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REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN99-014

LOCATION - California

VEHICLE - 1998 CHRYSLER CIRRUS

CRASH DATE - June 1998

Submitted:

August 25, 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 Chrysler Cirrus with manual safety belts and dual redesigned front air bags, and a 1987 Honda Civic					
16. <i>Abstract</i> This report covers a remote investigation of an air bag deployment crash that involved a 1998 Chrysler Cirrus (case vehicle) and a 1987 Honda Civic (vehicle #2). This case is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of the collision events and the unrestrained driver (82-year-old female) was killed. The case vehicle was traveling north in the inside southbound lane (i.e., going the wrong way) of a divided, limited access state highway in an interchange area. Vehicle #2 was traveling south in the inside southbound lane of the same roadway. According to several witnesses, the case vehicle entered the southbound roadway via the southbound entrance ramp, came to a stop in the gore, executed a U-turn and proceeded north, apparently unaware that she was in the southbound lanes. The posted speed limit was 105 km.p.h. (65 m.p.h.). Several witnesses estimated that vehicle #2 was traveling approximately 97 - 105 km.p.h. (60 - 65 m.p.h.). There is no physical evidence that either driver attempted any avoidance actions. The crash occurred in the inside southbound lane. The front of the case vehicle impacted the front of vehicle #2, causing the case vehicle's driver and front right air bags to deploy. The impact was slightly offset to the left, but was essentially head-on. Both vehicles rotated a few degrees counterclockwise and came to rest in the inside southbound lane close to the point of impact. The crash severity for the case vehicle was high (greater than 40 km.p.h. [25 m.p.h.]). According to the non-invasive death examination, the case vehicle driver sustained a fractured pelvis, an unspecified injury to the pancreas, other unspecified internal injuries, and various injuries to the upper and lower extremities. She was hospitalized and was declared dead approximately 44 hours post-crash.					
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Additional photographs are available in SCI EDCS case IN99-014

BACKGROUND

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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 Chrysler Cirrus (case vehicle) and a 1987 Honda Civic (vehicle #2). The crash occurred in June 1998, at 4:15 p.m., in California, and was investigated by the applicable state police department. This case is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of collision events. The unrestrained driver (82-year-old female) was killed. The Police Crash Report was received in March 1999; the police photographs and the coroner's report of a non-invasive death examination were received in June. This report is based on the Police Crash Report, the death examination report, police photographs, occupant kinematic principles, and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle was traveling north in the inside southbound lane (i.e., going the wrong way) of a divided, limited access state highway in an interchange area. Vehicle #2 was traveling south in the inside southbound lane of the same roadway. According to several witnesses, the case vehicle entered the southbound roadway via the southbound entrance ramp, came to a stop in the gore, executed a U-turn and proceeded north, apparently unaware that she was in the southbound lanes. The roadway consisted of, from east to west, the northbound lanes, a grass median with positive barrier, a narrow asphalt shoulder, three through lanes, a gore, an exit ramp, a wide asphalt shoulder and the grass roadside. It was daylight, the weather was clear and the concrete road surface was dry and without defects. There were no traffic controls other than a painted single solid yellow edge line with raised reflectorized yellow delineators on the east road edge, lane lines consisting of raised reflectorized white delineators, painted solid white lines with raised reflectorized white delineators defining the gore and exit ramp, and a painted solid white edge line with raised reflectorized white delineators on the west. The posted speed limit was 105 km.p.h. (65 m.p.h.). Several witnesses estimated that vehicle #2 was traveling approximately 97 - 105 km.p.h. (60 - 65 m.p.h.) and stated they did not observe any braking or other avoidance actions by vehicle #2. There is no physical evidence that either driver attempted any avoidance actions.

The crash occurred in the inside southbound lane. The front of the case vehicle impacted the front of vehicle #2, causing the case vehicle's driver and front right air bags to deploy. The impact was slightly offset to the left, but was essentially head-on (**Figure 1**). Both vehicles rotated a few degrees counterclockwise and came to rest in the inside southbound lane close to the point of impact, with the case vehicle headed due north and vehicle #2 headed slightly east of due south.



Figure 1: Case vehicle (white, headed north) and vehicle #2 at final rest (case photo #7)

CASE VEHICLE

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The case vehicle was a front wheel drive 1998 Chrysler Cirrus five-passenger, four-door sedan (VIN: 1C3EJ56H6WN-----) equipped with a 2.5 liter V-6 engine and an automatic transmission with selector lever mounted as part of the center console. Four-wheel anti-lock brakes were standard equipment for this model vehicle. The case vehicle's wheelbase was 274 centimeters (108.0 inches). The odometer reading is unknown. The case vehicle was towed from the scene due to disabling damage.

