AUTO LIABILITY

Putting smart cars to the test

Driver-assistance technologies are designed to help motorists, but how do they assist auto liability insurers?

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Self-driving cars aren't here yet, but Advanced Driver Assist Systems (ADAS) are widespread. These systems can independently warn drivers of potential risks, steer, brake and accelerate. As forensic engineers, we can see the influence of ADAS in the crash data that we can download from cars. And they are changing the way we reconstruct accidents.

What are ADAS?

ADAS can be divided into *passive* and *active* systems. Passive systems will warn a driver of a possible danger and leave it to the driver to steer or brake to avoid it. Active systems, on the other hand, will take control of the vehicle and actively steer, accelerate or brake if the driver does not.

Lane Departure Warning (LDW) and Forward Collision Warning (FCW) are passive systems, while Lane Keeping Assist (LKA), Adaptive Cruise Control (ACC), and Automatic Emergency Braking (AEB) are active.

Lane-keeping systems are designed to prevent cars from drifting out of their lane. They warn the driver of a lane departure (LDW), or actively redirect the vehicle by steering or applying the brake on one side (LKA). Both systems rely on cameras to detect visible lane-marker lines; forward-facing cameras determine where the car is located relative to the lines painted on the road. Neither will work on roads without lines, and both will disengage if heavy rain, snow, or wear make the road lines impossible for the cameras to detect.

Adaptive Cruise Control is designed to maintain a safe following distance between vehicles. When engaged, ACC will maintain a set speed, and can slow down or accelerate with traffic according to a pre-set following distance or time. Some ACC are able to brake the vehicle to a stop. ACC controls speed through direct throttle and brake application; it relies on a camera and radar — which is less susceptible than the camera to the effects of rain, snow, or fog — to determine distance and relative speeds to objects ahead.

Forward Collision Warning and Automatic Emergency Braking are designed to recognize impending collisions, alert the driver (FCW) and apply the brakes if the driver does not (AEB). These systems use a combination of cameras, radar and sometimes lidar — similar to radar, except using lasers instead of radio waves — to look ahead for obstacles.

ADAS cases

Crashes involving ADAS-equipped cars generate potential liability for manufacturers of cars and their ADAS technology. For instance, drivers could claim that their automated emergency brake systems should have prevented a collision with a car that ran a stop sign on a cross street. To get a clear view of that case, one must first separate the existing confusion surrounding the way the systems work and their limitations from genuine system failures.

In these kinds of cases, investigators will first identify the features or systems with which the car is equipped. Next, they will figure out which ones had been enabled, turned on, or disabled by the driver at the time of the collision. Then, an assessment of the effectiveness of the ADAS requires a big picture understanding of the crash circumstances and the limitations of the ADAS.

ADAS limitations

Let's say a driver believes that his or her AEB systems should have prevented a collision with a car that ran a stop sign on a cross street. In this example, the driver might have experienced a system limitation rather than a failure. That's because forward-facing cameras and radar — upon which most AEB systems rely — may not detect vehicles approaching from the side in time to avoid a collision.

Understanding the specific limitation of a particular system may require a detailed engineering analysis. For example, our tests of Toyota's AEB system, published by the Society of Automotive Engineers, found that if the driver lifted his or her foot slightly from the accelerator pedal after the AEB warning sounded, the system would sometimes turn off.

Some organizations, such as the Insurance Institute for Highway Safety (IIHS), for example, have created a useful safety rating system for these new driver-assist technologies. However, these test results are not applicable to many accident scenarios.

Changing accident reconstruction

In addition to generating new liability issues, ADAS are changing the way engineers reconstruct accidents altogether. Testimony from a driver is no longer sufficient to form the basis for assumptions about pre-impact steering, braking and accelerating that affect speed calculations.

In a recent intersection crash, for example, based on the amount of damage, we calculated that a car was travelling at the speed limit when it collided with a truck. The car's driver said he did not have time to react. Before ADAS, this would lead us to assume that the speed of the car did not change before the crash, and that the approach speed was therefore equal to the impact speed.

However, crash data downloaded from the car indicated that the AEB system slowed the car significantly before the collision, which meant that the car actually approached the intersection at well over the speed limit.

There are currently no government standards for the performance of ADAS. IIHS safety ratings (noted above) are based on tests of rear crash prevention and pedestrian avoidance, and the test results are posted online. Although the IIHS data are helpful, many gaps still exist in the information that accident investigators need to reconstruct crashes involving ADAS accurately.

We should begin filling those data gaps sooner rather than later if we want to stay on top of the technology. It is clear that ADAS is becoming more common, and so a solid understanding of both ADAS function and limitations is necessary to determine whether the manufacturer of the car or the systems are liable in an accident.

Today, the extraction and analysis of ADAS data by forensic engineers can produce a more accurate picture of a collision. In cases like the example above, providing insurance companies with an analysis accounting for the ADAS data can tip the scale when it comes to assigning each party's percentage of fault equitably. cu

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