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REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN99-030

LOCATION - PENNSYLVANIA

VEHICLE - 1998 HONDA CIVIC LX

CRASH DATE - February 1998

Submitted:

December 2, 1999

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

Technical Report Documentation Page

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15. <i>Supplementary Notes</i> Remote air bag deployment investigation involving a 1998 Honda Civic LX with manual safety belts and dual redesigned frontal air bags, and a 1989 Chrysler New Yorker					
16. <i>Abstract</i> This report covers a remote investigation of an air bag deployment crash that involved a 1998 Honda Civic LX (case vehicle) and a 1989 Chrysler New Yorker (vehicle #2). This crash is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of collision events, and the unrestrained driver (82-year-old male) was pronounced dead 146 minutes post-crash. The case vehicle was traveling south in the southbound lane of a two-lane, undivided, state roadway, approaching a right-hand curve. The case vehicle was intending to continue its southerly travel path. Vehicle #2 was traveling north in the northbound lane of the same state roadway and was approaching the same curve from the opposite direction (i.e., a left-hand curve for vehicle #2). The case vehicle drifted left of center, across the northbound lane, off the east pavement edge, and collided with vehicle #2 on the east gravel and dirt shoulder. In an attempt to avoid the collision, vehicle #2's driver had steered onto the east shoulder. The front left of the case vehicle impacted the front left of vehicle #2, causing the case vehicle's driver and front right passenger air bags to deploy. Both vehicles rotated slightly counterclockwise post-crash. The pre-crash posture, seat adjustments, or steering wheel position of the case vehicle's driver is not known. He was not wearing his available, active, three-point, lap-and-shoulder, safety belt system and sustained, according to his autopsy record, bilateral rib fractures with flail chest, a cerebral laceration, a partial transection of the thoracic aorta, a fractured pelvis with extensive perivesicular hemorrhage, a cerebral contusion, subpleural hemorrhages at the rib fractures, diffuse subarachnoid hemorrhage, a focal hemorrhage at the left cerebral hemisphere, a diffusely edematous brain, a skull fracture of the frontal bone, bilateral fractures of the maxilla, a fractured sternum, and multiple integumentary abrasions, contusions, and lacerations.					
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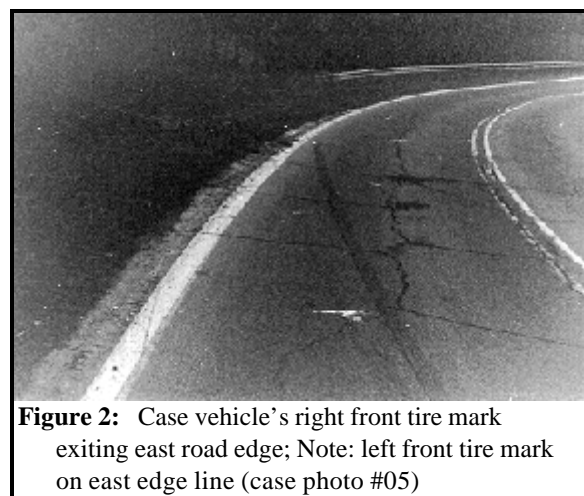
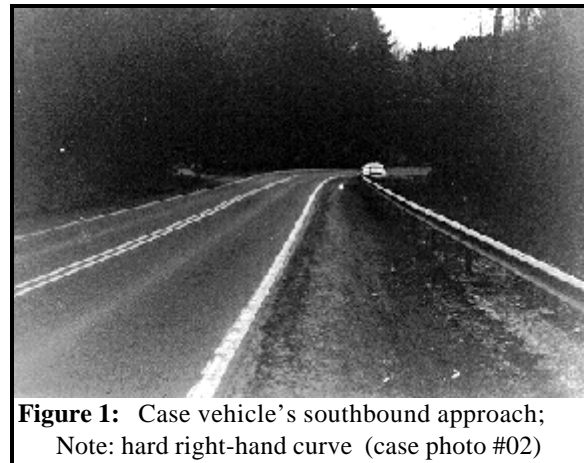
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Additional photographs are available in SCI EDCS case IN99-030

