CRASH DATA RESEARCH CENTER
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Buffalo, NY 14225

CALSPAN ON-SITE IMPACT FIRE INVESTIGATION

SCI CASE NO.: CA11018
OFFICE OF DEFECTS INVESTIGATION

VEHICLE: 2008 DODGE CHARGER POLICE VEHICLE

LOCATION: VIRGINIA

CRASH DATE: APRIL 2011

Contract No. DTNH22-07-C-00043

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
Washington, D.C. 20590

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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 are 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 STANDARD TITLE PAGE

1. Report No. CA11018	*2. Government Accession No.*	*3. Recipient's Catalog No.*	
4. Title and Subtitle Calspan On-Site Impact Fire Investigation Office of Defects Investigation Vehicle: 2008 Dodge Charger Police Vehicle Location: Virginia		*5. Report Date*: September 2011 *6. Performing Organization Code*	
7. Author(s) Crash Data Research Center		*8. Performing Organization Report No.*	
9. Performing Organization Name and Address Calspan Corporation Crash Data Research Center P.O. Box 400 Buffalo, New York 14225		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-07-C-00043	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Washington, D.C. 20590		*13. Type of Report and Period Covered* Technical Report Crash Date: April 2011 *14. Sponsoring Agency Code*	
15. Supplementary Note An investigation of the front-to-rear crash of a 2008 Dodge Charger and a 2003 Lexus GS430.			
16. Abstract This on-site investigation focused on the crash of a 2008 Dodge Charger Police Vehicle and the cause of a fuel leak that resulted in a fuel-fed fire. The back left aspect of the Dodge was struck by the front right aspect of a 2003 Lexus GS430. The Crash Investigation Division (CID) of the National Highway Traffic Safety Administration (NHTSA) was notified of the crash by the Agency's Office of Defects Investigation (ODI). The CID in turn forwarded that notification to the Calspan Special Crash Investigations (SCI) team and assigned an on-site investigation on June 23, 2011. The Dodge Charger was westbound driven by a restrained 23-year-old police officer. A 33-year-old female Field Training Officer (FTO) was an unrestrained front right occupant in the Dodge. As the Dodge decelerated and approached a three-leg intersection, the vehicle was struck on its back left by the front right of the Lexus. The Lexus was driven by a 57-year-old restrained male. The minor offset impact-engagement extended to wheel-to-wheel contact which resulted in suspension damage to both vehicles. The Dodge's damaged left rear suspension components and/or wheel interacted with the fuel filler tube and fuel tank inlet that was located immediately forward of the axle. The fuel tank's inlet nozzle and check valve separated from the tank, thus allowing the fuel to freely escape the fuel tank. The Dodge driver applied the brakes and brought the vehicle to a controlled stop. A post-crash fire developed approximately one minute after the crash. Both police officers exited the vehicle and were uninjured. The driver of the Lexus was not injured.			
17. Key Words Offset frontal-to-rear Fuel-fed fire Minor damage Suspension damage		*18. Distribution Statement* General Public	
19. Security Classif. (of this report) Unclassified	*20. Security Classif. (of this page)* Unclassified	*21. No. of Pages* 18	*22. Price*

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LOCATION: VIRGINIA
CRASH DATE: APRIL 2011

BACKGROUND

This on-site investigation focused on the crash of a 2008 Dodge Charger Police Vehicle and the cause of a fuel leak that resulted in a fuel-fed fire. **Figure 1** is a left rear oblique view of the Dodge. The back left aspect of the Dodge was struck by the front right aspect of a 2003 Lexus GS430. The Crash Investigation Division (CID) of the National Highway Traffic Safety Administration (NHTSA) was notified of the crash by the Agency's Office of Defects Investigation (ODI). The CID in turn forwarded that notification to the Calspan Special Crash Investigations (SCI) team and assigned an on-site investigation on June 23, 2011. The NHTSA provided a Police Crash Report (PAR) and police contact information, on-scene police images and post-crash images of the Dodge taken during an initial inspection that was conducted by the Agency. The Calspan SCI team immediately contacted the Fleet Manger of the involved police agency and established cooperation to conduct an on-site vehicle inspection. The inspection of the Dodge Charger took place on June 27, 2011. The investigation involved the inspection and documentation of the Dodge and the crash site. The Event Data Recorder in the Dodge was imaged during the SCI inspection. In addition, the front right occupant of the Dodge and police department's Fleet Manger were interviewed. The Lexus had been repaired prior to SCI notification and returned to its owner. The Lexus's damage was documented by on-scene police images and a repair order that was obtained from its insurer.

Figure 1: Left rear oblique view of the 2008 Dodge Charger Police Vehicle.

The Dodge Charger was westbound driven by a restrained 23-year-old male police officer. A 33-year-old female Field Training Officer (FTO) was an unrestrained front right occupant in the Dodge. As the Dodge decelerated and approached a three-leg intersection, the vehicle was struck on its back left by the front right of the Lexus. The Lexus was driven by a 57-year-old restrained male. The minor offset impact-engagement extended to wheel-to-wheel contact which resulted in suspension damage to both vehicles. The Dodge's damaged left rear suspension components and/or wheel interacted with the fuel filler tube and fuel tank inlet that was located immediately forward of the axle. The fuel tank's inlet nozzle and check valve separated from the

tank, thus allowing the fuel to freely escape the fuel tank. The Dodge driver applied the brakes and brought the vehicle to a controlled stop. A post-crash fire developed approximately one minute after the crash. Both police officers exited the vehicle and were uninjured. The driver of the Lexus was not injured.

