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

NHTSA

DOT HS 813 272

March 2022

Special Crash Investigations: On-Site Reported Unintended Acceleration Crash Investigation; Vehicle: 2006 Honda Civic; Location: New Jersey; Crash Date: January 2017

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Suggested APA Format Citation:

Crash Research & Analysis, Inc. (2022, March). *Special Crash Investigations: On-site reported unintended acceleration crash investigation; Vehicle: 2006 Honda Civic; Location: New Jersey; Crash Date: January 2017* (Report No. DOT HS 813 272). National Highway Traffic Safety Administration.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT HS 813 272		

4. Title and Subtitle	5. Report Date
Special Crash Investigations: On-Site Reported Unintended Acceleration Crash Investigation; Vehicle: 2006 Honda Civic; Location: New Jersey; Crash Date: January 2017	March 2022
	6. Performing Organization Code
7. Author Crash Research & Analysis, Inc.	**8. Performing Organization Report No.** CR17005
9. Performing Organization Name and Address Crash Research & Analysis, Inc. P.O. Box 302 Elma, NY 14059	**10. Work Unit No. (TRAIS)**
	11. Contract or Grant No. 693JJ919C000004
12. Sponsoring Agency Name and Address National Highway Traffic Safety Administration 1200 New Jersey Avenue SE Washington, DC 20590	**13. Type of Report and Period Covered** Technical Report Crash Date: January 2017
	14. Sponsoring Agency Code

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 on-site investigation of the report of an unintended acceleration of a 2006 Honda Civic and the subsequent run-off-road/fixed-object frontal crash of the vehicle. The Honda's 86-year-old belted driver reported to the law enforcement agency that as he accelerated the vehicle from a stopped position, the pedal stuck in position and caused a loss of control. The Honda traveled across a multi-lane roadway, overrode the curb, struck a small commercial sign, sheared a STOP sign, and then struck a large-diameter pole. The Honda's certified advanced 208-compliant (CAC) frontal air bag, left inflatable curtain (IC) air bag, and left front seat-mounted side impact air bag deployed as a result of the crash. The driver sustained police-reported non-incapacitating (B-level) injuries and was transported to a local hospital by ambulance. He was hospitalized and then transferred to a different facility for a higher level of care. The driver died 6 days post-crash as a result of complications unrelated to the crash. The SCI investigator was unable to identify any evidence or circumstance to support the driver's report of an unintended acceleration event.

17. Key Words	18. Distribution Statement
air bag, deployment, fixed object	This document is available to the public from the DOT, BTS, National Transportation Library, Repository & Open Science Access Portal, rosap.ntl.bts.gov.

19 Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	25	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

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On-Site Reported Unintended Acceleration Crash Investigation
Office of Defects Investigation
Case Number: CR17005
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Location: New Jersey
Crash Date: January 2017

Background

This report documents the on-site investigation of the reported unintended acceleration of a 2006 Honda Civic (Figure 1) and the subsequent run-off-road/fixed-object frontal crash of the vehicle. The Honda's 86-year-old belted driver reported to the law enforcement agency that as he accelerated the vehicle from a stopped position, the pedal stuck in position and caused a loss of control. The Honda traveled across a multi-lane roadway, overrode the curb, struck a small commercial sign, sheared a STOP sign, and then struck a large-diameter pole with its front plane. The Honda's certified advanced 208-compliant (CAC) frontal air bag, left inflatable curtain (IC) air bag, and left front seat-mounted side impact air bag deployed as a result of the crash. The driver sustained police-reported non-incapacitating (B-level) injuries and was transported to a local hospital from the crash scene by ambulance. He was hospitalized, and then transferred to a different facility for a higher level of care. The driver died 6 days post-crash as a result of medical complications unrelated to the crash or crash injuries.

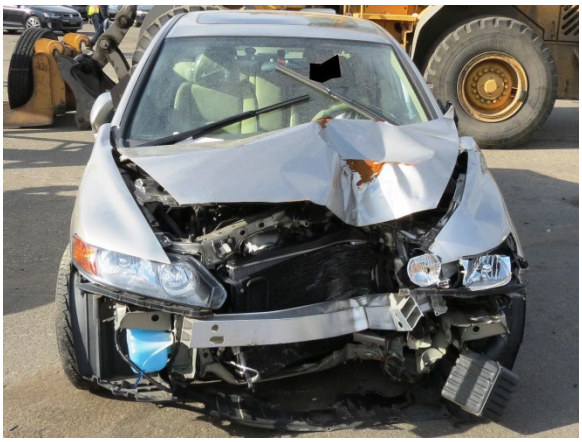


Figure 1. Front plane view of the 2006 Honda Civic at the time of the SCI inspection

NHTSA was notified of the reported unintended acceleration and crash by a family member of the driver in February 2017. A police crash report (PCR) documenting the crash was subsequently obtained, and the crash notification and on-site investigation assignment was forwarded to the Special Crash Investigations (SCI) team at Crash Research & Analysis, Inc., in April 2017. The SCI team contacted the Honda's insurer and established cooperation to inspect the vehicle at the insurance vehicle salvage facility where it was located. The on-site portion of this investigation occurred in April 2017 and consisted of the detailed inspection of the Honda and the documentation of the crash site. The SCI vehicle inspection included measurement of the

vehicle's exterior damage, an evaluation of the manual and supplemental restraint systems, identification of points of occupant contact, and an examination of the accelerator pedal and surrounding floor area of the Honda. Due to its age, the Honda was not equipped with an air bag control module (ACM) supported by the Bosch Crash Data Retrieval tool.

