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**Special Crash Investigations
On-Site Alleged Air Bag Inflator
Rupture Crash Investigation
Vehicle: 2007 Honda CR-V
Location: Texas
Crash Date: October 2017**

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16. Abstract This report documents the on-site investigation of the alleged rupture of the driver's air bag inflator in a 2007 Honda CR-V sport utility vehicle (SUV). The Honda was involved in a distributed front plane impact with the rear plane of a 1994 Mack single-unit straight truck on a limited-access roadway. During the crash, the Honda's driver's frontal and right Inflatable curtain (IC) air bags deployed. The crash resulted in fatal injuries to the Honda's 41-year-old male driver. Law enforcement documentation of the crash indicated that the driver was not restrained by the available 3-point lap and shoulder seat belt system. The investigating law enforcement agency observed that the fabric of the driver's air bag was torn, and alleged that the driver's air bag inflator may have ruptured. Through the course of this SCI investigation, it was determined that the unbelted driver produced significant distributed loading to the deployed driver's air bag that increased the pressure in the inflated bag beyond the fabric's tolerance. This caused the fabric of the air bag to burst along the right circumference of the steering wheel rim. The air bag's inflator operated as designed, without rupture or evidence of malfunction.			
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**SPECIAL CRASH INVESTIGATIONS
ON-SITE ALLEGED AIR BAG INFLATOR RUPTURE
CRASH INVESTIGATION
CASE NUMBER: CR17031
VEHICLE: 2007 HONDA CR-V
LOCATION: TEXAS
CRASH DATE: OCTOBER 2017**

BACKGROUND

This report documents the on-site investigation of the alleged rupture of the driver's air bag inflator in a 2007 Honda CR-V sport utility vehicle (SUV) (**Figure 1**). The Honda was involved in a distributed front plane impact with the rear plane of a 1994 Mack single-unit straight truck on a limited-access roadway. During the crash, the Honda's driver's frontal and right inflatable curtain (IC) air bags deployed. The crash resulted in fatal injuries to the Honda's 41-year-old male driver. Law enforcement documentation of the crash indicated that the driver was not restrained by the available 3-point lap and shoulder seat belt system. The investigating law enforcement agency observed that the fabric of the driver's air bag was torn, and alleged that the driver's air bag inflator may have ruptured. Through the course of this SCI investigation, it was determined that the unbelted driver produced significant distributed loading to the deployed driver's air bag which increased the pressure in the inflated bag beyond the fabric's tolerance. This caused the fabric of the air bag to burst along the right circumference of the steering wheel rim. The air bag's inflator operated as designed, without rupture or evidence of malfunction.



Figure 1. Right front oblique view of the Honda at the time of the SCI vehicle inspection.

The crash was reported by the law enforcement agency and notification was forwarded to the Special Crash Investigations (SCI) team at Crash Research & Analysis, Inc., in October of 2017. The SCI investigator contacted the law enforcement agency and established cooperation to inspect the vehicle. The on-site investigation took place in November of 2017, and the vehicle inspection was attended by a representative from the manufacturer of the Honda. The vehicle was not supported by the Bosch Crash Data Retrieval (CDR) tool/software; no event data recorder (EDR) data could be imaged from the Honda by the SCI investigator. Further, the Honda representative did not have owner permission to image data from the vehicle. An inspection of the Mack truck was conducted, and the crash site was documented. On-scene images were obtained from the investigating law enforcement agency.

SUMMARY

Crash Site

The crash occurred on an east/west limited access roadway during dark early morning hours in October 2017. According to documentation in the police crash report (PAR), the environmental conditions at the time of the crash included clear skies with dry roadway surfaces. There was no artificial lighting in the vicinity of the crash.

The east/west roadway was divided by a center median strip with a concrete, Jersey-type barrier. The eastbound portion consisted of four travel lanes and a right shoulder, each approximately 3.5 m (11.5 ft) wide. Delineation included a single solid-yellow line on the median side, a single solid-white line adjacent to the shoulder, and broken white lane lines. In the area of the crash, the roadway progressed up a slight grade (less than 2%) to an overpass above a local street. The roadway surface was asphalt, while the overpass was concrete. Speed was regulated by a posted limit of 113 km/h (70 mph). **Figure 2** provides an east-facing view for the Honda's approach. A crash diagram is included at the end of this report.