CRASH SUMMARY

Crash Site

This crash occurred during the nighttime hours of April 2011 on a four-lane-divided roadway in an urban setting. A three-leg intersection, which was controlled by standard (red/amber/green) traffic signals, was located immediately west of the crash site. The crash site was illuminated by overhead street lighting. The environmental condition was clear and the road surface was dry. At the crash site, the road was oriented in an east/west direction. The westbound traffic was separated from the eastbound traffic by a raised center median. The westbound lanes were configured with three lanes that passed straight through the intersection and a right turn only lane. The width of the traffic lanes measured 3.3 m (10.8 ft). There was a positive 2% grade in the westbound direction entering into the intersection. The crash occurred in the center straight through lane (**Figure 2**). The final rest position of the Dodge was denoted by a 2 m (6 ft) diameter burn pattern in the asphalt road surface that was located 34 m (112 ft) east of the intersection. The FTO estimated the point of impact was approximately one car length east of the vehicle's final rest position. The speed limit in the area of the crash was 56 km/h (35 mph).

Figure 2: Westbound trajectory view of the Dodge approaching the point of impact and final rest position.

Pre-Crash

The driver of the Dodge was a recent hire to the police department and on the night of the crash was assigned to have the FTO ride along as the front right occupant. The driver and the FTO drove the vehicle to the department's fuel depot and filled the fuel tank of the Dodge. The driver and FTO then proceeded to begin their road patrol.

Approximately 10 to 15 minutes after filling the fuel tank and within 8 km (5 miles) of the fuel depot, the Dodge was traveling west in the center straight-through lane approaching the intersection. The FTO could not recall if the vehicle was approaching a red traffic signal or if the signal had recently cycled to the green phase. In either case, she estimated the speed of the Dodge was "slow", approximately 16 to 24 km/h (10 to 15 mph). The Lexus was also westbound in the center straight-through lane directly behind the Dodge. The speed of the Lexus was greater than the speed of the Dodge. As the Lexus approached the back plane of the Dodge,

its driver steered to the left in an effort to avoid the crash. The avoidance maneuver by the Lexus was unsuccessful, as it occurred too late in the pre-crash sequence. The subsequent police investigation determined the Lexus driver was alcohol impaired. The Scene Diagram is included at the end of this technical report.

Crash

The front right corner of Lexus struck the back left corner of the Dodge (Event 1). The directions of force were in the 12 o'clock and 6 o'clock sectors for the Lexus and Dodge, respectively. The initial engagement was located outboard of the respective vehicle's bumper reinforcements in the "soft" corner structures. As the collision developed, the engagement of the vehicles transitioned into direct wheel-to-wheel contact. The right front wheel assembly of the Lexus contacted the left rear wheel assembly of the Dodge. This contact resulted in wheel/suspension damage to both vehicles.

The momentum of the Lexus deflected the Dodge to its right and the vehicles separated. The Lexus entered and traveled across the inside westbound lane and mounted the center median. The Lexus driver counter-steered back to the right and braked. The Lexus came to rest on the inside westbound lane forward of the Dodge.

The driver of the Dodge braked and the vehicle came to a controlled stop approximately two to three car lengths from the initial point of impact. The separated left rear wheel of the Dodge and/or its fractured suspension components interacted with the filler tube and fuel tank inlet nipple during the impact sequence. This resulted in a separation of the inlet nipple from the fuel tank and a fuel leak. Subsequently, a major fire developed (Event 2).

Post-Crash

The Dodge driver and FTO radioed to dispatch that a crash had occurred. The FTO's cellular telephone was displaced from the right sun visor into the second row as a result of the crash. The FTO reported that she turned and was reaching between the front seats to retrieve it when she realized there was fire at the vehicle's left rear area. She instructed the driver to exit the vehicle, as she exited through the front right door. Based on an interview, the driver reportedly opened the left front door and exited the vehicle. In doing so, the flames surged forward along the left side of the vehicle and singed the driver. The FTO estimated that approximately one minute elapsed between the impact and the time she noticed the fire at vehicle's left rear.

The fire department and additional police responded to the scene within five minutes of the call for assistance. The firefighters extinguished the fire. The driver and FTO were transported to a local hospital as a precaution. They were examined and released after determining that they were not injured. The driver of the Lexus was not injured in the crash.

2008 DODGE CHARGER POLICE VEHICLE

Description

The 2008 Dodge Charger four-door sedan was equipped with the manufacturer's police equipment package and was identified by the Vehicle Identification Number (VIN) 2B3LA43G08Hxxxxxx. **Figure 3** is a left side view of the Dodge. The Dodge was purchased new by the police department on February 28, 2008 and had been in-service approximately 56,371 km (35,028 miles). The odometer reading was documented during the vehicle's refueling immediately prior to the crash. The rear-wheel drive vehicle was powered by a 5.7-liter, V8 engine linked to a 5-speed automatic transmission with a steering column mounted shift lever. The service brakes were power-assisted front and rear disc with 4-wheel anti-lock. The Dodge was equipped with traction control, electronic stability control, a direct Tire Pressure Monitoring System (TPMS), and a tilt and telescoping steering column. In addition to the standard features, the police package included a heavy duty ABS, police performance tuned steering, and a severe-duty cooling system for the engine oil, transmission fluid, and power steering. The Continental ContiPro Contact tires were the manufacturer's recommended size of P225/60R18 and were mounted on OEM steel wheels. The vehicle manufacturer recommended cold front and rear tire pressure was 241 kPa (35 PSI). The tire data at the time of the SCI inspection was as follows:

Figure 3: Left side view of the Dodge Charger.

Position	Measured Pressure	Measured Tread Depth	Restriction	Damage
LF	241 kPa (35 PSI)	2 mm (3/32 in)	No	None
LR	Tire Flat	Unknown	No	75% Tire burned and debeaded, Rim deformed
RR	Tire Flat	Unknown	No	100% Tire burned
RF	Tire Flat	2 mm (3/32 in)	No	None

The interior of the Dodge was configured with front bucket seats and a rear bench seat. Located between the front seats was a control panel which contained radios, switches and equipment for several police vehicle functions. There was a longitudinal partition which split the second row into two sections. The second row left position was accessible from the front row and was equipped with a standard interior. The second row right position was not accessible from the front row and was used to isolate and transport individuals detained for suspected criminal activity.

