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Special Crash Investigations: Remote Crash Avoidance Technology Investigation; Vehicle: 2019 Honda Accord; Location: California; Crash Date: September 2019

DISCLAIMER

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15. Supplementary Notes

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 remote investigation of a 2019 Honda Accord Hybrid equipped with crash avoidance technologies, including lane departure warning with lane keeping assist, forward collision warning, and a collision mitigating braking system with crash imminent braking. The Honda was involved in a single-vehicle pedestrian crash that occurred shortly after sunrise in September 2019 in a residential neighborhood, and visibility was a factor. The Honda was driven by a belted 39-year-old male. The pedestrian was an 84-year-old male who was crossing the street in mid-block and not in a crosswalk. As the pedestrian entered the eastbound travel lane, he was struck by the Honda and displaced east approximately 24 m (80 ft) on the roadway and was declared deceased at the scene. The driver was not injured. The Honda was towed from the scene and placed in police evidence. There were no indications that any crash avoidance technology activated in this crash.

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Special Crash Investigations
Remote Crash Avoidance Technology Investigation
Case Number: DS20003
Vehicle: 2019 Honda Accord
Location: California
Crash Date: September 2019

Background

This report documents the remote investigation of a 2019 Honda Accord Hybrid (Figure 1) equipped with crash avoidance technology, including lane departure warning with lane keeping assist, forward collision warning, and a collision mitigating braking system with crash imminent braking. The Honda was involved in a single-vehicle pedestrian crash. The investigation was intended to determine what role, if any, the crash avoidance technology played in the crash. This investigation was initiated by the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration in response to a notification from the Crash Report Sampling System. SCI assigned the case to Dynamic Science, Inc., in February 2020, with instructions to obtain additional information about the crash. The on-scene photos and an in-vehicle video were obtained. According to an insurance representative, the vehicle was repaired. The Honda was supported by the Bosch Crash Data Retrieval (CDR) system. The police investigator was contacted, and it was determined that the vehicle's event data recorder (EDR) was not imaged during their inspection. Efforts to contact the driver to image the EDR were not successful.

Figure 1. The 2019 Honda Accord (police image)

This single-vehicle crash occurred shortly after sunrise in September 2019 in a residential neighborhood, and visibility was a factor. The crash site was in the eastbound lane of a two-lane undivided roadway. The Honda was driven by a belted 39-year-old male. The pedestrian was an 84-year-old male who was crossing the street from north to south in mid-block and not in a crosswalk. As the pedestrian entered the eastbound travel lane, he was struck by the Honda and displaced east approximately 24 m (80 ft) on the roadway and was declared deceased at the scene. The driver was not injured. The Honda was towed from the scene and placed in police

evidence. Based on the video, there were no indications that any crash avoidance technology activated in this crash.

Summary

Crash Site

The crash site was in the eastbound lane of a two-lane undivided roadway. The asphalt roadway was straight, dry, and had parking on both sides. The eastbound lane was separated from the westbound lane by a painted dashed yellow line. The travel lane width was 6.0 m (20 ft). The posted speed limit was 48 km/h (30 mph). At the time of the crash, the sun's azimuth was 97 degrees, and its elevation above the horizon was 16 degrees. The weather at the nearest reporting station was 19 °C (67 °F), 79 percent humidity, fair conditions, and calm winds. The pedestrian's path of travel appears to have been one of the two driveways separated by a short wall. The driveways led to several condominiums. A crash diagram is included at the end of this report.

Pre-Crash

The driver was traveling from his residence to his parents' place of work. The windshield wipers were on for an unknown reason. The driver reported that the visor was down and that the sun was in his eyes (Figure 2). He was not wearing sunglasses. The driver had several medical conditions that limited his mobility. He drives using only his right hand. The vehicle was equipped with an after-market car camera system (Atom Gold Model EQ5000) that was in operation at the time of the crash. The camera was later removed by police investigators and secured as evidence. A copy of the video was obtained by SCI. The Honda was traveling eastbound and had stopped at an intersection approximately 54 m (178 ft) west of the area of impact. The driver accelerated from the stop eastbound (Figure 3) for approximately six seconds to an SCI-calculated speed of 49 km/h – 56 km/h (31mph – 35 mph[1]).

Figure 2. Driver's view prior to crash, extracted from onboard video

The pedestrian was walking southbound (Figure 4) and using a cane. He traveled approximately 6.4 m (21 ft) into the roadway prior to impact. It is unknown if he walked at a constant speed as he crossed the roadway or if he stopped at the roadway and then began crossing. In the first instance, using a 50th percentile walking velocity for people 60 years and older of 4.1 fps, he would have been in the roadway for 5.1 seconds. In the second instance, starting from a stop with a normal walking acceleration rate of 1.6 f/s/s, he would have reached walking speed in 2.6 seconds and would have been in the roadway for 6.4 seconds.