The case vehicle sustained very heavy direct contact damage across almost the entire front. The bumper and grille were pushed downward and rearward, with the engine hood bent down and folded over the damaged front area (**Figure 2**). Both headlight assemblies were broken away. The left side of the engine compartment was crushed against the cowl and the left front wheel assembly was pushed rearward against the lower left A-pillar (**Figure 3**). The left A-pillar was displaced rearward, causing the left roof side rail and windshield header to buckle, with stress cracks across the entire width of the windshield. The left front door opening was distorted and the door came open. There was substantial intrusion into the driver's seating area, including the instrument panel, steering column and the floor pan. Some of the rigid plastic components on the interior of the driver's door were shattered and there is a blood stain on the left side of the driver's air bag (**Figure 4**). The CDC for the case vehicle, estimated from on-scene photographs, is **12-FDEW-4**, with principal direction of force 0 degrees. The WinSMASH reconstruction program was used to calculate Delta V based on a CDC-only estimated crush profile. These CDC-only calculations provide a borderline reconstruction but the results appear reasonable. The Total, Longitudinal and Lateral Delta Vs are, respectively: 89 km.p.h. (55 m.p.h.), -89 km.p.h. (-55 m.p.h.) and 0 km.p.h. (0 m.p.h.).

CASE VEHICLE DRIVER

The case vehicle's driver [82-year-old female; White (unknown if Hispanic); 171 centimeters, 64 kilograms, (67.5 inches, 140 pounds)] was not

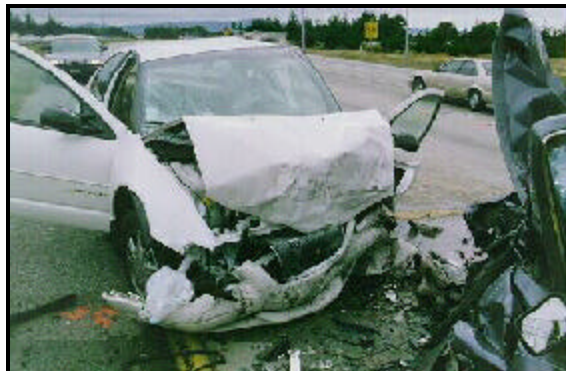


Figure 2: Front of case vehicle; Note, left door came open during crash, right door opened by rescue workers (case photo #10)



Figure 3: Left side of case vehicle (case photo #12)



Figure 4: Case vehicle driver's seating area; Note, floor pan intrusion and displaced steering column (case photo #16)

restrained by the available manual three-point lap-and-shoulder safety belt system. Her pre-crash seated posture, seat adjustments and steering wheel adjustments are not known. She was transported to a hospital, where she was admitted for treatment. She was declared dead at 12:25 p.m. on the second day post-crash (i.e., approximately 44 hours post-crash). The following discussion of the driver’s injuries is based on the coroner’s report of a non-invasive death examination and the principles of occupant kinematics. The coroner’s report includes a brief review of the course of hospitalization, but hospital records were not acquired and the injury information must be regarded as incomplete.

The unrestrained case vehicle driver was probably seated in a normal driving posture, with her back against the seatback, her feet on the floor or foot controls and at least one hand on the steering wheel. There is no physical evidence nor testimony that she attempted any avoidance maneuver. The single impact to the front of the case vehicle deployed the air bags and caused the driver to move forward and upward. She encountered the deployed driver’s air bag, causing abrasions on her face. She continued to move forward, deflating the air bag as the steering assembly intruded. She impacted the steering wheel causing contusions on her upper right chest, in the arm pit area, and on her lower abdomen. She sustained an unspecified injury to her pancreas and a fracture of the pelvis. Her left arm flailed, contacting the interior surface of the left door and the instrument panel, and she sustained an unspecified fracture (“wrist”), a laceration and several contusions on her left forearm. The floor pan in the driver’s footwell intruded, forcing her legs against the underside of the instrument panel, and she sustained bruising on both knees and lower legs. She sustained an extensive laceration along the outer aspect of the right foot, possibly due to contact with the foot controls. At the death examination, her left lower leg was in a cast and she had external pinning devices in her right lower leg and right foot. The injuries that were being treated by the application of these devices are not described in the death examination report, but they are suggestive of fractured bones. The coroner describes a sutured incision along the midline of the upper abdomen and a small caliber drainage tube emerging at the left-front of her abdomen, with no further discussion. In addition, the coroner describes a sutured incision on the top of her left foot. She was declared dead approximately 44 hours post-crash, in the intensive care unit of the hospital.