The Dodge was equipped with manual 3-point lap and shoulder safety belts for the four seated positions. The front safety belts were equipped with retractor pretensioners. Additional safety systems included Certified Advanced-208 Compliant (CAC) frontal air bags, front seat-mounted side impact air bags and side impact Inflatable Curtain (IC) air bags.

The Dodge's fuel system consisted of a High-Density Polyethylene (HDPE) fuel tank that was mounted forward of the rear drive axle and centered within the undercarriage under the rear seat. The saddle-type tank was designed with two outboard reservoirs and a center crossover that spanned the driveshaft tunnel. The tank was molded in two halves (top and bottom) and fused together circumferentially. It was secured to the undercarriage of the vehicle with two 3 cm (1 in) wide steel tank straps and had a 72 liter (19 gallon) capacity. At the time of the crash, the fuel tank was full, as the police officer-occupants had just filled the vehicle at the start of the work shift.

Figure 4 is an image of an exemplar fuel tank for reference. The exemplar fuel tank was a new OEM replacement part inspected at a Dodge repair facility. The top aspect of the tank contained two 11 cm (4.5 in) diameter ports for the electric fuel pumps/sending units. These units were retained within the tank with metal back rings. The fuel was supplied to the engine from the right side of the tank. Two plastic valves were mounted to the top of the tank and secured with rubber grommets. The fill inlet port was located at the lower left rear corner of the tank. The white plastic inlet valve was fused to the tank. This plastic inlet contained a spring-loaded internal check valve and had a 5 cm (2 in) long neck for the attachment of the filler tube.

Figure 4: Exemplar fuel tank.

The Dodge was fitted with a left plane-mounted filler tube. The filler cap was concealed within the fill door that was located in the upper aspect of the left quarter panel over the rear axle. The top of the filler cap door was at the level of the beltline. The door had an interior-mounted release lever. The fill cap was a typical 6 cm (2.5 in) diameter plastic cap with a ratchet-type locking system.

The filler tube was secured within the quarter panel/filler door area with a rubber boot and a retainer clip. The filler tube was formed to follow the contour of the forward aspect of the inner fender and extended to the fuel tank, inboard of the inner fender and the wheel opening. The 3 cm (1 in) diameter filler tube was steel construction and approximately 81 cm (32 in) in length. The filler tube connected to the tank inlet check valve with a 4 cm (1.5 in) diameter neoprene

hose that was approximately 13 cm (5 in) in length. This hose was secured to the filler tube and the check valve with two stainless steel hose clamps. **Figure 5** is a view of the undercarriage of an exemplar Dodge taken below the rear axle looking forward depicting the designed orientation of the fuel tank, the tank inlet, and the left rear suspension. **Figure 6** is a closer view of the exemplar depicting the filler neck and its connection at the tank inlet.

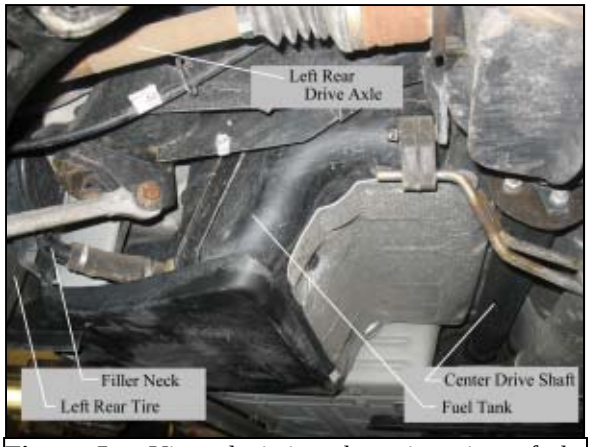


Figure 5: View depicting the orientation of the undercarriage of an exemplar Dodge Charger.

Figure 6: Closer view of the exemplar Dodge depicting the orientation at the left rear wheel/suspension.

Exterior Damage

The Dodge Charger sustained minor exterior damage as a result of the impact (Event 1) and major fire damage (Event 2). The rear bumper fascia was consumed in the fire; therefore the precise location of the direct damage on the rear plane could not be determined. There was no discernable contact to the rear bumper reinforcement. Therefore, the direct vehicle-to-vehicle contact had to have occurred within the 10 cm (4 in) unsupported left rear corner area, outboard of the left end of the reinforcement. A crush profile was documented along the 134 cm (52.8 in) width of the reinforcement as follows: C1 = 1 cm (0.5 in), C 2 = 0, C3 = 0, C4 = 0, C5 = 0, C6 = 0. The narrow engagement wrapped around the corner and extended 77 cm (30.3 in) forward along the body line of the quarterpanel (**Figure 7**). The vertical rod in the figure depicts the end of the direct body damage. The direct damage along the left plane was located at a height of 76 cm (30 in). This height was consistent with the general location of the damage on the Lexus. It was noted during the SCI inspection that there was no damage to the inner structure of the rear corner area below the body damage. An examination of an exemplar Dodge Charger determined that this area was concealed by a plastic body panel that was consumed in the fire. This plastic panel was also consumed on the right plane of the Dodge.

During the impact, as the vehicles' body structures deformed, the vehicle-to-vehicle engagement transitioned into direct wheel-to wheel contact. **Figure 8** is a view of the outboard surface of left rear wheel. A 30 cm (12 in) section of the rim deformed and had folded over onto itself. The force of the wheel-to wheel contact fractured the casting at the outer bearing, and the left rear

wheel separated from the arms of the five link suspension. The left rear drive shaft was missing at the time of the SCI inspection. An analysis of the vehicle's corner impact damage was beyond the scope of WinSMASH model. The Collision deformation Classification (CDC) assigned to this damage pattern was 06BLEE6.