Figure 2. East-facing view of the roadway for the Honda's pre-crash travel trajectory.

Pre-Crash

The 41-year-old male driver occupied the Honda alone. He operated the vehicle eastbound on the limited access roadway in the right center travel lane. The Honda was towing a 2000 Stoughton single-axle utility trailer. Cargo on the trailer consisted of only a few hoses that were secured with ratchet straps. Simultaneous to the Honda's travel, the Mack traveled east in the same travel lane. It was traveling at slower speeds ahead of the Honda as it progressed up the slight inline toward the overpass. The Honda rapidly approached the Mack. There was no evidence of avoidance action by either driver prior to the crash.

Crash

The front plane of the Honda struck the back plane of the Mack in an inline, front-to-rear configuration (Event #1). Directions of force were in the 12 o'clock sector for the Honda and the 6 o'clock sector for the Mack. The vehicles experienced prolonged engagement and maintained an eastbound trajectory while the Mack's driver applied the truck's brakes.

Following impact with the Mack, the Honda experienced intra-unit contact damage as the utility trailer pitched forward and upward, then contacted the back plane of the Honda with the tongue. This fractured the jack of the tongue of the trailer and deformed the Honda's tailgate. However, this contact and resulting damage is not considered as a crash event due to its intra-unit nature.

Due to the braking input by the Mack's driver, the Mack came to a controlled stop in its original travel lane on top of the overpass. The Honda remained engaged against the Mack, with its front plane under-riding the Mack's back plane. The respective vehicles' final rest positions were documented by the investigating law enforcement agency (**Figure 3**).

Post-Crash

Local fire department, emergency medical services (EMS), and law enforcement personnel were dispatched to the crash scene. Upon the arrival of emergency response personnel, the male driver of the Honda was observed to be unresponsive, with severe head and facial injuries bleeding profusely. He was pronounced deceased at the crash site by EMS personnel, and did not receive any medical treatment or care. His body was removed from the vehicle by a medical examiner for autopsy. The 28-year-old male driver of the Mack did not sustain injury in the crash. The Mack, Honda, and utility trailer were all recovered from the crash site and towed to a local yard, where they were held on impound by the investigating law enforcement agency.

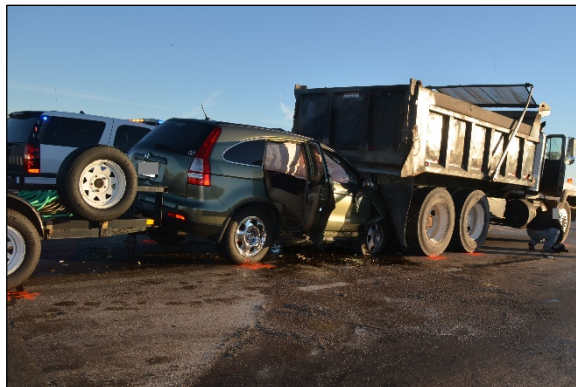


Figure 3. View of the Honda and Mack at final rest (on-scene image provided by the law enforcement agency).

2007 HONDA CR-V

Description

The 2007 Honda CR-V (**Figure 4**) was manufactured in Japan in November 2006 and was identified by the Vehicle Identification Number (VIN): JHLRE38317Cxxxxxx. The Honda was a 4-door SUV equipped with the LX-level trim package. It was built on a 262 cm (103.1 in) wheelbase and had a gross vehicle weight rating (GVWR) of 2,070 kg (4,560 lb). Front and rear axle ratings were 1,050 kg (2,310 lb) and 1,040 kg (2,290 lb), respectively. The Honda's curb weight was 1,544 kg (3,404 lb). Its powertrain consisted of a 2.4 liter, inline 4-cylinder, gasoline engine linked to an automatic transmission with front-wheel drive.



Figure 4. Front left oblique view of the 2007 Honda CR-V at the time of the SCI vehicle inspection.

The vehicle manufacturer's recommended tire size and cold tire pressure for all four axle positions were P225/65R17 at 210 kPa (30 PSI). All four equipped tires at the time of the SCI inspection were Michelin Defender tires of the recommended size, with matching Tire Identification Numbers: B93T 04JX. The tires all had ample tread of 7 mm (9/32 in) or more. The right front tire was engaged against the wheel well (restricted) and had deflated; all other tires were unrestricted and remained inflated.

