How to fight a burning Tesla

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On Nov. 3, a Tesla S with two people onboard raced at high speeds through Indianapolis before smashing into a tree. The violent impact killed the occupants, spread so much debris that responders initially thought it was a car vs. motorcycle crash and set off an incredibly hot fire.

Even days later as the remains of the vehicle sat in an impound yard, it needed a 150-foot buffer zone to keep from igniting other vehicles.

This was no garden variety car fire.

Over the past decade, nearly every automobile manufacturer has developed fully electric vehicles or hybrid vehicles that use both a small gasoline engine coupled with an electric motor powered by a rechargeable battery pack.

Other alternative fueled vehicles include compressed propane gas, compressed natural gas and hydrogen fuel cells. And there are solar-powered vehicles under development with rechargeable battery storage similar to that of an electric vehicle.

And most car manufacturers, working with the National Fire Protection Association, have developed both generic and specific training programs to teach firefighters how to identify, stabilize, power down

and handle emergencies such as fires, victim extrication and possible hazardous waste associated with these incidents.

Why they burn

Several instances this year involving the very high-end Tesla Model S have drawn special attention due to the severity of these crashes and resulting fires. Along with the latest in downtown Indianapolis, other fires have occurred in Seattle, Tennessee, France and Mexico.

In addition to crashes, some of the earlier fires involving Teslas were reportedly caused by debris in the roadway puncturing and gouging the undercarriage of the lithium-ion battery pack.

The damaged battery pack exposed the lithium, causing an exothermal reaction and subsequent fire. This hazard was thought to have been solved with the installation of a titanium cover encasing the battery pack, giving the undercarriage more resistance to severe damage.

The recent Indianapolis crash occurred Nov. 3 at 1 a.m. on Illinois Avenue near the intersection of 16th Street. Those who regularly attend conferences there will be familiar with this area, which is almost due north of the convention center near the I-65 entrance ramp on Meridian.

As of early December, the results of the Indianapolis Police investigation had not been finalized or released. However, eyewitnesses told several news agencies that the Tesla was traveling on Illinois at a very high speed when it struck a tree and burst into flames.

The impact of the crash left a debris field estimated at over 150 yards. Video of the scene shows the Tesla’s lithium-ion battery was ripped apart during the impact, spreading parts of individual battery cells over a wide area that also ignited producing popping, projectile-like fireworks.

Indy Fire's response

On arrival, the Indianapolis Fire Department had to deal with the fully involved car with entrapped victims, navigate the debris field and attempt to extinguish a fire that in part was fueled by the burning lithium metal.

At a press conference, Indianapolis Battalion Chief Ken Jones described the scene as one they had been trained to handle. He said that the Tesla Emergency Response Guide called for “copious amounts of water” to control the main car fire.

While the individual cell fires in the debris field were controlled with dry chemical extinguishers, the only way to effectively cool this was with the application of large amounts of water. One recommendation from a Tesla representative is to continue water application on the vehicle for at least 30 minutes after the fire has been suppressed.

Tactically, this may mean using a master stream, 2½-inch or multiple 1¾-inch fire lines, to suppress and cool the fire. Vehicle fires don’t typically call for surround-and-drown tactics, but these are not typical vehicle fires.

Chief Jones said that even under these most difficult conditions, IFD firefighters extricated a male passenger about 20 minutes after their arrival and transported him to a local trauma center where he later died of his injuries. The female driver was pronounced dead at the scene.

The extrication was made even more hazardous since the impact of the crash had severely mangled the vehicle. Compounding this hazard was that many of the features of the car such as the orange “no cut” areas were distorted, bent or out of place.

Chief Jones described the extrication as a “peel and peek” operation that required great care to avoid potential harm to either the firefighters or the victims.

How to prep

So how do fire chiefs prepare for such an event in their response area?

First, firefighters must wear full PPE, including SCBA on all vehicle fires. Vehicles are built from many materials including steel, aluminum and composite resins. But they also contain plastics and synthetics that can off-gas cyanide and carcinogens as well as sulfuric acid, carbon nickel, copper, lithium or cobalt.

Vehicle fires can also take an unexpected turn of events, whether a tire that explodes and destabilizes the vehicle, a ruptured fuel tank or the ignition of some exotic contents kept in the trunk. That’s why PPE and SCBA are always essential for firefighter safety.

Next, while carefully approaching the vehicle, firefighters need to identify if it uses an alternative fuel or an electrified battery pack. Most manufacturers place an emblem on the trunk and sides that indicates if it is powered by fuel other than gasoline.

Finding the emblem in the dark may be difficult. Tesla recommends the use of a thermal imaging camera to scan any electric vehicle to see if the battery is overheating or burning.

Once identified, firefighters must size-up the emergency and establish priorities (rescue, extinguishment, extrication, patient care), immobilize the vehicle from any sudden movement and start handling the emergency according to the listed priorities.

Remember that after the emergency, there may also be a need for overhaul that involves extremely hazardous materials, so this may take a prolonged time to safely mitigate.

Additional training

Where do you get the necessary training to handle these different types of vehicles? In the case of a Tesla, you should become familiar with their response guides that may vary somewhat by model. The Tesla web page for first responders is a good place to start.

For more generic automotive models, the NFPA offers several online training programs. Other NFPA alternative-fuel programs are available here.

Electric and hybrid vehicles can generate an electric shock that in some cases can unleash 600 or more volts to an unsuspecting firefighter.

While this is discussed in several training videos on extrication techniques, it is perhaps even more important when using large amounts of water to overcome the fire.

Many auto manufacturers recommend using insulated tools for overhaul and staying away from gas struts or cylinders that can explode under high heat. Their best advice is to approach these devices from the side if possible.

As always, the bottom line is to be trained and prepared before an incident occurs.

At such incidents, take the necessary precautions to protect firefighters by maintaining a strong incident command that provides at minimum for a safety chief, rapid-intervention team and accountability. Give special considerations to hazmat, including a hot zone, warm zone, entry area and a safe zone for the media and bystanders.

After the incident, it is essential to decontaminate all PPE and any affected buildings, streets or residences.

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