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**Special Crash Investigations:  
On-Site Air Bag Inflator Rupture  
Crash Investigation;  
Vehicle: 2004 Honda Civic;  
Location: Louisiana;  
Crash Date: July 2017**

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**Special Crash Investigations**  
**On-Site Air Bag Inflator Rupture Crash Investigation**  
**Office of Defects Investigation**  
**Case Number: CR17033**  
**Vehicle: 2004 Honda Civic**  
**Location: Louisiana**  
**Crash Date: July 2017**

**BACKGROUND**

This report documents the on-site investigation of the driver air bag inflator rupture in a 2004 Honda Civic that resulted in the fatality of a belted 60-year-old male driver. The Honda (**Figure 1**) was involved in an inline, front-to-rear crash with a 2015 Toyota Camry. The crash occurred when the Toyota, driven by a belted 28-year-old female, was stopped in traffic on an east/west, multi-lane roadway during the afternoon hours. The Honda's front plane then struck the Toyota's back plane. Dual-stage frontal air bags in the Honda deployed during the crash. During deployment, the Honda driver's frontal air bag inflator ruptured, projecting multiple metallic fragments rearward. These fragments struck the driver and produced severe neck injuries. Emergency medical services personnel transported him to the hospital while providing trauma and resuscitative care, but he succumbed to his injuries. He was pronounced deceased upon arrival at the hospital.



**Figure 1.** Front left oblique view of the 2004 Honda Civic at the time of the SCI vehicle inspection.

Notification of the July 2017 crash was provided to the vehicle's manufacturer by an attorney representing the deceased driver in November 2017. In turn, the manufacturer reported the crash to the National Highway Traffic Safety Administration. Crash notification was forwarded to the Special Crash Investigations team at Crash Research & Analysis, Inc., and an on-site investigation was assigned in November 2017. The SCI team established cooperation to conduct an inspection of the vehicle and the driver air bag assembly. At the request of parties, including a representative from the Honda's manufacturer, the inspection took place in December 2017. The on-site SCI investigation consisted of an inspection of the Honda to document exterior and interior damage, identify points of occupant contact, assess manual restraint systems, and inspect the supplemental restraint systems. Due to the Honda's model year, it was not equipped with an Event Data Recorder (EDR) supported by the Bosch Crash Data Retrieval (CDR) tool. No crash data for this vehicle was available. The crash site was documented, and on-scene images were obtained from the law enforcement agency.

## SUMMARY

### *Crash Site*

The crash occurred on a multi-lane, east/west roadway during the afternoon hours in July 2017. Environmental conditions documented by the police crash report indicated that the concrete roadway surface was wet due to rain.

Both vehicles were traveling westbound. Their direction of travel was on straight and level roadway consisting of two 3.5 m (11.5 ft) wide travel lanes delineated by a broken white line (**Figure 2**). A single, solid-white line bordered the right roadway edge, while a single, solid-yellow line delineated the 4.8 m (15.7 ft) wide center-turn lane that divided the eastbound and westbound portions of the roadway. Speed was regulated by a posted limit of 64 km/h (40 mph). A crash diagram is included at the end of this report.



**Figure 2.** West-facing view of the Honda's pre-crash travel trajectory.

### *Pre-Crash*

The Honda was driven by a belted 60-year-old male driver in the right travel lane. A canine accompanied the driver in the Honda; however, the location and position of the dog in the vehicle is unknown. The Toyota was also traveling west ahead of the Honda.

The Toyota's belted 28-year-old female driver observed traffic building up at an intersection ahead, and slowed the Toyota to a controlled stop in the roadway behind other stopped traffic. The Honda rapidly approached the stopped Toyota. Documentation by the investigating law enforcement agency identified approximately 38 m (125 ft) of skidding tire marks on the wet concrete roadway surface from the Honda. This indicated that the driver of the Honda suddenly recognized the stopped traffic and took evasive braking action, but he was traveling at a speed too great to decelerate completely prior to impact. It should be noted that no tire marks were visible at the time of the SCI crash site inspection due to environmental conditions, traffic, and the length of time between the date of the crash and the SCI inspection.

