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# **Special Crash Investigations On-Site Alleged Air Bag Non-Deployment Crash Investigation**

**Vehicle: 2006 Honda Odyssey**

**Location: Florida**

**Crash Date: July 2017**

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<b>16. Abstract</b> This report documents the on-site investigation of a crash involving a 2006 Honda Odyssey minivan and the non-deployment of its air bag systems. The Honda was involved in a severe front plane crash with a large-diameter hardwood tree and concrete block wall when it crossed through a T-configuration intersection at high speed and departed the roadway. An unbelted 32-year-old female driver sustained fatal injuries as a result of the crash. The Honda was equipped with front seat belt retractor pretensioners, a Certified Advanced 208-Compliant (CAC) frontal air bag system, roof side-rail-mounted side impact (only) inflatable curtain (IC) air bags, and front seat-mounted side impact air bags. The pretensioners did not actuate and none of the air bag systems deployed. Through the course of this investigation, it was determined that uneven ground surface and ground-level objects located immediately prior to the large-diameter tree possibly prevented the Honda's ACU from detecting the severe frontal crash event. Based on the SCI investigator's expertise, an independent crash event similar in severity to the focal tree impact of this crash would be expected to result in supplemental restraint system actuation/deployment.			
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## Table of Contents

<b>BACKGROUND .....</b>	<b>1</b>
<b>SUMMARY .....</b>	<b>2</b>
Crash Site .....	2
Pre-Crash .....	3
Crash .....	3
Post-Crash .....	4
<b>2006 HONDA ODYSSEY .....</b>	<b>4</b>
Description .....	4
Vehicle History .....	5
Exterior Damage .....	6
Event Data Recorder .....	7
NHTSA Recalls and Investigations .....	7
Interior Damage .....	7
Manual Restraint Systems .....	8
Supplemental Restraint Systems .....	9
Air Bag Non-Deployment Discussion .....	9
<b>2006 HONDA ODYSSEY OCCUPANT DATA .....</b>	<b>10</b>
Driver Demographics .....	10
Driver Injuries .....	11
Driver Kinematics .....	13
<b>CRASH DIAGRAM .....</b>	<b>15</b>

**Special Crash Investigations  
Office of Defects Investigation  
On-Site Air Bag Non-Deployment Crash Investigation  
Case Number: CR18001  
Vehicle: 2006 Honda Odyssey  
Location: Florida  
Crash Date: July 2017**

**BACKGROUND**

This report documents the on-site investigation of a crash involving a 2006 Honda Odyssey minivan (**Figure 1**) and the non-deployment of its air bag systems. The Honda was involved in a severe front plane crash with a large-diameter hardwood tree and a concrete block wall when it crossed through a T-configuration intersection at high speed and departed the roadway. An unbelted 32-year-old female driver sustained fatal injuries as a result of the crash. The Honda was equipped with front seat belt retractor pretensioners, a Certified Advanced 208-Compliant (CAC) frontal air bag system, roof side-rail-mounted side impact (only) inflatable curtain (IC) air bags, and front seat-mounted side impact air bags. The pretensioners did not actuate and none of the air bag systems in the vehicle deployed as a result of the crash.



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

Notification of the crash was sent to the National Highway Traffic Safety Administration by a representative of the vehicle’s owner in January 2018. The notification was forwarded to the Special Crash Investigations (SCI) group and assigned for on-site investigation to the team at Crash Research & Analysis, Inc. (CRA). The SCI team located the vehicle at a regional salvage facility. However, cooperation was delayed due to insurance and legal complications. Cooperation was finally established and the on-site investigation took place in March 2018. On-site activities included an inspection of the Honda to document its exterior and interior damage and to assess the manual and supplemental restraint systems. Because of the legal complications, the Honda’s insurer did not permit the SCI investigator to remove the Honda’s air bag control unit (ACU). Furthermore, since the make/model year of the Honda was not supported by the Bosh Crash Data Retrieval (CDR) software and tool at the time of the inspection, the SCI investigator was unable to image any event data recorder (EDR) data from the Honda. After completing the vehicle inspection, the SCI investigator documented the crash site with photographs and a Nikon Nivo 5+M total station mapping system. On-scene images were obtained from the investigating law enforcement agency.

Through the course of this investigation, it was determined that uneven ground surface and ground-level objects located immediately prior to the impacted large diameter tree possibly prevented the Honda’s ACU from detecting the severe frontal crash event. The corresponding

undulation of the vehicle most likely enabled the Honda's ACU algorithm following its roadside departure; however, it determined that the detected forces were of insufficient severity to warrant actuation/deployment commands. Due to the high speed of the vehicle and the close proximity of the tree, there may have been insufficient time for the ACU algorithm to reset and begin sensing for a subsequent event. This hypothesis was made in the absence of any electronic crash event data from the vehicle, based on the SCI investigator's expertise and supported by the fact that an independent event similar in severity to the focal tree impact would be expected to result in supplemental restraint system actuation/deployment.

