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REMOTE ALLEGED SAFETY-RELATED DEFECT REPORT

CASE NUMBER - IN99-073
LOCATION - Texas
VEHICLE - 1998 VOLVO S70
INCIDENT DATE - April 1999

Submitted:

March 22, 2002

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Contract Number: DTNH22-94-D-17058

Prepared for:

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National Highway Traffic Safety Administration
National Center for Statistics and Analysis
Washington, D.C. 20590-0003

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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. *Supplementary Notes* Remote alleged safety-related defect investigation involving a 1998 Volvo S70, four-door sedan, with manual three-point safety belts with dual front air bags and seat back-mounted side air bags			
16. *Abstract* This report covers a remote alleged defect investigation of a side air bag deployment that involved a 1998 Volvo S70 (case vehicle). This incident is of special interest because the case vehicle was equipped with side air bags and the front right seat back-mounted side air bag deployed inadvertently when there was no crash impact. The vehicle's unrestrained front right passenger (79-year-old female) sustained minor soft tissue injuries to her right arm as a result of being struck by the deploying side air bag. The case vehicle was stopped in a parking lane along a city street and was in the process of picking up two elderly persons from a bus stop. One person got into the front right seating area and got seated. When she closed the front right door, the front right seat back-mounted side air bag deployed. This investigation is based on the available photographs, the insurance company's damage description and the repair invoice. The side air bag sensor cover on the right front seat track along the outside of the base of the seat and the corresponding area opposite the sensor cover on the interior surface of the front right door panel showed impact markings, indicating that something was wedged between the door panel and sensor cover when the door was pulled closed. The case vehicle's front right passenger was seated and had not yet put on her available, active, three-point, lap-and-shoulder safety belt and sustained, according to her interview, minor injuries consisting of a contusion to her upper right arm. The case vehicle's driver (44-year-old female) was seated upright and slightly turned to her right. She was restrained by her available, active, three-point, lap-and-shoulder safety belt and did not sustain any injuries as a result of this incident. The rear right passenger in the case vehicle (elderly female) was seated, had not yet put on her available, active, three-point, lap and shoulder belt, and did not sustain any injuries as a result of this incident. The case vehicle was driven from the scene.			
17. *Key Words* Side Air Bag Deployment Motor Vehicle Non-Collision Incident Injury Severity		18. *Distribution Statement* General Public	
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BACKGROUND

IN99-073

This remote report was brought to NHTSA's attention on April 28, 1999 by the driver of the case vehicle. This incident involved a 1998 Volvo S70 (case vehicle). The incident occurred in April, 1999, at approximately 5:40 p.m., in Texas, but was not investigated by any police agency. This incident is of special interest because the case vehicle was equipped with side air bags, and the case vehicle's front right passenger (79-year-old female) sustained a minor injury when her front right seat back-mounted side air bag deployed without any exterior impact. This contractor interviewed the front right passenger on June 21, 1999, and had conversations with the case vehicle's driver and the repair shop service manager on May 19, 1999. This summary is based on the interview with the front right passenger, insurance photographs of the case vehicle, the repair invoice, and this contractor's evaluation of the evidence.

INCIDENT CIRCUMSTANCES

The case vehicle was stopped in a parking lane along a city street and was in the process of picking up two elderly persons from a bus stop. One person got into the front right seating area and became seated. When she closed the front right door, the front right seat back-mounted side air bag deployed. Initial interviews with the case vehicle's driver and the service manager from the repair shop indicated that the front right passenger's purse became wedged between the door and the outside base of the front right seat (i.e., at the side air bag sensor's location). When the door was closed, the purse was compressed against the mechanical sensor, causing the side air bag to deploy (**Figures 1** and **2**).