### *Crash*

The crash occurred as the front plane of the Honda struck the rear plane of the Toyota in an inline configuration. Directions of force were in the 12 o'clock sector for the Honda and the 6 o'clock sector for the Toyota. This displaced the Toyota from its stopped position to the west.

Due to the pre-crash emergency braking input, the front plane of the Honda was pitched downward. This caused the Honda's front plane to underride the Toyota's back plane as the vehicles engaged and were displaced to the west. Following the engagement, the vehicles separated. The Honda slid to rest in the roadway shortly after impact, while the Toyota was brought to a controlled stop by its driver a short distance to the west.

### *Post-Crash*

Local fire department, emergency medical, and law enforcement personnel were dispatched to the scene. The male driver of the Honda was observed to have a severe laceration with profuse

bleeding to his neck. He was immediately transported by ambulance to a local hospital for treatment. The 28-year-old female driver of the Toyota complained of pain and was also transported by ambulance to a local hospital for evaluation and treatment of reported “possible” (C-level) injuries.

Both vehicles were removed from the crash scene by a local recovery service and towed to a local yard. The Honda was then placed into secured storage by the attorney representing the family of its driver, where it remained for the SCI inspection. The owner of the Toyota retrieved the vehicle from the tow yard and had it repaired.

## **2004 HONDA CIVIC**

### ***Description***

The 2004 Honda Civic (**Figure 3**) was manufactured in March 2004 and was identified by the vehicle identification number (VIN) 1HGEM22174Lxxxxxx. It was a black 2-door coupe, equipped with the DX-level trim package and built on a 262 cm (103.1 in) wheelbase. The gross vehicle weight rating (GVWR) was 1,555 kg (3,430 lb), with front and rear axle ratings of 820 kg (1,810 lb) and 750 kg (1,650 lb), respectively. The vehicle’s curb weight was 1,114 kg (2,456 lb). The Honda’s powertrain consisted of a 1.7-liter, inline, 4-cylinder gasoline engine linked to a 4-speed automatic transmission with front-wheel drive.



**Figure 3.** Front right oblique view of the 2004 Honda Civic at the time of the SCI vehicle inspection.

The vehicle manufacturer’s recommended tire size was P185/70R14 front and rear, with cold tire pressures of 210 kPa (30 PSI). At the time of SCI inspection, the vehicle was equipped with four various tires of size P195/60R15. All had ample tread. The right front tire was flat, either as a result of collision damage and/or the passage of time between the date of the crash and the date of inspection. The remaining tires remained inflated and were not damaged or restricted.

The interior of the Honda Civic was configured for the seating of five occupants (2/3). The front row consisted of bucket seats with adjustable head restraints. The driver’s seat was adjusted to a track position 6 cm (2.4 in) forward of full rear, with the seat back slightly reclined. The second row consisted of a bench seat with adjustable head restraints in the outer positions. Manual safety features included 3-point lap and shoulder seat belts for all seat positions. The front seat belts were equipped with buckle and retractor pretensioners. Supplemental restraint was provided by the Honda’s dual-stage frontal air bag system.

### ***Exterior Damage***

Damage to the exterior of the Honda was distributed across the front plane, attributable to the crash event with the Toyota. In the damage pattern was moderate front plane deformation, with longitudinal displacement of the bumper beam, hood, radiator support, and underlying front plane components. Both headlight assemblies were disintegrated, and the bumper fascia was fractured and separated from the vehicle. Direct contact spanned the entire 150 cm (59.0 in)

undeformed end width (UEW). Using a direct and induced damage length of 118 cm (46.5 in) across the entire bumper beam, a residual crush profile was obtained. Due to the underride characteristics of the damage pattern, residual crush was also documented at the level of the upper radiator support on the deformed hood. The averaged resultant crush profile consisted of the following measurements: C1 = 19 cm (7.5 in), C2 = 20 cm (7.9 in), C3 = 18 cm (7.1 in), C4 = 14 cm (5.5 in), C5 = 18 cm (7.1 in), and C6 = 17 cm (6.7 in). Maximum crush on the bumper beam was observed 30 cm (11.8 in) right of the left front bumper corner. The collision deformation classification (CDC) assigned to the Honda Civic for the frontal damage pattern was 12FDEW2. **Figure 4** depicts a horizontal view of the frontal damage and crush profile, while **Figure 5** depicts the damage profile from overhead.