Figure 7: View of the left rear quarterpanel and impact damage to the Dodge.

Figure 8: View depicting the damage to the left rear wheel rim of the Dodge.

Rear Suspension and Fuel System Damage

Analysis of the physical evidence and the dynamics of the impact indicated that direct wheel-to-wheel contact between the Lexus and Dodge caused the fracturing of the Dodge's 5-link suspension and the separation of the left rear wheel. **Figure 9** is an image of the fractured suspension arms, bearing casting and wheel. The separated left rear wheel assembly was then displaced forward by the Lexus. Subsequently, it came into contact with the forward lower aspect of the wheel opening and with the lower aspect of the filler neck, which was located within this region. The isolated damage is highlighted in **Figure 9**.

Figure 9: View of the Dodge's fractured rear suspension, bearing casting and separated left rear wheel.

The wheel-to-filler neck contact placed the connection between the filler neck and the fuel tank in tension. It appeared that the inlet nozzle (and integral check valve) dislodged from overload and separated from the fuel tank. The separated nozzle/check valve allowed gasoline to flow freely from the tank and the vapors ignited in a fuel-fed fire. The fuel tank, neoprene hose section and nozzle/check valve were consumed in the fire. The rubber grommet at the filler door was also consumed and the filler neck separated from the quarterpanel. **Figure 10** is a close-up view into the left rear wheel well opening of the fractured suspension. The position of the filler neck was reconstructed for the purposes of the image.

Figure 11 is an image of the filler neck. This component was found within the trunk at the time of the SCI inspection. Only one of the clamps that were used to secure the neoprene hose at the tank connection was found with the filler neck. The 3 cm (1 in) diameter filler neck had primarily retained its shape. Impact damage was noted to the downstream end of the tube (toward the fuel tank). A 2 x 2 cm (0.8 x 0.8 in) flat spot was identified on the bottom side of the tube. This area was centered 5 cm (1.8 in) from the end of the tube. A corresponding flat spot was located of the top side of the tube. The flat spot was located 3 cm (1 in) from the end of the tube. The downstream end of the tube was oval as a result and measured 2 cm x 3 cm (0.8 in x 1.1 in). The recovered hose clamp was also oval and measured 3 cm x 4 cm (1 in x 1.5 in). The consistent shape of the tube and clamp indicated that this clamp may have been located at the outboard end of the neoprene hose section.

Figure 10: View of the Dodge's left rear wheel well opening and reconstructed position of the filler neck.

Figure 11: View of the filler neck from the Dodge.

Event Data Recorder

The Dodge was equipped with an Air bag Control Module (ACM) that had Event Data Recorder (EDR) capabilities. The ACM was mounted on the center tunnel under the center instrument stack. This module was supported by the Bosch Crash Data Retrieval software. The ACM was removed from the vehicle by the investigating police department during the SCI inspection. The module casing was intact and undamaged by the fire. The EDR was imaged via a direct connection to the ACM with software version 3.8 and reported using version 4.1.2. The crash event was not recognized by the EDR; no event was recorded. The imaged data is included at the end of this report as Attachment A.

Interior Damage

There was no interior damage or intrusion related to the crash forces of the impact. There was fire damage to the second row which consumed the interior and partial fire damage to the driver's position.

Manual Restraint Systems

The Dodge Charger was equipped with 3-point lap and shoulder safety belts for the four designated seating positions. Based on an exemplar vehicle, all belt systems utilized continuous loop webbing and sliding latch plates. The driver's belt system retracted onto an Emergency Locking Retractor (ELR). The front right and rear seat belt systems utilized ELRs and switchable Automatic Locking Retractors (ALRs). Both front belt systems were equipped with adjustable D-rings and retractor pretensioners. The driver's safety belt was partially burned in the fire. The front right safety belt was intact. There was no crash related evidence on the restraints. The driver was restrained at the time of the crash based on the interview of the FTO. The front right occupant, FTO, was not restrained per the interview.

Supplemental Restraint Systems

The Dodge Charger was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system. The manufacturer of this vehicle had certified that the frontal air bags in the Dodge Charger meet the requirements of the advanced air bag portion of Federal Motor Vehicle Safety Standard No. 208. The CAC frontal air bag system consisted of dual-stage air bags for the driver and front right passenger positions, seat track positioning sensors, safety belt buckle switches, a front right occupant weight sensor and retractor pretensioners. The vehicle was also equipped with front seat-mounted side impact air bags and roof rail-mounted IC air bags. The IC air bags deployed due to the consequence of the fire. None of the other air bags deployed.

2008 DODGE CHARGER POLICE VEHICLE OCCUPANTS

Driver Demographics

Age / Sex:	23 years / Male
Height:	185 cm (73 in)
Weight:	68 kg (150 lb)
Eyewear:	None
Seat Type:	Bucket
Seat Track Position:	Full-rear
Manual Restraint Use:	3-point lap and shoulder belt
Usage Source:	Occupant interview data
Air bags:	None deployed
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Exited unassisted through left front door
Transport from Scene:	Ambulance
Medical treatment:	Transported to a local hospital for evaluation and released

Driver Injuries

Injury No.	Injury	AIS 2005/08	Injury Source	Confidence Level
1	Not injured	N/A	N/A	N/A

Data Source – FTO interview

Driver Kinematics

The driver of the Dodge was seated in a full-rear track position with the seat back reclined and the adjustable head restraint positioned above the seat back. He was wearing a police uniform and his utility belt. The driver was restrained by the manual safety belt system. There was no loading evidence on the safety belt system; however, the occupant interview indicated safety belt usage. The driver was in the process of slowing the vehicle; therefore his right foot was on the brake pedal. His hand positions were unknown.