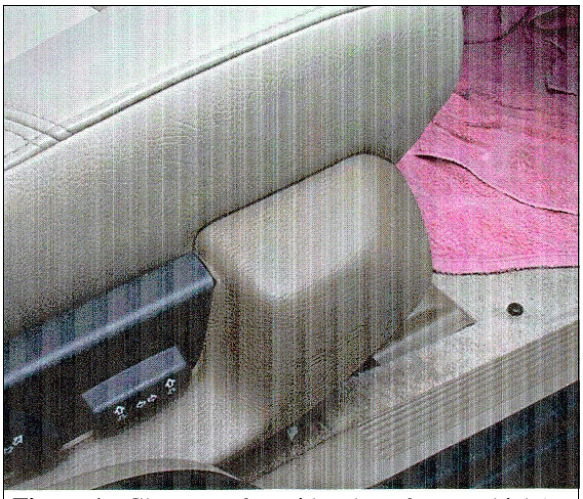

Figure 1: Close-up of outside edge of case vehicle's front right seat showing covering over contacted air bag sensor; Note: sensor is located near seat track adjustment controls (case photo #05)

Subsequent interviews with the case vehicle's driver and the front right passenger have discounted any mention of a purse or any other objects being wedged between the door and outside seat base at the time of the side air bag's deployment. In fact, the case vehicle's front right passenger claims that neither she nor the rear right passenger were carrying a purse at the time of the crash. Based on the insurance company's inspection and the design of the seat-mounted side air bag sensor, this contractor believes the case vehicle's side air bag deployed because some unknown object was wedged between the door panel and sensor plate when the door was pulled closed.

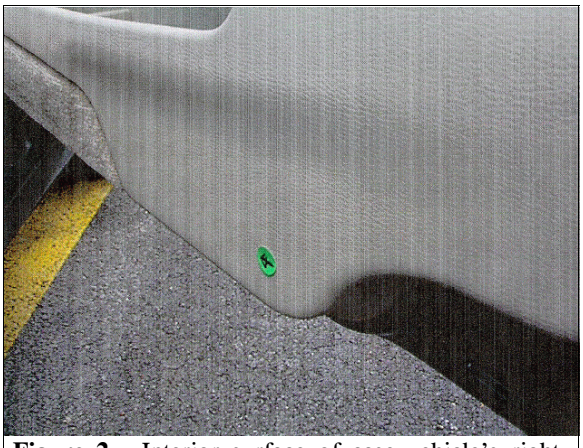

Figure 2: Interior surface of case vehicle's right front door showing area of contact (i.e., green dot) opposite air bag sensor mechanism (case photo #06)

The case vehicle was a front wheel drive 1998 Volvo S70 GLT, five-passenger, four-door sedan (VIN: YV1LS5676W1------). The case vehicle was equipped with anti-lock brakes. The case vehicle was driven from the scene. This investigation is based on the available photographs, the insurance company's damage description and the repair invoice. The side air bag sensor cover on the right front seat track along the outside of the base of the seat and the corresponding area opposite the sensor cover on the interior surface of the front right door panel showed impact markings, indicating that something was wedged between the door panel and sensor cover when the door was pulled closed. (**Figures 1** and **2**). Photographs also document the absence of deformation to the exterior surface of the case vehicle's right front door (**Figure 3**). The case vehicle's front right bucket seat was replaced along with the side air bag module, seat back padding, and the air bag igniter.

Figure 3: Case vehicle's right side showing no evidence of exterior damage (case photo #01)

AUTOMATIC RESTRAINT SYSTEM

The case vehicle was equipped with driver and front right passenger front air bags, and seat back-mounted side air bags at the driver and front right seat positions, for a total of four air bags. The front right side air bag deployed inadvertently as a result of a non-collision event, and no other air bags deployed. The driver and front right passenger safety belt systems were equipped with retractor pretensioners that did not actuate.

The front right seat back-mounted side air bag was located on the outside edge of the front right seat back along the forward seam line. Photographs show that the air bag opened at the designated tear points along the upholstery seam down the right side of the seat back (**Figure 4**). The was no evidence of damage to the air bag nor the adjacent components as a result of the deployment. A physical inspection of the air bag was not conducted and the presence of tethers, vent ports, and the air bag's dimensions are not known. According to the manufacturer's service manual (quoted below), the side air bags are designed with a vent through the cushion, so it will collapse slowly enough to act as a brake on the occupant.

