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Special Crash Investigations: Alleged Air Bag Inflator Rupture Investigation; Vehicle: 2002 Chrysler PT Cruiser; Location: California; Crash Date: January 2019

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Each crash represents a unique sequence of events, and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicles or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team on the date this report was published.

16. Abstract

This report documents the on-site investigation of an alleged air bag inflator rupture in a 2002 Chrysler PT Cruiser involved in a crash in which the belted 54-year-old driver sustained fatal injuries. The Chrysler was being driven westbound, pulling a 1999 utility trailer of an unknown size and weight. The other vehicle was a 2009 Honda CR-V being driven by a 49-year-old male. The Chrysler had successfully passed a slower-moving unidentified westbound vehicle and returned to the westbound lane when, for unknown reasons, the Chrysler departed the roadway on the right edge, returned to the roadway, crossed over the center line, and then entered the eastbound lane. The front plane of the Honda struck the left plane of the Chrysler. The Chrysler came to rest on the roadway west of the point of impact (POI), and the Honda came to rest on the south shoulder east of the POI. The driver of the Chrysler was declared deceased on-scene by emergency responders prior to being removed from the vehicle. The occupants of the Honda were transported by ambulance to a local hospital and treated for suspected minor injuries. Examination of the Chrysler driver's deployed frontal air bag revealed no evidence of damage caused by the inflator or external sources such as driver loading or crash events. The air bag inflator, manufactured by ARC Automotive, Inc., in Knoxville, Tennessee, was intact and revealed no evidence of rupture.

17. Key Words	18. Distribution Statement
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Office of Defects Investigation
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Location: California
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BACKGROUND

This report documents the on-site investigation of an alleged air bag inflator rupture in a 2002 Chrysler PT Cruiser (**Figure 1**) involved in a crash in which the driver sustained fatal injuries. The case was initiated by the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration following a notification received by the Office of Defects Investigations (ODI). The notification suggested that damage to the driver's deployed frontal air bag and seat belt was related to the fatal injuries sustained by the driver. The case was assigned to Dynamic Science, Inc., and field inspections were completed in April 2019. The SCI team obtained the county medical examiner/coroner report to obtain injury data and cause of death. The Chrysler was configured with an occupant restraint control (ORC) that was not supported by the Bosch Crash Data Retrieval (CDR) tool and therefore not imaged during the inspection.

Figure 1. The 2002 Chrysler PT Cruiser.

The crash occurred during the early evening hours in January 2019 in California. Conditions were dark without illumination, clear, and dry. The crash site was an undivided east/west two-lane State highway. The Chrysler was driven westbound by a belted 54-year-old male and was pulling a 1999 single-axle utility trailer of an unknown length and weight. The trailer was made by San Diego Custom Trailer & Liquid Tank Manufacturing, Encinitas, California. The other vehicle was a 2009 Honda CR-V, driven eastbound by a 49-year-old male. The Chrysler had successfully passed a slower-moving unidentified westbound vehicle and returned to the westbound lane when, for unknown reasons, the Chrysler departed the roadway on the right edge, returned to the roadway, crossed over the center line, and then entered the eastbound lane. The front plane of the Honda struck the left plane of the Chrysler. The Chrysler came to rest on the roadway west of the point-of-impact (POI), and the Honda came to rest on the south shoulder east of the POI. The driver of the Chrysler was declared deceased on-scene by emergency responders prior to being removed from the vehicle. The occupants of the Honda were transported by ambulance to a local hospital and treated for minor injuries. Examination of the driver's deployed frontal air bag revealed no evidence of damage caused by the inflator or external causes such as driver loading or crash events. The air bag appeared to have deployed normally and was unremarkable.