At impact with the Lexus, the driver responded to the 6'oclock impact force by initiating a rearward trajectory. His back loaded the seatback and his head engaged the head restraint. The crash forces were distributed over a wide area of the seat back which did not yield during the crash. The driver was not injured.

The combination of the pre-crash speed of the Dodge and the impact forces displaced the vehicle forward and to its right. The driver reapplied a braking force and brought the vehicle to a controlled stop within the FTO estimated distance of approximately two car lengths.

Post-crash, the driver remained in the vehicle to report the crash. The FTO detected the fire and instructed the driver to exit the vehicle. He unbuckled his manual restraint system and opened the left front door and exited the vehicle unassisted. According to the interview, he exited the Dodge in the path of the forward progressing fire and the fire singed his left arm. He was subsequently transported to a local hospital as a routine precaution where he was evaluated for possible injury and released.

Front Right Occupant Demographics

Age / Sex:	33 years / Female
Height:	165 cm (65 in)
Weight:	113 kg (250 lb)
Eyewear:	None
Seat Type:	Bucket
Seat Track Position:	Full-rear
Manual Restraint Use:	None
Usage Source:	Occupant interview data
Air bags:	None deployed
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Exited unassisted through right front door
Transport from Scene:	Ambulance
Medical treatment:	Transported to a local hospital for evaluation and released

Front Right Occupant Injuries

Injury No.	Injury	AIS 2005/08	Injury Source	Confidence Level
1	Not injured	N/A	N/A	N/A

Data Source – FTO interview

Front Right Occupant Kinematics

The front right occupant of the Dodge was seated in a rear track position with the seat back reclined and the head restraint adjusted above the level of the seat back. She stated during the SCI interview that she was not wearing the manual safety belt system. The front right occupant was wearing her police uniform and her utility belt.

The occupant responded to the 6 o'clock impact force by moving rearward with respect to the vehicle and loading the seatback and the head restraint. These components absorbed her loading forces and she was not injured.

The occupant rebound slightly forward and came to rest in her seat position. Immediately following the crash, the occupant used her police radio to notify the on-duty dispatcher of the crash. She then proceeded to retrieve her cellular telephone from the sun visor only to find that it had been displaced into the back seat area by the crash. As she turned to reach into the back seat, she noted the smoke and fire and instructed the driver the exit the vehicle. The front right occupant opened the right front door and exited the vehicle unassisted. She was subsequently transported to a local hospital for evaluation of possible injury as a departmental procedure following the crash. She was not injured and was released without treatment.

2003 LEXUS GS430

Description

The 2003 Lexus GS430 4-door sedan was manufactured in Japan and was identified by the VIN: JT8BL69S530xxxxxx. This vehicle was repaired by its insurer prior to the SCI notification of this crash and was not inspected. The rear-wheel drive Lexus was equipped with a 4.3 liter V8 engine linked to a 5-speed automatic transmission. The brake system was 4-wheel disc with ABS. The manual restraint system consisted of 3-point lap and shoulder safety belts for the five seated positions. The front safety belts were equipped with retractor pretensioners. The vehicle was equipped with driver and front right passenger air bags, front seat-mounted side impact air bags and IC air bags. None of the vehicle's air bags deployed during the crash. The insurance repair estimate indicated the vehicle's odometer reading was 98,339 km (61,107 miles).