The interior of the Honda was configured for the seating of up to five occupants (2/3). The front row consisted of leather-surfaced, forward-facing bucket seats with adjustable head restraints. At the time of the SCI inspection, the driver's seat was adjusted to a track position between middle and rear, with the seatback slightly reclined and the adjustable head restraint 4 cm (1.6 in) upward. The Honda's second row consisted of a non-adjustable bench seat. Manual safety features included 3-point lap and shoulder seat belts for all five seat positions. The front seat belts were equipped with retractor pretensioners. The Honda was further equipped with supplemental restraint systems that consisted of frontal air bags for both the driver and front right passenger positions, as well as dual-sensing (side impact and rollover) IC air bags.

Exterior Damage

Damage to the exterior of the Honda was located on the front plane and back plane, associative to the two impact events of the crash. Front plane damage was related to the underride of the Mack truck's back plane, while back plane damage was related to the intra-unit contact with the small utility trailer.

In the front plane damage pattern was moderate deformation and crush to frontal components. The bumper fascia, grille, and both headlight assemblies were fractured. The bumper fascia was completely separated from the Honda and no longer with the vehicle. The bumper beam, radiator support, hood, and frontal components were crushed rearward, with deflection of the forward aspect of the left front/right front fenders.

Direct contact damage associative to the front crash event spanned the entire width of the front plane. A residual crush profile was documented, with measurements taken to the leading edge of the deformed hood/upper radiator support and deformed bumper beam. The width of the direct and induced damage (Field-L) for the crush profile measured 105 cm (41.3 in). The averaged crush profile produced the following resultant measurements: C1 = 36 cm (14.2 in), C2 = 42 cm (16.5 in), C3 = 41 cm (16.1 in), C4 = 41 cm (16.1 in), C5 = 34 cm (13.4 in), and C6 = 35 cm (13.8 in). **Figure 5** depicts the front plane damage pattern, while **Figure 6** depicts the damage profile from an overhead perspective.



Figure 5. Frontal damage pattern and deformation to the 2007 Honda CR-V.

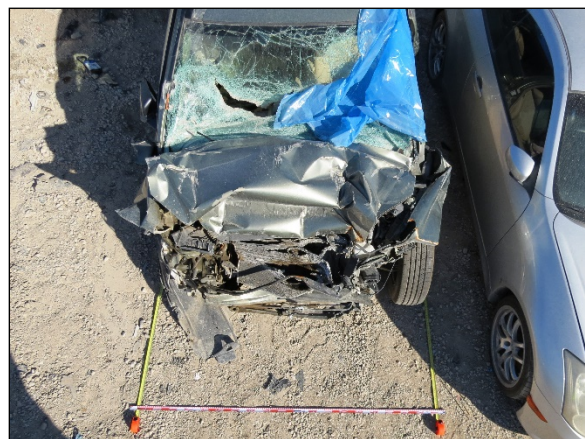


Figure 6. Overhead view of the frontal damage profile to the 2007 Honda CR-V.

Although the maximum crush in the profile observed at the center of the damage profile (C3/C4 locations) measured 48 cm (18.9 in), there was direct contact observed to both A-pillars from contact with the bottom of the Mack's dump body. A fracture pattern across the width of the windshield evidenced engagement of the glazing with the back plane of the Mack. Therefore, based on the observed visible damage to the Honda, the Collision Deformation Classification (CDC) assigned for the Event 1 impact with the Mack was 12FDAW6.

The barrier algorithm of the WinSMASH model was used to calculate the delta-V of the impact for the Honda. The total calculated delta-V was 52 km/h (32 mph). The longitudinal component of the calculated delta-V was -52 km/h (-32 mph), with a lateral component of 0 km/h (0 mph). Based on SCI expertise, these results fit the collision model but appeared underestimated, likely due to the underride characteristics of the crash.