## SUMMARY

### *Crash Site*

The crash occurred during July 2017 in a suburban, residential area at the T-configuration intersection of two local roadways. According to the National Weather Service, conditions in the locale at the time of the late evening-hours crash included clear skies with a temperature of 29 °C (84 °F), an easterly breeze of 13.0 km/h (8.1 mph), and relative humidity of 63 percent. The physical environment of the roadway and intersection was documented during the SCI crash site inspection using photographs and a Nikon Nivo 5.M+ total station mapping system.

The Honda was traveling westbound on a two-lane local roadway at the time of the crash (**Figure 2**). It consisted of a 2.9 m (9.5 ft) wide travel lane in each direction, separated by a double-solid yellow centerline with single solid-white fog lines. The roadway had no shoulders, and was bordered by grassy roadsides with surrounding residential properties. This local roadway intersected a north/south local roadway in a T-configuration. The intersected roadway contained a 3.2 m (10.5 ft) wide travel lane for each travel direction, also separated by a double-solid yellow centerline and with single-solid edge lines. For the Honda's pre-crash travel trajectory, the roadway was straight and essentially level.



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

The intersected roadway was inclined approximately 3 percent, with a hillcrest approximately 305 m (1,000 ft) to the south. Speed in all directions was regulated by posted limits of 48 km/h (30 mph).

Opposite the east/west roadway at the intersection was a grass roadside that transitioned to a residential subdivision. Along the Honda's trajectory in the roadside was a shallow depressed grass swale. The elevation change in the depression measured 25 cm (9.8 in) relative to the roadway edge.



**Figure 3.** West-facing view toward the roadside west of the intersection and the impacted tree.

The swale contained an 8 cm (3.1 in) raised water main utility fixture and a concrete-box sewer drain. The fixture was located 3.7 m (12.2 ft) from the edge of the roadway. A 1.5 m (4.9 ft) wide concrete sidewalk paralleled the north/south roadway centered 7.9 m (25.9 ft) west of the pavement edge and a large diameter tree was located 9.2 m (30.2 ft) west of the referenced edge. Immediately beyond the tree, a concrete block barrier wall surrounded the subdivision that was located west of the intersection. The wall was located 10.3 m (33.8 ft) west of the roadway edge. **Figure 3** depicts the roadside, grass swale, tree, and concrete wall. A crash diagram is included at the end of this technical report.

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

Due to the fatal outcome of the Honda's driver, the specific activities of the 32-year-old female driver and her route of travel prior to the crash remain unknown. However, it was determined by the law enforcement agency investigating the crash that the driver suffered from mental health ailments and had been discharged from a medical facility on the day of the crash after receiving mental health care. She had a history of suicidal tendencies and threats. In the hours preceding the crash, the driver engaged in a verbal altercation with her significant other and expressed suicidal tendencies and verbal allegations.

The driver of the Honda was operating the vehicle westbound on the local roadway. Witnesses to the crash reported that they observed the Honda traveling at high speed on the local roadway, with its headlights and taillights not illuminated (off). The combination of the witness reports and the damage to the vehicle observed by the SCI investigator during inspection confirmed that the driver operated the Honda at a speed well above the posted 48 km/h (30 mph) limit. The SCI investigator concluded based on his inspection of the vehicle and reconstruction of the crash that the Honda's speed at impact was approximately 97-105 km/h (60-65 mph). No evidence of avoidance steering or braking input was identified during the SCI crash site inspection, reported by the witnesses, or documented by the on-scene law enforcement investigation.

It was apparent that the Honda approached the intersection from the east at high speed, maintained a straight-line trajectory through the intersection, and departed the T-configuration intersection opposite the intersecting east/west roadway. It entered the grass swale and traversed the slight depression of the soil surface. Based on the location of the tree impact, it is likely that the Honda's left front tire overrode the steel cover of the water main utility connection. The Honda then continued west out of the swale and crossed over the sidewalk as it approached the large diameter tree.

### ***Crash***

The first crash event occurred as the front plane of the Honda struck the large diameter tree. The impact was centered on the left frame rail of the Honda, and produced a 12 o'clock direction of

force. As the Honda engaged the tree, severe deformation to the front plane was produced and a counterclockwise rotation about the vehicle's vertical axis was induced. As the Honda continued to engage the tree, the right aspect of its front plane struck the concrete block wall surrounding the subdivision (Event 2). Associated forces fractured an approximate 2.4 m (8.0 ft) section of the wall (**Figure 4**). Based on the trajectory of the Honda, location of the impact, and rotation of the vehicle, the associated direction of force for the wall impact was in the 1 o'clock sector for the Honda. The Honda completed approximately 80-degrees of counterclockwise rotation and rebounded from the tree toward the north. It came to final rest adjacent to the concrete block wall, facing south.



