 3-leg intersection of a 4-lane, divided, state highway and a city street. Both vehicles were traveling on the state highway approaching the 3-leg intersection from opposite directions. The state highway was straight and traversed in an east-west direction. There were no traffic controls at the intersection for the highway. On the east leg of the intersection, the westbound roadway had one through lane and a left turn lane. The eastbound roadway had one through lane and one right turn

lane. On the west leg of the intersection the westbound roadway had one through lane and a through/right turn lane. The eastbound roadway had one through lane. The roadways were divided by a painted median, which was 2 m (6.7 ft) in width on the east leg of the intersection and 5.2 m (17.1 ft) in width on the west leg. Each lane of the involved roadways were approximately 3.7 m (12.1 ft) in width. The roadways were bordered by bituminous shoulders. The southern shoulder was 2.5 m (8.2 ft) in width and the northern shoulder was 5.7 m (18.7 ft) in width. The roadway pavement markings consisted of solid white edge lines, solid white lane lanes, white left and right turn lane arrows, and solid yellow median lines. The roadway surface was dry bituminous. The grade for the Hyundai was negative 3% and positive 3% for the Ford. The speed limit was 89 km/h (55 mph). The Crash Diagram is on page 9 of this report.

Figure 2: View southwest to the approach of the Hyundai in the left turn lane to the impact area

Figure 3: Eastbound approach of the Ford to the impact area

Figure 4: Damage to the front plane of the Ford from the impact to the right side plane of the Hyundai

Pre-Crash: The Hyundai was traveling west in the left turn lane and the driver initiated a left turn maneuver at the 3-leg intersection to proceed southbound (**Figure 2**). The Ford was traveling east in the first lane from the right (**Figure 3**) and the driver intended to continue east through the intersection. Based on the SCI interview with the driver of the Hyundai, eastbound traffic was heavy and the traffic in the second lane from the right was stopped but was not blocking the intersection. The driver of a stopped eastbound vehicle signaled the Hyundai's driver to proceed with the left turn through the intersection. The driver of the Hyundai stated he did not see the Ford and did not make any avoidance maneuvers prior to the crash.

Crash: The front plane of the Ford (**Figure 4**) impacted the right plane of the Hyundai (**Figure 1**). The force direction on the Hyundai was within the 2 o'clock sector and the impact triggered a deployment of the front right seat-mounted side impact air bag and right IC air bag. After the impact, the Hyundai's driver maneuvered the vehicle into the south leg of the intersecting street and stopped near the west curb

of the southbound roadway. The Ford's driver steered the vehicle to the paved shoulder near the south curb, east of the intersection.

Post-Crash: The police were notified of the crash at 1709 hours and arrived at the crash scene at 1728 hours. Emergency medical and rescue services also responded. Rescue personnel mechanically opened the Hyundai's right front door and removed the front right passenger from the vehicle. She was transported by ground ambulance to a hospital where she was treated in the emergency room and released. The driver was not injured nor transported for medical treatment. Both vehicles were towed from the crash scene due to damage.

2008 HYUNDAI ELANTRA SE

DESCRIPTION

The Hyundai was a front-wheel drive, 5-passenger, 4-door, sedan (VIN: KMHDU46D78Uxxxxxx) manufactured on April 8, 2008. The vehicle was equipped with a 2.0-liter, 4-cylinder engine, a 4-speed automatic transmission, 4-wheel, anti-lock brakes with electronic brake force distribution, braking assist, traction control, electronic stability control, and a tilt steering column. The driver and front right passenger frontal air bags were certified by the manufacturer to be compliant to the Advanced Air Bag portion of Federal Motor Vehicle Safety Standard (FMVSS) NO. 208. The windshield glazing was AS-1 while the remainder of the glazing was AS-2 tempered. Prior to the crash, all of the glazing was either closed or fixed. The vehicle's odometer reading at the SCI inspection could not be determined since the vehicle was without power. The driver estimated the vehicle's mileage at approximately 85,295 kilometers (53,000 miles) The specified wheelbase was 265 cm (104.3 in).

The vehicle manufacturer's recommended tire size was P225/55R16. The vehicle was equipped with tires of the recommended size. The recommended cold tire pressure for the front tires and rear tires was 241 kPa (35 psi). The tire data for the Hyundai are presented in the table below.