This case was brought to the NHTSA's attention by a review of the 1998 Fatality Analysis Reporting System (FARS) in February 1999. The crash involved a 1998 Honda Civic LX (case vehicle) and a 1989 Chrysler New Yorker (vehicle #2). The crash occurred in February 1998, at 8:02 p.m., in Pennsylvania, and was investigated by the applicable state police agency. This case is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of collision events and its unrestrained driver (82-year-old male) was fatally injured. The Police Crash Report was received in March 1999, police photographs and insurance company photographs in July and the autopsy report in October. This report is based on the Police Crash Report, the autopsy report, police photographs, insurance company photographs, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling south in the southbound lane of a two-lane, undivided state highway, approaching a right-hand curve (**Figure 1**), apparently intending to continue south. Vehicle #2 was traveling north in the northbound lane of the same state roadway and was approaching the same curve from the opposite direction (a left-hand curve for vehicle #2). It was dark, no lights, no adverse weather, and no reported roadway defects. The roadway was bituminous, dry, a negative grade to the south, no reported vision obstructions, with posted speed limit 72 km.p.h. (45 m.p.h.). Traffic control devices present for southbound traffic included a Turn Sign (Manual on Uniform Traffic Control Devices, W1-1R), with an attached 40 km.p.h. (25 m.p.h.) Advisory Speed Plate (MUTCD, 13-1), and a Large Arrow Sign (MUTCD, W1-6) to warn of the roadway's sharp right curve. Pavement markings consisted of a double solid yellow (no passing) centerline and single solid white edge lines on the east and west pavement edges. The case vehicle drifted across the centerline, crossed the northbound lane and departed the east pavement edge. The case vehicle driver braked, leaving a right front tire skid mark measured by the investigating officer as 29.5 meters (96.8 feet) in length (**Figure 2**). The driver of vehicle #2 swerved to his right and departed the east road edge prior to the collision.



The impact occurred on the east gravel and dirt shoulder. The front left of the case vehicle impacted the front left of vehicle #2, causing the case vehicle's driver and front right passenger supplemental restraints (air bags) to deploy. According to the Police Crash Report, both vehicles rotated slightly counterclockwise post-impact and came to rest on the east roadside.

CASE VEHICLE

The case vehicle was a front wheel drive 1998 Honda Civic LX, five-passenger, four-door sedan (VIN: 2HGEJ6675WH-----) equipped with a 1.6 liter, I-4 gasoline engine and a four-speed automatic transmission with the shift lever at an unknown location. Four-wheel anti-lock brakes were an option for this vehicle, but it is not known if the case vehicle was so equipped. The wheelbase for the case vehicle was 262 centimeters (103.2 inches). No odometer reading was reported. The case vehicle was towed from the scene due to disabling damage.

Insurance company photographs of the case vehicle are the only available views of the damage and the vehicle is covered with snow. Direct damage to the case vehicle included: the left side of the front bumper and fascia displaced rearward; the grille shattered; both headlamp assemblies missing; the front edge of the hood's left side crumpled and the rear portion tented near the cowl; the left front fender shoved rearward and outward; and the left front tire jammed against the lower A-pillar (**Figures 3 and 4**). Induced damaged included: straightening of the upper A-pillar; outward bowing of the left front door; shattering (kernelizing) of the left front door glazing; outward bowing of the left rear door; and the right front fender pulled to the left. Based on insurance company photographs, the CDC for the case vehicle was estimated as **01-FYEW-3** (principal direction of force 20 degrees). The WinSMASH reconstruction program, missing vehicle algorithm based on CDC-only estimated crush profile for the case vehicle, provides a borderline reconstruction, and the results appear reasonable. The case vehicle's estimated Total, Longitudinal, and Lateral Delta Vs are, respectively: 35.9 km.p.h. (22.3 m.p.h.); -33.7 km.p.h. (-20.9 m.p.h.); and -12.3 km.p.h. (-7.6 m.p.h.).



Figure 3: Case vehicle's front left damage; Note: front hood edge direct damage (case photo #08)



Figure 4: Case vehicle's front left damage from left oblique view; Note: induced damage to left front door (case photo #9)

Interior damage descriptions were developed from the one available insurance company photograph

(Figure 5 below). The steering wheel and column were displaced upward and to the right; the steering wheel rim was depressed below the hub, with the right side of the rim lower than the left; no visible marks or stains were visible on the driver's deployed air bag fabric; and the left front corner of the instrument panel was crimped and intruded into the greenhouse area.

CASE VEHICLE DRIVER

The case vehicle's driver [82-year-old, White (unknown if Hispanic) male, height and weight unknown] was not restrained by the available, active, three-point, lap-and-shoulder safety belt system. There were no other occupants in the case vehicle. His pre-crash seat adjustments, steering wheel position, and posture are not known. He was transported from the scene in an ambulance to a medical facility, where he was pronounced dead 146 minutes post-crash. The following discussion of the driver's injuries is based on a complete autopsy report, insurance company photographs, and occupant kinematic principles.