**Figure 4.** West-facing view toward the impacted wall and tree with the Honda at final rest (on-scene image provided by the investigating law enforcement agency).

### ***Post-Crash***

There were several witnesses to the crash who notified the local emergency response system. Fire department, emergency medical services (EMS), and law enforcement personnel were dispatched to the crash scene. The female driver of the Honda was found by emergency personnel to be physically entrapped in the vehicle and unresponsive. She was absent of vital life signs, and was pronounced deceased at the crash site. The investigating law enforcement agency documented the crash site. The Honda was recovered from the crash site and towed to a local yard before being transferred to a regional salvage facility. At the time of the SCI vehicle inspection, the Honda remained at the salvage facility under insurance and legal holds. The damaged wall was repaired prior to the SCI crash site inspection.

## **2006 HONDA ODYSSEY**

### ***Description***

The Honda was identified by the Vehicle Identification Number 5FNRL38866Bxxxxxx. It was manufactured in Alabama in February 2006. The Honda was a 4-door minivan built on a 300 cm (118.1 in) wheelbase with a 3.5 liter, V-6, gasoline engine. Its electronic odometer reading remains unknown due to severe damage to the instrument cluster as a result of the crash. A placard declared that the Honda's gross vehicle weight rating was 2,700 kg (5,952 lb). Front and rear axle ratings were 1,305 kg (2,877 lb) and 1,450 kg (3,197 lb), respectively. The curb weight was 2,095 kg (4,619 lb). The vehicle manufacturer's recommended tire size for all



**Figure 5.** Front right oblique view of the Honda.

four axle positions was P235/710R. Recommended cold tire pressures were 230 kPa (33 PSI) front and 240 kPa (35 PSI) rear.

At the time of the SCI inspection (**Figure 5**), the vehicle was equipped with Cooper GLS Touring tires of size P235/65R16 at all four axle positions. All four tires had matching tire identification numbers (TINs) of U946 1DR, with ample tread of 4 mm (5/32 in) or more. The left front tire/wheel was separated entirely from the vehicle, though the tire itself was not damaged and remained inflated. The right front was restricted and deflated, but there was no visible damage to the tire itself. Both rear tires were inflated, undamaged, and not restricted.

The interior of the Honda was configured for the seating of up to seven occupants (2/2/3). Both the front row and second row consisted of forward-facing bucket seats with adjustable head restraints, while the third row was a split 3-passenger bench seat. All interior surfaces were surfaced with a faux leather material. The specific pre-crash track adjustment of the driver's seat could not be determined during the SCI inspection due to damage to the seat, seat track, and surrounding floor. Manual safety features included 3-point lap and shoulder seat belts for all seven seat positions. The front seat belts were equipped with retractor pretensioners. The Honda was further equipped with supplemental restraint systems that consisted of frontal, front seat-mounted side impact, and side impact IC air bags.

### ***Vehicle History***

A comprehensive vehicle history report was obtained from a commercial service. Based on the Honda's VIN, it had two owners during its lifetime. The first owner had purchased the vehicle new in 2006 and registered it in the State of Florida. Routine maintenance/service (oil and filter changes, tire rotations, etc.) was performed during their ownership period. The Honda was then involved in a left front crash with another vehicle in February 2008.

The SCI investigator obtained a copy of a police crash report (PAR) for this previous crash. It indicated the Honda had initiated a left U-turn from the right lane and was struck on the forward aspect of its left plane by a 2001 GMC Yukon that was passing the Honda in the left lane. According to the PAR, air bags in the Honda deployed in the crash. Based on the documented configuration of the crash, the SCI investigator estimated that the associated direction of force was likely in the 7 to 8 o'clock sectors for the Honda. This would have likely resulted in the deployment of the vehicle's left front seat-mounted and left IC air bags as a result of a left side impact algorithm deployment. It is likely that the frontal air bag system in the Honda was not commanded to deploy due to a lack of an associated longitudinal deceleration for the crash pulse. The Honda was repaired after that crash and continued to be used until it was listed for sale in September 2008 with an odometer reading of 78,246 km (48,620 mi).

The second (current) owner of the Honda purchased the vehicle in November 2008 and registered it in Florida. The vehicle again received routine maintenance/service for the duration of its ownership. A crash was reported in August 2013 when another vehicle struck the Honda in the left rear. Minor damage was sustained, without air bag deployment. The vehicle was repaired, and continued to be driven with routine maintenance/service until the incident crash in July 2017. The last known reported odometer reading was 208,996 km (129,864 mi) in October 2016. There was no mention in the history report of service to the vehicle's air bag systems, nor was there any indication of any manufacturer recalls.