SUMMARY

Crash Site

The crash site was a two-lane east/west State highway (**Figure 2**). The lanes were separated by double yellow painted stripes in fair condition with a centerline transverse rumble strip. The lanes measured 3.7 m (12.0 ft) in width. The roadway was bordered by solid white painted fog lines in fair condition. An additional 0.4 m (1.3 ft) width of pavement bordered the fog lines. The drop-off from pavement to shoulder measured approximately 15 cm (6.0 in). The roadway was bordered by gravel shoulders measuring 2 m (6.6 ft) in with on the north edge and 4 m (13.1 ft) in width on the south edge. The roadway was straight and level. The paved asphalt surface was in fair condition. Conditions at the time of the crash were dark without illumination, clear, and dry. The posted speed limit was 89 km/h (55 mph). A crash diagram is included at the end of this report.

Figure 2. Crash site, westbound approach for the 2002 Chrysler PT Cruiser.

Pre-Crash

The Chrysler was pulling a 1999 single-axle utility trailer of an unknown length and weight. According to the driver's spouse, neither the vehicle nor trailer were carrying cargo. The Chrysler was traveling westbound at an unknown speed when, against a solid double yellow line, the driver successfully passed a slower moving unidentified westbound vehicle and returned to the westbound lane. It then departed the roadway on the right edge traveling an unknown distance on the shoulder before reentering the roadway on the right edge, overcorrecting and crossing over the westbound lane and center line, and entering the eastbound lane. The damage pattern and observed direction of force suggested the vehicle was in a left-side-leading clockwise yaw prior to impact. Either the Chrysler or the trailer deposited linear tire marks on either side of the centerline measuring 19.3 m (63.3 ft) and 18.0 m (59.0 ft), respectively. The Honda was traveling eastbound at a police-reported speed of approximately 89 km/h (55 mph).[1] Scene evidence including gouges and tire marks at the POI suggested it stayed in its original travel lane. The driver stated to police he observed the Chrysler just prior to impact and steered right.

Crash

The front plane of the Honda struck the left plane of the Chrysler in the eastbound lane (Event 1). The POI was identified by a group of gouge marks located 2 m (6.6 ft) south of the center line. Following the impact, the Chrysler initiated a post-impact counterclockwise rotation and its left front wheel likely contacted the left plane of the Honda in a secondary side-slap configuration (Event 2). The Chrysler traveled in a westbound trajectory, depositing gouge marks in the eastbound and westbound lanes before coming to rest facing west near the centerline at a distance of 15 m (49 ft) west of the POI. The Honda initiated a post-impact counterclockwise rotation and traveled 11 m (36 ft) in an eastbound trajectory before coming to rest facing north on

[1] The medical examiner's report stated the Honda's speedometer was fixed at 84 km/h (52 mph) after the crash, which was slightly lower than the police estimated speed.

the south shoulder. The areas of rest were documented by police markings and evidenced by vehicle fluid spills. During the crash, the Chrysler's rear bumper, trailer hitch, and trailer were displaced from the vehicle and came to rest on the roadside south of the eastbound lane.

The barrier algorithm of WinSMASH was used due to the "towed trailing unit" status of the Chrysler. For the Chrysler in Event 1, WinSMASH calculated a total delta V of 28 km/h (17 mph), a longitudinal delta V of -14 km/h (-9 mph), a lateral delta V of 24 km/h (15 mph) and a barrier equivalent speed (BES) of 28 km/h (17 mph). The results were considered reasonable but borderline. The barrier algorithm did not calculate values for the Honda. The estimated damage severity for the Honda was moderate.

For Event 2, no reconstruction was possible. Damage to the Chrysler was located at the left front wheel and tire, and crush measurements were not obtained. Damage to the Honda was documented using police photographs and crush measurements were not obtained. The estimated damage severity for both vehicles was minor.

Post-Crash

The driver of the Chrysler was declared deceased on-scene by emergency responders prior to being removed from the vehicle. The occupants of the Honda were transported by ambulance to a local hospital and treated for minor injuries.

