

# Rescue Procedures

## for AirBag -Equipped Vehicles



<http://www.nhtsa.dot.gov/people/outreach/safesobr/16gp/procedures.html>

An unnecessary concern exists in the emergency services community that air bag-equipped vehicles involved in crashes may be hazardous to rescue workers and victims. Information among rescue professionals significantly exaggerates the potential hazards of deployed and undeployed air bags during rescue operations. This could result in delays in assistance to victims of motor vehicle crashes.

The following guidelines will assist law enforcement officers, fire service personnel, emergency medical service providers, and other public safety personnel who arrive on the scene of a crash in minimizing risks when extricating victims from air bag-equipped vehicles.

### **INCIDENTS WITH A DEPLOYED AIR BAG**

Deployed air bags are not dangerous. They are not very hot or about to catch fire. Air bags deploy one time only and pose no danger after deployment.

If an air bag has deployed, it will be drooping from the steering wheel, the dashboard, or the side of the driver or passenger seat. Rescue personnel who arrive immediately after air bag deployment will see smoke and powder inside the vehicle. The smoke is produced by the combustion of sodium azide and other chemicals within the inflator module.

The powder, usually corn starch or talcum powder, is used to ensure smooth deployment of the air bag by preventing it from sticking together while it is stored within the module. Also mixed with the residual powder is a small amount of sodium hydroxide, a by-product of the combustion that takes place in the inflator module. Alone, this chemical is slightly alkaline and may cause skin and eye irritation.

Some additional discomfort may be experienced if the powder gets into a cut or onto burned skin. Body parts exposed to the powder should be washed with soap and water.

The actual combustion process is contained within the inflator module and lasts for less than 1/10 of a second. The same gloves and eye protection that shield rescue personnel from sharp edges, glass, and body fluids also protect them from sodium hydroxide in the powder.

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## **INCIDENTS WITH AN UNDEPLOYED AIR BAG**

Although it is rare, an air bag can suddenly deploy during rescue operations, creating a hazardous operating condition, causing further injury, and delaying medical assistance to victims. While every crash poses unique conditions, there are some procedures that will help minimize risks.

**Identify the presence of undeployed air bags.** Look for the words, Supplemental Inflatable Restraint or Air Bag, or the initials, SIR, SRS, or SIPS, printed on the steering wheel hub, instrument panel, dashboard, windshield, or sun visor to determine whether the vehicle is equipped with air bags. Vehicles equipped with side air bags may have these words or initials over the driver side B pillar or on the outboard side or back of the seat.

If you still cannot tell whether the vehicle has air bags, you should assume it has them, especially if the vehicle is a newer model.

**Disconnect the power to the air bag system.** Turn off the engine and disconnect or cut both battery cables. Disconnect the negative cable first, followed by the positive. Make certain that the cables do not return or “spring back” to their original placement on the battery. **Note:** Move seats with occupants away from the front air bags before disconnecting the battery in case the front seats are powered.

Should circumstances permit, disconnect or cut the negative battery cable near the engine block. During any disconnect, an arc will be created because there is always a current draw on the battery even when the ignition key is turned off. The battery will go through discharge and will generate some flammable hydrogen gas around the battery area. Keep the arc away from the battery to help prevent the gas from being ignited.

In a severe crash, make certain the battery case has not been penetrated with metal body parts that could re-connect the electrical circuit. Battery disconnect can often be verified by attempting to turn on the headlights and taillights. However, be aware that the impact of the crash may trip a circuit breaker or blow a fuse, causing the lights not to work.

Even after a battery disconnect, it is possible that static electricity can deploy the air bag. Static electricity can be generated by the use of hydraulic shears and rams, rescue personnel sliding across the seat, and the cutting of safety belts. After a crash, it is not possible to determine how much static electricity is present around the vehicle and specifically what wires individuals and extrication equipment may contact. Also, the use of rams and the prying open of body parts can trigger the deployment of mechanically-activated side air bags. This is why it is always best to treat air bag systems as if they were “live.”

**If time permits, wait until the air bag system is deactivated.** Check the Air Bag Deactivation Times chart (this can be found on the Internet at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)) to find out how long it takes for the backup system to completely deactivate. Some vehicles may take up to 30 minutes to deactivate, but most vehicles take 1 minute or less. While this will significantly lower the chance of accidental deployment, it does not make it 100 percent safe.

More importantly, rescue personnel must consider the need to reach and extricate victims as soon as possible and to reach medical care within the “golden hour” in order to provide the best chance for victims’ survival and recovery.

**When possible, extrication preparation efforts should be performed from the side of the occupants, through the roof, and away from the potential deployment path of the air bags.**

**Avoid placing yourself or equipment between an undeployed air bag and the occupant.**

**Move seats with occupants away from frontal air bags and lower the seat back if it is appropriate for the victim and type of injuries.** When possible, tilt the steering wheel to provide additional clearance. This should be done before disconnecting the battery in case the front seats are powered.

