

# A S\*I\*M\*P\*L\*E Approach to Vehicle Collisions

Rapidly changing designs of both conventional and electric vehicles (EVs) make it nearly impossible for first responders to be familiar with every model they may see at the scene of a collision. Hybrids (HEVs), plug-ins (PEVs) and conversions may be impossible to distinguish during initial approach. To create a safer rescue environment for themselves and their patients, responders should use A S\*I\*M\*P\*L\*E approach that applies to all collisions, and always remember the first step:

## Assume every vehicle is a hybrid

By assuming every vehicle is a hybrid, with potential hazards from both hydrocarbon fuels and electric drivetrains, responders can use the same set of key actions with all vehicles and efficiently create a safer rescue environment.

## Secure vehicles from movement

An EV might not make any engine or motor noise when it is on. Responders performing the outer circle survey may be injured if an unconscious patient awakens and unexpectedly depresses the accelerator pedal.

### Key Actions:

- Be especially ready for vehicle movement during rapid approaches to patients.
- Place two wheel chocks with your initial response gear as an obvious reminder to secure all vehicles from movement.

## Isolate the hazards

Responders should disable the 12-volt electrical system to deactivate high voltage EV circuits and the Supplemental Restraint System (SRS). Be aware that high voltage EV circuits can remain live if the 12-volt system is active, and the SRS often has capacitors for backup power.

Modern SRS designs make it difficult or impossible to stay outside all airbag deployment paths - simply leaning into a window or opening a door to assess a patient can put responders at risk of serious injury or death. Responders must stay as far from airbags as possible during rescue.

### Key Actions:

- Switch off the vehicle, then remove and maintain all vehicle keys at least 50 feet away.
- Remove 2-inch sections from the ground cable, then the positive cable, of the 12-volt battery. Insulate cable ends so contact cannot be re-established.
- If the 12-volt battery cannot be located, remove all fuses. Note that batteries may be found under the hood, in the trunk, or even under passenger seats.
- Avoid contact with battery fluids or electrical components exposed by damage.
- Promptly extend and cut the seatbelts after gaining interior access.
- Remove any devices plugged into power outlets so there is no reverse feed of power.

## Manage the incident scene

The presence of new technologies and hazards can cause seemingly minor incidents to escalate quickly, making it more important to establish effective management at every scene. The Incident Manager (IM) must alert everyone to potential dangers. In addition to protecting themselves from approaching traffic, all responders should immediately alert the IM to any hazards they identify.

### Key Actions for the IM:

- Protect responders with effective parking and traffic control.
- Request and stage needed additional resources promptly.
- Interact with LEOs promptly to secure the scene.
- Alert receiving hospitals early for multiple- or severely-injured patients per local protocol.
- Alert the tow operator to reduce fire risk by using a flatbed or by keeping EV drive wheels off the ground, and to store EVs away from buildings or other vehicles. Tow operators must assume that all batteries are charged.

Assume every vehicle is a hybrid

Secure vehicles from movement

Isolate the hazards

Manage the Incident scene

Protect everyone from fire

Look before spreading or cutting

Extricate – do not extract

EVs are capable of silent, electric-powered movement with no warning.

Capacitors can store energy for the SRS and other electrical systems for several minutes after the 12-volt electrical system is disabled.

### Protect everyone from fire

Most modern vehicles use plastic fuel tanks with fuel lines that are pressurized to 15-95 psi. If a fuel line ruptures, fuel can instantly spray on ignition sources, causing a rapidly growing fire that can melt plastic tanks and release more fuel.

Vehicles powered by unconventional fuels such as natural gas may require closing valves or dissipating vapors. Lithium ion batteries can contain flammable electrolytes and generally require large amounts of water to control combustion or prevent ignition. Heat can cause pressurized vehicle components such as hood supports to dislodge or explode. Such projectiles have injured responders.

#### Key Actions:

- Identify the vehicle's fuel(s) and reduce each fuel's associated hazards.
- Position a charged fire hose with a minimum 100 GPM flow between the greatest fire hazard and responders with patients.
- Staff the fire hose with at least two firefighters who are fully protected with PPE including SCBA with the mask in place.
- Protect patients from heat and fire with coverings that also offer excellent flash fire protection.
- Consider positioning two charged hoses when large vehicles or multiple vehicles are involved.
- Consider the use of Class B firefighting foam.

High voltage circuits in EVs can remain live if the 12-volt electrical system is active.

### Look before spreading or cutting

Several vehicle components are hazardous if damaged or severed, such as compressed gas inflators for SRS airbags (often found in the 'A', 'C' or 'D' posts, the lower dashboard area, or the roofline) or pyrotechnic seatbelt pre-tensioners (often located in the mid- to low- 'B' post area).

#### Key Actions:

- Perform the Peek-and-Pry technique without fail, peeling away interior trim components to expose potential hazards and avoiding those hazards during any spreading or cutting operations.

### Extricate – do not extract

Manufacturers are designing many vehicles with smaller dimensions, lower weight, better crash performance and improved comfort. New designs may place patients closer to or directly beside the 'B' post, and likely include high-strength/low-weight metal alloys.

In older vehicles, responders could rotate packaged patients in their seats, but in smaller modern vehicles this may risk additional injury from greater spinal manipulation. Now, the best extrication path may be over a reclined seat and then through the roof or the rear window of the vehicle.

#### Key Actions:

- Extricate, do not extract - remembering to remove the metal from around the patient.
- Adjust cutting locations to avoid SRS components and deployment paths, high-strength structural members, or high-voltage components.

The best extrication path may be over a reclined seat and then through the roof or the rear window of the vehicle.

Always remember the first step of A S\*I\*M\*P\*L\*E approach:

**Assume every vehicle is a hybrid**

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