2002 CHRYSLER PT CRUISER

Description

The 2002 Chrysler PT Cruiser was a 5-door, 5-passenger hatchback station wagon identified by the Vehicle Identification Number (VIN) 3C4FY58B22Txxxxxx. It was configured with a 4-cylinder, 2.4 liter, gasoline engine, front-wheel drive, hydraulic brakes, automatic transmission, and tilt steering column functionality.

The vehicle was configured with seating for five in two rows. The front row had a pair of bucket seats with adjustable head restraints. The driver's head restraint was set 2 cm (0.8 in) above the seat back. The seat track position was between the middle and rear most setting and the seat back was set to a slight recline. The second row of seats had been removed from the vehicle prior to the inspection. The Chrysler was equipped with an aftermarket trailer hitch of an unknown make that had been installed by the driver at an unknown time. The hitch was displaced during the crash. The vehicle was pulling a 1999 single-axle utility trailer of an unknown length and weight identified in the police report with the VIN 4A6UC1011X1xxxxxx.

Figure 3. The 2002 Chrysler PT Cruiser.

Exterior Damage

The Chrysler sustained moderate severity crush damage to the left plane caused by the vehicle-to-vehicle impact (**Figure 3**). Direct damage began at the left rear bumper corner and extended forward

167 cm (65.7 in) spanning the back and passenger sectors and ending at the left B-pillar. The Field L began at the left rear bumper corner and extended forward 170 cm (66.9 in). The vertical aspect of direct damage extended upward from sill to the roof. Twenty measurements were taken using the Nikon total station and the Faro Blitz program calculated six crush measurements as follows: C_1 = 37 cm (14.6 in), C_2 = 31 cm (12.2 in), C_3 = 35 cm (13.8 in), C_4 = 23 cm (9.1 in), C_5 = 11 cm (4.3 in), and C_6 = 6 cm (2.4 in). Maximum crush located at the left rear bumper corner measured 37 cm (14.6 in) and the Collision Deformation Classification (CDC) for the Chrysler in Event 1 was 10LZAW3. Post- crash damage was present where responders forced open the driver's door.

The Chrysler's left front wheel was fractured and bent during a secondary event where it likely struck the left plane of the Honda in a side-slap configuration. Crush measurements were not obtained. The CDC for the event was 99LFWN3, and the estimated damage severity was minor.

The trailer was displaced from the Chrysler during the crash. Police photos taken on-scene indicated that wood flooring was displaced from the trailer and the metal framework appeared to be bent (**Figure 4**).

Figure 4. The 1999 utility trailer (on-scene police photo).

Air Bag Inflator Discussion

The notification suggested the driver's frontal air bag was related to an air bag recall and that damage to the air bag and seat belt were related to the fatal injuries sustained by the driver. It alleged the deployed driver's frontal air bag fabric was frayed and full of gunshot residue. It alleged that the driver's seat belt webbing was burned and charred. Inspection of the air bag and seat belt by SCI revealed the allegations to be unfounded. The coroner's report stated cause of death was "multiple blunt force injuries." References to the driver's safety systems included in the coroner's reported stated that upon his arrival the driver's frontal air bag was deployed and the seat belt appeared stretched and loosened, with the latch plate unbuckled. There was no mention of damage to either the air bag, the inflator, or the seat belt.

Figure 5. ARC Automotive, Inc., front air bag inflator, the 2002 Chrysler PT Cruiser.

The investigation determined the inflator was manufactured by ARC Automotive, Inc., in Knoxville, Tennessee. The inflator was unremarkable and revealed no evidence of rupture or other damage (**Figure 5**). The air bag fabric was fully intact and revealed no evidence of fraying

or containment of foreign matter as was alleged in the notification (**Figure 6**). Labeling on the air bag indicated the year of manufacture was 2002. The passenger's deployed frontal air bag inflator was similarly unremarkable, and the air bag was undamaged. According to a vehicle recall search last queried in August 2020, the Chrysler's air bags were not subject to any open or past recalls. The vehicle had one prior owner from 2002 to 2014. A vehicle history report stated the Chrysler was involved in a non-deployment sideswipe configuration crash with another vehicle in 2005. A second crash of an unknown nature resulting in damage to the right front sector of the vehicle was reported in 2008. A third report of damage involving the back plane was reported in 2012.