[1] Calculated using Searle Min/Max pedestrian formula with a throw distance of 24 m (80.3 ft) and a drag factor of 0.50.

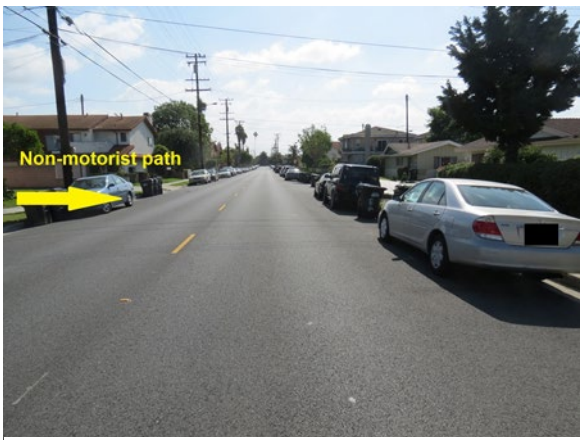


Figure 3. The 2019 Honda Accord approach to area of impact, looking east

Figure 4. Pedestrian's path, looking south

Crash

As the pedestrian crossed the westbound lane and entered the eastbound lane, he was struck by the front of the Honda (Figure 5). According to the police report, he was thrown 24.4 m (80.3 ft) to the east to the westbound travel lane (Figure 6). The driver of the Honda stopped, put the vehicle in reverse, and then backed up a certain distance before parallel parking the vehicle.

Figure 5. Driver view post-impact, extracted from onboard video

Figure 6. Pedestrian's path to final position, looking east (police image)

Post-Crash

The pedestrian was declared deceased at the scene on the roadway. According to the autopsy report, the cause of death was due to blunt force injuries. The manner of death was an accident. The Honda driver was not injured. The Honda was towed from the scene and placed in police evidence.

2019 Honda Accord

Description

The 2019 Honda Accord Hybrid EX-L was a 4-door, 5-passenger sedan identified by the Vehicle Identification Number (VIN) 1HGCV3F50KAxxxxxx. The vehicle was equipped with a 2.0-liter, 4-cylinder gasoline engine coupled to an automatic transmission, front-wheel drive, and ABS. It had Michelin Energy P225/50R17 tires in fair condition, according to the police report.

Exterior Damage

The Honda sustained moderate damage from the impact with the pedestrian (Figures 7–8). The left side of the hood had an indentation and a blue scuff mark. The aft side of the driver side hood was slightly deformed. The driver side windshield was fractured and pushed inward with blood and hair on the windshield. The collision deformation classification (CDC) was 12FLHW6. There was minor damage to the right side of the vehicle that was related to a previous collision, according to the driver.

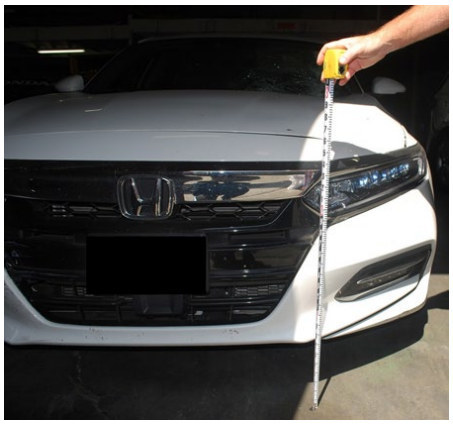


Figure 7. Frontal damage, the 2019 Honda Accord (police image)

Figure 8. Windshield damage, the 2019 Honda Accord (police image)

Event Data Recorder

The Honda was supported by the Bosch CDR system. The police investigator was contacted, and it was determined that the vehicle's EDR was not imaged during the inspection.

NHTSA Recalls and Investigations

A search of recalls last queried in November 2021 using the vehicle's VIN revealed two unrepaired recalls, one related to a fuel pump issue (21V-215) and one related to communication between the body control module and other components (20V-771).

Interior Damage

There were no reports of any interior damage, other than the fractured windshield caused by the pedestrian impact.

Manual Restraint Systems

The front row had driver and front right passenger lap and shoulder seat belts. The driver's belt had continuous loop belt webbing, a sliding latch plate, an emergency locking retractor (ELR), and an adjustable upper anchor. According to the police report, the driver was belted.