Position	*Measured Pressure*	*Measured Tread Depth*	*Restricted*	*Damage*
LF	193 kPa (28 psi)	7 mm (9/32 in)	No	None
LR	193 kPa (28 psi)	6 mm (8/32 in)	No	None
RR	165 kPa (24 psi)	6 mm (8/32 in)	No	None
RF	193 kPa (28 psi)	7 mm (9/32 in)	No	None

The front row was equipped with cloth-covered bucket seats and adjustable head restraints. The second row was equipped with a cloth-covered bench seat with folding backs and adjustable head restraints. The driver's and front right passenger's seat tracks were adjusted to the middle positions. The second row seats had fixed tracks.

The Hyundai sustained right plane damage during the impact with the Ford. The right side doors and quarter panel were directly damaged. The direct damage began 78 cm (30.7 in) rear of the right front axle and extended 163 cm (64.2 in) rearward along the right plane. Crush measurements were taken at the lower door level and the maximum residual crush was 14 cm (5.5 in) occurring 23 cm (9.1 in) forward of C_4. The height of the maximum door crush was 44 cm (17.3 in) and occurred on the lower center portion of the right front door. The door sill differential was 8 cm (3.1 in). The height of the sill was 31 cm (12.2 in). The vehicle's wheelbase was unchanged by the impact.

The Collision Deformation Classification (CDC) was 02RPEW2 (60 degrees). The Damage algorithm of the WinSMASH program calculated the total Delta V as 19 km/h (11.8 mph). The longitudinal and lateral velocity changes were -10 km/h (-6.2 mph) and -16 km/h (-9.9 mph), respectively. Based on the damage to both vehicles, the results appeared reasonable.

INTERIOR DAMAGE

The front right passenger loaded through the seat-mounted side impact air bag and contacted the rear upper quadrant of the right front door (**Figure 5**). No other occupant contacts were observed.

Figure 5: Occupant contact scuff marks on the rear upper quadrant of the right front door of the Hyundai

The right front door was jammed shut and had to be mechanically opened by rescue personnel. All other doors remained closed and operational. None of the glazing was cracked or disintegrated from impact forces.

The vehicle sustained two intrusions of the passenger compartment. The forward lower quadrant of the right front door and the right B-pillar intruded laterally 5 cm (2 in) and 4 cm (1.6 cm), respectively.

MANUAL RESTRAINT SYSTEMS

The front row was equipped with driver and front right passenger lap-and-shoulder safety belts. The driver's safety belt was equipped with continuous loop belt webbing, a sliding latch plate, an Emergency Locking Retractor (ELR), and an adjustable upper anchor that was in the full-up position. The front right passenger's safety belt was equipped the same as the driver, but had a switchable ELR/Automatic Locking Retractor (ALR). The adjustable upper anchor was in the full-up position. The front seat positions were equipped with retractor-mounted pretensioners. Both safety belts functioned normally and there was no evidence of pretensioner actuation. The second row was equipped with lap-and shoulder safety belts. Lower Anchors and Tethers for Children (LATCH) were present at the outboard seating positions. The second row safety belts

were equipped with continuous loop belt webbing, a sliding latch plate, switchable ELR/ALRs, and non-adjustable upper anchors.

Inspection of the driver's safety belt assembly revealed a scuff mark on the belt webbing made by the latch plate belt guide, located 74 cm (29.1 in) from the stop button. No load marks were found on the latch plate belt guide or D-ring. This evidence indicated that the driver was restrained at the time of the crash.

Inspection of the front right passenger's safety belt assembly revealed no evidence of loading. Based on the SCI interview, the front right passenger was restrained during the crash.

SUPPLEMENTAL RESTRAINT SYSTEMS

The Hyundai was equipped with a Certified Advanced 208-Compliant (CAC) driver and front right passenger frontal air bags. These air bags did not deploy in this crash.

The vehicle was also equipped with front seat-mounted side impact air bags and roof side rail-mounted IC air bags. Based on the 7th edition of Homatro's Rescuer's Guide to Vehicle Safety Systems, the side impact sensors were located within the lower B-pillars. The inflators were located within the C-pillars. The front right seat-mounted side impact air bag and right IC air bag deployed in this crash. The left IC air bag and driver's seat-mounted side impact air bag did not deploy.

Figure 6: The Hyundai's front right seat-mounted side air bag

The deployed front right seat-mounted side impact air bag was oblong in shape and was 27 cm (10.6 in) in width and 50 cm (19.7 in) in height (**Figure 6**). There was one 8 cm (3.1 in) wide vent port at the top of the air bag. The air bag deployed through a tear seam on the outboard side of the seat back. Inspection of the air bag revealed no discernable evidence of occupant contact and no damage.

