

**CRASH DATA RESEARCH CENTER**

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**OFFICE OF DEFECTS INVESTIGATION  
CALSPAN ON-SITE CRASH RELATED VEHICLE FIRE INVESTIGATION  
SCI CASE NO: CA08053**

**VEHICLE: 2007 DODGE CHARGER POLICE VEHICLE  
LOCATION: TEXAS  
CRASH DATE: NOVEMBER 2008**

Contract No. DTNH22-07-C-00043

Prepared for:

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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

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| <p>15. <i>Supplementary Note</i><br/>An investigation of a post-crash fire in a 2007 Dodge Charger Police Vehicle involved in a multiple impact crash event.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                     |                                                                                                        |                                                             |
| <p>16. <i>Abstract</i><br/>This on-site investigation focused on the cause of a fuel leak that resulted in a fuel-fed fire of a 2007 Dodge Charger Police Vehicle that was involved in a three vehicle multiple event crash. The High Density Polyethylene (HDPE) fuel tank in the Charger was a saddle-bag design located forward of the rear axle spanning the drive shaft. The vehicle manufacturer certified that the 2007 Dodge Charger was compliant with the 80 km/h (50 mph)/70 percent overlap moving deformable barrier test requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 301.</p> <p>The Dodge Charger was involved in a police pursuit with lights and siren activated at the time of the crash. The Dodge entered an intersection where it was struck on the right side by a 1999 Honda Accord. The impact displaced the Dodge into a clockwise rotation as it traversed through the intersection. The center and rear aspects of the Dodge's left plane struck the front left aspect of a stopped 2005 BMW 325i. This impact resulted in damage to the left rear suspension of the Dodge and redirected the vehicle into a counterclockwise rotation. The Dodge rotated approximately 360 degrees and began a diagonal trajectory back through its original travel lane toward the outboard curb. The right front tire/wheel of the vehicle struck the curb in the area of a storm sewer. This impact resulted in severe right front suspension damage and caused the vehicle to pitch down. The rear tires of Dodge left the ground and the vehicle rotated approximately 90 degrees. The rear undercarriage of the Dodge impacted the ground, evidenced by a semi-circular imprint of left rear wheel rim. At this time, the separated left rear wheel/suspension was in the area of and/or under the left aspect of the fuel tank at the fuel inlet. The ground impact caused an undetermined component of the suspension to displace the fuel inlet from the tank. As the vehicle slid to rest, sparks generated from the asphalt road surface ignited the fuel vapors and a fire developed. The police officer driver exited the vehicle through the front left door and was not injured.</p> |                                                                     |                                                                                                        |                                                             |
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## TABLE OF CONTENTS

|                                      |    |
|--------------------------------------|----|
| BACKGROUND .....                     | 1  |
| SUMMARY                              |    |
| Vehicle Data                         |    |
| 2007 Dodge Charger .....             | 2  |
| 2007 Dodge Charger Fuel System ..... | 3  |
| 1999 Honda Accord EX.....            | 4  |
| 2004 BMW 325i .....                  | 4  |
| Crash Site .....                     | 4  |
| Crash Sequence.....                  | 5  |
| Vehicle Damage                       |    |
| 2007 Dodge Charger                   |    |
| Exterior Damage .....                | 7  |
| Fuel Tank Damage .....               | 9  |
| Safely Belt Systems .....            | 10 |
| Air Bag Systems .....                | 11 |
| Event Data Recorder .....            | 11 |
| 1999 Honda Accord EX                 |    |
| Exterior Damage .....                | 11 |
| 2004 BMW 325i                        |    |
| Exterior Damage .....                | 12 |
| Driver Demographics/ Data .....      | 13 |
| Driver Injury .....                  | 13 |
| Driver Kinematics .....              | 13 |
| Crash Schematic.....                 | 15 |

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***BACKGROUND***

This on-site investigation focused on the cause of a fuel leak that resulted in a fuel-fed fire of a 2007 Dodge Charger Police Vehicle that was involved in a three vehicle multiple event crash. The Dodge Charger was equipped with a police package consisting of a 5.7 liter Hemi gasoline powered engine, Electronic Stability Program (ESP), advanced frontal air bags, and four-wheel anti-lock brakes. The vehicle was not equipped with inflatable side impact protection. The High Density Polyethylene (HDPE) fuel tank in the Charger was a saddle-bag design located forward of the rear axle spanning the drive shaft. The vehicle manufacturer certified that the 2007 Dodge Charger was compliant with the 80 km/h (50 mph)/70 percent overlap moving deformable barrier test requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 301. **Figure 1** is a view of an exemplar 2007 Dodge Charger.