**Do not drill or cut into the air bag module or apply heat above 350 °F in the area of the steering wheel, dashboard, or side seat panel.**

**Do not mechanically displace or cut through the steering column until the battery has been disconnected and all other rescue techniques have been performed and exhausted.** On most air bag systems cutting through the steering column should not cause the air bag to deploy. However, some mechanical systems with the sensor built into the back of the air bag module are sensitive to sudden movement. Painstaking care should be exercised to provide a smooth, continuous movement while using hydraulic rams and other displacement tools to move or cut the steering column. Be certain to have as much clearance as possible between the victim and the undeployed air bag before moving or cutting the steering column. Even after these procedures are followed, emergency personnel should treat every undeployed air bag as if it were “live.”

## **INCIDENTS WITH A FIRE**

An undeployed air bag is designed to inflate in a normal manner if the chemicals sealed inside the air bag module reach a temperature above 350 °F. In case of a passenger compartment fire, the gas generators may reach 350 °F and ignite, causing the air bags to deploy.



Any effective fire fighting medium, including water, can be used to extinguish fires. Use normal fire extinguishing procedures, and proceed with normal rescue guidelines. Cool the steering column, air bag module, and the passenger side dash area for several minutes after initial fire knockdown.

### **SIDE AIR BAGS, WINDOW CURTAIN AIR BAGS, AND SEAT BELT PRETENSIONERS: CONCERNS FOR FIRST RESPONDERS**

One of the dangers of motor vehicle side impact collisions are injuries to the head, neck, and upper extremities, especially when an occupant is thrown toward a side window. To help reduce occupant injuries and fatalities, side air bags are being introduced in an increasing number of new vehicles. Side air bags are designed to deploy from either the doors or the outboard side of the seat. Some new vehicles feature rear seat side air bags. Some vehicles that feature side air bags include Ford, Lexus, Mercedes-Benz, and Cadillac DeVille. The Audi has front and rear seat side air bags. The Kia Sportage has a knee bolster air bag that deploys from under the steering column.

Seat belt pretensioners are also being installed in more vehicles. The pretensioner is designed to take up slack in the seat belt so that the “ride down” effect can start sooner. It also helps to position the occupant back and squarely in the seat so that the air bag can more effectively deploy. At the crash scene, disconnect the seat belt immediately. This will prevent an undeployed pretensioner from injuring the victim if it deploys during extrication.

Side window curtain air bags will be introduced in fall 1998 in selected Mercedes-Benz and Volvo vehicles. They will drop down from above the door frame to protect occupants from intrusion, splintering glass, and side window ejection.

In 1997, BMW introduced an Inflatable Tubular Structure (ITS) system air bag in some of its vehicles. This is a form of side impact protection for the head. It is installed above the door frame of the vehicle and drops down (in a tube shape, diagonally crossing the window) when it deploys. This device is deactivated with the other electrical air bag systems in the vehicle. First responders should remember the presence of this type of air bag when cutting away the vehicle’s roof.

These occupant protection systems alert first responders to many situations at a crash scene. It is most important to avoid potential injury to emergency personnel responding to a crash involving the latest high-tech vehicles. To be safe, responders must be aware of new systems and how they work. First responders

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at the crash scene need to be aware of these equipment advancements and their location in the vehicle during extrication procedures. These occupant protection devices are described on the Internet ([www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)). Several manufacturers and their air bag systems are discussed.

If any first responders note side air bags deployed in a crash, please contact:

Special Crash Investigation Notification  
24-hour phone: (202) 493-0400  
Fax: (202) 366-5374  
Internet address: <http://www.nhtsa.dot.gov>  
E-mail address: [airbag.crash@nhtsa.dot.gov](mailto:airbag.crash@nhtsa.dot.gov)

## **RECOGNIZE THE POTENTIAL FOR INTERNAL INJURIES**

Prior to the introduction of air bags and lap and shoulder belts, seriously injured occupants involved in crashes usually had visible signs of injuries (such as bleeding, facial lacerations, abrasions, bruises, and broken bones) that were obvious to rescue personnel. Now, occupants protected by these devices may not have as many visible injuries but may still need medical attention for internal injuries. After a crash, serious internal injuries may be present but may not be apparent. To address this situation and increase the chances that these crash occupants receive timely and appropriate emergency care, encourage medical personnel to consider the possibility of internal injuries.

## **REPORTING TO MEDICAL PERSONNEL**

Collect and report circumstances surrounding the crash and possible internal injuries to medical personnel.

**Steering wheel deformation** Lift the air bag and look for a bent steering wheel rim. This could indicate internal injuries.

**Close proximity of the driver to the steering wheel** Occupants of small stature or large girth sitting close to the steering wheel are at greater risk of internal injuries.

**Energy of the crash** Twenty or more inches of vehicle crush indicate high crash forces that can cause serious internal injuries.