However, a representative of the Honda's manufacturer attended the SCI vehicle inspection and successfully imaged Event Data Recorder (EDR) data from the vehicle using a proprietary tool and software. Electronic copies of the hexi-decimal data were provided to the SCI investigator on-site, and an electronic interpretation of the data was later forwarded to the SCI investigator by the manufacturer's representative. Records documenting the driver's injuries and treatment course were obtained from the medical facilities.

Summary

Crash Site

The crash occurred in the area of several commercial establishments with entrance/exit driveways to a generally east/west multi-lane roadway during the afternoon hours in January 2017. According to the National Weather Service, conditions in the locale at the time of the crash included overcast skies with scattered rain showers, a temperature of 8°C (46°F), a 71-percent relative humidity, and 14.8 km/h (9.2 mph) northwesterly breeze. A Nikon Nivo 5.M+ total station was used by the SCI investigator to document the physical environment of the crash site.

The roadway consisted of two 3.8 m (12.5 ft) wide eastbound travel lanes, a 3.6 m (11.8 ft) wide center gore area, and a pair of 3.3 m (10.8 ft) wide westbound lanes that were in transition to a single 5.0 m (16.4 ft) wide lane in the area of the crash. Roadway delineation included single broken white lane lines with single solid white fog lines, while the gore area was demarcated by double-solid yellow lines and cross hatches. Speed was regulated by a posted limit of 80 km/h (50 mph).

A commercial driveway 9.6 m (31.5 ft) wide intersected the roadway from the south. Figure 2 shows a north-facing view of the roadway and crash site from the south intersecting driveway, in the initial travel trajectory of the Honda. A commercial driveway 7.7 m (25.3 ft) wide was located on the opposite side of the road, with grass areas on both sides populated by several small objects. This included a small commercial sign that measured 1.2 m (3.9 ft) wide by 1.3 m (4.3 ft) tall and was supported by a pair of 10x10 cm (4x4 in) non-breakaway hardwood posts, as well as a 2.0 m (6.7 ft) tall red octagonal STOP sign with additional No Left Turns sign. There was also a large gas station sign, supported by two 50 cm (19.7 in) diameter, non-breakaway steel I-beam posts that were covered with a stainless-steel casement. The northernmost post was the focal point of impact and final rest location for the Honda. A crash diagram is included at the end of this report.

Figure 2. North-facing view of the physical environment at the crash site

Pre-Crash

Prior to the crash, the Honda approached the multi-lane roadway from a driveway on the south side of the roadway. It was driven by the 86-year-old male, who was restrained by the 3-point lap and shoulder seat belt with the shoulder portion routed beneath his left arm and across his chest. The driver's restraint usage was determined by the evidence documented during the SCI vehicle inspection and a review of the driver's injuries as documented by his medical records. Despite posted signage that prohibited left turns from the driveway, the driver positioned the Honda at the mouth of the driveway with the intention of exiting the commercial driveway and turning left. He waited for traffic on the multi-lane roadway to clear, then depressed the accelerator pedal of the Honda, and directed the vehicle across the eastbound travel lanes of the multi-lane roadway. After the Honda crossed over the center of the multi-lane roadway, it proceeded on an errant trajectory to the northwest.

Due to its age, the Honda was not supported by the Bosch CDR tool. Although a manufacturer representative used a proprietary tool to image EDR data from the vehicle's ACM, it did not contain any pre-crash data samples or parameters. Therefore, specifics concerning the driver's application status and magnitude of depression for either the accelerator pedal and/or brake pedal remain unknown. Steering input by the driver, if any, is also unknown.

The SCI vehicle inspection found no evidence of interference of any object with either foot pedal, and both operated smoothly and without malfunction at the time of inspection (see Driver Foot Controls and Reported Unintentional Acceleration Discussion). As the vehicle continued forward, the driver was unable to react to the unexpected acceleration of the vehicle or provide corrective action after the errant trajectory was initiated. The Honda continued to the northwest and approached the roadside in a tracking attitude. Based on a preponderance of the evidence gathered during the on-site inspection and documentation of the crash circumstances, the SCI investigator concluded that the Honda driver experienced a misapplication of the accelerator pedal.

Crash

The first and second crash events occurred nearly simultaneously as the Honda's left front and right front tires struck and overrode the west curb return of the north intersecting commercial driveway (Events 1 and 2). The location of the impacts and their low severity likely were of insufficient magnitude to induce injury to the Honda's driver or result in supplemental restraint system actuation/deployment. However, the first impact likely contributed to the air-out of the left front tire, and both impacts were evidenced by marks on the concrete curb's surface. The Honda continued along its errant trajectory and struck the small commercial sign (Event 3). The sign itself engaged the left bumper corner, while the northernmost non-breakaway post engaged the bumper beam. This sheared the post and deflected the sign westward. The right front corner aspect of the Honda then struck the STOP sign (Event 4).