### **Exterior Damage**

Damage to the exterior of the Honda was located on the front plane, associative to the severe frontal impact with the large-diameter tree and minor severity impact with the concrete block wall. Deformation and damage associated with the Event #1 impact was biased to the left aspect of the front plane, with severe longitudinal crush. The bumper beam, bumper fascia, hood, and surrounding components were deformed rearward in a distinct U-shaped deformation pattern, with an extent that included direct contact to the windshield header. Direct contact on the bumper beam began 35 cm (13.8 in) left of the centerline and extended to the left front bumper corner. The width of the distinct U-shaped deformation was 35 cm (13.8 in), equivalent to the diameter of the impacted tree. **Figure 6** depicts a front plane view of the Honda and its severe deformation pattern, highlighted by a vertically-oriented calibrated measuring tape. **Figure 7** depicts the severity of the deformation from an overhead perspective.



**Figure 6.** View of the front plane damage profile to the 2006 Honda Odyssey.



**Figure 7.** Deformation to the front plane of the Honda from an overhead perspective.

From a front plane perspective, the width of the direct and induced damage (Field-L) for the crush profile measured 111 cm (43.7 in). The SCI investigator obtained a crush profile along the severely deformed bumper beam, which produced the following resultant measurements: C1 = 135 cm (53.1 in), C2 = 138 cm (54.3 in), C3 = 93 cm (36.6 in), C4 = 65 cm (25.6 in), C5 = 49 cm (19.3 in), and C6 = 41 cm (16.1 in). Maximum crush was located 20 cm (7.9 in) right of the left front bumper corner at the apex of the U-shaped deformation, near the C2 measurement location.

Based on the observed damage, the collision deformation classification (CDC) assigned to the Honda for the Event 1 impact with the large-diameter tree was 12FLAE7. The barrier algorithm of the WinSMASH program was used to calculate the severity of the crash for analysis purposes. The total calculated delta-V of the Honda for the front crash event with the large diameter tree was 91 km/h (56.5 mph). Longitudinal and lateral components of the calculated delta-V were -91 km/h (-56.5 mph) and 0 km/h (0 mph), respectively. These results appeared underestimated.

The secondary impact of the Honda's front plane with the concrete block wall (Event 2) was a minor severity impact. Minimal additional damage occurred to the right half of the Honda's front plane, which overlapped the induced damage from the initial impact. Due to the severe

deformation associated with the focal impact with the tree, no crush profile corresponding to the secondary wall impact could be accurately distinguished or documented. The estimated CDC assigned to the Honda for this secondary impact was 01FREE1. No WinSMASH calculations were performed for the secondary event due to the corner/yielding object impact.

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

The 2006 Honda Odyssey was equipped with an air bag control unit (ACU) mounted to the center tunnel beneath the center instrument panel. The ACU monitored the diagnostic functions of the vehicle's supplemental restraint systems (air bags and seat belt pretensioners) and controlled the deployment/actuation of those devices dependent upon crash event trigger severity. The ACU did not have EDR capabilities supported by the Bosch Crash Data Retrieval (CDR) software and tool; therefore, the SCI investigator could not image any data from the Honda during inspection. The SCI investigator requested to remove the ACU from the vehicle during the inspection process and retain it, but the Honda's insurer refused.

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

A query of the 2006 Honda Odyssey's VIN on [www.safercar.gov](http://www.safercar.gov) as of the date of this report identified no open manufacturer recalls or investigations concerning this specific vehicle.

### ***Interior Damage***

The interior of the Honda was inspected for crash-related damage, including intrusion and occupant contact. Due to the approximate 7-month passage of time between the date of the crash and the SCI inspection, substantial degradation of the vehicle's interior masked any surface occupant contact evidence. However, extensive occupant compartment intrusion was observed. There was severe longitudinal and vertical intrusion of the left instrument panel, steering wheel, left floor/toe pan, and surrounding components. The entire occupant space in front of the driver's seat position was consumed by the intrusion, with rearward deflection of the driver's seat and engagement of the left floor/toe pan with the driver's seat cushion. The entire instrument panel was displaced rearward and vertically by the longitudinal deformation of the frontal and engine compartment components. This induced the separation of polymer surfaces, and exposed the underlying structure of the instrument panel.