Intra-unit damage sustained by the Honda resulted from the forward vertical pitch of the small utility trailer during the frontal impact with the Mack, and consisted of minor deformation to the center aspect of the tailgate (**Figure 7**). The damage was attributed to contact with the trailer jack and tongue. Due to the nature of the damage and its minor severity, no residual crush profile was documented during the SCI inspection. It should be noted that the damage and contact is not considered to be a crash event due to its intra-unit characteristics. Therefore, no CDC could be assigned to the damage pattern, and no WinSMASH calculations could be performed.



Figure 7. Back plane view of the 2007 Honda CR-V and intra-unit damage from the utility trailer.

Event Data Recorder

The 2007 Honda CR-V was equipped with an air bag control module (ACM) that commanded actuation/deployment of supplemental restraint systems (pretensioners and air bags). The ACM did not have event data recorder (EDR) capabilities supported by the Bosch CDR tool/software. Therefore, no EDR data could be imaged by the SCI investigator during the vehicle inspection. Although the Honda manufacturer's representative had the capability to image data from the Honda, a lack of permission from the vehicle's owner prevented the representative from interrogating the Honda's systems. No EDR data from the Honda was available for this SCI investigation.

Interior Damage

The interior of the Honda was inspected for crash-related intrusion, damage, and occupant contact. The engagement of the Honda with the Mack included direct contact of the Honda's upper A-pillars and windshield glazing with the sharp bottom edge of the back plane of the Mack's dump body.

Although the dump box engaged and deformed the A-pillars, it did not penetrate the laminated windshield. Rather, it cracked and deformed the windshield in a perpendicular fashion, such that the horizontal concavity of the windshield was flattened. This likely was associated with a maximum longitudinal intrusion of the windshield and dump box of approximately 8 cm (3.0 in).

Additional longitudinal intrusions included 16 cm (6.3 in) of the left instrument panel, 14 cm (5.5 in) of the center instrument panel, 12 cm (4.7 in) of the right instrument panel, 5 cm (2.0 in) of the left toe pan, and 25 cm (9.8 in) of the right toe pan.

Aside from the aforementioned intrusions and pre-crash historical wear and tear to the vehicle's interior, other discernable interior crash-damage was related to the deployment of the supplemental restraint systems, the burst of the driver's frontal air bag fabric, and occupant contact. Damage and occupant contact associated with the deployment and burst of the driver's air bag system are detailed in the Driver's Frontal Air Bag discussion of the Supplemental Restraint Systems section of this report.

Occupant contact identified in the Honda was attributable to the driver's forward kinematic response and displacement that resulted from his lack of manual restraint usage. This included significant deformation/collapse of the steering wheel rim from loading by the driver's chest (**Figure 8**), scuffing to the left lower instrument panel by the driver's knees, and a distinct fracture pattern to the windshield glazing from contact by the driver's head/face (**Figure 9**). The driver likely experienced induced loading and indirect contact with the Mack's dump body through the windshield glazing of the Honda during the vehicles' maximum engagement. The driver's head also contacted the visor and windshield header in the Honda.



Figure 8. Steering wheel rim/column deformation in the Honda from driver loading.



Figure 9. Contact to the windshield glazing from the Honda driver's head.

Aside from the windshield, none of the Honda's glazing sustained damage or was contacted by the occupant during the crash. Other than the aforementioned contact, the only remaining damage in the Honda associative to the crash was the approximate 15 cm (5.9 in) forward deflection of the center aspect of the second-row seatback, attributable to cargo loading during the crash.

Manual Restraint Systems

The Honda was equipped with 3-point lap and shoulder seat belt systems for all five seating positions. The front seat belt systems used continuous loop webbing with sliding latch plates and 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. All three seat belt systems in the second row used continuous loop webbing with sliding latch plates and ELR/ALR retractors.

At the time of the SCI inspection, the driver's D-ring was adjusted to its fully downward position. The webbing was locked in position as a result of pretensioner actuation and taut against the B-pillar. Based on the observations of the SCI investigator and its post-crash condition, it was apparent that the seat belt system was not in use by the driver at the time of the crash. **Figure 10** depicts the driver's 3-point lap and shoulder seat belt system at the time of the SCI inspection.



Figure 10. Driver's 3-point lap and shoulder seat belt system in the 2007 Honda CR-V.