The damage with CDC algorithm of the WinSMASH model was used to calculate a reconstruction of the frontal impact for analysis purposes. The calculated delta V of the Honda Civic for its impact with the Honda Accord was 31 km/h (19 mph). Longitudinal and lateral components of the delta V were -31 km/h (-19 mph) and 0 km/h (0 mph), respectively. These results seemed reasonable.

#### ***Event Data Recorder***

The 2004 Honda Civic was equipped with an air bag control module (ACM) that monitored and commanded actuation/deployment of supplemental restraint systems (pretensioners and air bags). This ACM did not have EDR capabilities supported by the Bosch CDR tool. No crash data from the Honda was available.

#### ***Interior Damage***

The interior of the Honda Civic was inspected for crash-related damage and occupant contact. There was no intrusion of the occupant compartment space associative to the exterior crash force. At the time of the SCI inspection, the majority of the interior surfaces surrounding the driver's area were covered in a visible white/gray discoloration. This was bacteria/mold that had developed over the course of time since the crash. A powdery residue, one metallic object, and several polymer fragments were observed to be scattered on the floor space in front of the driver's position. The polymer fragments were from fractured trim components surrounding the steering column, while the residue had fallen out of the driver's air bag module. There was no damage to the roof/headliner associated with any fragments from the air bag inflator, and no



**Figure 4.** Front damage profile to the 2004 Honda Civic.



**Figure 5.** Overhead view of the Honda's damage profile.

fragments were found anywhere else in the vehicle's interior. **Figure 6** depicts the driver's area in the Honda at the time of inspection.

Occupant contact in the Honda's interior was identified to the left instrument panel. A heating, ventilation, and air conditioning (HVAC) louvre on the left aspect of the left instrument panel was fractured and displaced, likely from contact by the driver's left hand. There were also areas of scuffing to the lower instrument panel beneath the steering wheel/column and deformation at the left aspect of the panel, attributable to contact from the driver's knees.

### ***Manual Restraint Systems***

The Honda Civic was equipped with 3-point lap and shoulder seat belt systems for all five seating positions. The front-seat belt systems used continuous loop webbing with sliding latch plates and fixed D-rings. The driver's seat belt system retracted onto an emergency locking retractor (ELR), while the front-right occupant's seat belt used an ELR/automatic locking retractor (ALR). Both front-seat belt systems were equipped with buckle and retractor pretensioners. All three seat belt systems in the second row used continuous loop webbing with sliding latch plates and ELR/ALR retractors.

At the time of the SCI inspection, the driver's seat belt system was observed to have been cut in two locations. These cuts were the result of the actions of emergency responders to remove the driver from the Honda. A 105 cm (41.3 in) long section remained attached to the lower anchor, and contained the sliding latch plate (**Figure 7**). Minor loading evidence abrasions were observed in the belt path of the latch plate. A second section was loose, and measured 76 cm (29.9 in) in length. This section had two areas of tears to the webbing (likely from metallic fragments from the ruptured inflator) and was covered in the driver's blood. The final section measured just 9 cm (3.5 in) in length, and was protruding from the D-ring. Based on the post-crash condition of the driver's seat belt system, it was apparent that the driver was belted at the time of the crash.

### ***Supplemental Restraint Systems***

The Honda was equipped with front seat belt buckle and retractor pretensioners and dual-stage frontal air bags for both the driver and front right passenger positions. The crash resulted in the actuation of the Honda driver's front seat belt pretensioners, as well as the deployment of its dual-stage frontal air bag system.



**Figure 6.** View of the driver's area in the Honda.



**Figure 7.** Lower portion of the driver's seat belt webbing and latch plate in the Honda.

### ***Driver's Frontal Air Bag***

The driver's frontal air bag had deployed from the steering wheel-mounted module. There was no damage to the H-configuration cover flaps, though the module housing itself appeared deformed. The entire module/assembly was partially separated from the steering wheel spokes (**Figure 8**). The SCI investigator observed that the fabric of the driver's air bag was separated entirely from the module. It was revealed that the investigating law enforcement agency had cut the fabric circumferentially adjacent to the cover flaps during the investigation process as they sought to determine the source of the driver's penetrating injuries. The air bag fabric was retained as evidence and remained in possession of the law enforcement agency at the time of the SCI vehicle inspection.