**Figure 8.** Crossing view of the Honda's driver position and surrounding intrusion from the left.



**Figure 9.** Area above the driver's seat position in the Honda, possibly from contact by the driver's head.

The steering rim was deformed forward by occupant loading, while the entire steering assembly was deflected rearward and upward by the deformation/intrusion. It was observed to be in close proximity to the roof of the vehicle above the driver's seat position at the time of the SCI inspection (**Figure 8**). An area of mold/fungus on the roof of the Honda above the steering wheel may have related to an area of occupant contact/body substance transfer (**Figure 9**). Intrusions into the Honda's interior were documented by the SCI investigator as follows:

<b>Position</b>	<b>Component</b>	<b>Magnitude</b>	<b>Direction</b>
1,1	Instrument panel left	32 cm (12.6 in)	Longitudinal
1,1	Instrument panel left	28 cm (11.0 in)	Vertical
1,2	Instrument panel center	29 cm (11.4 in)	Longitudinal
1,2	Instrument panel center	29 cm (11.4 in)	Vertical
1,3	Instrument panel right	17 cm (6.7 in)	Longitudinal
1,3	Instrument panel right	16 cm (6.3 in)	Vertical
1,1	Steering assembly	31 cm (12.2 in)	Longitudinal
1,1	Steering assembly	30 cm (11.8 in)	Vertical
1,1	Floor pan	56 cm (22.0 in)	Longitudinal
1,1	Floor pan	37 cm (14.6 in)	Vertical
1,1	Toe pan	68 cm (26.8 in)	Longitudinal
1,1	Toe pan	53 cm (20.9 in)	Vertical

Both Honda front doors were jammed shut by deformation and damage associated to the severe front plane impact with the tree. The left rear door was removed and the front doors were forced open by emergency response personnel using hydraulic rescue tools following the crash. The windshield glazing was fully fractured by the impact forces, but not holed. It is likely that the left front glazing disintegrated by the impact forces. However, the left rear, right rear, and right front glazing remained intact and were disintegrated post-crash by emergency personnel during their post-crash use of hydraulic tools.

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

The Honda was equipped with 3-point lap and shoulder seat belt systems for all seven seating positions. The front seat belt systems used continuous loop webbing with sliding latch plates and adjustable D-rings. The driver's seat belt system retracted onto an emergency locking retractor (ELR), while the front right passenger's seat belt used an ELR/automatic locking retractor (ALR). Both front seat belt systems were equipped with retractor pretensioners, neither of which was actuated as a result of the crash.

At the time of the SCI inspection, the driver's D-ring was adjusted fully downward. The webbing of the driver's seat belt system was extended from the retractor and had been tied around the frame of the left front door, an attempt by a prior individual to prevent the door from fully opening during the vehicle's post-crash movement. The SCI investigator noted that the webbing was soiled from its extended duration exposure to the environmental elements. The webbing spooled freely into and out of the retractor. Evidence of historical wear was discernable to both the latch plate and webbing. However, no visible loading evidence could be detected along the

length of the webbing or in the belt path of the latch plate (**Figure 10**). It was apparent to the SCI investigator that the Honda's driver was not belted at the time of the crash.

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

The Honda was equipped with front seat belt pretensioners and multiple inflatable supplemental restraints. These included a CAC frontal air bag system that consisted of frontal air bags for the driver and front right passenger positions, with seat belt buckle switch sensors, seat track position sensors, and a front right occupant presence (weight) sensor. The Honda was further equipped with front seat-mounted side impact air bags mounted in the outboard aspect of the front seat backs, as well as side impact IC air bags along each roof side rail. None of the supplemental restraint systems actuated or deployed in the incident crash.



**Figure 10.** Latch plate of the Honda driver's seat belt system with minor loading abrasion evidence.

One of the two previous crashes identified by the vehicle history report for the Honda indicated that air bag deployment had occurred. Although the location of vehicle damage was reported as left front, there was no description in the vehicle history report to identify which of the Honda's air bags had deployed associative to that previous crash. Regardless, it was evident that the Honda had been repaired and was in good working order, as it was placed back into service and later resold after passing subsequent maintenance and State-regulated inspections.

### ***Air Bag Non-Deployment Discussion***

None of the Honda's available supplemental restraint systems actuated or deployed in the incident crash. Due to the model year of the vehicle, it was not supported by the Bosch CDR software/tool and the SCI investigator had no means by which to obtain any data from the vehicle's ACU. Due to pending legal implications, the insurance owner of the Honda refused to allow the SCI investigator to remove the vehicle's ACU during the inspection process. The SCI investigator was able to openly visualize the ACU during inspection without vehicle alteration, due to the extent of damage sustained by the vehicle in the crash. **Figure 11** depicts the exposed ACU in the Honda at the time of the SCI inspection, which did not appear damaged in any way.

It was evident to the SCI investigator during inspection of the vehicle that the focal frontal crash event with the large diameter tree was a significant impact event. An independent, isolated impact event producing a similar damage pattern would be expected to be associated with significant deceleration forces that would result in actuation/deployment commands. However, the SCI investigator's inspection of the crash site revealed that the large diameter tree (focal point of impact) was not the only object in the vicinity (**Figure 12**). The SCI investigator further observed that the approach to the tree was not perfectly smooth or level. Instead, there was a depressed grass swale, sewer drain cover, water main connection, and sidewalk between the edge of the roadway and the large diameter tree. On its approach to the large diameter tree, the Honda would have traversed through the swale, overrode the water main connection with its left front tire/wheel, and mounted the concrete sidewalk surface.