**Figure 1: Exemplar 2007 Dodge Charger Police vehicle.**

The Dodge Charger was involved in a police pursuit with lights and siren activated at the time of the crash. The Dodge entered an intersection where it was struck on the right side by a 1999 Honda Accord. The impact displaced the Dodge into a clockwise rotation as it traversed through the intersection. The center and rear aspects of the Dodge's left plane struck the front left aspect of a stopped 2005 BMW 325i. This impact resulted in damage to the left rear suspension of the Dodge and redirected the vehicle into a counterclockwise rotation. The Dodge rotated approximately 360 degrees and began a diagonal trajectory back through its original travel lane toward the outboard curb. The right front tire/wheel of the vehicle struck the curb in the area of a storm sewer. This impact resulted in severe right front suspension damage and caused the vehicle to pitch down. The rear tires of Dodge left the ground and the vehicle rotated approximately 90 degrees. The rear undercarriage of the Dodge impacted the ground, evidenced by a semi-circular imprint of left rear wheel rim. At this time, the separated left rear wheel/suspension was in the area of and/or under the left aspect of the fuel tank at the fuel inlet. The ground impact caused an undetermined component of the suspension to displace the fuel inlet from the tank. As the vehicle slid to rest, sparks generated from the asphalt road surface ignited the fuel vapors and a fire developed. The police officer driver exited the vehicle through the front left door and was not injured.

The investigating police department notified a regional office of the National Transportation Safety Board (NTSB) of the crash. A courtesy inspection was conducted by the NTSB and their

investigators provided details of the crash and fire to the Crash Investigation Division (CID) of the National Highway Traffic Safety Administration (NHTSA). The notification was forwarded to NHTSA's Office of Defects Investigation (ODI) and ODI requested further research of the crash through the Special Crash Investigations (SCI) Program. The Calspan SCI team was assigned the research project on December 2, 2008. Cooperation with the investigating police department was established and the on-site investigation took place December 9-10, 2008. The Dodge Charger and its fuel system, Honda Accord, BMW 325i and crash site were inspected during the course of the investigation.

**SUMMARY**

**VEHICLE DATA**

**2007 Dodge Charge Police Vehicle**

The 2007 Dodge Charger four-door sedan was equipped with the manufacturer's police equipment package and was identified by the Vehicle Identification Number (VIN) 2B3KA43H77H (production number deleted). **Figure 2** is a left side view of the Dodge. The Dodge had been in-service approximately 33,795 km (21,000 miles). The vehicle was powered by a 5.7-liter, eight-cylinder engine linked to a five-speed automatic transmission with a steering column mounted shift lever. The service brakes were power-assisted front and rear disc with anti-lock and Brake Assist. The Dodge was equipped with a steering angle sensor, a yaw sensor, traction control, stability control, a 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 tires were Firestone Firehawk, size P225/60R18 mounted on OEM steel wheels. The vehicle manufacturer recommended cold front and rear tire pressure was 207 kPa (30 PSI). The tire data at the time of the SCI inspection was as follows:



**Figure 2: Left view of the Dodge Charger.**

| <b>Position</b> | <b>Measured Pressure</b> | <b>Measured Tread Depth</b> | <b>Damage</b>                     |
|-----------------|--------------------------|-----------------------------|-----------------------------------|
| Left Front      | Tire Flat                | Unknown                     | Rim abrasions, tire burned        |
| Right Front     | Tire Flat                | 6 mm (7/32 in)              | Cut side wall and rim deformation |
| Left Rear       | Tire Flat                | Unknown                     | Tire burned                       |
| Right Rear      | 207 kPa (30 PSI)         | 6 mm (7/32 in)              | None                              |

The interior of the Dodge was configured for five-passenger seating with front bucket seats and a rear bench seat. Located between the front seats was a control panel which contained switches for several police vehicle functions. The interior data could not be obtained due to the complete burn of the occupant compartment.