Figure 6. Driver's deployed front air bag, the 2002 Chrysler PT Cruiser.

In an interview with the driver's spouse, she stated she was not aware of any prior crashes or air bag deployments; or of service, maintenance, or replacement of either frontal air bag. She believed the frontal air bags were original equipment. The year of manufacture for the vehicle and air bag module corresponded, suggesting the air bag was likely original to the vehicle. The air bag module including the inflator assembly was removed from the vehicle during the SCI vehicle inspection and sent to NHTSA.

The driver's seat belt revealed evidence of driver loading commonly found in crashes of similar severity but no evidence of burn damage from air bag deployment was present as was alleged in the notification.

Interior Damage

The Chrysler's interior sustained damage caused by impact forces and deployed air bags. The windshield was fractured and in place, the left side doors were jammed shut prior to being sprung, and the driver's and front right occupant's front air bags were deployed. The vehicle's second row left position was reduced by lateral intrusion of the side panel aft of the B-pillar (28 cm [11.0 in]), C-pillar (20 cm [7.9 in]), sill (17 cm [6.7 in]) and roof side rail (15 cm [5.9 in]). The second row seats had been removed from the vehicle prior to the crash.

Manual Restraint Systems

The vehicle was equipped with a three-point continuous lap and shoulder seat belt for the driver. The adjustable D-ring was set in the full-down position and the pretensioner had actuated at impact locking the belt in the used position. The belt was configured with a sliding latch plate that revealed evidence of historical usage and driver loading at impact with the other vehicle. The webbing exhibited loading evidence beginning 39 cm (15.4 in) above the lower anchor bolt. The retractor pretensioner actuated at impact locking the belt in the used position.

Supplemental Restraint Systems

The vehicle was equipped with driver's and passenger's frontal air bags. The driver's air bag deployed from the steering wheel hub at impact with the other vehicle. In its deflated state the air

bag measured 52 cm (20.5 in) in diameter. It was configured with two vent ports in the back panel measuring 3 cm (1.2 in) in diameter. The air bag appeared to have deployed normally and revealed no evidence of damage or occupant loading. The circular cover flap opened at the tear points and measured 11 cm (4.3 in) in diameter. The cover flap was configured with a clear layer of plastic on the inner side which was likely fractured during deployment. The fractured layer remained adhered to the outer layer. No other damage was noted.

The front right occupant's air bag deployed from a module in the top instrument panel. In its deflated state the air bag measured 67 x 40 cm (23.4 x 15.7 in). It was configured with two vent ports on the back panel each measuring 7 cm (2.8 in) in diameter. The air bag appeared to have deployed normally and revealed no evidence of damage or occupant loading. The rectangular cover flap opened at the tear points and measured 48 x 13 cm (18.9 x 5.1 in).

NHTSA Recalls and Investigations

A recall search last queried in July 2020 using the vehicle's VIN revealed this vehicle was subject to two incomplete recalls as follows: NHTSA Recall No. 02V-215, Manufacturer Recall No. B23, Recall Date August 7, 2002, involved a fuel pump issue that could result in a fire. NHTSA Recall No. 04V-268, Manufacturer Recall No. D18, Recall Date June 2, 2004, involved a power steering pressure hose issue that could result in a fire.