Exterior Damage

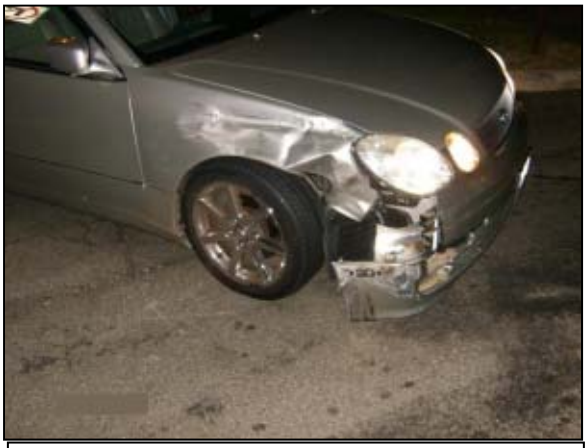


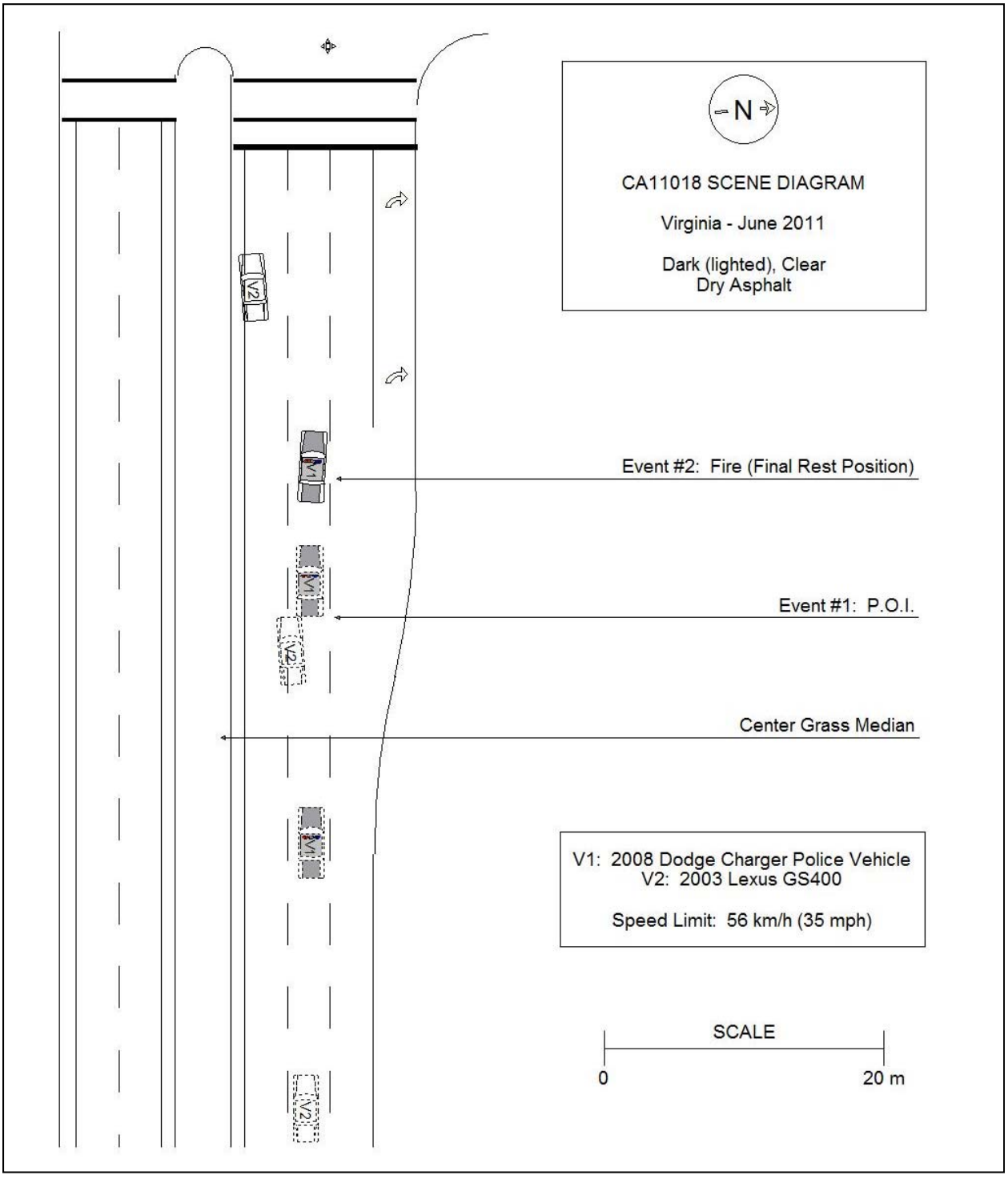
Figure 12: Front right oblique view of the Lexus. Image supplied by the police investigation.

Figure 12 is an on-scene police image of the damaged front right corner area. Analysis of the image indicated the direct contact damage began immediately outboard the right end of the front bumper reinforcement and wrapped around the corner onto the right fender. The width of the direct contact to the frontal plane was an estimated 15 cm (6 in). The longitudinal length of the direct contact along the fender was an estimated 102 cm (40 in). The direct contact ended at the aft edge of the wheel opening. The lead edge of the fender was crushed inboard exposing the face of the right front tire. The right wheelbase was reduced and estimated 5 to 8 cm (2 to 3 in). The tire was in contact with the aft portion of the wheel opening. The insurer's repair order indicated that all of the right front suspension components were replaced. The total cost of the repair was $7,772.07 ($4687.35 Parts + Labor and Tax). An analysis of this corner impact damage was beyond the scope of the WinSMASH program. The CDC assigned to this damage pattern was 12FREE5.

Occupant Data

The Lexus was occupied by the 57-year old male driver, who was restrained by the vehicle's 3-point lap and shoulder safety belt system. He did not sustain injury as a result of the crash, and did not seek medical treatment.

SCENE DIAGRAM



ATTACHMENT A:

2008 Dodge Charger EDR Data

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	2B3LA43G08H******
User	
Case Number	
EDR Data Imaging Date	06/27/2011
Crash Date	
Filename	CA11018 CDR.CDRX
Saved on	Monday, June 27 2011 at 13:19:29
Collected with CDR version	Crash Data Retrieval Tool 3.8
Reported with CDR version	Crash Data Retrieval Tool 4.1.2
EDR Device Type	Airbag Control Module
Event(s) recovered	None

Comments

No comments entered.

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

GENERAL INFORMATION:

CAUTION: During Bench top imaging, make sure the ACM is not moved, tilted or turned over while connected to and powered by the CDR Interface Module. Also, after a CDR imaging process, wait 2 minutes after power is removed from the ACM before attempting to move the module. Not following these general ACM guidelines for bench top imaging could cause new events to be recorded in the ACM.

The ACM current fault status will be altered if the ACM is powered-up without having all of the other vehicle inputs connected (e.g., bench top imaging). This situation will occur when the CDR tool is connected directly to the ACM. This will not affect the stored fault data information in any of the Event Records. Always make a note in the CDR case comments section when an ACM bench top imaging process is being performed.

The recorded Event will contain Pre-Crash data.

- T0 (where '0' is subscript) (-0.1 sec.) is defined as either:
  - The last sample point in the vehicle data buffer when the ACM commanded a deployment
  - The algorithm wakeup.
  - Please note that the algorithm wakeup may be different for front, side, and roll-over events and their associated parameters.
- The VIN is captured by the ACM and then recorded as the Original VIN after 10 consecutive ignition cycles of capturing the same number. Once it has been recorded, this number can not be modified.