### 2007 Dodge Charger Fuel System

The 2007 Dodge Charger was equipped with 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. **Figure 3** is a new exemplar fuel tank that was inspected as part of this SCI investigation. The tank was a saddle-bag design with two outboard reservoirs and a center crossover that spanned the driveshaft. It was secured to the undercarriage of the Dodge Charger with two 3 cm (1 in) wide steel tank straps and had a 72 liter (19 gallon) capacity. At the time of the crash, an estimated 64 liters (17 gallons) of gasoline was in the tank as the officer filled the vehicle at the on-set of his work shift.

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. A white plastic inlet valve was fused to the tank. This plastic inlet contained a spring loaded internal check valve and a 5 cm (2 in) neck for the attachment of the filler tube.



Figure 3: Exemplar fuel tank.

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

The filler tube was secured to the quarter panel/filler door area with a rubber boot and a retainer clip. The filler tube was formed to the contour of the forward aspect of the inner fender and extended to the tank inboard of the inner fender and the wheel opening. **Figure 4** is a view of an exemplar Dodge at the rear left wheel opening depicting the designed orientation of the fuel tank and inlet. The filler tube was steel and was 3 cm (1 in) in diameter and approximately 81 cm (32 in) in length.



Figure 4: Exemplar mounted fuel tank.

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.

### ***1999 Honda Accord EX***

The 1999 Honda Accord EX four-door sedan was identified by the VIN: JHMCG5656XC (production number deleted). The Accord was equipped with a 2.3-liter, inline four-cylinder engine linked to a four-speed automatic transmission with a console mounted shift lever. The braking system consisted of power-assisted front and rear disc with anti-lock. The interior of the Honda was configured for five-passenger seating. The first row consisted of bucket seats for the driver and right front position. The second row seating was a 60/40 split bench. Additionally, the Honda was equipped with a redesigned frontal air bag system.

### ***2004 BMW 325i***

The 2004 BMW 325i four-door sedan was identified by VIN WBAEV33474 (production number deleted). The power train consisted of a 2.5-liter, inline six-cylinder engine linked to a five-speed automatic transmission with a console mounted shift lever. The braking system consisted of power-assisted front and rear disc with anti-lock. Traction control and stability control were standard features for this vehicle. The safety systems consisted of the CAC frontal air bag system, seat back mounted side impact air bags, curtain air bags, and front safety belt pretensioners. The interior of the BMW was configured for five-passenger seating. The first row consisted of bucket seats with a second row bench.

### ***CRASH SITE***

This three-vehicle crash occurred during the evening hours in November 2008. At the time, it was dark; however, the area was illuminated by overhead street lamps. The weather was clear. The crash occurred at the four-leg intersection of a four-lane east/west road and a three-lane one-way southbound road in an urban residential setting. The intersection was controlled by a properly operating standard (green/amber/red) traffic signal. Leading into the intersection, the east/west road had an estimated negative three percent (-3%) grade for westbound traffic. At the intersection, the road transitioned to a level grade. The opposing travel directions were separated by double yellow lines. Concrete drainage gutters and curbs bordered the outboard road edges. West of the intersection, a 1.2 m (4 ft) wide sidewalk was located adjacent to the outboard travel lane. The speed limit in the area of the crash was 48 km/h (30 mph). **Figure 5** is a trajectory view of the westbound Dodge leading into the intersection.