Figure 3. Northwest-facing view of the points of impact by the Honda at the crash site

Impact forces sheared the sign's metallic non-breakaway post at ground level and displaced it toward the northwest. Neither of the impacts (Event 3 nor Event 4) produced significant damage to the vehicle, and they likely were of insufficient magnitude to induce occupant injury. Figure 3 shows a northwest-facing view of the curb return, small commercial sign, and STOP sign at the time of the SCI inspection, following replacement of the struck signs. In the image, yellow marking cones highlight the Honda's left side tire marks, while blue marking cones highlight the right side tire marks. The Honda continued on an errant trajectory through the grass swale with a northwest heading. It ultimately struck the large-diameter, non-breakaway post (Event 5). Associated crash forces induced moderate front plane deformation to the Honda and were the likely source of deployment for the Honda's inflatable supplemental restraint systems. The vehicle rotated approximately 10 degrees counterclockwise and came to final rest against the post.

Post-Crash

The local emergency response system received communications reporting the crash and dispatched firefighting, emergency medical, and law enforcement personnel to the scene. The first arriving law enforcement officer found the driver in the vehicle. Law enforcement documentation of the crash in the PCR indicated that the driver stated to the investigating officer that he had "attempted to accelerate from a stop and make a left turn … as he accelerated, the accelerator pedal got stuck and he accelerated across [the roadway]." The driver complained of pain to his chest and was assisted from the vehicle by emergency medical personnel. He was then transported by ambulance to a local hospital for evaluation and treatment of his injuries.

Following the driver's transport from the scene, the Honda and crash site were documented by the investigating officer. The Honda was recovered from the scene and towed to a local yard before being transferred to a vehicle salvage facility. As a result of the law enforcement investigation, the driver was issued a summons for careless driving under New Jersey's vehicle and traffic law and was issued a driver retest form. The driver was later transferred from the local hospital to a regional trauma center with a higher level of care. During his course of treatment, the driver died 6 days later as a result of medical issues unrelated to the crash or his crash injuries.

2006 Honda Civic

Description

The 2006 Honda Civic (Figure 4) was identified by the VIN 1HGFA16826Lxxxxxx. It was manufactured in March 2006. The electronic odometer reading could not be obtained during the SCI vehicle inspection due to inoperability of the instrument cluster display. The front-wheel drive Honda had a 270 cm (106.3 in) wheelbase and powered by a 1.8-liter, inline, 4-cylinder gasoline engine. It had a center-console-mounted shifter for its 5-speed automatic transmission. The vehicle's gross vehicle weight rating was 1,695 kg (3,737 lb), with front and rear gross axle weight ratings of 895 kg (1,973 lb) and 800 kg (1,764 lb). The vehicle manufacturer's recommended tire size and pressure were P205/55R16 at 221 kPa (32 PSI) for all four axle positions. The tires were of the recommended size, with specific tire data at the time of the SCI inspection that included the following.

Figure 4. Left front oblique view of the 2006 Honda Civic EX at the time of the SCI vehicle inspection

Position	Make/Model	Tire Identification Number (TIN)	Tread Depth	Damage	Restricted
LF	Goodyear Eagle RS-A	M6T2 011R 4610	6 mm (8/32 in)	Cut in sidewall	No
LR	Bridgestone Turanza	0BT2 PM2 0706	2 mm (2/32 in)	None	No
RR	Bridgestone Turanza	0BT2 PM2 0706	2 mm (2/32 in)	None	No
RF	Goodyear Eagle RS-A	4BT2 TPHR 4506	6 mm (8/32 in)	None	No

The Honda's interior had the EX trim package, with seating for up to five occupants. The driver and front right seats were cloth-surfaced, forward-facing bucket seats with adjustable head restraints. The driver's seat featured manual seat track and seatback recline adjustments. The second row had a three-passenger bench seat. All seat positions in the Honda had 3-point lap and shoulder seat belts for manual restraint, as described in the Manual Restraint Systems section of this report. The vehicle was also equipped with supplemental restraint systems, which are described in detail in the Supplemental Restraint Systems section.

Vehicle History

According to a commercially available vehicle history report, the Honda driver was the sole owner in its titled history. The vehicle was first registered and titled in New Jersey in April 2006. There were no crashes or damage reports other than the crash under investigation. Routine service and maintenance were the only historical records.

Exterior Damage

Overlapping damage caused by the crash sequence was located on the front plane of the Honda. There did not appear to be any visible damage to the vehicle from the curb impacts (Events 1 and 2), based on a visual inspection beneath the vehicle. However, the SCI investigator had no means to lift the vehicle to perform a thorough inspection of the undercarriage and confirm a complete lack of damage. Directions of force from the curb impacts were within the 12 o'clock sector, and the corresponding collision deformation classifications assigned to the Honda were 12FLWN3 and 12FRWN3. No delta V calculations could be computed due to the lack of residual deformation/damage.

Damage from the third and fourth impact events with the small commercial sign and STOP sign were overlapped by the subsequent fifth event impact with the large-diameter, non-breakaway post. Furthermore, the front bumper fascia of the Honda was completely separated and not with the vehicle at the time of inspection. This further hindered SCI's identification of the direct contact damage patterns. However, based on the width of the Honda and the location of its tire marks at the crash site, the SCI investigator was able to determine that the impact with the small commercial sign (Event 3) occurred at the left front corner of the Honda, while the impact with the STOP sign (Event 4) occurred at the right front corner. Neither of these impacts were of sufficient magnitude to produce significant discernable deformation patterns to the vehicle's underlying frontal components. The CDCs assigned to the Honda for Event 3 and Event 4 were 12FLEN1 and 12FREN1, respectively. No delta V calculations could be computed due to the lack of residual deformation/damage.