**Figure 8.** Damaged steering column trim in the Honda as a result of driver air bag inflator rupture.

The SCI investigator observed the driver's air bag module with its internal components exposed (**Figure 9**). It was visually apparent that the inflator had ruptured, as only the rear half of the housing remained. A large portion of the inflator was found loose in the vehicle (**Figure 10**). This fragment had been discovered in the vehicle post-crash (exact location unknown) by a family member of the driver and secured in the vehicle by the attorney. A label on the front of this inflator fragment contained the serial nomenclature JBAN4736344.



**Figure 9.** View of the Honda's driver air bag module and exposed internals at the time of the SCI inspection.



**Figure 10.** Separated portion of the Honda's air bag inflator that remained in the vehicle.

The driver's air bag module was removed from the steering wheel hub by extracting two torx screws and disconnecting the wiring harness. This process was performed by the Honda manufacturer's representative during the joint inspection process. **Figure 11** depicts the back aspect of the module following its removal from the vehicle. Warning labels were visible on the sides of the module. There also were markings identifying the Honda manufacturer on the module's components. However, there were no labels affixed to the air bag module housing that provided serial numbers or manufacturer part numbers. Found loose in the hub of the steering wheel was the label from the backside of the inflator (**Figure 12**). The serial nomenclature on the label matched the nomenclature from the front of the separated portion of the inflator, and also identified the year of manufacture as 2002.



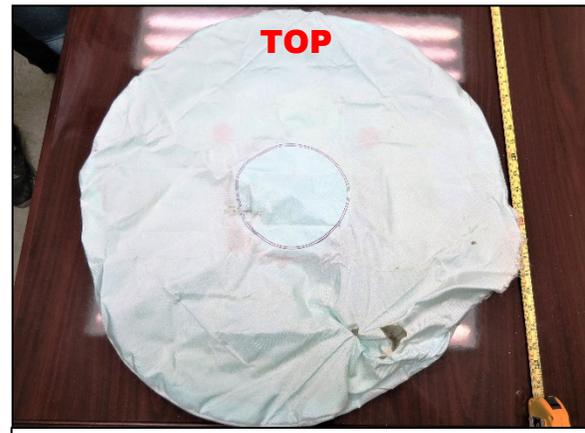
**Figure 11.** View of the driver's air bag module following its removal from the 2004 Honda Civic.



**Figure 12.** Label found in the hub of the Honda's steering wheel following removal of the air bag module.



**Figure 13.** Fragments from the Honda's air bag inflator retained by the investigating law enforcement agency.



**Figure 14.** View of the 2004 Honda Civic's driver air bag fabric.

The SCI investigator met with the law enforcement agency after completing the vehicle inspection to examine the remnants of the driver's air bag that had been retained as evidence. Among these components were two washers, the wire mesh filtering agent, and an aluminum

fragment (**Figure 13**). In its deflated state (**Figure 14**), the overall diameter of the air bag was 62 cm (24.4 in). A 16 cm (6.3 in) long burst of the fabric was identified on the right aspect of its circumference.

There was an area of melted fabric at the right lower quadrant of the air bag's face, where a hot metallic object (wire mesh) had come to rest following deployment/rupture. Last, a 7 cm (2.8 in) long jagged perforation was observed to the left aspect of the center stitch pattern (**Figure 15**). It was determined that the tear resulted from a fragment of the ruptured inflator being expelled outward and through the fabric during the deployment/rupture. Nomenclature on the back of the driver's frontal air bag module identified that it had been assembled in Mexico on September 17, 2002.