Figure 5: Case vehicle driver's seat area; Note: deployed air bag and damaged steering wheel rim (case photo #13)

The case vehicle's driver was probably seated in a normal driving posture with his back against the seat back, at least one hand on the steering wheel, and his feet on a foot control (likely the brake pedal) and the floor. Investigating officers and scene photographs indicate that the case vehicle's driver applied his brakes pre-crash; there was no definitive proof of any steering input. The vehicle-to-vehicle impact caused the case vehicle's driver and front right passenger air bags to deploy. The unrestrained driver moved forward and slightly to the right. He contacted his deploying air bag, causing contusions to the left orbit and left neck, plus an abrasion to the left forearm. He continued forward, deflating the air bag and impacting the steering assembly, and sustained bilateral fracture of the maxilla, bilateral fractured ribs and fractured sternum with flail chest, a partial transection of the thoracic aorta with extensive hemorrhage not confined to the mediastinum, and subpleural hemorrhage at the rib fracture sites. His lower extremities contacted the lower instrument panel and caused multiple abrasions and cuts to the left knee and lacerations to the left mid-anterior leg. As his body continued forward, he pitched upward with the steering wheel acting as a fulcrum and he sustained a fracture of the pelvis at the pubis. His head contacted the windshield/roof header resulting in a left forehead laceration, a depressed fracture of the frontal bone, a laceration of the cerebrum, a contusion of the cerebrum, diffuse subarachnoid hemorrhage, and a focal hemorrhage in the left cerebral hemisphere. The entire brain was diffusely edematous.

CASE VEHICLE DRIVER INJURIES

IN99-030

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Partial transection of the aorta near the left subclavian artery, with extensive hemorrhage not confined to the mediastinum	420218.6 untreatable	Steering wheel hub, spokes and/or rim	Probable	Autopsy
2.	Bilateral flail chest, with fractured ribs left 5-10 and right 1-7	450266.5 critical	Steering wheel hub, spokes and/or rim	Probable	Autopsy
3.	Depressed skull fracture, left frontal area	150408.4 severe	Windshield header	Possible	Autopsy
4.	Laceration of anterior cerebrum	140688.4 severe	Windshield header	Possible	Autopsy
5.	Focal hemorrhage, left cerebral hemisphere, NFS	140629.4 severe	Windshield header	Possible	Autopsy
6.	Contusion of anterior cerebrum, NFS	140602.3 serious	Windshield header	Possible	Autopsy
7.	Entire brain is diffusely edematous, NFS	140668.3 serious	Windshield header	Possible	Autopsy
8.	Diffuse subarachnoid hemorrhage	140684.3 serious	Windshield header	Possible	Autopsy
9.	Fracture of pelvis anteriorly at the pubis with internal rotation of left hip and marked perivesicular hemorrhage	852600.2 moderate	Steering wheel rim	Probable	Autopsy
10.	Extensive bilateral subpleural hemorrhage along the rib fracture sites	441800.2 moderate	Steering wheel hub, spokes and/or rim	Probable	Autopsy
11.	Fracture of sternum	450804.2 moderate	Steering wheel hub, spokes and/or rim	Probable	Autopsy
12.	Bilateral fractures, maxilla, NFS	250800.2 moderate	Steering wheel rim	Possible	Autopsy
13.	Laceration, left forehead	290602.1 minor	Windshield header	Possible	Autopsy
14.	Ecchymosis (contusion), left orbit	297402.1 minor	Windshield header	Possible	Autopsy
15.	Ecchymosis (contusion), 1 by 4 inches, left neck	390402.1 minor	Driver's air bag	Probable	Autopsy

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
16.	Abrasion, left posterior forearm	790202.1 minor	Driver's air bag	Probable	Autopsy
17.	Multiple abrasions, left knee	890202.1 minor	Left instrument panel	Probable	Autopsy
18.	Multiple lacerations, left knee and mid-anterior left leg, NFS	890600.1 minor	Left instrument panel	Probable	Autopsy

VEHICLE #2

Vehicle #2 was a front wheel drive, 1989 Chrysler New Yorker, five-passenger, four-door sedan (VIN: 1C3BC4639KD-----) equipped with a 3.0 liter, V-6 gasoline engine and a four-speed automatic transmission with the shift lever at an unknown location. Four-wheel, anti-lock brakes were an option for this vehicle, but it is not known if vehicle #2 was so equipped. The wheelbase for vehicle #2 was 260 centimeters (102.2 inches). No odometer reading was reported. Vehicle #2 was towed from the scene due to disabling damage. There were no available photographs of damage to this vehicle.

Vehicle #2's restrained driver [19-year-old male; race/ethnicity, height, and weight unknown] and restrained front right passenger [18-year-old male; race/ethnicity, height, and weight unknown] both sustained police-reported "moderate" injuries and were taken by ambulance to a medical facility.