Figure 5. Overhead view of the damage profile to the Honda's front plane associative to the Event 5 impact

The final impact (Event 5) with the large-diameter pole was the most severe event in the crash sequence, and likely was the only event associated with supplemental restraint system actuation/deployment commands. Direct contact damage began 6 cm (2.4 in) right of center on the Honda's hood and extended to the left front corner. The approximate horizontal width of the direct contact damage profile (Figure 5) measured 35 cm (13.8 in) and corresponded to the diameter of the non-breakaway pole. A residual crush profile was documented using a combined direct and induced damage length of 126 cm (49.6 in) across the Honda's entire deformed front bumper beam width. Resultant measurements were as follows: C1 = 17 cm (6.7 in), C2 = 47 cm (18.5 in), C3 = 35 cm (13.8 in), C4 = 21 cm (8.3 in), C5 = 12 cm (4.7 in), and C6 = 0. Maximum crush was located 25 cm (9.9 in) right of the left front bumper corner, immediately inboard of the left frame rail end. The CDC assigned to the Honda for the Event 5 impact was 12FYEN3.

A reconstruction of the impact was calculated using the barrier algorithm of the WinSMASH model for analysis purposes. The total delta V was 41 km/h (25 mph), with a longitudinal component of -41 km/h (-25 mph) and a lateral component of zero. These results appeared reasonable

Event Data Recorder

The 2006 Honda Civic was equipped with a supplemental restraint systems (SRS) control unit that monitored the diagnostic functions of the vehicle's restraint systems (air bags and seat belt pretensioners) and controlled the deployment/actuation of those devices dependent upon crash event severity. Due to its age, the Honda was not equipped with an EDR supported by a commercially available tool/software. However, at NHTSA's request the manufacturer provided a representative and the proprietary equipment to image the EDR component of the Honda's SRS control unit. This representative was present at the time of the SCI vehicle inspection, and the SCI investigator observed the representative use the proprietary equipment to image the data. Following completion of the on-site inspection, the manufacturer interpreted the data and provided a summary to NHTSA. The data interpretation, then forwarded to the SCI investigator for review, is included at the end of this report as Appendix A.

The following discussion is a summary of the data interpretation. The Honda's EDR data indicated that there were "no faults" detected in the supplemental restraint systems prior to the crash. Pre-crash data markers detected that the driver's seat belt was buckled and that the driver's seat track was in a rearward position. No occupant was detected at the front row right position. A frontal trigger was recognized. It commanded the driver's seat belt pretensioner to actuate and the driver's frontal air bag to deploy. The first-stage air bag deployment occurred 21 milliseconds after trigger recognition, while the second-stage deployment occurred at 61 milliseconds. The detected delta V was between 4.86 and 6.49 km/h (3.02 – 4.03 mph) at the time of pretensioner actuation and between 11.36 and 12.97 km/h (7.06 – 8.06 mph) at the first-stage deployment. It should be noted that these reported delta V values were at the time of the commands; the delta V was still increasing at the time of the commands, and the maximum delta V had not been achieved and was not reported. A second trigger, recognized as left lateral, resulted in the commanded deployment of the left seat-mounted air bag and the left IC air bag at 19 milliseconds after trigger recognition. No time between the frontal trigger and the lateral trigger was specified.

Based on a review of the interpreted data, it is the SCI investigator's opinion that the recorded triggers were both related to the final frontal impact with the large-diameter, non-breakaway post. The sequence of the events (frontal first, followed by lateral), and the severity of the frontal event did not appear representative of any of the other impact events. The severity of the curb impacts, small commercial sign impact, and STOP sign impact would all likely have produced minimal crash severities (delta V) of less than 8 km/h (5mph).

Deployment of supplemental restraint systems is not typically commanded in events of such low magnitude. Further, the lateral trigger detected by the Honda likely correlates to, and was evidenced by, the off-center (left-bias) of the impact on the front plane and the resulting CCW rotation during engagement.

Interior Damage

The interior of the Honda was inspected for crash-related damage and occupant contact. There was no intrusion into the occupant space of the vehicle's interior related to the events of the crash sequence. All of the Honda's doors remained closed during the crash and were operational post-crash. Although the windshield was cracked by the impact forces adjacent to the left A-pillar, the remaining glazing of the Honda was intact and undamaged.