Supplemental Restraint Systems

The Honda was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system for the driver and front right passenger positions. The CAC system incorporated front seat belt buckle switch sensors, seat track position sensors, retractor pretensioners, and a front right occupant presence (weight) sensor. The Honda was further equipped with side impact air bags mounted in the outboard aspect of both front seats, as well as dual sensing (side-impact and rollover) IC air bags mounted in the roof side rails. In this crash, only the driver's frontal and the right IC air bags deployed.

Driver's Frontal Air Bag

The driver's frontal air bag had deployed from the steering wheel hub-mounted module. There was no rupture of the inflator or other apparent malfunction of the system during deployment. The unbelted driver responded to the frontal crash forces with a forward trajectory and contacted the deployed air bag with his chest. Due to the severity of the crash and his unrestrained status, the driver experienced significant prolonged loading of the inflated air bag. The air bag became compressed between the steering wheel rim and the driver, which increased the internal pressure of the air bag. Despite its venting, the fabric of the air bag was unable to withstand the high internal pressure created by the compression of the bag by the driver during his kinematic response. This pressure exceeded the strength load of the air bag's fabric, which caused the fabric to separate and burst on its face, along the circumference of the steering wheel rim.



Figure 11. Deployed driver's frontal air bag with burst fabric, highlighted by yellow marking tape.



Figure 12. Lateral view of the Honda's air bag inflator, removed from the module during SCI documentation.

Figure 11 depicts the driver's air bag as documented by the SCI investigator. The SCI investigator and the manufacturer representative from Honda disassembled the involved air bag module for inspection. A new manufacturer replacement air bag module was provided by the Honda representative for exemplar/comparison purposes. Upon inspection, it was determined that the involved air bag module was a genuine manufacturer component. The air bag module itself was the original equipment installed in the Honda CR-V during its manufacture; however, the air bag inflator had been replaced during certified service as remedy for a manufacturer recall (see *NHTSA Recalls and Investigations*). According to the Honda representative, the modified bracket and labeling present on the involved air bag module indicated that the recall remedy had been performed in accordance with the manufacturer's specified procedure. There was no rupture of the Honda's air bag inflator (**Figure 12**).

NHTSA Recalls and Investigations

The commercially obtained vehicle history report indicated that this specific 2007 Honda CR-V had received service for two manufacturer recalls. The first recall was issued on May 24, 2016, and identified by the NHTSA Campaign 16V346000. The second was issued January 17, 2017, and identified by the NHTSA Campaign 17V030000. Respectively, they concerned the replacement of both the passenger's and driver's frontal air bag inflators due to the potential for the air bag inflators to rupture during deployment. According to the history report, the recall remedy was performed for both recalls on April 12, 2017, when the Honda's odometer reading was 290,998 km (180,818 mi). No other recalls were identified by the vehicle history report.

A Honda representative confirmed during the joint vehicle inspection that the recall service had performed in accordance with the manufacturer's specified procedure, based on his visual inspection of the driver's air bag module and disassembly in the presence of the SCI investigator. He further indicated that manufacturer records reported that the vehicle record was updated on April 13, 2017, as having received service in relation to the aforementioned recalls. It should be noted that the passenger's frontal air bag module was not inspected as part of the joint vehicle inspection, due to its lack of deployment and involvement in the crash.

A query of the 2007 Honda CR-V's VIN on www.safercar.gov, as of the date of this technical report, revealed that there were no open/active recalls concerning this specific vehicle. There were no open investigations concerning this or any other 2007 Honda CR-Vs.

2000 STOUGHTON TRAILERS UTILITY TRAILER

Description

The utility trailer was manufactured in 2000 by Stoughton Trailers, Inc., and identified by the VIN 1DW1C5323YExxxxxx. It was a single-axle trailer with a 1.5 x 2.4 m (5.0 x 8.0 ft) flatbed deck. The trailer was of steel construction. During the crash, the trailer pitched forward and was involved in intra-unit contact with the back plane of the Honda. This fractured the jack from the trailer's tongue. **Figure 13** depicts the small utility trailer at the time of the SCI inspection.



Figure 13. Front left oblique view of the 2000 Stoughton Trailers utility trailer.