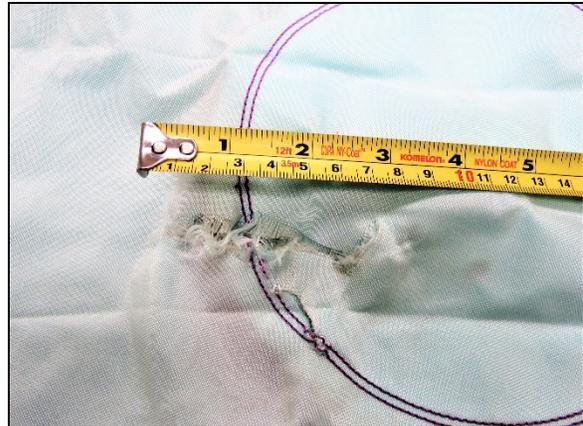
Based on a preponderance of the evidence, the SCI investigator determined that the driver's frontal air bag inflator in the 2004 Honda Civic ruptured during the deployment sequence, producing multiple fragments. These fragments were projected rearward and cut through the air bag's fabric, then continued into the occupant compartment. Several of these fragments contacted the driver's seat belt webbing and the driver, partially cutting the seat belt webbing and inducing severe lacerations to the driver's neck. The driver's injuries ultimately led to his death.

### ***Passenger's Frontal Air Bag***

The passenger's frontal air bag (**Figure 16**) deployed from the module in the top of the instrument panel through the cover flaps without damage. In its deflated state, the air bag measured 66 cm (26.0 in) wide and 73 cm (28.7 in) tall. It extruded 50 cm (19.7 in) rearward from the module. The air bag was vented on both sides by 5 cm (2.0 in) vents. There was no damage or occupant contact discernable during the SCI inspection to the front right occupant's frontal air bag.

### ***NHTSA Recalls and Investigations***

A query of the 2004 Honda Civic's VIN on [www.safercar.gov](http://www.safercar.gov) revealed that there was one open recall concerning this specific vehicle as of the date of this report. The recall was issued on October 2, 2015, and identified by the NHTSA Campaign number 15V-370. The recall concerned certain vehicles that were equipped with dual-stage driver frontal air bags that could be susceptible to moisture intrusion and other factors, including manufacturing variability that, over time, could cause the inflators to rupture during air bag deployment. In such circumstances,



**Figure 15.** Deployed passenger's air bag in the 2004 Honda Civic.



**Figure 16.** Deployed passenger's air bag in the 2004 Honda Civic.

the ruptured inflator could induce occupant injury. The recall remedy was replacement of the inflator by the vehicle's manufacturer. No remedy had been reported for this specific 2004 Honda Civic in regard to this specific driver air bag inflator, either prior to the crash or at the time of the SCI investigation.

**2004 HONDA CIVIC OCCUPANT DATA**

***Driver Demographics***

Age/sex: 60 years/male  
 Height: 182 cm (71.5 in)  
 Weight: 112 kg (248 lb)  
 Eyewear: Unknown  
 Seat type: Forward-facing bucket seat with adjustable head restraint  
 Seat track position: Between middle and rearward  
 Manual restraint usage: 3-point lap and shoulder seat belt  
 Usage source: Vehicle inspection  
 Air bags: Dual-stage frontal air bag available; deployed  
 Alcohol/drug involvement: BAC=0; positive for THC and oxycodone  
 Egress from vehicle: Removed from vehicle while unconscious  
 Transport from scene: Ambulance to a local hospital  
 Type of medical treatment: Pronounced deceased shortly after arrival at a local hospital

***Driver Injuries***

<b>Injury No.</b>	<b>Injury</b>	<b>Injury Severity AIS 2015</b>	<b>Involved Physical Component (IPC)</b>	<b>IPC Confidence Level</b>
1	Perforation of left side of laryngeal cartilage; open laryngeal fracture	340214.4	Ruptured air bag inflator fragments	Certain
2	Perforation of soft tissues of left side of upper esophagus	340108.4	Ruptured air bag inflator fragments	Certain
3	Perforation of soft tissues of left side of pharynx	340608.4	Ruptured air bag inflator fragments	Certain
4	Fracture of 1st cervical vertebra	650216.2	Ruptured air bag inflator fragments	Certain
5	Fracture of left side of hyoid bone	350200.2	Ruptured air bag inflator fragments	Certain
6	Irregular, hemorrhagic obliquely oriented deep laceration to front of neck	310602.1	Ruptured air bag inflator fragments	Certain
7	Large contusions on front of neck	310402.1	Ruptured air bag inflator fragments	Certain
8	15x14 cm area of contusion to left upper aspect of chest	410402.1	Seat belt webbing	Possible