Figure 7: The Hyundai's right IC air bag

The deployed right IC air bag extended from the A-pillar to the C-pillar (**Figure 7**). There were no external vent ports. The IC was 170 cm (55.1 in) in width and 32 cm (12.6 in) in height,

and was attached to the A-pillar by a 15 cm (5.9 in) nylon tether. The IC did not extend below the beltline. Inspection of the IC revealed no discernable evidence of occupant contact and no damage.

2008 HYUNDAI ELANTRA SE OCCUPANTS

DRIVER DEMOGRAPHICS

Age/Sex:	63 years/male
Height:	178 cm (70 in)
Weight:	91 kg (200 lb)
Eyewear:	Glasses
Seat Type:	Bucket
Seat Track Position:	Middle position
Manual Restraint Usage:	Lap-and-shoulder
Usage Source:	Vehicle inspection
Air Bags	Frontal, seat-mounted side impact, and IC, not deployed
Alcohol/Drug Involvement:	Police reported none, not tested
Egress from Vehicle:	Through driver's door without assistance
Transport from Scene:	None
Medical Treatment:	None

DRIVER INJURIES

The driver did not sustain any injuries as a result of this crash. During the SCI interview, he complained only of soreness to the left wrist from bracing on the steering wheel during the crash.

DRIVER KINEMATICS

The impact with the Ford displaced the driver to the right and forward, opposite the 2 o'clock direction of force. He loaded his safety belt and remained in his seat position throughout the crash.

FRONT RIGHT PASSENGER DEMOGRAPHICS

Age/Sex:	60 years/female
Height:	173 (68 in)
Weight:	82 kg (180 lb)
Eyewear:	Glasses
Seat Type:	Bucket seat
Seat Track Position:	Middle position
Manual Restraint Usage:	Lap-and-shoulder belt
Usage Source:	Driver interview
Air Bags	Frontal: Non-deployed; Seat mounted, IC: Deployed
Alcohol/Drug Involvement:	None reported

Egress from Vehicle: Removed from vehicle by EMS
Transport from Scene: Ground ambulance
Medical Treatment: Treated and released

FRONT RIGHT PASSENGER INJURIES

Injury Number	Injury Description	AIS 2005/08	Injury Source	Confidence Level
1	Fracture right 7th rib, laterally	450201.1,1	Right front door panel, rear upper quadrant	Certain
2	Contusion (hematoma), 15.2 cm (6 in) long, right forearm, not further specified	710402.1,1	Right front door panel, rear upper quadrant	Certain

*Source(s): Emergency Room Records and Interviewee Data. Injury Number #1 came from **ER** data and Injury Number #2 came from both **ER and Interviewee** data.*

FRONT RIGHT PASSENGER KINEMATICS

The frontal impact by the Ford on the right plane of the Hyundai displaced the front right passenger to the right and forward, opposite the 2 o'clock direction of force. She loaded through the deployed seat-mounted side impact air bag and contacted the rear upper quadrant of the right front door, which caused a fracture of the 7th right rib and a contusion on the right forearm.

2003 FORD MUSTANG

DESCRIPTION

The 2003 Ford Mustang was a rear wheel drive, 4-passenger, 2-door coupe (VIN 1FAFP40453Fxxxxxx) equipped with a 3.8 liter, V-6 engine, a 3-speed automatic transmission, and an Event Data Recorder (EDR). The vehicle was not equipped with anti-lock brakes, traction control, or electronic stability control. The front row was equipped with redesigned frontal air bags, manual lap-and-shoulder safety belts, and safety belt pretensioners. The second row was equipped with manual lap-and-shoulder safety belts and Lower Anchors and Tethers for Children (LATCH).

The vehicle manufacturer's recommended tire size was P225/55R16. The vehicle was equipped with tires of the recommended size. The recommended cold tire pressure for the front tires and rear tires was 241 kPa (35 psi). The tire data for the Ford are presented in the table below.

Position	*Measured Pressure*	*Measured Tread Depth*	*Restricted*	*Damage*
LF	207 kPa (30 psi)	3 mm (4/32 in)	No	None
LR	234 kPa (34 psi)	3 mm (4/32 in)	No	None
RR	221 kPa (32 psi)	2 mm (3/32 in)	No	None
RF	34 kPa (5 psi)	2 mm (3/32 in)	No	None

EXTERIOR DAMAGE

The Ford sustained front plane damage during the impact with the Hyundai. The direct damage began at the front right bumper corner and extended across the full width of the front plane, 152 cm (59.8 in) across the frontal plane. The crush measurements were taken at the bumper level and the residual maximum crush was 26 cm (10.2 in) occurring at C_6.