CDR FILE INFORMATION:

Event(s) Recovered definitions:

- None - There are no stored events in the Airbag Control Module (ACM)
- Not Retrievable - Event Data may be stored in the ACM but is not retrievable by the CDR tool.
- For Continental ACMs:
  - Event Record 1 - Data from an event is stored in the ACM (not necessarily in chronological order)
  - Event Record 2 - Data from another event is stored in the ACM (not necessarily in chronological order)
  - Event Record 3 - Data from another event is stored in the ACM (not necessarily in chronological order) (for modules with 3 stored events)
- For all other ACMs:
  - Most Recent Event - Data of the most recent event is displayed in the report
  - 1st Prior Event - Two events are stored in the ACM, Data displayed is of the first prior event.
  - 2nd Prior Event - Three events are stored in the ACM, Data displayed is of the second prior event.
  - Etc., (for modules with 3 to 5 stored events)

CDR RECORD INFORMATION:

- If power to the ACM is lost during an event, all or part of the event data record may not be recorded. Two scenarios may be recorded under this condition:
  - "None" may be displayed in the "Event(s) Recovered" section of the report indicating no pre-crash vehicle data.
  - An event may be displayed in the "Event(s) Recovered" section of the report and "Interrupted" will be displayed for Vehicle Event Recorder Status.
  - Note: For the 2010-2012 MY Dodge Journey, Dodge Grand Caravan, Chrysler Town and Country, and Chrysler Grand Voyager, "interrupted" in Vehicle Event Recorder Status/Event Recorder Status indicates either be a non-deployment event or an interrupted deployment event.
- For ACMs that store non-deployment events, the minimum delta V required to store an event is a delta V of 5 mph (8 km/h) within a 150 ms interval.
- The Airbag Control Module Configuration indicates the inputs and outputs that the ACM for a particular vehicle monitors and/or controls.
- "Event Number" in the System Status at Event section of the report:
  - Indicates the event number per vehicle ignition cycle for:
    - 2010 - 2012 Sebring, Avenger, Caliber, Nitro, Compass, Liberty, Patriot, Wrangler, and Ram
  - Indicates the overall order of the events for all other applicable vehicles.
- "Total Number of Events Recorded" in the System Status at Event section of the report:
  - Stops incrementing when each event record is recorded by the ACM for:
    - 2010 - 2012 Sebring, Avenger, Caliber, Nitro, Compass, Liberty, Patriot, Wrangler, and Ram
  - Indicates the total number of events that the ACM has recorded for all other applicable vehicles.
- "Operation System Time at Event (min)" in the System Status at Event section of the report is a lifetime timer for the ACM. It indicates the amount of time, over the ACM's lifetime that the ACM has been powered up.
- "Time from Event 1 to 2 (sec)" in the System Status at Event section of the report indicates the time from t0 of the first event to t0 of the second event. If the value is greater than 5 seconds, ">5" will be displayed.
- Active Head Restraint (AHR) - This refers to the active head restraint systems that are electronically controlled by the ACM.
- For applicable vehicles, a "Yes" for a particular item in the Deployment Command Data section of the report indicates that the ACM commanded the deployment of the associated device. Note: For 2010 MY vehicles equipped with AHR, the AHR deployment will not be recorded in the EDR.
- Vehicle Data (Pre-Crash) is transmitted to the Airbag Control Module, by various vehicle control modules, via the vehicle's communication network.
- On 2006-2009 Ram 2500/3500, the Engine RPM recorded is limited to a maximum of 4080 RPM. On the 2008 - 2010 Dodge Grand Caravan, 2008-2010 Chrysler Town and Country and 2009-2010 Dodge Journey, the engine RPM resolution is 256 rpm. On all other vehicles, the resolution is 32 rpm.
- If a recorded event has Engine RPM equal to SNA and Speed, Vehicle Indicated equals SNA for each time stamp, then the data is default data and the event stored in the ACM is not valid.
  - The accuracy of the recorded Speed, Vehicle Indicated will be affected if the vehicle had the tire size or the final drive axle ratio changed from the factory build specifications.
  - Speed, Vehicle Indicated is reported as an average of the drive wheels.
- On the 2008 - 2009 Dodge Grand Caravan, 2008-2009 Chrysler Town and Country and 2009 Dodge Journey, the vehicle speed resolution is 2 kph. On all other vehicles, the resolution is 1 kph.
- The MIL (Malfunction Indicator Lamp) Status for the various recorded systems indicates the state of the applicable malfunction indicator lamp at the time that the data was captured. Note: Some fault codes could be stored due to component/system damage from the accident.
- For correct polarity of Maximum Delta-V Longitudinal or Maximum Delta-V Lateral, reference the graph and the table of Delta-V values.
- On vehicles equipped with ETC, "Accelerator Pedal, % Full" and "Engine Throttle, % Full" are relative values - relative pedal position and relative engine throttle. These parameters may record values of less than 100% when the pedal/throttle is actually at its maximum.

NOTE: The appropriate diagnostic tool should be used to read any stored Diagnostic Trouble Codes (DTC's) in the various electronic modules (ACM, PCM, ABS, TCM, etc., where applicable) for use in interpretation of some vehicle specific recorded data.

VEHICLE DATA DEFINITIONS:

Vehicle Event Recorder Status definitions:

- For additional definitions, please refer to the CDR Help File Glossary
- ABS MIL (if equip.) - This indicates the ABS fault indicator lamp status. It will only be "On" when there is a fault in the ABS system. The Electronic brake module DTC's should be read and recorded for final system interpretation.
- ESP MIL (if equip.) - This indicates the ESP/BAS fault indicator lamp status. It will only be "On" when there is a fault or thermal model shutdown in the ESP system. The ESP module DTC's should be read and recorded for final system interpretation.
- ESP Lamp (if equip.) - This is the status of the ESP symbol - "car with squiggly lines" indicator lamp. "On" indicates ESP has been turned off by the driver or has reduced performance and is not an indication of a fault in the system.
- ESP Lamp Flashing Requested (if equip.) - If "Yes", then an ESP, Traction Control or Trailer Sway Control (if equipped) event was active at the time of data capture.
- ESP Disabled (if equip.)- "Yes" indicates that ABS & ESP have been disabled by the driver or due to system performance.
- ESP Functional/Active (if equip.)- "YES" indicates that the ESP system is functional and has no faults.
- Panic Brake Assist Active (if equip.)- "Yes" indicates that all four of the brake circuits are under going ABS control.
- Steering Input (deg) (if equip.):
  - Steering Input polarity is positive for right turns on:

    - 2006 - 2007 Grand Cherokee
    - 2006 - 2007 Commander
    - 2005 - 2010 300, Magnum, and Charger
    - 2008 - 2010 Challenger
  - Steering Input polarity is negative for right turns on:
    - All other vehicles and model years not specified above
- Yaw Rate (deg/sec) (if equip.): All vehicles have negative yaw rate when making a right turn.
- ETC Lamp - Lamp “ON “indicates there is an active Electronic Throttle DTC.
- ETC Lamp Flashing - If “Yes”, then the ETC is in the limp-in mode.
- Engine Torque Applied - If “No”, then no engine torque output was applied (as in Park/Neutral for Automatic transmissions or clutch depressed on manual or during an ESP/Traction Control event). If “Yes”, then engine torque output was applied.
- Tire 1 (2) Location (if equip.)- This indicates the location of the tire pressure sensor data. Default is used to indicate that the location of the tire pressure sensor is unknown or there is no tire pressure sensor in the wheel. Vehicles with Base Tire Pressure Monitoring systems will display SNA for both Tire Locations as these vehicles do not send actual pressure values across the communication bus.
- Tire 1 (2) Pressure Status (if equip.)- This indicates the actual pressure status of the Tire Location defined in the previous column. Possible values are LOW, NORMAL, HIGH, or SNA for this parameter. Vehicles with Base Tire Pressure Monitoring systems will display NORMAL even though these vehicles do not send actual pressure values across the communication bus.
- Tire 1 (2) Pressure (psi) (if equip.)- This indicates the actual tire pressure value of the Tire Location defined. Vehicles with Base Tire Pressure Monitoring systems will display N/A for this parameter as these vehicles do not send actual pressure values across the communication bus.
- Cruise Control System - “On” indicates that the Cruise Control system is turned on.
  Cruise Control Active - “Yes” indicates the Cruise Control system is actively controlling vehicle speed. “No” indicates the system is NOT controlling vehicle speed.
- (if equip.) - If a parameter name is followed by the words (if equip.), then the parameter is only valid for vehicles equipped with the associated parameter/vehicle system.

APPLICATION INFORMATION:

- 2005 - 2009 Durango’s equipped with side airbags have EDR data that can be imaged by the CDR tool. Durango’s not equipped with side airbags have EDR Data that might be imaged by the CDR tool and can always be imaged by the supplier.
- For 2005 & 2006 MY, some Chrysler 300, Dodge Magnum, Dodge Charger, Jeep Grand Cherokee, and Jeep Commander models may contain EDR data that can not be imaged by the CDR tool.
- For 2006 & 2007 MY, some PT Cruiser models may contain EDR data that can not be imaged by the CDR tool.
- EDR Data is only recorded for frontal deployments in the following vehicles:
  - 2005-2007 Durango
  - 2006-2007 Ram 1500
  - 2006-2009 Ram 2500/3500 Heavy Duty
  - 2007 Aspen, Caliber, Compass, Patriot, Nitro, Sebring, Wrangler

03001_Chrysler_r011

System Status at Retrieval

Original VIN	2B3LA43G08H******
Airbag Control Module Part Number	04896097AE
Airbag Control Module Serial Number	T52MD3207B0042
Airbag Control Module Supplier	Bosch

System Configuration at Retrieval

Configured for Driver Seatbelt Switch	No
Configured for Front Center Seatbelt Switch	No
Configured for Front Passenger Seatbelt Switch	No
Configured for 2nd Row Left Seatbelt Switch	No
Configured for 2nd Row Center Seatbelt Switch	No
Configured for 2nd Row Right Seatbelt Switch	No
Configured for 3rd Row Left Seatbelt Switch	No
Configured for 3rd Row Center Seatbelt Switch	No
Configured for 3rd Row Right Seatbelt Switch	No
Configured for Driver Knee Airbag	No
Configured for Left Curtain #1	Yes
Configured for Right Curtain #1	Yes
Configured for Left Curtain #2	No
Configured for Right Curtain #2	No
Configured for Front Driver Seatbelt Pretensioner	Yes
Configured for Front Center Seatbelt Pretensioner	No
Configured for Front Passenger Seatbelt Pretensioner	Yes
Configured for 2nd Row Left Seatbelt Pretensioner	No
Configured for 2nd Row Center Seatbelt Pretensioner	No
Configured for 2nd Row Right Seatbelt Pretensioner	No
Configured for 3rd Row Left Seatbelt Pretensioner	No
Configured for 3rd Row Center Seatbelt Pretensioner	No
Configured for 3rd Row Right Seatbelt Pretensioner	No
Configured for Left Side Sensor #1	Yes
Configured for Left Side Sensor #2	Yes
Configured for Left Side Sensor #3	No
Configured for Right Side Sensor #1	Yes
Configured for Right Side Sensor #2	Yes
Configured for Right Side Sensor #3	No
Configured for Left Up Front Sensor	Yes
Configured for Right Up Front Sensor	Yes
Configured for Front Driver Digressive Load Limiter	No
Configured for Front Passenger Digressive Load Limiter	No
Configured for Driver Seat Track Position Sensor	Yes
Configured for Front Passenger Seat Track Position Sensor	Yes
Configured for Driver Airbag Disable Switch	No
Configured for Passenger Airbag Disable Switch	No
Configured for Front Passenger Occupant Classification System	No
Configured for Right Side Thorax	Yes
Configured for Left Side Thorax	Yes
Configured for Passenger Knee Airbag	No
Configured for Passenger Belt Tension Sensor	No
Configured for Driver Belt Tension Sensor	No
Configured for Occupant Detection Sensor	No
Configured for DOC Disable Switch	No