Supplemental Restraints System

The Honda had driver and passenger frontal air bags, front left and front right knee air bags, seat-back-mounted side impact air bags, and front and second row inflatable curtain (IC) side air bags. According to the police report and police photos, there were no air bag deployments.

Crash Avoidance Technology

The Honda had several crash avoidance technology packages as part of its Honda Sensing system. Honda Sensing is a driver support system that employs two kinds of sensors, a radar sensor located in the lower bumper and a front sensor camera mounted to the interior side of the windshield, behind the rearview mirror. The collision mitigation braking system (CMBS) package is discussed below.

According to the owner's manual, CBMS can assist when there is a possibility of striking a vehicle or pedestrian in front. It is designed to alert the driver when a potential collision is determined, as well as to reduce vehicle speed to help minimize collision severity when a collision is deemed unavoidable. The system initially provides visual and audible alerts[2] of a possible collision and light to heavy brake application as the potential for collision increases. The system is turned on every time the vehicle is started, even if it had been turned off since the last time the vehicle was driven. CBMS activates when the camera detects a pedestrian in front. This pedestrian detection feature may not activate or may not detect a pedestrian in front of the vehicle under certain conditions, including the following:

Environmental conditions

- Driving in bad weather (rain, fog, snow, etc.)
- Sudden changes between light and dark, such as an entrance or exit of a tunnel
- There is little contrast between objects and the background
- Driving into low sunlight (e.g., at dawn or dusk)
- Strong light is reflected onto the roadway
- Driving in the shadows of trees, buildings, etc.
- Roadway objects or structures are misinterpreted as vehicles and pedestrians
- Reflections on the interior of the windshield

Roadway conditions

- Driving on a snowy or wet roadway (obscured lane marking, vehicle tracks, reflected lights, road spray, high contrast)
- Driving on curvy, winding, or undulating roads
- The road is hilly, or the vehicle is approaching the crest of a hill

[2] Automatic pedestrian alerting system sound (for hybrid and EV only).

There are some limitations specific to pedestrian detection, including the following:

- When there is a group of people in front of the vehicle walking together side by side
- Surrounding conditions or belongings of the pedestrian alter the pedestrian's shape, preventing the system from recognizing that the person is a pedestrian
- When the pedestrian is shorter than about 1 m (3.3 ft) or taller than about 2 m (6.6 ft)
- When a pedestrian blends in with the background
- When a pedestrian is bent over or squatting, when their hands are raised, or they are running
- When the camera cannot correctly identify that a pedestrian is present due to an unusual shape (holding luggage, body position, size)

It is unknown if any alerts sounded. None could be heard in the onboard video of the incident.

The environmental conditions at the time of the crash, particularly driving into low sunlight, probably caused the PAEB system not to identify the pedestrian early enough to apply the brakes.

2019 Honda Accord Occupant

Driver Demographics

Age/sex:	39 years/male
Height:	173 cm (68 in)
Weight:	86 kg (189 lbs)
Eyewear:	None
Seat type:	Bucket
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder seat belt used
Usage source:	Police report
Air bags:	Driver frontal, knee seat-mounted side impact, and IC air bags available. None deployed.
Alcohol/drug data:	No apparent influence, per police report
Egress from vehicle:	Exited through left door under own power
Transport from scene:	None
Type of medical treatment:	None

Driver Injuries

There were no driver injuries.

Driver Kinematics

The 39-year-old male driver was seated upright and, per the police report, was using the available lap and shoulder belt. There were no substantive movement during the impact to the pedestrian and no injuries.

Pedestrian/Non-Motorist

Pedestrian/Non-Motorist Demographics

Age/sex:	84 years/male
Height:	165 cm (65 in)
Weight:	77 kg (170 lbs)
Eyewear:	Unknown
Alcohol/drug data:	Negative, per auto autopsy report
Transport from scene:	None
Type of medical treatment:	None, declared deceased at scene