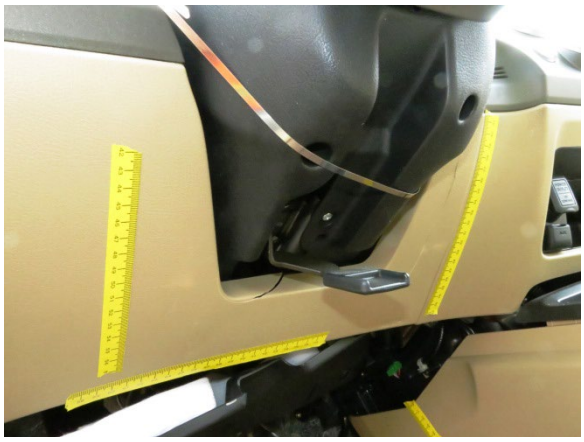


Figure 6. Driver knee contact to the left lower instrument panel in the Honda

There were two particular areas of certain occupant contact identified in the Honda, and one area of possible contact. The first certain area consisted of deformation and displacement of the left lower instrument panel/knee bolster. The polymer panel beneath the steering column was fractured and deformed forward, which was determined to have resulted from loading by the driver's knees during the Event 5 impact (Figure 6). The second area of certain contact was the deployed driver's frontal air bag, which had evidence consisting of body fluid transfer stains. This contact is described in the Supplemental Restraint Systems section.

The area of possible contact was the polymer fascia on the left aspect of the center tunnel, at the base of the center instrument stack and adjacent to the driver's foot pedals. An area of scuffing/discoloration was apparent, possibly related to contact from the driver's right foot. However, due to the proximity to the accelerator pedal and the quantity of scuffs in the above

area, it is highly probable that this was merely historical contact from routine operation and irrelevant to the driver's kinematics during the crash.

Manual Restraint Systems

The Honda had 3-point lap and shoulder seat belts for all five seat positions. Both the driver's and passenger's seat belts used continuous loop webbing with sliding latch plates and were height-adjustable at their respective B-pillar-mounted D-ring positions. They were both adjusted approximately three-quarters upward at the time of the SCI vehicle inspection. The driver's seat belt retracted onto an emergency locking retractor, while the front right seat belt used an ELR/automatic locking retractor. Both were equipped with both buckle and retractor pretensioners.

At the time of the SCI vehicle inspection, the driver's seat belt was extended from the retractor and locked. The retractor did not freely spool. Discernable loading evidence was observed on the latch plate, and both pretensioners were actuated.

Based on the condition of the driver's seat belt at the time of the SCI inspection (Figure 7), and as corroborated by the interpreted EDR data, it was certain that the system was in use by the driver at the time of the crash. Following a review of the medical record documentation concerning the driver and his injuries, the SCI investigator concluded that the seat belt was possibly routed beneath the driver's arm and across his chest at the time of the crash, rather than over his shoulder. For further discussion, see the Driver's Kinematics section of this report. The passenger's seat belt remained functional and was loosely stowed against the B-pillar; it was not in use at the time of the crash. The same was true of all three of the second row seat belts.

Figure 7. Latch plate loading evidence on the Honda's driver seat belt system

Figure 8. Deployed supplemental restraint systems in the Honda at the time of the SCI vehicle inspection

Supplemental Restraint Systems

The Honda had driver's and passenger's frontal air bags, front seat-mounted side impact air bags, and IC air bags. The frontal air bag system was a certified advanced 208-compliant system, including front seat belt buckle and retractor pretensioners, seat track position and seat belt buckle switch sensors, and a front right occupant presence detection (weight) sensor. The IC air bag system had side impact-sensing capabilities. The driver's frontal, left front seat-mounted,

and left IC air bags deployed (Figure 8) during the crash in response to the fifth and final impact (Event 5) with the large-diameter, non-breakaway pole. The driver's frontal air bag deployed from the steering wheel hub-mounted module without damage or occupant contact to the module cover flaps. In its deflated state, the air bag measured 64 cm (25.2 in) in overall diameter. There was a 17 cm (6.7 in) diameter center stitch pattern, to which internal tethers were affixed. Small 6 cm (2.4 in) diameter vents were located on the rear aspect of the driver's air bag at the 10 o'clock and 2 o'clock positions. An area of body fluid transfer indicative of possible occupant contact was located on the lower aspect of the air bag's face, right of center.

The left front seat-mounted side impact air bag deployed from the outboard aspect of the seatback. In its deflated state, the air bag measured 53 cm (20.9 in) tall by 36 cm (14.2 in) wide. There was a 5 cm (2.0 in) vent on the outboard aspect near the forward leading edge of the air bag. An oval, 12 cm (4.7 in) wide by 7 cm (2.8 in) tall no-fill portion was located at the upper aspect of the air bag. There was no discernable occupant contact visible to the driver's seat-mounted air bag.

The left IC air bag deployed downward from an accordion fold in the roof side rail at the edge of the headliner. In its deflated state, the air bag measured approximately 195 cm (76.8 in) in overall length. There was 44 cm (17.3 in) of vertical coverage at the front row position, 43 cm (16.9 in) at the B-pillar, and 39 cm (15.3 in) at the second row position. There was no discernable occupant contact or crash-related damage to the left IC air bag. At some time post-crash and for unknown reasons, an unknown individual cut the fabric of the IC air bag along the roof side rail at the front row position.

Figure 9. Brake pedal (left) and accelerator pedal (right) with the original floor mat and secondary aftermarket floor mat in the Honda at the time of the SCI vehicle inspection

Driver Foot Controls and Reported Unintentional Acceleration Discussion

The driver reported to the on-scene law enforcement officer that the Honda accelerated unintentionally, which precipitated the crash. The SCI investigator inspected the Honda's driver floor area and foot controls with the following summarized findings and observations.