**Figure 5: Westbound trajectory view 30 m (100 ft) from the intersection.**



## **CRASH SEQUENCE**

### ***Pre-Crash***

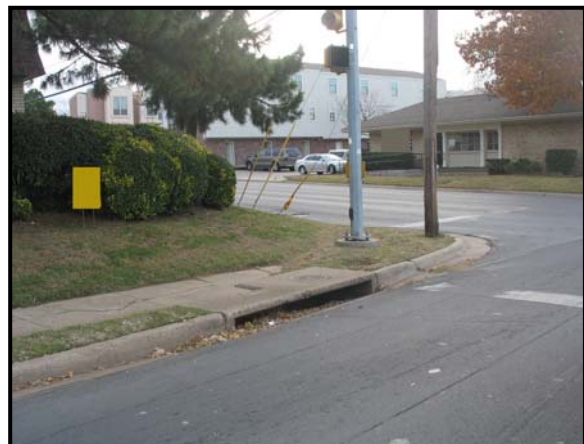
The police officer driver began his work shift at 1700 hours. He filled the 72 liter (19 gallon) fuel tank of the Dodge Charger at the beginning of the shift and attended his daily work detail briefing. His detail placed him as a chase vehicle at a sobriety check point located five blocks east of the crash site. The officer's duties required minimal driving between the time that the Dodge's fuel tank was filled and the time of the crash. It was estimated that the fuel load of the Dodge was at least 64 liters (17 gallons). While on this detail, a motorist avoided the check point and departed at a high rate of speed. The police officer entered the Dodge Charger, activated the vehicle's light and siren, and pursued the driver in the westbound direction. Both vehicles were traveling on the inboard lane. The police officer driver estimated that his speed during the pursuit and subsequent crash was 89 to 97 km/h (55 to 60 mph).

During the pursuit, the westbound suspect vehicle approached the intersection on a green traffic signal. **Figure 6** is a westbound view at the 15 m (50 ft) from the intersection. At that time, a southbound 1999 Honda Accord was stopped at the red traffic signal with the intention of continuing straight through the intersection. The Honda was driven by a 17 year old restrained female and occupied by a 14 year old restrained front right passenger. Additionally, a 2004 BMW 325i was eastbound approaching the intersection driven by a 31 year old restrained male.

The driver of the Honda reported that she observed the suspect vehicle pass through the intersection. She stated that she did hear a police siren; however, she thought the sound of the siren was coming from behind her. There were bushes and landscaping located to her left at the intersection that impeded her visibility to approaching westbound traffic, **Figure 7**. The traffic light cycled to green for southbound traffic and the driver accelerated the Honda forward into the path of the approaching westbound Dodge. The eastbound BMW stopped in the inboard travel lane for the (now) red traffic signal. The Dodge Charger entered the intersection on a red traffic signal precipitating the crash.



**Figure 6: Westbound view at the mouth of the intersection.**



**Figure 7: View of the Honda toward the westbound traffic.**

### ***Crash***

A schematic of the crash sequence is included at the end of this report as **Figure 25**. The forward and center aspect of the Dodge's right plane struck the front plane of the Honda. The force of the lateral impact across the front of the vehicle caused the Honda to rotate approximately 90 degrees clockwise as it separated from the impact. The Accord came to rest straddling the westbound lane divider 17.7 m (58 ft) west of the area of the impact.

The Dodge separated from the Honda with a clockwise rotation and was redirected to the southwest. The Dodge crossed the center line of the road and impacted the front left aspect of the stopped BMW with the center and rear aspects of its left plane. This impact involved significant contact between the left front tire/wheel of the BMW and the left rear tire/wheel of the Dodge. The force of the impact reduced the BMW's left wheelbase 10 cm (4 in) and displaced the vehicle rearward approximately 3 m (10 ft). **Figure 8** is a view of the final rest positions of the vehicles taken during the police investigation.



**Figure 8: On-scene view of final rest.**

The rear left suspension of the Dodge fractured and the wheel separated, held in place only by the rear stabilizer link and axle shaft. The separated rear left coil spring was found in the road.

The Dodge was redirected into a diagonal trajectory back across the westbound lanes with an impact induced counterclockwise (CCW) rotation. The vehicle rotated approximately 360 degrees evidenced by a series of tire/yaw marks in the road. During the CCW rotation, the outboard force on the separated left rear tire caused the left axle shaft to disengage from the differential. At this point, the fractured wheel assembly was attached to the frame by the rear stabilizer link.

As the Dodge entered the outboard westbound lane, the vehicle began a near tracking trajectory in a northwesterly direction as it approached the curb line. At the curb line, a storm drain was present along the vehicle's trajectory. The curb height in the storm drain measured 33 cm (13 in). The front right tire of the vehicle impacted the storm drain evidenced by an abrasion to the concrete. The force of the impact cut and debaded the front right tire, deformed the wheel rim and fractured the front right suspension. The impact caused the Dodge to pitch down (rear end up) and rotate CW. The rear tires of the Dodge left the road surface. As the vehicle rotated CW approximately 90 degrees, the separated left rear wheel and suspension gathered into the forward area of the left rear wheel opening. The left aspect of the fuel tank and inlet were located in this area. The rear of the vehicle came down and impacted the road surface evidenced by a semi-circular tire imprint of the left rear wheel. The horizontal orientation of the wheel exposed the fractured suspension components to fuel tank inlet and fuel filler tube. The compression of the impact separated and deformed the filler tube and caused the fuel tank inlet to separate from the tank. The separation released the gasoline of the fuel tank.