<b>Injury No.</b>	<b>Injury</b>	<b>Injury Severity AIS 2015</b>	<b>Involved Physical Component (IPC)</b>	<b>IPC Confidence Level</b>
9	1 cm scattered small contusions to left biceps, inferiorly and medially	710402.1	Ruptured air bag inflator fragments	Possible
10	3x1 cm contusion to anterior left shoulder	710402.1	Seat belt webbing	Probable
11	2x1 cm contusion to right knee medially and 3x1 cm contusion laterally	810402.1	Left lower instrument panel	Certain
12	1 cm contusion to left knee inferiorly and medially	810402.1	Left lower instrument panel	Certain

*Source: medical examiner report (internal).*

### ***Driver Kinematics***

The 60-year-old male was positioned in the driver’s seat of the 2004 Honda Civic. He had adjusted the seat’s track to a position 6 cm (2.4 in) forward of full rear, with the seat back slightly reclined and the adjustable head restraint fully downward. The driver used the available 3-point lap and shoulder seat belt system for manual restraint, as determined through an inspection of the post-crash condition of the seat belt system.

At impact with the Toyota, the driver initiated a forward trajectory. His use of the manual restraint system restricted his forward movement and prevented his overall displacement throughout the vehicle’s interior during the crash sequence.

The driver’s frontal air bag was commanded to deploy due to the detected severity of the crash by the vehicle’s seat systems. However, the inflator of the driver’s frontal air bag module ruptured, which caused metallic fragments of the inflator to be projected rearward toward the driver with explosive force as the air bag expanded. This caused several fragments to penetrate out of the air bag’s fabric and into the vehicle’s interior. Multiple fragments contacted the driver’s head, face, neck, and upper torso, producing multiple traumatic injuries.

The driver came to rest still belted and in the driver’s seat position of the Honda. Several of his neck injuries were of such severity that profuse bleeding was instigated. This resulted in significant blood loss, which caused the driver to enter hypovolemic shock (a medical condition caused by extensive blood loss) and become unconscious. Arriving emergency response personnel removed the driver from the vehicle and immediately transported him to a local hospital while providing traumatic and resuscitative care. The driver ultimately succumbed to his injuries and was pronounced deceased shortly after his arrival at the local hospital.

## **2015 TOYOTA CAMRY**

### ***Description***

The 2015 Toyota Camry was a 4-door sedan identified by the VIN 4T1BF1FK8FUxxxxxx. The Toyota (**Figure 17**) was a front-wheel-drive platform powered by a 2.5-liter, inline, 4-cylinder gasoline engine with automatic transmission. The interior of the Toyota was configured for the seating of up to five occupants. It was equipped with 3-point lap and shoulder seat belt systems

for all seat positions, as well as multiple supplemental restraint systems. Due to the passage of time between the date of the crash and the time of case notification, the Toyota had been repaired. It was not available for SCI inspection.



**Figure 17.** Front plane view of the 2015 Toyota Camry (on-scene image provided by the investigating law enforcement agency).