The accelerator pedal was mounted to the floor on its bottom aspect, with a suspended arm attached to its upper aspect that was linked to the throttle control. Figure 9 shows the Honda's driver foot controls at the time of the SCI inspection, with the original floor mat and secondary aftermarket floor mat visible. The pedal rotated forward about the floor-mounted hinge. The trapezoidal-shaped accelerator pedal was 20 cm (7.9 in) tall, measured 4 cm (1.6 in) wide at the top, and was 6 cm (2.4 in) wide at the bottom. Clearance between the top of the accelerator pedal and the bottom of the left lower instrument panel measured 15 cm (5.9 in). In its resting, non-depressed position, a maximum of 11 cm (4.3 in) of space was present behind the pedal. Space between the pedal and the center tunnel measured 3 cm (1.2 in) at the bottom, 5 cm (2.0 in) at the center, and 2 cm (0.8 in) at the top. There was a 10 cm (4.0 in) gap between the left edge of the accelerator pedal and the right edge of the brake pedal. The brake pedal was a suspended pedal design, with a 15 cm (5.9 in) gap between the bottom aspect of the pedal and the floor below. The surface area of the brake pedal measured 13 cm (5.1 in) wide by 6 cm (2.4 in) tall.

The Honda had original carpeted floor mats, which were identical in color to the carpet and upholstery in the vehicle. The driver's floor mat had two anchors at its rear aspect. At the time of the SCI inspection, the OEM floor mat remained secured in position by these two anchors. The mat did not interfere with the pedals' operation, nor was it capable of contacting either pedal while anchored in position. A second aftermarket carpeted floor mat, put in place by the vehicle's owner, was found covering the OEM floor mat. The aftermarket floor mat was slightly pink in color in comparison to the OEM floor mats and remaining OEM interior carpeting/upholstery. The aftermarket floor mat did not have anchors but had a rubber-type tread pattern on its underside to aid in holding the mat in position. At the time of the SCI inspection, this aftermarket mat was slightly angled with respect to the orientation of the OEM floor mat beneath it. The aftermarket floor mat as positioned did not interfere with the pedals' operation, nor did it restrict the restitution of the pedals to their respective original positions following their operation. Even if fully depressed, the brake pedal did not interact with either floor mat. Similarly, the positioning of the floor mats did not interfere with the operation of the accelerator pedal, and it was able to freely return to position if applied pressure was released. Figure 10 shows the floor area of the Honda at the time of the SCI vehicle inspection. Figure 11 shows the OEM and aftermarket floor mats, and their dimensional characteristics.

Figure 10. Aftermarket floor mat in the Honda, positioned undisturbed at the onset of the SCI vehicle inspection

Figure 11. View of the driver's floor mats found in the Honda at the time of the SCI vehicle inspection

The evidence gathered during this investigation led the SCI investigator to conclude that there was no evidence to support mechanical malfunction of the vehicle's foot controls. There also was no impingement of the floor mats with the vehicle's pedals, nor were there any objects present, foreign or other, to have interfered with the pedals' operation. It is the opinion of the SCI investigator that the driver experienced a misapplication of the pedals and continued to depress the accelerator pedal. Due to human reaction timing, when the driver did recognize that the vehicle was unexpectedly accelerating and on an errant trajectory, the crash sequence had already begun. These circumstances likely led the driver to believe that the vehicle had accelerated unintentionally, which precipitated in his report of a possible mechanical defect. The SCI investigator was unable to identify any evidence or circumstance to support the driver's allegation.

2006 Honda Civic Occupant

Driver Demographics

Age/sex:	86 years/male
Height:	165 cm (65 in)
Weight:	70 kg (154 lb)
Eyewear:	Unknown
Seat type:	Forward-facing bucket seat with adjustable head restraint
Seat track position:	Unknown
Manual restraint usage:	3-point lap and shoulder seat belt; shoulder portion possibly routed beneath the left arm and across the chest
Usage source:	Vehicle inspection, injury data, proprietary EDR data
Air bags:	Driver's frontal, seat-mounted side-impact, and IC air bags available; all deployed
Alcohol/drug data:	None
Egress from vehicle:	None
Transport from scene:	EMS to hospital; transferred to a Level 2 trauma center
Type of medical treatment:	Admitted; expired after 6 days

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Fracture of 1st left rib, comminuted fractures of left 2nd and 3rd ribs	450203.3	Seat belt system	Certain
2	Non-displaced fracture of right mastoid	150200.3	Injured, unknown source	Unknown
3	Hemomediastinum	442208.2	Tandem - Seat belt system and driver's frontal air bag	Certain
4	Right pneumothorax (30%)	442202.2	Tandem - Seat belt system and driver's frontal air bag	Certain
5	Left pneumothorax (30%)	442202.2	Tandem - Seat belt system and driver's frontal air bag	Certain
6	Minimal pneumomediastinum	442209.2	Tandem - Seat belt system and driver's frontal air bag	Certain
7	Slightly depressed sternal fracture with retrosternal hemorrhage	450804.2	Tandem - Seat belt system and driver's frontal air bag	Certain
8	Left C7 transverse process fracture extending through the C7-T1 uncovertebral joint	650220.1	Seat belt system	Probable
9	Subdural collection along inner table of frontal region	110402.1	Driver's frontal air bag	Probable
10	Extensive subcutaneous and soft tissue edema, hematoma of the neck	310402.1	Driver's frontal air bag	Probable
11	Extensive subcutaneous and soft tissue edema, hematoma of the chest	410402.1	Seat belt system	Certain

Source: initial hospital and subsequent trauma center records.

