INSIGHT

As heavy EVs proliferate, their weight may be a drag on safety

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How safe are electric vehicles? It's a question that keeps coming up in different ways in my role overseeing our vehicle crashworthiness evaluations.

When we first started testing electric vehicles in 2011, the question referred to fire risk. When damaged, lithium-ion batteries can ignite, and the fires can be extremely hard to put out. As a result, we have special procedures for EV testing, including monitoring the battery's voltage and temperature and asking our local fire department to be on site.

Fifty-five EV crash tests and zero fires later, I'm still worried about these batteries, but for a more mundane reason than their potential to burst into flames. My biggest concern is how heavy they are and what all that extra vehicle weight means for the safety of people on the road, specifically occupants of lighter vehicles as well as pedestrians and bicyclists.

With electric vehicles poised to take off and eclipse sales of conventional vehicles soon, we expect to test a lot more of them in the coming years. Many of those electric cars, SUVs and pickups will be contenders for our *TOP SAFETY PICK* and *TOP SAFETY PICK+* awards. As we do with the vast majority of vehicles on the U.S. market, we will put them through their paces.

There's a big difference between the first all-electric vehicle we tested — a 3,339-pound 2011 Nissan Leaf — and the current generation of EVs, many of which exceed 6,000 pounds. These are large SUVs and pickups, packed with power that requires a massive battery.

To put this extra weight in context, when I first heard about the 9,500-pound GMC Hummer EV, I had a practical concern. Would our crash test machine at the VRC be able to manage it? Could we pull a vehicle like this up to our test speed of 40 mph without breaking our machine?

To find out, we got some old junkers, loaded them with steel plates and a concrete block to get the weight up to about 9,500 pounds. Then we sent them down the runways. Everything worked; all we needed was a little extra charging time for the hydraulic system and a bit more clamping force on our tow cable to keep the vehicle in place.

Less easily solved is the problem this extra weight poses when one of these extremely heavy EVs crashes into another, nonelectric car or SUV with a typical weight of 3,000-4,000 pounds. (A nonelectric pickup, typically weighing about 5,000 pounds, might fare a bit better.)

When two vehicles collide, the heavier vehicle pushes the lighter one backward, resulting in higher forces on the people in the lighter vehicle and lower forces on people in the heavier vehicle. That's why we stipulate that our frontal crash test ratings — which are conducted against a fixed barrier and simulate a crash with an identically sized vehicle — can only be compared among vehicles of similar weight.

Over the years, we've conducted several demonstration crashes that paired larger vehicles with smaller ones to show the effect of size and weight on crashes. In two 2018 tests, one involving a midsize SUV and a small car and another involving a large car and a minicar, both the smaller vehicles performed poorly, despite good ratings in our tests.

Assuming the new generation of heavy EVs is designed to perform well in our crash tests, there is no reason they can't provide good protection to their occupants. In fact, their extra weight will afford them greater protection in a multivehicle crash. Unfortunately, given the way these vehicles are currently designed, this increased protection comes at the expense of people in other vehicles.

The extra weight may also present a threat to pedestrians and bicyclists, though the danger for them is not as straightforward. The weight differential between a person and any type of passenger vehicle is already so enormous that the additional weight from an EV battery would make little difference in most cases. (Large vehicles do represent a bigger threat to pedestrians and bicyclists, but that is due mostly to their height and shape, which affect both visibility and whether a person is knocked to the ground when struck.) However, it's not clear that all EVs have braking performance that matches their additional mass. If the extra weight leads to longer stopping distances, that will likely lead to an increase in pedestrian and cyclist deaths, which already have been on the rise in recent years.

And while there are questions about braking performance, we already know these vehicles have no problem accelerating. Today's supersized EVs are a double whammy of weight and horsepower. While there were many heavy vehicles on our roads before EVs, a delivery truck isn't designed to go from 0 to 60 in around three seconds like the Hummer mentioned earlier or the 7,000-pound Rivian R1T pickup. Even the more modest Kia EV6, a small SUV that weighs about 4,500 pounds, boasts the same rapid acceleration.

If the present trend toward ever-heavier, more powerful EVs continues, there will be a big increase in the number of super-heavy, high-acceleration machines all around us, including in residential neighborhoods. That will make a collision involving a huge weight disparity much more likely.

We don't need to put the brakes on electrification — there are good reasons for it — and we're not doomed to reverse all the safety gains of recent decades. But the development will require some new thinking about the kinds of vehicles we want on our roads.

For one thing, as a society, we should consider how much mass individuals should be driving around for the daily commute and around town. There are EVs with more reasonable weights. (Remember that Leaf?) The heaviest of the new EVs are heavier because they are bigger, but also because larger batteries afford them longer range and higher horsepower.

The ability to travel 400 miles on a charge is convenient but unnecessary for most commutes. As charging speed and infrastructure improves, it will arguably be less important for road trips too. As for horsepower, is the kind of rapid acceleration the new models boast really important or even a good idea? Vehicles with extreme levels of power simply encourage more speeding, which leads to more fatal crashes.

If substantially reducing EVs' weight is not an option, automakers should consider other design changes to improve crash compatibility. Heavier vehicles could be built with additional crush space in their front ends to help compensate for the effect of their extra weight in a crash with another vehicle. While we usually think about crumple zones as important for protecting a vehicle's own occupants, additional space would also protect people in other, lighter vehicles. With no engine taking up space

in the front of the vehicle, there may also be more flexibility to design front ends that are less likely to injure pedestrians and bicyclists.

In addition, I'm hopeful that expected improvements in battery technology will help by allowing smaller batteries to store more energy and that an expanding network of fast public chargers will take away some of the need for long ranges.

In the meantime, we need to double down on existing solutions. Manufacturers should equip all new vehicles with high-performing crash avoidance systems that recognize and brake for pedestrians and bicyclists, in addition to other vehicles, and good headlights that allow drivers to react quickly at night. States and local governments should consider lowering speed limits, factoring in the increased danger from weight disparities, and backing them up with increased enforcement.

Electric vehicles are here to stay, but we can choose what that means for safety.

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