The vehicle slid to rest in the outboard westbound lane without further rotation. The Dodge came to rest 14 m (46 ft) west of the tire imprint facing southwest. The sparks generated during the ground impact and slide to final rest ignited the fuel vapor resulting in a post-impact fire. The fire completely consumed the vehicle. **Figure 9** is a view of the Dodge at final rest.



**Figure 9: Final rest of the Dodge.**

### ***Post-crash***

The police and fire personnel responded to the scene. The police officer driver exited his vehicle through the front left door. He was not injured in the crash. The driver and front right passenger in the Honda were not injured. The driver of the BMW complained of an abrasion to his left forearm caused by the deploying air bag. He was transported, treated and released from a local hospital. All three vehicles sustained disabling damage and were towed from the scene.

## **VEHICLE DAMAGE**

### ***2007 Dodge Charger Exterior***

The Dodge Charger sustained multiple regions or zones of damage resultant to the multiple event crash sequence. The damage to the right plane consisted of a 252 cm (99.2 in) long region of deformation to the right fender and right doors as a result of the lateral impact with the Honda. The direct contact began on the right fender 15 cm (5.9 in) aft of the right front axle and extended to the right rear wheel opening. Refer to **Figure 10**. The maximum crush occurred on the right front door 16 cm (6.3 in) aft of the base of the A-pillar. The maximum crush measured 14 cm (5.5 in). The residual crush measured at the mid-door elevation was as follows: C1 = 1 cm (0.4 in), C2 = 10 cm (3.9 in), C3 = 11 cm (4.3 in), C4 = 13 cm (5.1 in), C5 = 12 cm (4.7 in), C6 = 3 cm (1.2 in). The Collision Deformation Classification (CDC) was 01-RYEW2.



**Figure 10: Right view of the Dodge.**

**Figure 11** is a left side view of the Charger depicting the contact damage from the BMW. The direct contact damage to the left plane began on the mid-aspect of the left front door 135 cm (53.1 in) aft of the front left axle. The direct contact damage extended 238 cm (93.7 in) to the left corner. The forward edge of the rear left door snagged in the impact and buckled the door panel rearward. The residual mid-door crush measured was as follows: C1 = 9 cm (3.5 in), C2 = 6 cm (2.4 in), C3 = 9 cm (3.5 in), C4 = 14 cm (5.5 in), C5 = 13 cm (5.1 in), C6 = 0. The CDC of this impact was 11-LZEW2. The body panel damage under-represented the severity of the impact due to the presence of significant wheel-to-wheel interaction between the vehicles. The

impact resulted in a near complete fracture of the left rear suspension components. The forward stabilizer link, lower control arm, and shock absorber fractured at the mounting points. The upper control arm fractured mid-shaft. The wheel remained attached by only the rear stabilizer link. During the post-impact rotation away from the BMW, the left axle shaft separated from the differential. **Figure 12** is a view of the left rear wheel and fractured suspension.



**Figure 11: View of the left side damage.**



**Figure 12: Damaged left rear wheel and suspension.**

The Dodge impacted the curb in the storm drain with the front right tire. This force of this impact resulted in moderate damage to the wheel, completely fractured the suspension and altered the dynamics of the vehicle. The CDC of this impact was 12-FRWN3. **Figure 13-14** are views of the fractured suspension and separated wheel. The mounting points of forward control arm link fractured and the control arm separated from the box frame retainer. The center control arm link fractured mid-shaft. The vertical strut separated at the upper aspect. There was minor body deformation in the aft aspect of the wheel opening from tire contact. The outer sidewall of the tire was cut during the impact. The outboard wheel rim was deformed over a 30 cm (12 in) region with a 6 cm (2.5 in) deflection of the bead. Directly opposite this deformation on the inboard side, the rim was deformed over a 20 cm (8 in) region with a 3 cm (1 in) bead deflection.