Driver Kinematics

The 86-year-old male was in the Honda's driver seat. Although the driver's seat was adjusted to its rearmost position at the time of the SCI inspection, such positioning is unlikely based on the driver's documented height. It is likely that the seat was adjusted during its post-crash movement through the recovery/salvage process. Regardless of the seat position, the driver used the available 3-point lap and shoulder seat belt for manual restraint, with the D-ring adjusted to a three-quarter height position. Injuries sustained by the driver, including the 1st left rib fracture, comminuted left 2nd and 3rd rib fractures, sternum fracture, bilateral pneumothoraxes, hemomediastinum, and pneumomediastinum, indicate that the shoulder portion of the driver's seat belt system was possibly routed beneath the driver's arm, rather than over his shoulder. The SCI investigator noted that no injury to the left clavicle was documented. The driver's use of the manual restraint system was confirmed through an inspection of the post-crash condition of the seat belt, a review and analysis of the driver's medical record data, and a review of the interpretation of the data imaged from the Honda.

Specific activities of the driver prior to the crash and the duration of his travel remain unknown. Regardless, the driver operated the Honda to the mouth of the commercial driveway and intended on executing a left turn across the multi-lane roadway. As the driver began to accelerate the vehicle into the roadway, he remained in position, with his hands on the steering wheel of the Honda. The driver initiated a rearward trajectory into the driver's seat in response to the acceleration of the Honda that resulted from the driver's likely misapplication of the foot pedals. The surprised driver likely increased his grip strength on the steering wheel and held firmly as he attempted to understand the unfolding events. At impact with the curbs, a small commercial sign, and a STOP sign, the driver remained in the driver's seat position. These closely spaced events were likely of insufficient magnitude to elicit a kinematic response from the driver or induce occupant injury.

The driver remained restrained, with the shoulder portion of the webbing routed beneath his left arm and with his hands on the steering wheel, as the Honda traversed across the grass swale. At impact with the large-diameter, non-breakaway post, the driver initiated a forward trajectory.

The seat belt pretensioner systems actuated and the air bags deployed while the driver maintained his forward displacement. His chest loaded the incorrectly routed shoulder portion of the seat belt system, resulting in the chest injuries. The driver's head loaded the deployed driver's frontal air bag, which induced head and neck injuries. Following his forward kinematic response to the frontal impact force and engagement, the driver rebounded against the driver's seat as the Honda rotated slightly CCW and came to final rest. At some point during the crash, the driver sustained a right mastoid fracture.

Following the crash, the driver was assisted from the vehicle by on-scene emergency services personnel and transported by ambulance to a local hospital for evaluation and care.

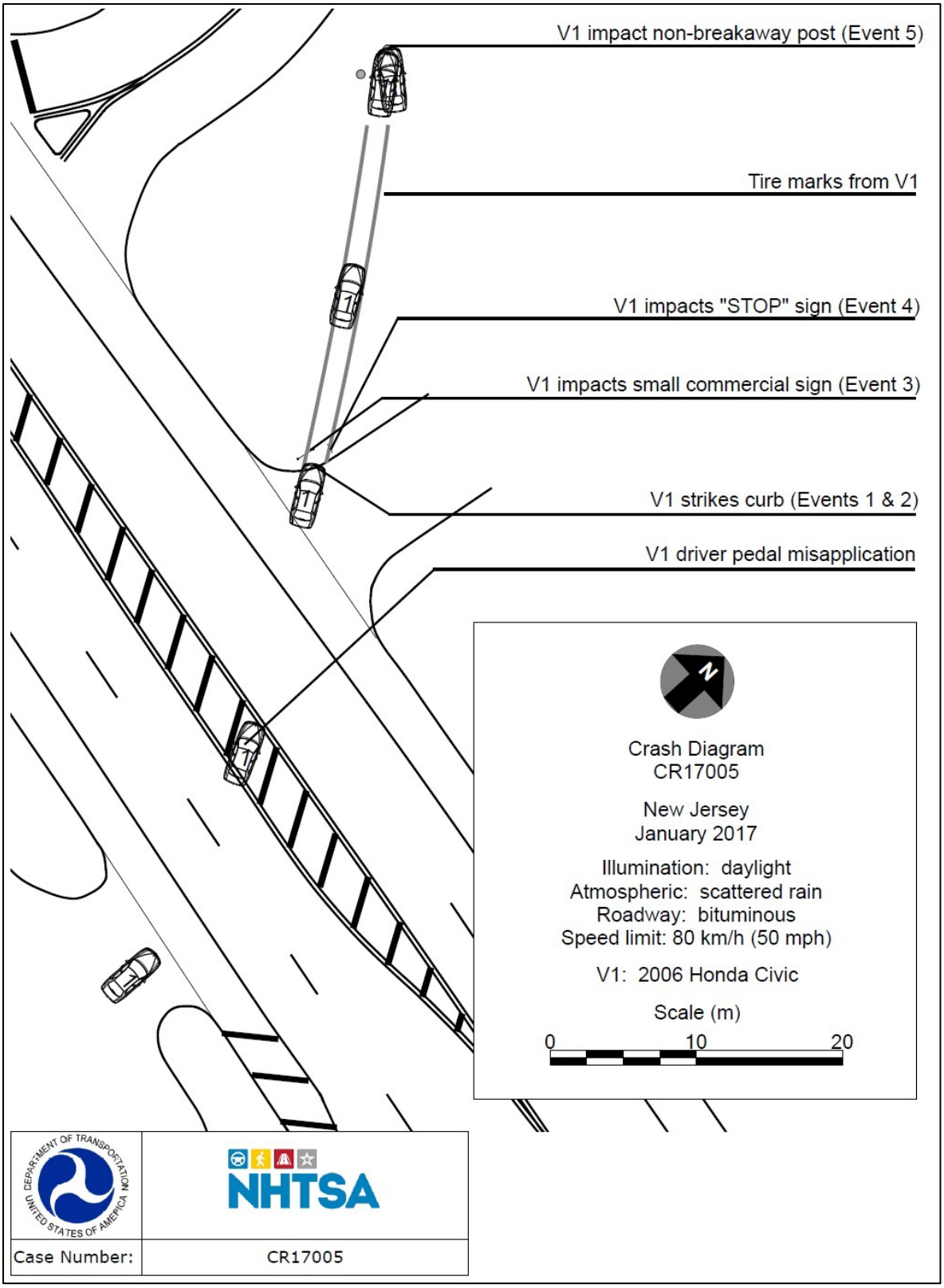
Documentation in the driver's medical records indicated that the driver was confused by the circumstances of the crash and stated to medical professionals that his foot had hit the accelerator pedal when the Honda was struck by another vehicle (*there were no other vehicles involved in this crash*). Regardless, within hours of the crash, the driver was in the process of being