**Figure 18.** Back plane damage to the Toyota (on-scene image provided by the investigating law enforcement agency).

### ***Exterior Damage***

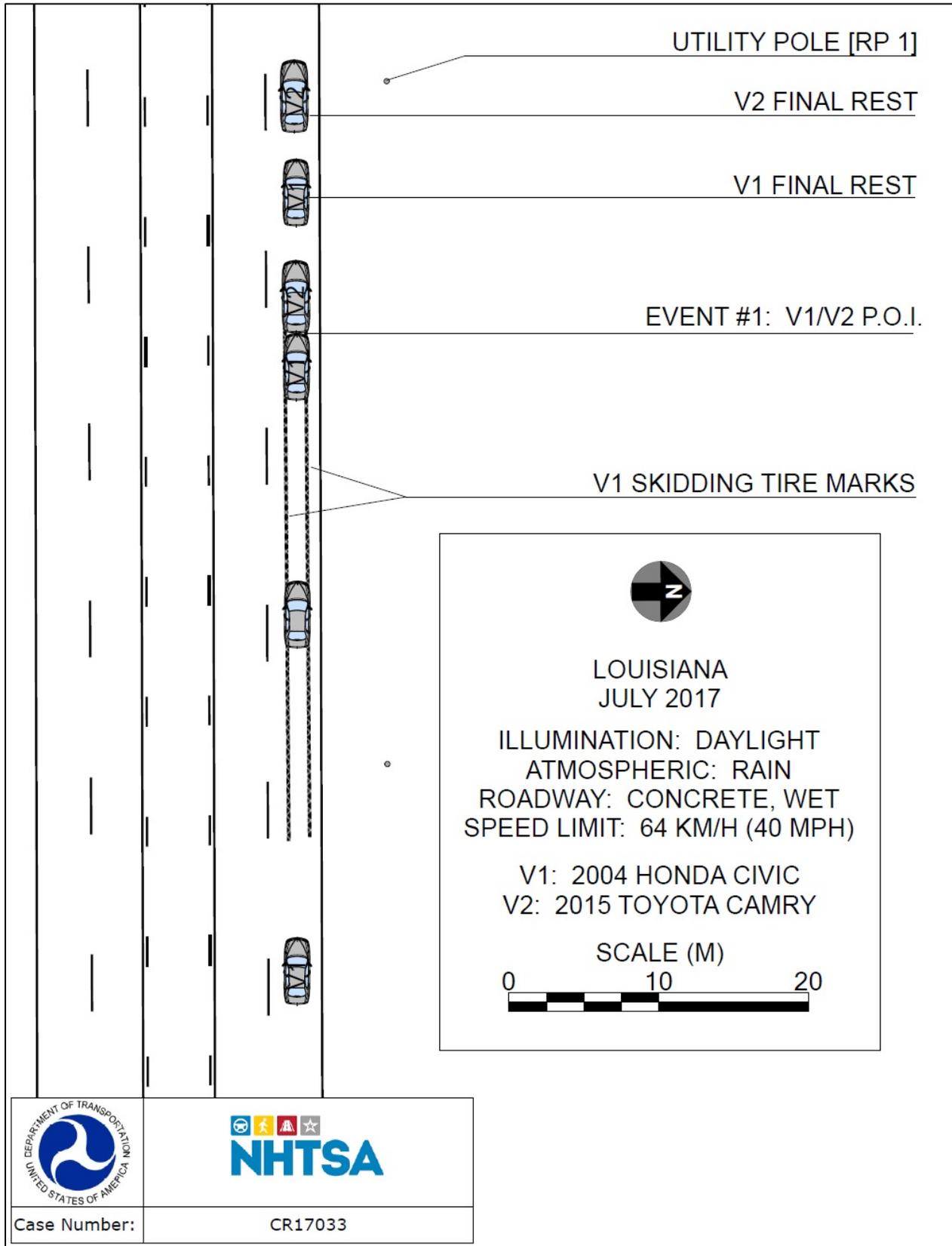
The following damage assessment was based on a review of on-scene images of the Toyota provided to the SCI investigator by the investigating law enforcement agency (**Figure 18**). The damage to the Toyota from the crash consisted of minor deformation to the rear bumper fascia.

The lower trim of the bumper fascia was fractured and separated from the vehicle. With the bumper fascia in place, there was no visible structural damage to the Toyota. The estimated CDC for the Toyota's damage profile was 06BDLW1. The damage CDC algorithm of the WinSMASH model was used to calculate the severity of the crash for the Toyota. The total delta V was 24 km/h (15 mph), with respective longitudinal and lateral components of 24 km/h (15 mph) and 0 km/h (0 mph). These results seemed reasonable.

### ***Occupant Data***

The 2015 Toyota Camry was driven by the 28-year-old female. According to law enforcement documentation, she was belted at the time of the crash. The Toyota's driver complained of pain and was transported by ambulance to a local hospital for evaluation and treatment of reported "possible" (C-level) injuries.

# CRASH DIAGRAM



DOT HS 812 994  
August 2020



U.S. Department  
of Transportation  
**National Highway  
Traffic Safety  
Administration**