**Figure 14: Front right suspension damage.**



**Figure 14: Front right wheel damage.**

### ***2007 Dodge Charger Fuel Tank Damage***

The fuel tank inlet was located in the lower left rear aspect of the fuel tank immediately forward of the rear left wheel opening. This area of the tank was the source of the leak and origin of the fire. **Figure 15** is a police image taken of the vehicle at final rest. As a direct consequence of the front right impact, the Dodge pitched down and rotated CW approximately 90 degrees. At ground contact, the separated rear left wheel and suspension was in the area of the fuel tank inlet. Due to the compression of the road impact, contact between the suspension/wheel and the fuel tank/inlet occurred at this time. That contact caused the separation of the fuel filler neck from the tank inlet as well as the separation of the inlet from the tank. It was possible, although undetermined, that the left outboard aspect of the fuel tank may have been punctured as well. The post-crash fire consumed that portion of the tank.



**Figure 15: Rear left area of the Dodge at final rest.**

**Figures 16 and 17** are views of the deformed filler neck and separated inlet. The filler neck was found dislodged within the rear left wheel opening. The tube was crushed full thickness 20 cm (8 in) from its downstream end. The mid-aspect of the tube was crushed and bent 90 degrees. The tube had separated from the filler door at its upper aspect and from the neoprene connector hose at its lower end. The band clamp fastening it to the connector hose fractured. The clamp was found along the curb line between the storm drain and final rest location. A cut 3 cm (1 in) in length was noted to the hose. The inlet valve completely separated from the tank. The check valve mounted within the inlet was not present and could not be found. There was no evidence of contact observed on the inlet or hose. The inlet was found in the grass beyond the sidewalk adjacent to the final rest area of the vehicle.



**Figure 16: View of the deformed filler tube.**



**Figure 17: View of the separated inlet.**

**Figure 18** is a view of the burned fuel tank looking to the right. **Figure 19** is a right view of the burned tank. The left third of the tank was consumed in the fire. The SCI inspection revealed that there was no deformation of the vehicle's sill, frame or undercarriage that would have

accounted for the inlet valve separation. The left band strap that held the tank in place was not deformed. **Figure 20** is a view depicting the orientation of the separated inlet and filler tube for reference.



**Figure 18:** View of the burned tank looking to the right side of the Dodge.



**Figure 19:** View of the burned tank looking to the left side of the Dodge.



**Figure 20:** View of the separated inlet and filler tube reconstructed for reference.

### ***2007 Dodge Charger Safety Belt Systems***

The Dodge Charger was equipped with three-point lap and shoulder belt systems for the five 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 could not recall if he had buckled the

safety belt system at the on-set of the pursuit. All belt webbings were destroyed in the fire and there was no remaining evidence to support driver belt use.

### ***2007 Dodge Charger Air Bag Systems***

The Dodge Charger was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system. The manufacturer of this vehicle has certified that the Dodge Charger is compliant with 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 presence sensor and retractor pretensioners. The driver was the sole occupant of the vehicle. The multiple event crash did not result in a sufficient longitudinal deceleration required to deploy the driver's air bag. The frontal air bag modules were consumed by the post-crash fire.

The Dodge Charger was not equipped with side impact air bags or inflatable curtain air bags.

### ***2007 Dodge Charger Event Data Recorder***

The Dodge was equipped with an Event Data Recorder (EDR) that was incorporated into the center tunnel mounted Air bag Control Module (ACM). This module was supported by the Bosch Crash Data Retrieval (CDR) software. The ACM was removed from the vehicle by the investigating police department. The module casing appeared to be intact; however, the plastic housing surrounding the umbilical was melted. It was not possible to connect the CDR hardware. It was unknown if the internal components of the module survived the fire. A download of the module was not attempted during the SCI inspection.