Pedestrian/Non-Motorist Injuries

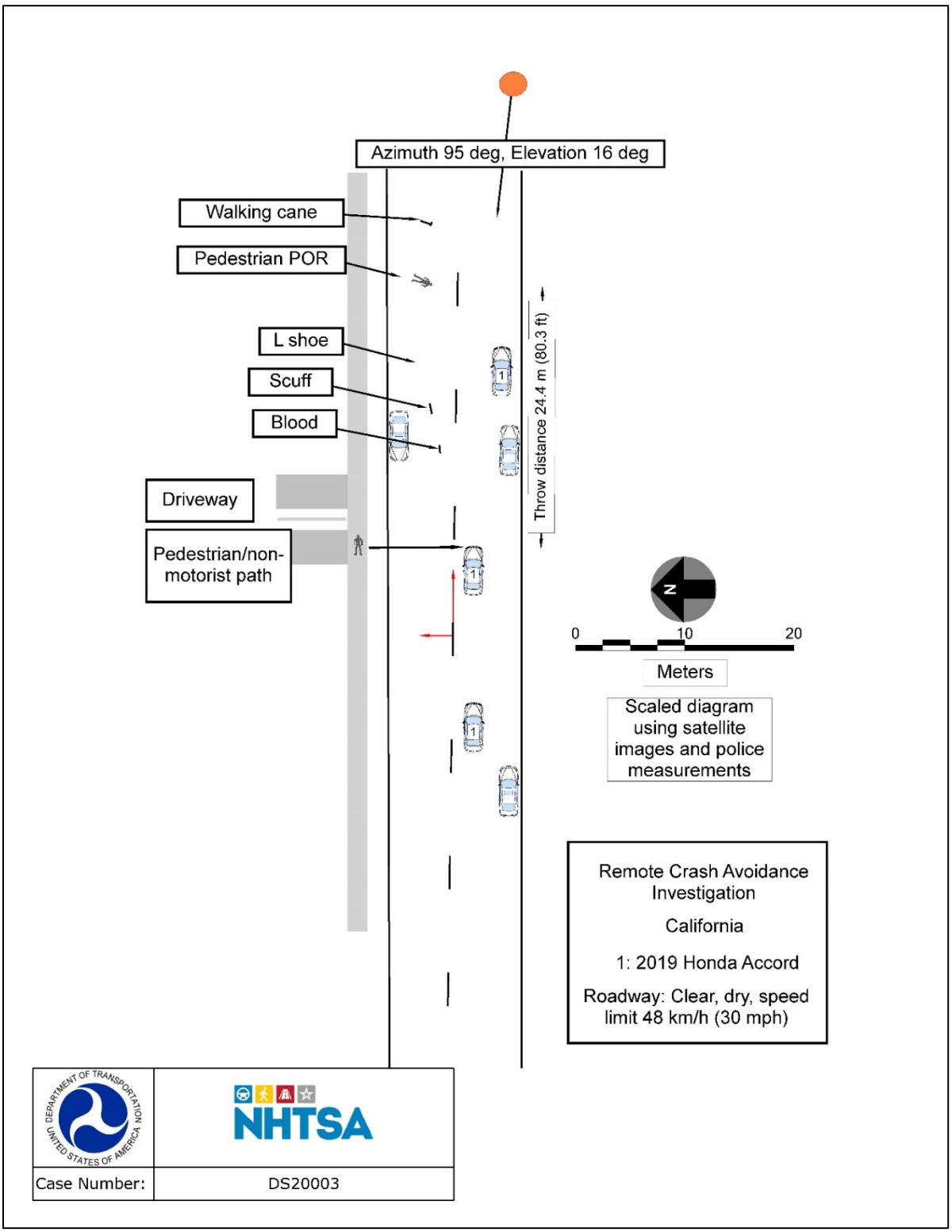
Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Skull fracture, right parietal and frontal bone, laceration with exposed skull	150402.2	Exterior of vehicle (windshield)	Certain
2	Right hip fracture	856100.2	Exterior of vehicle (hood)	Certain
3 4	Right tibia/fibula fracture	854000.2 854441.2	Exterior of vehicle (front bumper)	Certain
5	Abrasions, right upper back at shoulder	410202.1	Ground	Certain
6	Laceration, right elbow	710600.1	Exterior of vehicle	Probable
7	Abrasion, right elbow	710202.1	Exterior of vehicle	Probable
8	Abrasions, both cheeks, left chin, left temple	210202.1	Exterior of vehicle (windshield)	Probable
9	Contusions, right cheek and right ear	210402.1	Exterior of vehicle (windshield)	Probable
10	Contusions, left knee	810202.1	Ground	Probable
11	Contusion, left lower leg	810202.1	Ground	Probable
12	Contusions, right knee	810202.1	Exterior of vehicle (front bumper)	Probable

Source: autopsy report.

Pedestrian/Non-Motorist Kinematics

The pedestrian was standing upright and walking with a cane across the roadway from north to south (left to right from the driver's perspective). At impact, he wrapped along the hood and struck his head into the Honda windshield. He was then displaced forward and onto the roadway in the westbound travel lane approximately 24.4 m (80.3 ft) to the east.

Crash Diagram



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