discharged. However, a review of his second radiological exams revealed a small pneumothorax related to the crash, and he was recalled into the emergency department.

The driver's condition was monitored, and it continued to deteriorate. Bilateral pneumothoraxes developed, which ultimately led to the placement of bilateral chest tubes. As his condition worsened, the local hospital transferred the driver to a regional trauma center for an increased level of care. Once at the trauma center, the driver developed respiratory failure and atrial fibrillation. He was admitted into the intensive care unit (ICU) on the same day as the crash.

The driver's condition rapidly improved, and he was downgraded from the ICU to a floor bed. Radiology confirmed that the pneumothoraxes had resolved. On the day following the crash, he was fully alert, oriented, and ambulatory. Other medical issues not related to the crash or his crash injuries followed, and he expired 6 days after the crash.

Crash Diagram



Appendix A: Manufacturer's Interpretation of the 2006 Honda Civic EDR Data

NHTSA VOQ - xxxxxxxx
2006 Honda Civic
VIN: 1HGFA16826Lxxxxxx

Pursuant to NHTSA request, Honda interpreted certain data from the subject **SRS Control Unit** that was downloaded on April xx, 2017. That (EDR) data provided the following information:

1. No faults were detected in the air bag system prior to or at the time of the collision.

2. Power to the SRS Control Unit has been cycled 1 time since the collision (2 times including the collision).

3. The driver's seat belt was detected to be buckled at the time of the collision.

4. The driver's seat position was detected to be in the far position (at least approximately 25mm or more rearward of the full forward position).

5. The front passenger belt was detected as unbuckled at the time of the collision and the front passenger's seat belt pretensioner was disabled.

6. The front passenger seat was detected as being unoccupied and the passenger front and side torso air bags were disabled.

7. The air bag system detected a frontal deceleration of sufficient severity to deploy the driver's seat belt pretensioner at low threshold and the driver's front air bag at high threshold in staged inflation mode.

8. The time from frontal g-trigger ON to left side front crash sensor ON was -28 msec (the safing occurred 28 msec prior to g-trigger).

9. The time from frontal g-trigger ON to right side front crash sensor ON was -28 msec (the safing occurred 28 msec prior to g-trigger).

10. The time from frontal g-trigger ON to time of driver's seat belt pretensioner deploy command was 0 msec (the g-trigger and deploy command were simultaneous).

11. The time from frontal g-trigger ON to time of driver's front air bag 1st stage deploy command was 21 msec.

12. The time between the deploy commands for the 1st stage and 2nd stage of the driver's front air bag was 40 msec.

13. The delta V at time of driver's seat belt pretensioner deploy command was between 3.02 and 4.03 mph.

14. The delta V at time of driver's front air bag 1st stage deploy command was between 7.06 and 8.06 mph.

15. The calculated delta V from frontal g-trigger ON to T(end) or 250 msec later, whichever occurred first, was 1.59 mph.

16. The side collision air bag system detected a lateral deceleration of sufficient severity from left to right to command deployment of the driver's seat belt pretensioner, the left side torso air bag, and the left side curtain air bag.

17. The time from left side g-trigger ON to side deployment command was 19 msec.

18. The values from the left side side impact sensor (SIS), located near the base of the B-pillar, were sufficient that the system commanded deployment of the left side devices.

19. The driver's seatbelt pretensioner was commanded to deploy by the front collision prior to being commanded to deploy by the side collision.

Recorded delta V data may not represent actual delta V(s).

Please note event data should be considered in conjunction with other available physical evidence from the vehicle and scene.

DOT HS 813 272
March 2022

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

15491-030322-v2