**Figure 11.** View of the Honda's exposed ACU beneath the center instrument stack during the SCI inspection.



**Figure 12.** West-facing view of the roadside approach to the large diameter tree impact for the Honda's trajectory.

The large diameter tree was located 9.2 m (30.2 ft) from the edge of the roadway. The water main fixture/connection was located 3.7 m (12.2 ft) from the edge of the roadway and 5.5 m (18.0 ft) from the tree. At the reconstructed 105 km/h (65 mph) speed, the Honda covered the distance from the road departure to the water main in approximately 130 milliseconds. The elapsed time between the Honda's left front tire contact with the water main connection and the front plane impact the tree was approximately 150 milliseconds.

The SCI investigator theorized that undulation of the Honda as it traversed through the roadside toward the tree and its tire overrode the water main connection likely enabled the ACU's algorithm. As the algorithm deciphered the forces detected, it determined that no supplemental restraint actuation/deployment was warranted. However, due to the close proximity of the tree to the swale and corresponding algorithm enable, it is possible that it was unable to reset its algorithm sensing capability in the approximate 150 milliseconds leading up to the tree impact, and therefore did not detect the tree impact and could not provide supplemental restraint system actuation/deployment commands. It should be noted that absent proprietary manufacturer knowledge, no definitive conclusions concerning this theory could be made. The SCI investigator's inspection of the vehicle was unable to identify any anomaly with the Honda's supplemental restraint systems.

## 2006 HONDA ODYSSEY OCCUPANT DATA

### *Driver Demographics*

Age/sex:	32 years/female
Height:	160 cm (63 in)
Weight:	90 kg (198 lb)
Eyewear:	None
Seat type:	Forward-facing bucket seat with adjustable head restraint
Seat track position:	Unknown
Manual restraint usage:	None used; 3-point lap and shoulder seat belt system available

Usage source: Vehicle inspection  
 Air bags: Frontal, seat-mounted side impact, and IC air bags available;  
 None deployed  
 Alcohol/drug involvement: Methamphetamine intoxication, positive for oxycodone and  
 diazepam  
 Egress from vehicle: None  
 Transport from scene: None  
 Type of medical treatment: None; pronounced deceased at the crash site

***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	Brainstem laceration at pontomedullary junction	140212.6	Intruded steering wheel/rim/column	Probable
2	Brain lacerations under vault and base skull fractures	140688.3	Intruded steering wheel/rim/column	Probable
3	Base skull fracture – both linear and comminuted with dural lacerations	150206.4	Intruded steering wheel/rim/column	Probable
4	Vault skull fracture – both linear and comminuted with dural lacerations	150404.3	Intruded steering wheel/rim/column	Probable
5	Subarachnoid hemorrhage overlying cerebral hemispheres	140693.2	Intruded steering wheel/rim/column	Probable
6	Subarachnoid hemorrhage overlying cerebellar hemispheres	140466.2	Intruded steering wheel/rim/column	Probable
7	Frontal galeal hemorrhagic	110402.1	Intruded steering wheel/rim/column	Probable
8	Right occipital galeal hemorrhagic	110402.1	Roof	Possible
9	Anterior, posterior and lateral aspects of all ribs have complete displaced fractures	450214.5	Intruded steering wheel/rim/column	Certain
10	Lungs have large lacerations associated with rib fractures	441452.5	Intruded steering wheel/rim/column	Certain
11	Lungs have large contusions associated with rib fractures	441412.4	Intruded steering wheel/rim/column	Certain
12	Right pleural cavity filled with blood due to laceration	441800.2	Intruded steering wheel/rim/column	Certain