## ***VEHICLE DAMAGE***

### ***1999 Honda Accord EX Exterior***

**Figures 21 and 22** are the front left and overhead views of the Honda Accord. The Honda sustained moderate severity frontal damage as a result of the crash with the Dodge. The damage components consisted of the front bumper fascia, bumper beam, head light assemblies, hood, upper and lower radiator supports, and the fenders. The 10 o'clock direction force resulted in right shift of the frontal structure. The direct contact damage measured 148 cm (58.3 in) and extended across the full frontal plane. The maximum crush measured 20 cm (7.9 in) and was located 25 cm (9.8 in) inboard of the left end of the upper radiator support. During the impact, the front bumper fascia and bumper beam separated from the vehicle; therefore the crush was documented along the 125 cm (49 in) wide upper radiator support. The residual crush was as follows: C1 = 15 cm (6 in), C2 = 20 cm (7.9 in), C3 = 18 cm (7.1 in), C4 = 19 cm (7.5 in), C5 = 9 cm (3.5 in), C6 = 1 cm (0.4 in). There was no change in the wheelbase dimensions. The CDC for this impact was 70-FDEW-2 with an incremented end shift value of 60 added to the 10 o'clock direction of force.



Figure 22: Front left view of the Honda.



Figure 22: Overhead view of the frontal damage.

## **VEHICLE DAMAGE**

### ***2004 BMW 325i Exterior***

The 2004 BMW 325i sustained moderate severity damage to the front and left side planes, **Figures 23 and 24**. The direct contact damage began 50 cm (19.5 in) left of the centerline and extended 32 (12.5 in) to the left bumper corner. Crush was noted to the extreme outboard end of the bumper beam and measured 3 cm (1 in). The remainder of the bumper system was undamaged. As the vehicles continued to engage, the Dodge contacted the left side of the BMW resulting in deformation and abrasions to this plane. The direct contact damage extended 212 cm (83.5 in) onto the left front door. During this engagement, the left rear wheel of the Dodge impacted the BMW's front left wheel. The wheel deformed rearward and upward into the wheel opening. Refer to **Figure 24**. The left wheelbase was reduced 10 cm (4 in). The CDC for this impact was 12-FLEE-6.



Figure 23 Front view of the BMW.



Figure 24: Front left view of the BMW.



**DRIVER DEMOGRAPHICS/DATA**

Age/Sex: 31-year old/Male  
Height: 191 cm (75")  
Weight: 91 kg (200 lb)  
Seat Track Position: Rearward  
Safety Belt Use: Unknown  
Usage Source: Unable to determine via inspection due to fire damage, driver did not recall if used  
Egress from Vehicle: Exited unassisted from left front door  
Mode of Transport  
From Scene: Police vehicle  
Type of Medical Treatment: None, not injured

**DRIVER INJURIES**

| <i>Injury</i> | <i>Injury Severity (AIS 90/Update 98)</i> | <i>Injury Source</i> |
|---------------|-------------------------------------------|----------------------|
| Not injured   | N/A                                       | N/A                  |

**DRIVER KINEMATICS**

The 31-year old male driver of the 2007 Dodge Charger was an on-duty uniformed police officer. He was assisting at a sobriety checkpoint as a chase vehicle to pursue and stop any motorist that failed to stop at the checkpoint. Prior to the crash, he was outside his vehicle. A driver passed through the check point without stopping. The driver entered the Dodge Charger and initiated a pursuit of this vehicle. The police officer could not recall if he had fastened his safety belt at the on-set of the pursuit. He was seated in a rear track position with the head restraint adjusted above the seat back.

As the police officer approached the intersection, he was traveling with the overhead emergency lights and siren activated. The traffic light signal phase cycled to red for his westbound direction of travel. The driver of the Honda did not to detect the approaching police vehicle and accelerated into the intersection from a stopped position. The right side area of the Dodge Charger was struck by the front of the Honda resulting in a direction of force of 1 o'clock for the Charger. The driver initiated a slight forward trajectory in response to this impact.

The left rear door, the left C-pillar and the left rear tire and wheel of the Dodge impacted the front left corner area of the stopped BMW. This impact resulted in an 11 o'clock impact force and probably displaced the driver forward and to his left. Contact with the interior surfaces was minimal as the driver was not injured. The frontal air bag did not deploy during these crash events.

The latter impact event induced a CCW rotation to the Dodge Charger as it traversed the westbound travel lanes. The vehicle rotated approximately 360 degrees CCW and impacted a barrier curb at a storm sewer. The impact force for this event was 12 o'clock. The driver

responded by initiating a forward trajectory and possibly loading the left front door panel as the vehicle rotated 90 degrees to final rest.