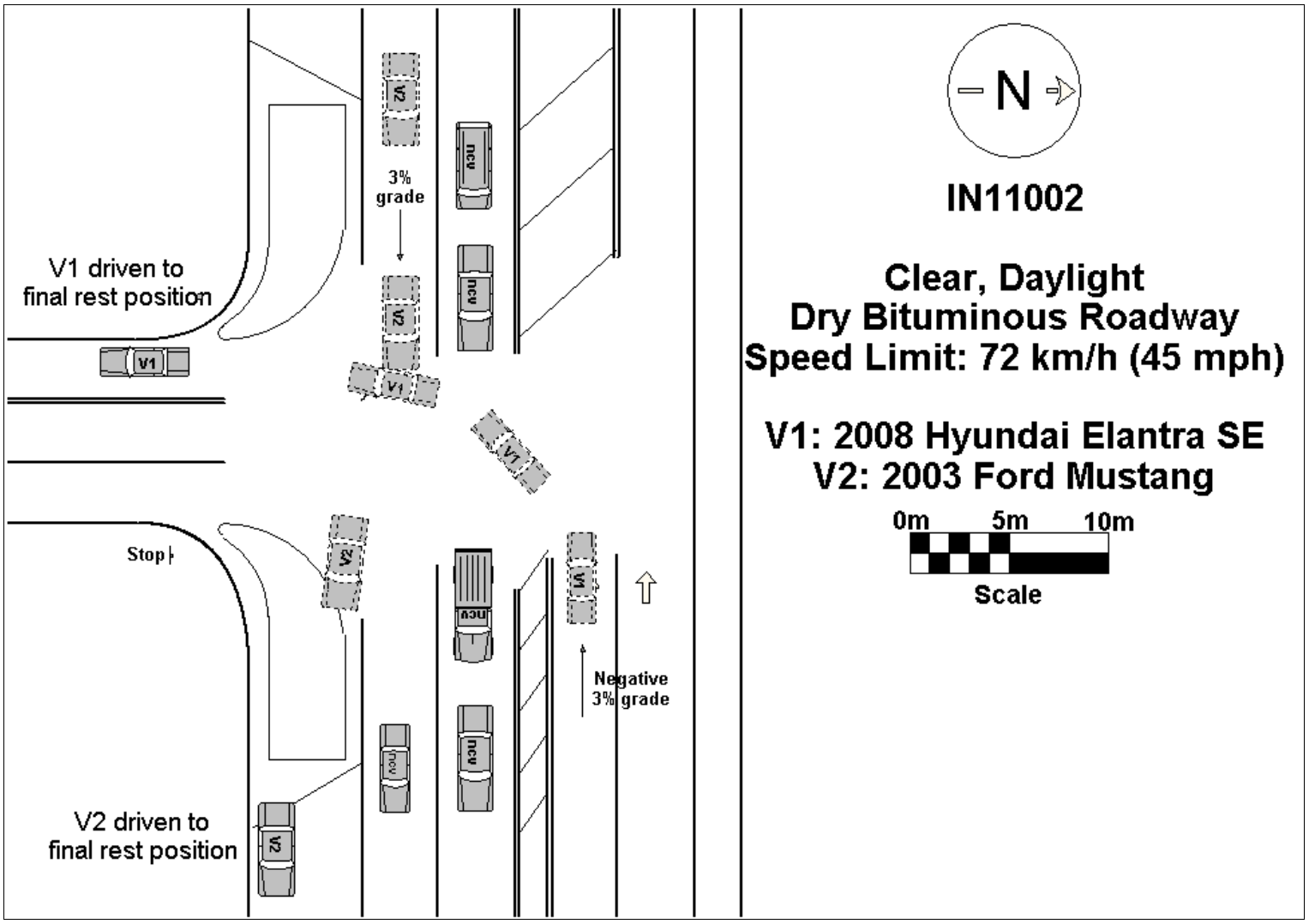
The CDC was 11FDEW1 (340 degrees). The Damage algorithm of the WinSMASH program calculated the total Delta V as 19 km/h (11.8 mph). The longitudinal and lateral velocity changes were -18 km/h (-11.2 mph) and 6 km/h (3.7 mph), respectively.