CASE VEHICLE DRIVER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Fractured pelvis, NFS	852600.2 moderate	Steering wheel rim	Probable	Coroner’s Report
2.	Injury to pancreas, NFS	542899.2 moderate	Steering wheel rim	Probable	Coroner’s Report
3.	“Fractured wrist,” left, NFS	751800.2 moderate	Left instrument panel	Probable	Coroner’s Report
4.	Abrasion, right cheek	290202.1 minor	Driver’s air bag	Probable	Coroner’s Report

Case Vehicle Driver Injuries (Continued)

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Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
5.	Contusion, right chest (armpit area)	490402.1 minor	Steering wheel rim	Probable	Coroner's Report
6.	Contusion, left forearm	790402.1 minor	Steering wheel rim	Possible	Coroner's Report
7.	Laceration, left forearm	790600.1 minor	Left side interior surface	Probable	Coroner's Report
8.	Contusion, lower abdomen (across pelvis and inguinal areas)	590402.1 minor	Steering wheel rim	Probable	Coroner's Report
9.	Contusion, left hand	790402.1 minor	Left instrument panel	Possible	Coroner's Report
10.	Contusions, bilateral knees	890402.1 minor	Left instrument panel	Probable	Coroner's Report
11.	Contusions, bilateral lower legs	890402.1 minor	Left instrument panel and below	Probable	Coroner's Report
12.	Laceration, right foot	890600.1 minor	Foot controls	Possible	Coroner's Report
13.	Contusions, bilateral feet	890402.1 minor	Floor pan	Probable	Coroner's Report
14.	"Sutured midline upper abdominal incision and drainage tube" -- abdominal injury NFS	515099.7 unknown	Unknown	Unknown	Coroner's Report
15.	"Left lower leg casted" -- injury to lower extremity, NFS	815099.7 unknown	Left instrument panel and below	Possible	Coroner's Report
16.	"External pinning device on the inner aspect of the right lower leg" -- injury to lower extremity, NFS	815099.7 unknown	Center instrument panel and below	Possible	Coroner's Report
17.	"External pinning device present through the top of the right foot" -- injury to lower extremity, NFS	815099.7 unknown	Floor pan	Possible	Coroner's Report

VEHICLE NUMBER 2

Vehicle #2 was a front wheel drive 1987 Honda Civic 1500 five-passenger four-door sedan (VIN: 1HGEC4532HA-----) equipped with a 1.5 liter L4 engine and a manual transmission with floor mounted shift lever. The vehicle was not equipped with anti-lock brakes. Vehicle #2's wheelbase was 245 centimeters (96.5 inches). The odometer reading was 264,216 kilometers (164,181 miles). Vehicle #2 was towed from the scene due to disabling damage.

Vehicle #2 sustained massively destructive direct contact damage across the entire front. The entire front bumper was crushed straight back into the cowl, with the left and right wheel assemblies crushed against the lower left and right A-pillars, respectively (**Figure 5, below**). The cowl was pushed rearward and both A-pillars were bent backwards, with the windshield header bent down and the roof buckled across the entire width. The movement of the A-pillars caused both front doors to be pushed rearward, displacing both B-pillars and resulting in all four doors coming open (**Figure 6**). The available photographs do not show the interior, but it is apparent that the front seat row sustained massive intrusion across the entire width. The CDC for vehicle #2, estimated from on-scene photographs, is **12-FDEW-6** with principal direction of force 0 degrees. The WinSMASH reconstruction program was used to calculate Delta-V based on a CDC-only estimated crush profile. These CDC-only calculations provide a borderline reconstruction but the results appear reasonable. The Total, Longitudinal and Lateral Delta-Vs are, respectively: 128 km.p.h. (79 m.p.h.), -128 km.p.h. (-79 m.p.h.) and 0 km.p.h. (0 m.p.h.).



Figure 5: Left side of vehicle #2 (case photo #19)



Figure 6: Right side of vehicle #2 (case photo #23)

Vehicle #2's driver [28-year-old male, race and ethnicity unknown, 188 centimeters, 107 kilograms, (74 inches, 235 pounds)] was restrained by the available manual three point lap-and-shoulder safety belt system and was the sole occupant of vehicle #2. He was declared dead at the scene and transported directly to the county morgue.