2007 HONDA CR-V OCCUPANT DATA

Driver Demographics

Age/Sex:	41 years/male
Height:	170 cm (67 in)
Weight:	117 kg (258 lb)
Eyewear:	Unknown
Seat type:	Forward-facing bucket seat with adjustable head restraint
Seat track position:	Between middle and rear
Manual restraint usage:	None used; 3-point lap and shoulder seat belt available
Usage source:	Vehicle inspection
Air bags:	Frontal, seat-mounted side impact, and IC air bags available; frontal air bag deployed
Alcohol/drug involvement:	None
Egress from vehicle:	None
Transport from scene:	None
Type of medical treatment:	None; pronounced deceased at the crash site

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Transection of aorta at ligament of arteriosum	420210.5	Steering wheel/column	Certain
2	Contusion of posterior right atrium of the heart	441002.1	Steering wheel	Certain
3	Right hemothorax	442200.3	Steering wheel/column	Certain

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
4	Left hemothorax	442200.3	Steering wheel/column	Certain
5	Contusions of middle and lower lobes of right lung	441408.3	Steering wheel/column	Certain
6	Fracture of sternum at level of 2 nd intercostal spaces	450804.2	Steering wheel/column	Certain
7	Fractures of left 5th – 7th costal cartilages; Fractures of left 4th – 10th ribs, anterolaterally	450203.3	Steering wheel/column	Certain
8	Laceration of liver	541820.2	Steering wheel	Probable
9	Laceration of spleen	544220.2	Steering wheel	Probable
10	30 cm contusion to right side of abdomen	510402.1	Steering wheel rim	Certain
11	30 cm contusion to left side of abdomen	510402.1	Steering wheel rim	Certain
12	Non-displaced fracture at C6 with hemorrhage in pre-vertebral fascia	650216.2	Windshield/intruding back plane of truck	Certain
13	Non-displaced fracture at C7 with hemorrhage in pre-vertebral fascia	650216.2	Windshield/intruding back plane of truck	Certain
14	Non-displaced fracture through T2	650416.2	Windshield/intruding back plane of truck	Probable
15	Subarachnoid hemorrhage over brainstem and proximal most spinal cord	140693.2	Windshield/intruding back plane of truck	Certain
16	Right frontal subscapular hemorrhage	110402.1	Windshield/intruding back plane of truck	Certain
17	4 cm full thickness laceration to skull from right eyebrow to forehead	210604.2	Windshield/intruding back plane of truck	Certain
18	1 cm full thickness laceration into subcutaneous tissue at lateral right forehead	210602.1	Windshield/intruding back plane of truck	Certain
19	15 cm area of abrasions to right and mid-forehead	210202.1	Windshield/intruding back plane of truck	Certain
20	2 cm area of abrasions to right side of nose	210202.1	Windshield/intruding back plane of truck	Certain

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
21	Compound fracture of right femur	853001.3	Left lower instrument panel	Certain
22	2 cm and 5 cm full thickness lacerations into subcutaneous tissue of right knee	810602.1	Left lower instrument panel	Certain
23	7 cm full thickness laceration into muscle at left pretibial area	810602.1	Left lower instrument panel	Certain
24	5 cm contusion to distal right thigh	810402.1	Left lower instrument panel	Certain
25	5 cm abrasion to distal right thigh; 18 cm area of red-brown abrasions to medial right thigh	810202.1	Left lower instrument panel	Certain
26	10 cm area of contusions to right ankle	810402.1	Foot pedals/toe pan	Certain
27	10 cm area of contusions to posterior right foot	810402.1	Foot pedals/toe pan	Certain
28	10 cm area of abrasions to right ankle	810202.2	Foot pedals/toe pan	Certain
29	10 cm area of abrasions to posterior right foot	810202.1	Foot pedals/toe pan	Certain
30	12 cm area of abrasions on and below right knee	810202.1	Left lower instrument panel	Certain
31	1 cm full thickness laceration into subcutaneous tissue on medial right forearm	710602.1	Left instrument panel	Probable
32	15 cm area of abrasions to medial right forearm	710202.1	Left instrument panel	Probable
33	10 cm area of abrasions to dorsa of right hand	710202.1	Left instrument panel	Probable
34	10 cm area of abrasions to dorsa of right fingers	710202.1	Left instrument panel	Probable
35	1 cm area of abrasions on dorsa of left fingers	710202.1	Left instrument panel	Probable

Source: Medical Examiner Report (internal).