2002 CHRYSLER PT CRUISER OCCUPANT

Driver Demographics

Age/sex:	54 years/male
Height:	180 cm (70 in)
Weight:	118 kg (260 lb)
Eyewear:	None
Seat type:	Bucket with adjustable head restraint
Seat track position:	Between middle and rear most
Manual restraint usage:	Lap and shoulder belt used
Usage source:	Vehicle inspection
Air bags:	Frontal air bag deployed
Alcohol/drug data:	Negative for alcohol; positive for amphetamine (0.07 ug/mL) and methamphetamine (1.6 ug/mL)
Egress from vehicle:	Deceased before being removed from vehicle
Transport from scene:	None
Type of medical treatment:	None

Driver Injuries

The driver had a history of diabetes mellitus. It was unknown whether that condition played a role in the crash or his death.

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Fracture NFS, open, left pelvic ring with bone exposed	856101.3	Left door panel, unknown quadrant	Probable
2	Abrasion, lower left neck	210202.1	Seat belt webbing	Certain
3	Abrasion, chest	410202.1	Seat belt webbing	Certain
4	Abrasions, lower abdomen	510202.1	Seat belt webbing	Certain
5	Abrasions, left shoulder	710202.1	Seat belt webbing	Certain
6	Abrasion, left elbow	710202.1	Left door panel, unknown quadrant	Possible
7 8	Abrasions, bilateral hands	710202.1 710202.1	Left IP	Possible
9	Contusions, left lower leg	810402.1	Lower left IP	Probable

Source: medical examiner report.

Driver Kinematics

The belted male driver was seated in an upright posture and prior to impact the vehicle was in a clockwise yaw with its left side leading. At impact with the other vehicle, the driver was displaced primarily left and slightly forward in response to the 10 o'clock direction of force. His frontal air bag deployed and his seat belt pretensioner actuated. He likely loaded the deployed air bag with his face, head, and chest. He loaded the shoulder and lap portions of the seat belt, causing abrasions to the left shoulder and lower abdomen and depositing scuff marks on the webbing. The driver possibly contacted the forward upper quadrant of the left door panel with his left flank, depositing fabric transfers to the trim. His left lower leg contacted the lower instrument panel, causing multiple contusions below the knee. His left hip contacted the left door panel, causing an unspecified open fracture to the left pelvic ring. The Chrysler was displaced in a counterclockwise rotation and came to rest facing west in the eastbound lane. He was declared deceased on-scene prior to being removed from the vehicle. A coroner investigation was performed and the medical examiner determined the cause of death was multiple blunt force injuries.

2009 HONDA CR-V

Description

The 2009 Honda CR-V was identified by the VIN JHLRE48559Cxxxxxx. It was a 5-door sport utility vehicle configured with a 4-cylinder, 2.4-liter, gasoline engine; 4-wheel drive; hydraulic brakes; and seating for five occupants.

Vehicle Damage

The Honda (**Figure 7**) sustained moderate to major severity damage distributed across the front plane. Police photos indicated the vehicle sustained direct damage to the front plane, distributed from bumper corner to bumper corner. The estimated CDC for the Honda in Event 1 was 12FDEW2. The estimated damage severity for Event 2 was minor. The estimated CDC for the Honda in Event 2 was 99L99999.