**Non-use of seat belts** Non-use of lap or lap and shoulder belts can result in multiple impacts and greater probability of internal injuries. An occupant who does not wear a seat belt but whose vehicle has an air bag will submarine under the air bag until his or her knees hit the knee bolster.

Emergency personnel should look for knee, leg, and hip injuries. Also, look for forearm bruising and fractures due to passengers' arms being positioned between the deploying air bag and their forehead.

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**Eyewitness reports** Verbal reports, photos, and video images of the interior and exterior of the crash vehicle help to convey the severity of the crash and can indicate the possibility and types of internal trauma.

## **CONCLUSION**

Deployed air bags are not dangerous. They deploy only one time and pose no threat to rescue personnel. Undeployed air bags can be dangerous. As with other responses to a crash scene or a “nothing showing” fire, complacency can injure. Knowledge, education, and experience are the answer.

For general information about air bag systems, contact:

*National Highway Traffic Safety Administration  
Occupant Protection Division (NTS-12)  
400 Seventh Street, SW  
Washington, DC 20590*

For additional copies of this brochure, contact:

*National Highway Traffic Safety Administration  
Media and Marketing Division (NTS-21)  
400 Seventh Street, SW  
Washington, DC 20590*

This brochure is also available on the Internet:

*[www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)*



## FREQUENTLY ASKED QUESTIONS

### **How does an air bag work?**

When a frontal or near frontal crash occurs at speeds comparable to a 10-to 14-mile-per-hour crash into a solid barrier, vehicle crash sensors trigger a chemical reaction inside the air bag module and this causes the frontal air bags to inflate. When crashing into movable barriers, the vehicle's speed must be higher to get a response from the sensors and to inflate the frontal air bags.

A moderate to severe side impact crash, or T-bone, will trigger that particular side air bag (if the vehicle is so equipped).

The rapidly inflating bag splits open the cover on the steering wheel, dashboard, or seat or side panel and fully inflates to help protect the driver and/or passenger(s). This entire inflation sequence takes place in less than 1/10 of a second. Less than 1 second after inflation, the air bag begins to deflate automatically.

### **Is it safe to breathe the passenger compartment air after an air bag has deployed?**

Yes. There have been no cases of acute or long-lasting respiratory distress reported by rescue workers who were exposed to air bag deployment by-products while attending to crash victims. There have been a few complaints of minor distress, such as brief coughing spells.

However, simulated tests were conducted with chronic asthmatic volunteers who were subjected to long-term exposure (20 minutes) of the atmosphere inside a vehicle with the windows rolled up after the driver and passenger side air bags had deployed. In this type of environment, test results revealed that prolonged exposure to this atmosphere can cause significant asthmatic reactions in some people.

Therefore, if a crash victim appears to be suffering from acute respiratory distress, rescue workers should consider the possibility of an asthmatic attack and treat the victim accordingly.

### **How should rescue workers deactivate mechanically operated side or frontal air bags?**

Some 1995-98 Volvos have side impact air bags, located in both front seats, that are independent of each other and the frontal air bag system. All Volvos with side air bags display the letters SIPS on the windshield or on the plastic cover on the outboard side of the seat. Each side air bag is a self-contained, mechanical, non-electrical system. In a crash, the side impact air bag will deploy if the seat panel receives sufficient pressure or a hard blow, or if the door is closed and there is an

object between the door and seat. Therefore, this type of contact with the seat should be avoided during victim extrication.

Rescue workers can disarm the Volvo's side air bag system by locating and cutting the black, ribbed cable running from the sensor's unit to the air bag. The cable can be reached between the bottom and back cushions of the seat.

The side air bags in Mercedes-Benz vehicles are operated by the electrical system and are deactivated with the frontal air bags.

The Jaguar XJS model (up to model year 1995) has a mechanically-activated frontal air bag system that cannot be deactivated in the field. Use extreme caution to avoid sharp, jolting impacts to the steering column, and try to move the seat backward to aid in the extrication of the victim.

## **IMPORTANT POINTS TO REMEMBER**

Identify undeployed air bags. Look for air bags in the front, side, and, with some new vehicles, overhead positions. If you still cannot tell whether the vehicle has air bags, assume it has them.

Move seats with occupants away from frontal air bags. Do this before disconnecting the battery in case the front seats are powered. When possible, tilt the steering wheel to provide additional clearance.

Deactivate the air bag system by disconnecting the battery cables, and, when you can, wait for the proper deactivation time.

Stay out of the deployment path.

Never place any equipment between an undeployed air bag and an occupant.

Wear gloves and eye protection such as those normally worn by rescue personnel.

Any effective fire fighting medium, including water, can be used to extinguish fires. Use normal fire extinguishing procedures, and proceed with normal rescue guidelines. Cool the steering column, air bag module, and the passenger side dash area for several minutes after the initial fire knockdown.

Treat every undeployed air bag as if it were "live."