Driver Kinematics

The Honda was occupied by the 41-year-old male driver who was seated in the forward-facing bucket seat with the seat adjusted to a track position between middle and rear. The seat back was slightly reclined, and the adjustable head restraint was 4 cm (1.6 in) upward. The driver was not restrained by the available 3-point lap and shoulder seat belt system. His lack of restraint usage was determined based on the observations of the SCI investigator during the vehicle inspection and evidenced by the type and severity of the injuries he sustained in the crash. The driver operated the Honda eastbound on the limited access roadway and approached the much slower

moving Mack truck without providing any avoidance action. Due to his fatal outcome, it remains unknown if the driver was distracted prior to the crash or if he simply did not see the darkly-colored back plane of the truck in the dark, early morning conditions.

At impact with the back plane of the Mack, the driver initiated a forward trajectory. His lack of belt use subjected him to unrestricted forward movement and displacement about the Honda's interior. Although the driver's frontal air bag deployed, he experienced a significant forward trajectory in response to the severe frontal crash forces.

The driver contacted and loaded the deployed supplemental restraint system with his chest, while his extremities extended forward and contacted the left upper and lower instrument panel. As the crash forces reached their maximum, the driver's torso loaded the deployed driver's frontal air bag with such force that it compressed the air bag to the point that an over-pressurization occurred and the fabric of the air bag burst along the circumference of the steering wheel rim. The driver maintained his forward trajectory and loaded the steering wheel rim and column, collapsing the circumference of the wheel and deforming the column. This produced extensive soft tissue and internal injuries to the driver's chest and abdomen.

The sustained forward momentum of the driver caused his head to flex forward as his torso's movement was restricted by its engagement with the steering column. The driver's head contacted the windshield of the Honda, which fractured the glazing above the steering column. Simultaneously, the maximum engagement of the vehicles caused the lower edge of the Mack's dump body to engage the windshield and A-pillars of the Honda. This was in alignment with the location of the driver's head contact to the windshield, resulting in indirect contact of the driver's head with the back plane of the Mack's dump body. Massive head injuries to the driver were induced by this contact and loading.

The driver remained displaced forward from position as the vehicles came to a combined final rest, with the front plane of the Honda underridden beneath the back plane of the Mack. First arriving emergency response personnel identified that the driver of the Honda was absent of any life signs. No resuscitative efforts were initiated, and he was pronounced deceased at the crash site. A qualified medical professional removed the driver's body for the Honda and performed a post-mortem internal examination. The documentation of this exam by the medical examiner provided the basis for the injuries to the driver substantiated in this report.

1994 MACK RB600

Description

The 1994 Mack RB600 (**Figure 14**) was a single-unit straight truck identified by the VIN 1M2P264Y6RMxxxxxx. It was manufactured in April 1994 as an incomplete chassis. It was then completed in June 1994 with a steel dump body. The Mack's GVWR was placarded at 25,401 kg (56,000 lbs). A 12.0 liter, inline 6-cylinder, diesel engine powered the Mack, and was linked to a



Figure 14. Front left oblique view of the 1994 Mack RB600 at the time of the SCI vehicle inspection.

manual transmission with 6x4 rear-wheel drive. The interior of the Mack was configured for the seating of up to two occupants. Both front seats were pedestal-mounted, with seat track and seatback recline adjustments. The Mack was equipped with 3-point lap and shoulder seat belts for manual restraint. It was not equipped with any supplemental restraint systems.

Exterior Damage

There was no discernable damage to the Mack truck, despite its involvement in the crash. The steel construction of the Mack's frame and heavy-duty dump body withstood the crash forces from the Honda's impact. **Figure 15** depicts the back plane of the Mack at the time of the SCI inspection, with a calibrated measuring tape for visual reference. The CDC assigned to the Mack was 06BDWW1. No WinSMASH calculations could be computed due to the lack of damage and vehicle type, which were beyond the scope of the model's capabilities.

