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Date: 3/2010

New Car Technology

PURPOSE

The purpose of this section is to; give basic knowledge of, and to set basic guidelines for handling a response to an incident pertaining to new car technologies including: Supplemental Restraints Systems and Hybrid Vehicles.

CONTENT

Red Oak Fire Rescue personnel should learn about new vehicle systems before they appear on the road, not after an incident occurs. In addition, innovative vehicles may present other hazards of which responders should also be aware. The responder should be able to “Recognize, Identify and Locate” new equipment and hazards pertaining to these vehicles. The rescuer should be able to locate all supplemental restraint systems and effectively mitigate any incidents. The rescuer should also be able to recognize a Hybrid Vehicle and be aware of all possible dangers involved with extrication and or fire of these vehicles.

Supplemental Restraint Systems: SRS systems include: airbags and seatbelt pretensioners.

These airbag systems can be easily recognized by their symbols located on the airbag’s protective cover. The cover may have an abbreviation such as SRS,SIPS,ROPS,AIRBAG. The seatbelt pretensioner maybe hidden from sight by the seat or a protective covering, the firefighter would not be aware of the location of the system, unless they specifically check for it.

Red Oak Fire Rescue personnel must be able to recognize the potential locations of each of these systems.

These systems can be located all over the interior of the vehicle. It is the responsibility of the firefighter to “Recognize” that the vehicle has airbags/pretensioners, also to “Identify” the location of the SRS and “Locate” the need for removing the potential hazards.

Hybrid Vehicles: The hybrid vehicle was first developed in 2000. These vehicles were placed into service for pure economic reasons. The ability to achieve 27-68 miles per gallon of fuel by using one of these new technology driven vehicles was considered a large break through in the 21st century. Any vehicle is a hybrid when it combines two or more sources of power. Hybrid cars run off a rechargeable battery and fossil fuels or other sources of energy.

- Hybrid engines are built smaller to accommodate the 99% of time when they are not going up hill or accelerating quickly. It uses the battery to provide extra acceleration power when needed.
- When the car is stopped, hybrid gasoline motors can shut off and run off of their electric motor and battery.
- Hybrid cars are often lighter and more aerodynamic; tires are often stiffer and inflated higher to reduce drag.
- Hybrid cars often recover braking energy and use it to charge the battery.

The Firefighter must be able to recognize the body style of a hybrid and be aware of those safety concerns when dealing with such a vehicle.



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GENERAL GUIDELINES

Firefighter safety; as always, is our greatest priority.

Common Safety Guidelines and Procedures of Supplemental Restraint Systems:

- Always treat any vehicle as if it has a live air bag.
 1. Disable the vehicle. Shift the vehicle into park, and shut off the ignition/power. This will shut down the ignition system, the fuel pump, and the battery power to most SRS. Doing this causes the SRS reserve electrical charge in the capacitor of the electric control unit (ECU) to drain down.
 2. Disconnect the power [12-volt (v) battery] as soon as possible to prevent the SRS from accidentally deploying during extrication. When necessary, disconnect the low-voltage battery supply. However, in a hybrid vehicle, disconnecting the 12-v auxiliary battery may not safely power down the low-voltage system. In some hybrid systems, the high-voltage system can be stepped down (via converter) to provide power to the low-voltage system if the vehicle is "on." Vehicle propulsion is still capable in this situation, even if the 12-v auxiliary battery is disconnected. For this reason, it should be department policy for responders to immobilize all vehicles at a crash or fire. It is not necessary to disconnect the power at every incident—for example, a minor motor vehicle crash not requiring extrication may not indicate that the battery power needs to be shut down.
 3. As a general rule, if extrication is indicated, then power down the vehicle.
 4. Never try to disconnect or cut any high-voltage power cables or components; serious electrical burns or electrocution may result!
 5. It is important to turn the ignition key or push the power button to the "off" position. Doing this will provide increased safety at a hybrid vehicle crash by accomplishing the following:
 - Prevents the vehicle from moving under its own power;
 - Opens (disrupts current flow) low-voltage relays, shutting down the HV system;
 - Isolates the high-voltage battery power; and
 - Shuts down the fuel pump.