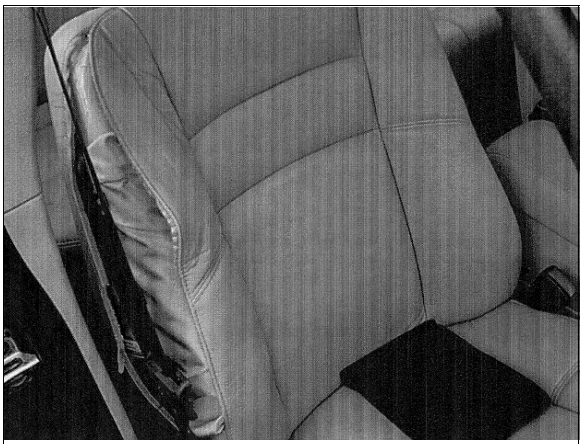

Figure 4: Case vehicle's front right passenger seat with deployed air bag exposed along separated upholstery seam (case photo #03)

The manufacturer's service manual refers to the side air bags as the "Side Impact Protection System" (SIPS). The following discussion is quoted from the service manual.

> The SIPS bag is a separate system in each front seat. There is no connection between the two SIPS bags. In the event of a certain side impact collision, the SIPS bag will be activated only on the side of the collision. The sensor unit is a pyrotechnic impact sensor, which will be activated only if it is struck with an impact that causes the deformed door to hit the sensor with a speed of about 2 m/s (6.6 ft/sec). The system is calibrated to avoid unnecessary activation such as by a blow to the door or a light impact with a stationary object.
>
> The pressure plate will deform the aluminum cover, pushing a firing pin and releasing the ignition charge. The ignition charge creates an impulse which is transmitted through the firing circuit as a shock wave. When the shock wave reaches the cushion module, it ignites the powder charge in the gas generator.
>
> When released, the gas blows through a firing chamber tube and into the cushion. Activation of the first gas generator occurs immediately and the second is activated after a delay of about 3 milliseconds. The delay is designed to maintain the pressure and volume of the inflated cushion for an adequate time.
>
> During inflation, the cushion breaks open the cushion module cover, rips open the chair upholstery seam and pushes out to inflate to its full volume. The cushion inflates toward the door panel to help protect the passenger's rib cage during the collision. There is a vent through a hole in the cushion, so it will collapse slowly enough to act as a brake on the driver/passenger.
>
> There is no diagnostic system or warning lamp connected to the SIPS bag.

The service manager also informed this contractor that when the interior of the case vehicle is being serviced for any reason, the mechanic is instructed to place a molded hard cover over the sensor pressure plate to protect the mechanic from inadvertently compressing the sensor pressure plate while working. The necessity for this protective measure indicates the sensitivity of the sensor's pressure plate.

CASE VEHICLE'S FRONT RIGHT PASSENGER

The case vehicle's front right passenger (79-year-old female, black, non-Hispanic, 163 centimeters, 77 kilograms [64 inches, 170 pounds]) was not restrained by her available, active, three-point, lap-and-shoulder safety belt. She sustained a minor soft tissue injury and did not seek treatment.

Immediately prior to the incident, the front right passenger had just gotten seated in an upright posture with her back against the seat back, her feet on the floor, and her right arm extended to her right after closing the door. Her seat track was located in its middle position (**Figure 5**). When she pulled the door closed, the seat back-mounted side air bag deployed. The deploying side air bag contacted the front right passenger in her upper right arm. She sustained a minor contusion to her upper right arm but did not seek treatment.

Figure 5: Case vehicle' s front right seating area; Note: rippled upholstery along outside of front right seat back (case photo #04)

CASE VEHICLE FRONT RIGHT PASSENGER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Contusion, upper right arm	790402.1 minor	Side air bag	Certain	Interviewee

CASE VEHICLE'S DRIVER

The case vehicle's driver (44-year-old female, black, non-Hispanic, height and weight unknown) was seated in an upright posture, but slightly turned to the right, with the right half of her back against the seat back, her left foot on the floor, her right foot on the brake, her left hand on the steering wheel, and her right hand on the center console.

The case vehicle's driver was restrained by her available, active, three-point, lap and shoulder belt. She did not sustain any injuries as a result of this incident.

CASE VEHICLE'S REAR RIGHT PASSENGER

The case vehicle's rear right passenger (elderly, exact age not known, female, black, non-Hispanic, height and weight not known) was seated in an upright posture, but slightly turned to the right, with the majority of her back against the seat back, both feet on the floor, her left hand on her lap, and her right arm extended backwards pulling her safety belt webbing across her body.

The case vehicle's rear right passenger had not yet buckled her available, active, three-point, lap and shoulder belt. In addition, this passenger did not sustain any injuries as a result of this incident.