<b>Injury No.</b>	<b>Injury</b>	<b>Injury Severity AIS 2015</b>	<b>Involved Physical Component (IPC)</b>	<b>IPC Confidence Level</b>
13	Left pleural cavity filled with blood due to laceration	441800.2	Intruded steering wheel/rim/column	Certain
14	Mid-aspect of right femur has a complete displaced closed fracture	853221.3	Intruded left lower instrument panel	Certain
15	Mid-aspect of left femur has a complete displaced closed fracture	853221.3	Intruded left lower instrument panel	Certain
16	Distal aspects of right tibia has complete displaced closed fracture	854332.3	Intruded left lower instrument panel	Certain
17	Distal aspects of right fibula has complete displaced closed fracture	854442.2	Intruded left lower instrument panel	Certain
18	Right foot has complete displaced closed fractures	852004.2	Intruded floor pan	Certain
19	Proximal aspect of left clavicle has displaced fracture	750511.2	Intruded steering wheel/rim	Probable
20	Maxilla fracture, NFS	250800.2	Intruded steering wheel/rim	Probable
21	Mandible fracture, NFS	250600.1	Intruded steering wheel/rim	Probable
22	Broken nose, NFS	251000.1	Intruded steering wheel/rim	Probable
23	Facial lacerations, NFS	210600.1	Intruded steering wheel/rim	Probable
24	Facial contusions, NFS	210402.1	Intruded steering wheel/rim	Probable
25	Facial abrasions, NFS	210202.1	Intruded steering wheel/rim	Probable
26	Left wrist dislocated	772430.1	Intruded left instrument panel	Probable
27	Torso contusions, NFS	410402.1	Intruded steering wheel/rim	Probable
28	Torso abrasions, NFS	410202.1	Intruded steering wheel/rim	Probable
29	Irregular lacerations to right upper extremity, NFS	710600.1	Intruded left instrument panel	Probable
30	Irregular lacerations to left upper extremity, NFS	710600.1	Intruded left instrument panel	Probable

<b>Injury No.</b>	<b>Injury</b>	<b>Injury Severity AIS 2015</b>	<b>Involved Physical Component (IPC)</b>	<b>IPC Confidence Level</b>
31	Contusions to right upper extremity, NFS	710402.1	Intruded left instrument panel	Probable
32	Contusions to left upper extremity, NFS	710402.1	Intruded left instrument panel	Probable
33	Abrasions to right upper extremity, NFS	710202.1	Intruded left instrument panel	Probable
34	Abrasions to left upper extremity, NFS	710202.1	Intruded left instrument panel	Probable
35	Irregular lacerations to right lower extremity, NFS	810600.1	Intruded left lower instrument panel	Certain
36	Irregular lacerations to left lower extremity, NFS	810600.1	Intruded left lower instrument panel	Certain
37	Contusions to right lower extremity, NFS	810402.1	Intruded left lower instrument panel	Certain
38	Contusions to left lower extremity, NFS	810402.1	Intruded left lower instrument panel	Certain
39	Abrasions to right lower extremity, NFS	810202.1	Intruded left lower instrument panel	Certain
40	Abrasions to left lower extremity, NFS	810202.1	Intruded left lower instrument panel	Certain

Source: Autopsy report (internal).

### ***Driver Kinematics***

The 32-year-old female was positioned in the driver's seat of the 2006 Honda Odyssey. Although the exact track position of the driver's seat could not be determined during the SCI inspection due to vehicle damage, based on the driver's demographics, it was probable that she adjusted the seat to a middle track position.

The driver's seat back was slightly reclined, and the adjustable head restraint was positioned 2 cm (0.8 in) upward. She did not use the available 3-point lap and shoulder seat belt system for manual restraint. Her lack of restraint usage was determined through a post-crash inspection of the seat belt system by the SCI investigator, which revealed a lack of loading evidence that would have otherwise corresponded to restraint usage.

Post-crash investigation activities by the law enforcement agency revealed that the driver was operating the Honda while intoxicated by methamphetamines. A post-mortem toxicology screening further identified oxycodone and diazepam in the driver's system. Reports from family members and other acquaintances of the driver to the law enforcement agency detailed that on the day of the crash, the driver had been released from a medical facility following an extended stay during which she had been treated for mental illness and suicidal tendencies. In the hours

preceding the crash, the driver engaged in a domestic altercation and made suicidal threats. She had then departed in the Honda. Her activities immediately preceding the crash remain unknown.

As the Honda traveled west on the local roadway, the driver maintained a speed in excess of the posted limit. The SCI reconstruction of the crash estimated the Honda's speed to be approximately 97 to 105 km/h (60-65 mph). There was no avoidance attempt by the driver prior to the crash. She steered the Honda in a straight-path trajectory along the local roadway, proceeded through the controlled T-configuration intersection, and departed the roadway. Although the SCI investigator concluded that the forces acting upon the Honda as it traversed off of the roadway and through the swale on approach to the tree were of sufficient magnitude to enable the Honda ACU's algorithm, they were not of significant magnitude to elicit a kinematic response from the driver.