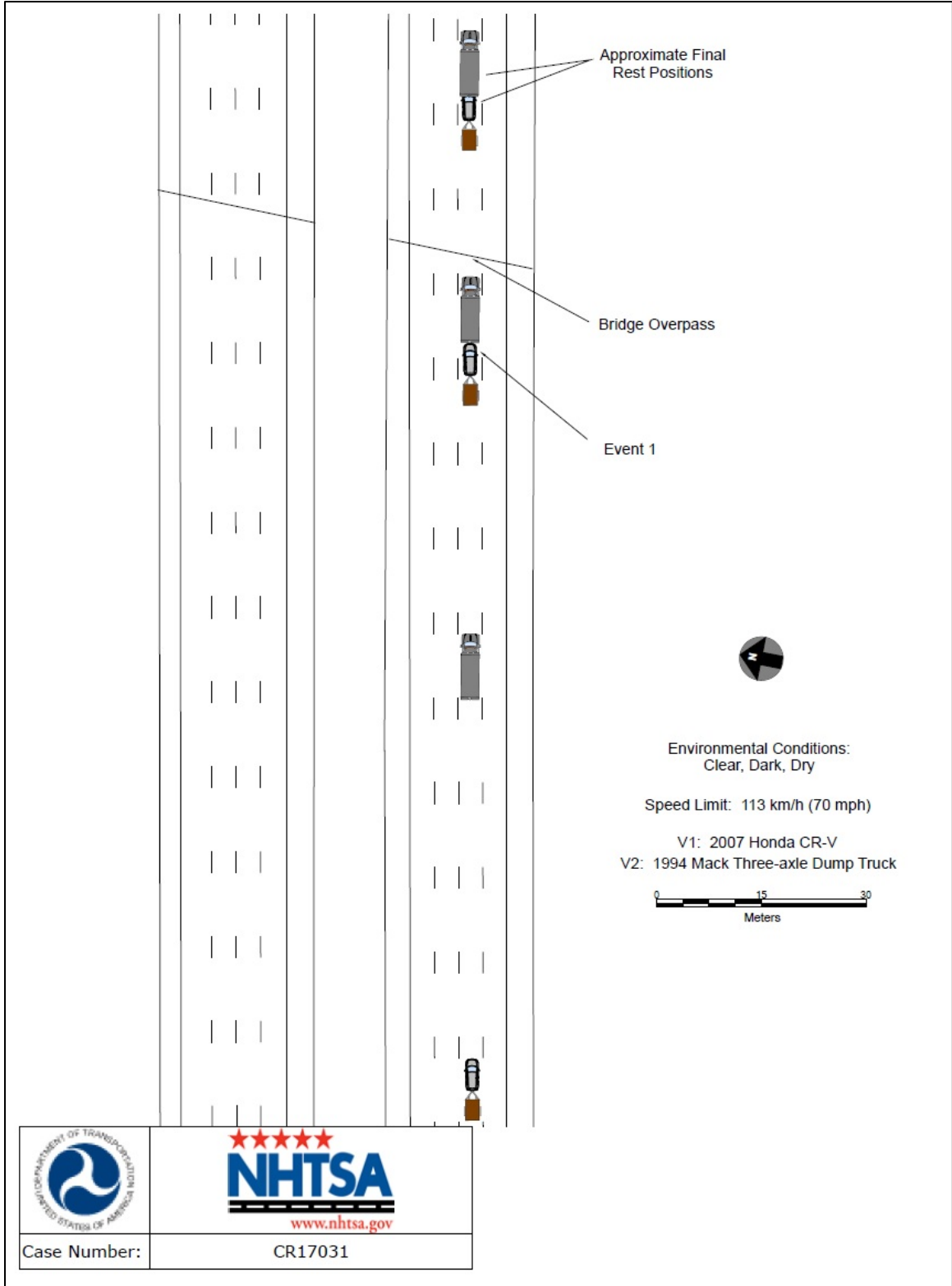
Occupant Data

The Mack was occupied by its 28-year-old male driver. According to law enforcement documentation, the driver was restrained by the truck's 3-point lap and shoulder seat belt system at the time of the crash. Following the impact, the driver of the Mack brought the truck to a controlled stop in the roadway. He exited the vehicle without assistance, denied injury, and refused medical treatment/transport.



Figure 15. Back plane view of the 1994 Mack dump truck.

CRASH DIAGRAM



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