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Common Safety Guidelines and Procedures for Hybrid Vehicles:

1. **Do Not Cut**, Disconnect or Handle High Voltage cable that is color-coded **Orange**;
2. Be aware that high voltage cable commonly runs under the vehicle chassis. Firefighters need to be aware of this hazard when lifting or stabilizing hybrid vehicles;
3. High Voltage systems need to be shut down before firefighters enter damaged hybrid vehicles or before starting extrication procedures. This also prevents accidental movement of the vehicle because there may be no engine noise even though a hybrid vehicle is powered;

Hybrid systems have inverters that step up HV battery current (144 v to 300 v) to a higher voltage and can store this high voltage (up to 600 v) current even after the HV battery power is shut down or disabled. Never assume that the HV electrical system is safe by simply performing power disconnect. Refer to the individual make and model ERG for inverter capacitor power drain-down times and other responder safety recommendations.

- Note: Before disconnecting the 12-v power, actuate the vehicle's motorized components—electric power locks, latches, windows, and seats. Killing the power to an electric seat that must be moved for operations can add critical minutes to the overall rescue efforts.
- Properly stabilize crash vehicles. Step blocks or cribbing can be used to transfer the vehicle's weight from the wheels onto the cribbing. Vehicles in unusual positions may require specialized stabilization equipment such as tensioning mechanical struts.
- Additionally, address the rescue techniques appropriate for cutting, crushing, pushing, or spreading metal components in vehicles with deployed or nondeployed SRS components. The risk of accidentally deploying the SRS is greatest during this phase of the rescue. Without following the ROFR SOG, there is a greater chance for freelancing; increasing the potential for the SRS's accidentally being deployed or a hidden pressurized gas inflator's being breached.



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SRS SAFETY: TIME AND DISTANCING

The ECU capacitor can store an electrical charge from zero to 10 minutes or more, depending on the vehicle's make, model, and year. Older SRS typically have the greatest reserve capacitor drain downtime.

Keep in mind that not all air bags are activated by electrical current: Some side-impact protection systems and older frontal driver air bags are activated by mechanical initiators. The responder cannot reliably deactivate the mechanical SRS in the field.

Safety Note:

- If air bags are nondeployed, do not cut into, crush, intentionally deploy, or restrain an air bag or its components; serious injury may result. Should there be a situation where no other options are available and a side-impact curtain or similar side-impact air bag must be cut, consider the active inflator side a hot zone. As an example, it is impossible to displace a dash when the side-impact curtain air bag inflator is located in the A-pillar or the windshield pillar. In this situation, the curtain air bag will need to be cut to rotate the dash up and away from the victim.

- Always distance yourself from a non-deployed air bag. Potentially, any non-deployed supplemental restraint device has the capability of activating, even when the vehicle's power is disconnected. As a redundancy, practice distancing yourself as much as possible from the air bag deployment path. The "**5-10-20 Rule for Air Bags**" below can be used as a guide. And, do not place any hard object in the deployment path. Serious injury could result if the air bag is accidentally deployed.
 1. 5 inches for side-impact air bags. Determine what type SIP is present and its potential deployment path. Distance yourself 5 inches alongside and parallel with the door and deployment path of the air bag.
 2. 10 inches for driver frontal air bags. Driver frontal air bags typically deploy outward from the steering wheel hub to the vehicle operator for a distance of approximately 10 inches.
 3. 20 inches for passenger frontal air bags. The passenger frontal air bag will deploy outward to the frontal passenger(s) for a distance of 20 inches or greater.



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5-10-20 RULE FOR AIR BAGS

Not all air bags are included in the 5-10-20 rule.

The rule is a generic guide for the most commonly found air bags. Newly developed air bags, such as knee bolster and carpet (floor-mounted) air bags that may be present in new model vehicles, are not included in the rule.

Do not be fooled by the size of a side-protection air bag. Even small SIP air bags will deploy incredibly fast with considerable force.

An SIP air bag's deployment path will be within the occupant cage and is intended to block the occupant from side-impact intrusion.

- The 5-inch rule corresponds in direct relation to the centerline of the air bag's deployment path as it deploys up/down along the window area or out from seat-mounted air bags. It does not refer to the actual deployment path in front of the air bag, as the 5-10-20 Rule does for driver and passenger frontal distancing.

Many air bags deploy down from the roof, up from the door, or forward from the seat. Scanning the vehicle for telltale air bag identifications will indicate which type of SIP is present and the actual deployment path.

As always, the guidelines listed above do not cover every possible situation. The use of positive safety guidelines and common sense will bring positive results.