The Ford's EDR was imaged using version 3.5.1 of the Bosch Crash Data Retrieval software via connection to the diagnostic link connector. The EDR file was read and reported with version 4.0. The EDR recorded a non-deployment event. The maximum longitudinal cumulative Delta V was 17.75 (-10.97 mph) at 116 msec following Algorithm Enable (AE). No pre-crash data was reported. The EDR report[1] is attached at the end of this report.

OCCUPANT DATA

The driver of the Ford sustained police reported "B" (non-incapacitating) injuries and was transported by ambulance to a medical facility.

1. Page 8 was deleted for confidentiality purposes.


V1 driven to final rest position
V2
3% grade
V2
V1
V1
Stop
V2
Negative 3% grade
V2 driven to final rest position
V2
N
IN11002
Clear, Daylight
Dry Bituminous Roadway
Speed Limit: 72 km/h (45 mph)
V1: 2008 Hyundai Elantra SE
V2: 2003 Ford Mustang
0m 5m 10m
Scale

Attachment A
Event Data Recorder Report
2003 Ford Mustang

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	1FAFP40453F******
User	
Case Number	
EDR Data Imaging Date	02/02/2011
Crash Date	
Filename	IN11002.CDRX
Saved on	Wednesday, February 2 2011 at 17:09:00
Collected with CDR version	Crash Data Retrieval Tool 3.5.1
Reported with CDR version	Crash Data Retrieval Tool 4.0
EDR Device Type	airbag control module
Event(s) recovered	Non-Deployment

Comments

No comments entered.

Data Limitations

The retrieval of this data has been authorized by the vehicle's owner, or other legal authority such as a subpoena or search warrant, as indicated by the CDR tool user on Wednesday, February 2 2011 at 17:09:00.

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

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

Important

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

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

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

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

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

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

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

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

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

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

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

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

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

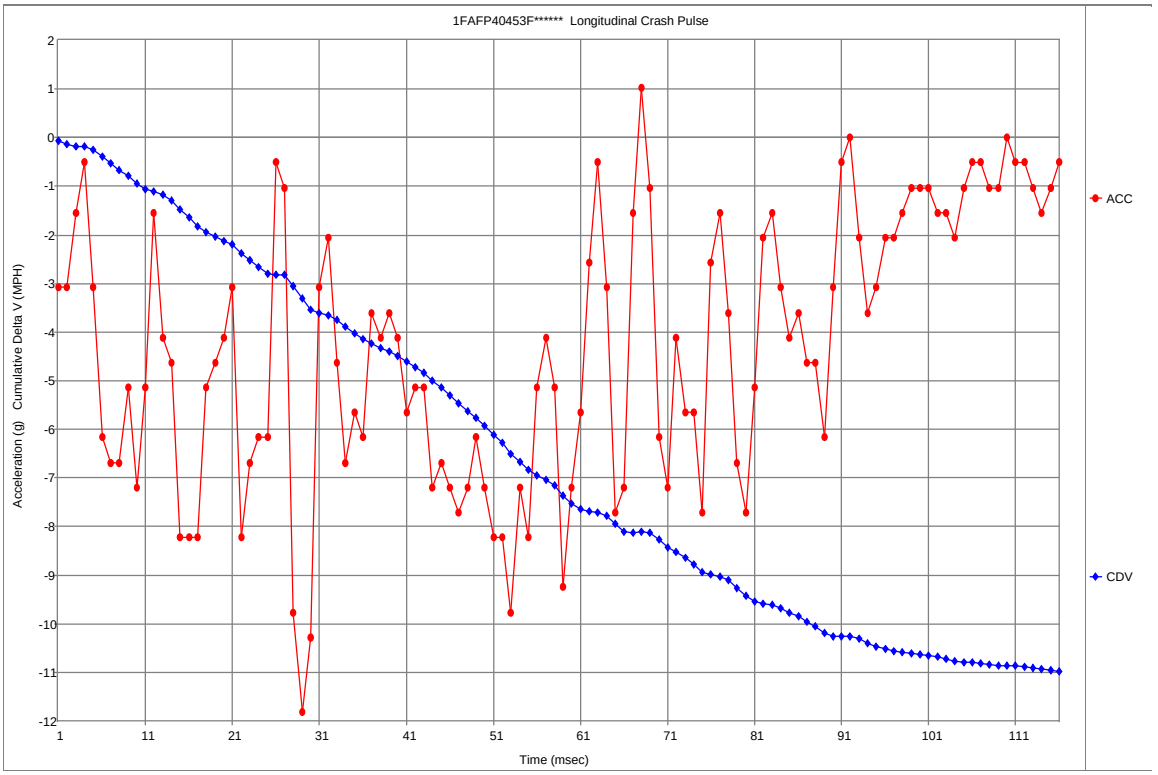
6. This module is not intended to record acceleration/deceleration in a side-impact event. If the side impact generates a longitudinal deceleration component sufficient to wake up the frontal deployment algorithm, there may be a recording of longitudinal deceleration in a side impact event.