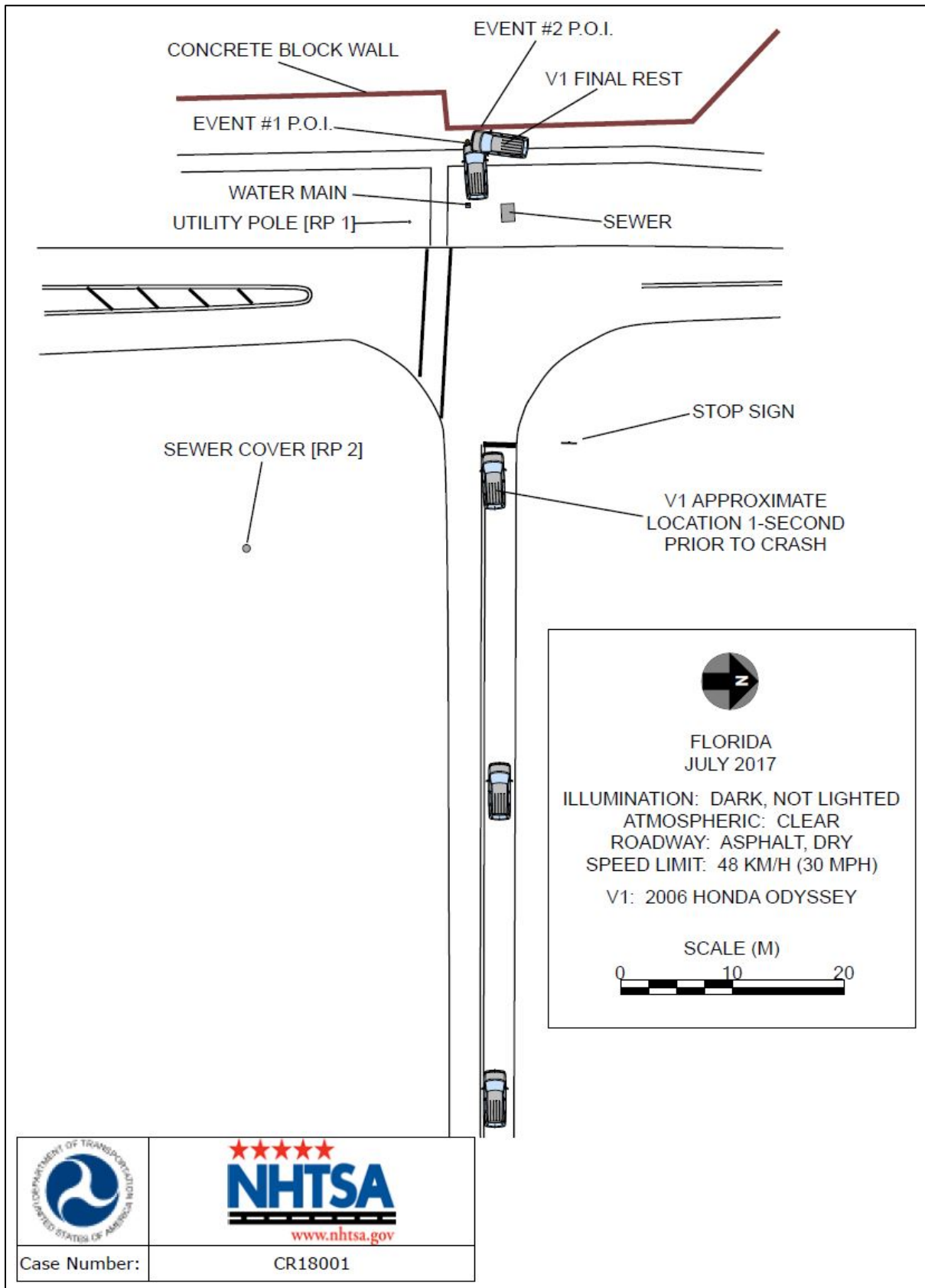
At impact with the large diameter tree, the unbelted driver initiated a forward trajectory. She slid forward from the driver's seat and contacted the left lower instrument panel with her knees, steering wheel/column with her chest, and left upper instrument panel with her upper hands. Her body loaded against these components as the Honda engaged the tree. Massive crush to the left front aspect of the Honda produced severe longitudinal deformation, which displaced frontal components and produced catastrophic intrusion into the occupant space of the driver's position. The entire instrument panel, steering wheel/column, and toe pan were deformed rearward and vertically with extensive magnitude.

The displacement of these components exacerbated the driver's contact and loading, and subsequently displaced the driver rearward. The floor of the Honda at the driver's position was deformed rearward, collapsing the entire space between the driver's seat and the foot controls. The driver's legs were forced upward and rearward. The driver remained in contact with the frontal components for her position as the Honda rotated about the tree and struck the concrete block wall.

In their entirety, the extent of the intrusions and the severity of the delta-V of the impact forces from the tree impact resulted in extensive injuries to the driver's head, upper extremities, chest, and lower extremities. The driver sustained fatal injuries and was physically trapped in the Honda as the vehicle came to final rest.

Emergency response personnel located the driver in the Honda, her body absent of vital life signs. She was pronounced deceased at the crash site, and her body was removed for post-mortem examination.

# CRASH DIAGRAM



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



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