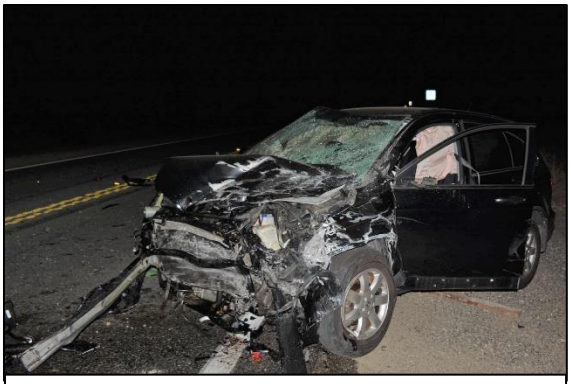
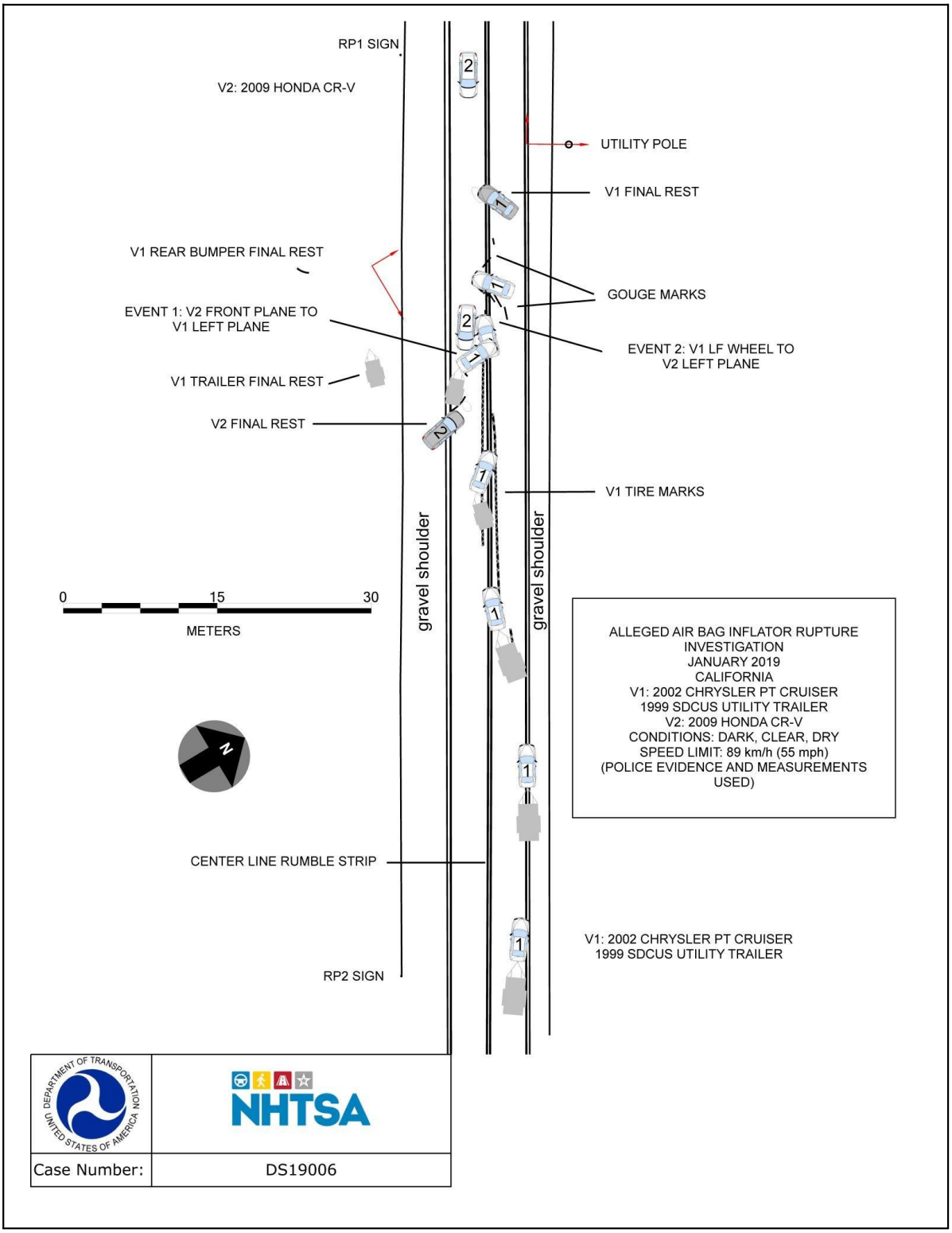


Figure 7. The 2009 Honda CR-V (police photo).

Occupant Data

The driver of the Honda was a belted 49-year-old male and the front right occupant was a belted 39-year-old female. They sustained police-reported minor injuries and were transported to a local hospital for treatment.

CRASH DIAGRAM



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