As the Dodge came to rest, the driver detected the fire and immediately opened the left front door and exited the vehicle. He was not injured. The fire consumed the interior of the vehicle and destroyed all possible evidence of driver contact.

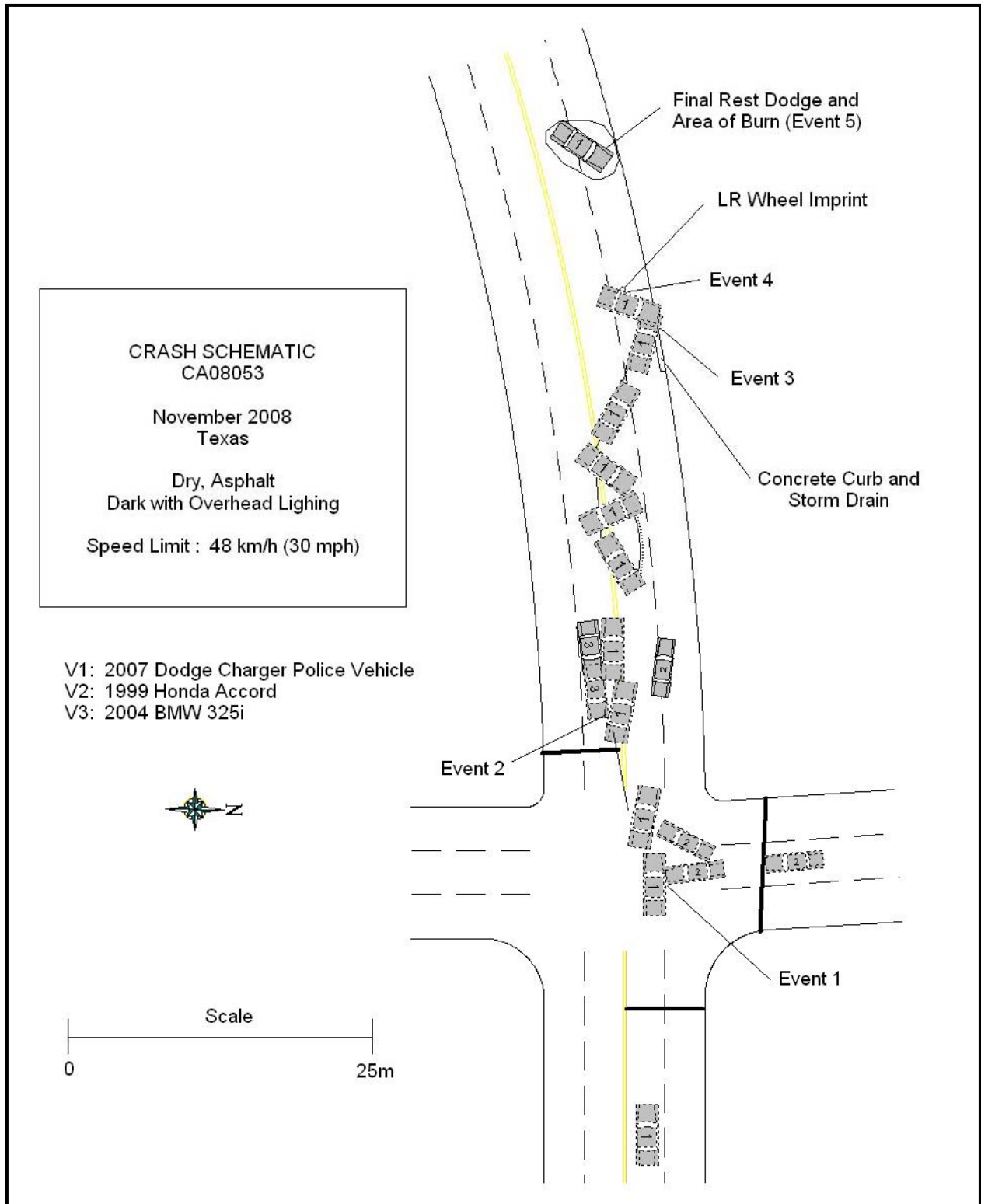


Figure 25: Crash schematic.