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

02001_RCM-1_r002

System Status At Non-Deployment

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


1FAFP40453F****** Longitudinal Crash Pulse
Acceleration (g) Cumulative Delta V (MPH)
Time (msec)
ACC
CDV

Crash Pulse Data

Milliseconds	Long. Acceleration (Gs)	Long. Cumulative Delta V (MPH)
1	-3.08	-0.07
2	-3.08	-0.14
3	-1.54	-0.17
4	-0.51	-0.18
5	-3.08	-0.25
6	-6.17	-0.38
7	-6.68	-0.53
8	-6.68	-0.68
9	-5.14	-0.79
10	-7.20	-0.95
11	-5.14	-1.06
12	-1.54	-1.09
13	-4.11	-1.18
14	-4.63	-1.29
15	-8.22	-1.47
16	-8.22	-1.65
17	-8.22	-1.83
18	-5.14	-1.94
19	-4.63	-2.04
20	-4.11	-2.13
21	-3.08	-2.20
22	-8.22	-2.38
23	-6.68	-2.53
24	-6.17	-2.66
25	-6.17	-2.80
26	-0.51	-2.81
27	-1.03	-2.83
28	-9.77	-3.05
29	-11.82	-3.31
30	-10.28	-3.53
31	-3.08	-3.60
32	-2.06	-3.65
33	-4.63	-3.75
34	-6.68	-3.89
35	-5.65	-4.02
36	-6.17	-4.15
37	-3.60	-4.23
38	-4.11	-4.32
39	-3.60	-4.40
40	-4.11	-4.49
41	-5.65	-4.62
42	-5.14	-4.73
43	-5.14	-4.84
44	-7.20	-5.00
45	-6.68	-5.15
46	-7.20	-5.30
47	-7.71	-5.47
48	-7.20	-5.63
49	-6.17	-5.77
50	-7.20	-5.92
51	-8.22	-6.11
52	-8.22	-6.29

Milliseconds	Long. Acceleration (Gs)	Long. Cumulative Delta V (MPH)
53	-9.77	-6.50
54	-7.20	-6.66
55	-8.22	-6.84
56	-5.14	-6.95
57	-4.11	-7.04
58	-5.14	-7.15
59	-9.25	-7.36
60	-7.20	-7.52
61	-5.65	-7.64
62	-2.57	-7.70
63	-0.51	-7.71
64	-3.08	-7.78
65	-7.71	-7.94
66	-7.20	-8.10
67	-1.54	-8.14
68	1.03	-8.11
69	-1.03	-8.14
70	-6.17	-8.27
71	-7.20	-8.43
72	-4.11	-8.52
73	-5.65	-8.64
74	-5.65	-8.77
75	-7.71	-8.94
76	-2.57	-8.99
77	-1.54	-9.03
78	-3.60	-9.11
79	-6.68	-9.25
80	-7.71	-9.42
81	-5.14	-9.54
82	-2.06	-9.58
83	-1.54	-9.61
84	-3.08	-9.68
85	-4.11	-9.77
86	-3.60	-9.85
87	-4.63	-9.95
88	-4.63	-10.05
89	-6.17	-10.19
90	-3.08	-10.26
91	-0.51	-10.27
92	0.00	-10.27
93	-2.06	-10.31
94	-3.60	-10.39
95	-3.08	-10.46
96	-2.06	-10.51
97	-2.06	-10.55
98	-1.54	-10.59
99	-1.03	-10.61
100	-1.03	-10.63
101	-1.03	-10.65
102	-1.54	-10.69
103	-1.54	-10.72
104	-2.06	-10.77
105	-1.03	-10.79
106	-0.51	-10.80
107	-0.51	-10.81

Milliseconds	Long. Acceleration (Gs)	Long. Cumulative Delta V (MPH)
108	-1.03	-10.83
109	-1.03	-10.86
110	0.00	-10.86
111	-0.51	-10.87
112	-0.51	-10.88
113	-1.03	-10.90
114	-1.54	-10.94
115	-1.03	-10.96
116	-0.51	-10.97