

Revolutionizing Our Roadways

Liability Considerations for Automated and Connected Vehicles

Manufacturers of automated vehicles (AVs) and connected vehicles (CVs) are rapidly developing technologies with the potential to disrupt the U.S. transportation system. AVs use a variety of sensors, computers, and electronic controls to take over a portion or all of the responsibility for driving. These vehicles are not yet fully developed and are currently being tested on roads across the country (including in Texas).

Similarly, CVs use radio communications hardware, specially developed applications, and onboard vehicular displays to warn drivers about impending dangerous situations. CVs will ultimately result in a dense network of vehicles, all communicating with each other and the infrastructure to improve safety, mobility, and environmental outcomes. CVs do not actually take over the task of driving in any way but instead send information to the vehicular operator (either human or automated), who then decides how to respond to the information.

The liability implications for AVs and CVs are unique and are discussed in this brief.

Liability Implications for AVs

AVs promise a shift in vehicle control away from the driver and toward the vehicle. The same shift may occur in liability for harm caused by vehicle crashes and related events. The possibility that increased liability may be placed on AV manufacturers, developers, and retailers concerns some AV industry representatives, and many worry that these concerns could slow the development and proliferation of AVs (1). Given the significant benefits that AVs could offer society, industry concern is worth attention from the public sector. AVs have the potential to reduce crashes, improve mobility, and reduce the environmental impact of driving.

Products liability law, one area of law relevant to AVs, is diverse and complex. Because there is no federal products liability law, products liability is governed by state law, which can and does vary widely from state to state and is subject to individual courts' interpretations. The U.S. Department of Commerce has put into action the Model Uniform Products Liability Act (MUPLA), which provides legal guidelines states can follow. However, MUPLA is not mandatory, and products liability law remains largely determined by each state. The many theories of products liability law do not all always apply to all cases. Where they may, however, plaintiffs often bring suit, citing multiple theories as a means of increasing their odds of a successful case.

These complications make it difficult to make definitive or precise statements about the legal implications from AVs. Much of the uncertainty surrounding the AV field will be resolved in court as AVs reach the market and legal cases arise.

Despite the complexity and uncertainty, there is an active discussion in the legal and academic communities surrounding automation, and several papers have been written on the topic. This brief reviews several of the recent analyses and discusses the applicable legal theories, how automation could affect liability and vehicle insurance markets, and various policy recommendations or prescriptions.

Liability Implications for CVs

CVs may also present liability concerns or questions for the state. The CV system provides a communication platform through radios (known as dedicated short-range communication [DSRC]) or other wireless communications that enable vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), and vehicle-to-other-modes-of-transportation (V2X) communication. This communication system can prevent vehicle crashes, improve mobility, and provide environmental benefits. State and local governments will likely take an active role in the CV program because they will bear the responsibility of installing and operating the requisite roadside infrastructure. Governments may worry that operating such a system could result in added liability, which is discussed in this brief.

What Is Products Liability?

Liability is the determination of legal responsibility for harm or damage. Products liability is the area of law that addresses the liability of parties for damage caused by the product in question. Liability, in the context of motor vehicle crashes, may be assigned to the drivers involved in the crash and often is. However, in the event of a defect in the vehicle, the vehicle designer, manufacturer, or marketer/retailer may be found liable through products liability law.

Products liability claims can be based on three theories of liability:

- Negligence.
- Strict liability.
- Breach of warranty of fitness.

These theories assess liability based on the defendant's actions leading to the harm, and one or more theories must be the basis of a products liability claim.

The second issue in determining liability is defining the nature of the defect causing harm. Defect types in products liability law include:

- Design defects.
- Manufacturing defects.
- Warning and instruction defects.

Tortious misrepresentation, while not technically a defect, is also included in this area for its relevance as a potential form of tort claim.

Negligence

A negligence claim considers the reasonableness of the defendant's care. *Reasonableness* is often defined by an industry standard of care. For example, product manufacturers are obligated to "exercise a reasonable degree of care in designing their products so that those products will be safe when used in reasonably foreseeable ways" (2).

A hypothetical example from the literature illustrates manufacturer negligence: a vehicle manufacturer only tested its automated braking systems on dry roads (2). If a consumer used the system on wet roads and was injured in a crash, the consumer could argue the manufacturer was negligent in not anticipating the reasonably foreseeable condition where motorists use their vehicle in wet conditions.

An operator is considered negligent and liable for harm if he or she failed to take *reasonable care* when operating his or her vehicle (3). In the hypothetical example from the literature, a vehicle operator would be negligent if he or she failed to maintain the vehicle's brakes, causing a crash. Failure to maintain or repair the brakes was unreasonable, and thus the actions were negligent, leaving the operator liable for the harm the victim suffered.

Strict Liability

Under strict liability, a designer or manufacturer can be liable for harm a product causes regardless of his or her actions in creating the product. No finding of fault is necessary if the product was sold in a "defective condition unreasonably dangerous to the user" (4). The product is considered defective if it "left the supplier's control lacking any element necessary to make it safe for its intended use or possessing any feature that renders it unsafe for the intended use." Under strict liability, a manufacturer can be found liable even if it exercises "all possible care" when manufacturing and selling a product (2).

Breach of Warranty of Fitness

A breach of warranty of fitness, from contract law, occurs when a manufacturer either explicitly or implicitly wrongly markets a product as having a sufficient level of quality (2). An assurance of a product's quality is known legally as a warranty. If the product is of insufficient quality but the warranty assured sufficient quality, and a user is injured as a result, the designer, manufacturer, or seller may be liable based on breach of warranty. Two types of warranties might be breached: *express warranty* and *implied warranty*.

Express Warranty

An express warranty is a promise a seller makes about a good to a prospective buyer. In the context of automation, an express warranty can include:

- Actual vehicle warranties.
- Advertising as a description of the good in conjunction with the sale.
- A sample or demonstration as part of the sale process.

In a hypothetical example from the literature, if a manufacturer's brochure states that the vehicle's parallel parking system is able to park in spaces 3 feet longer than the vehicle but only actually functions in spaces 5 feet longer than the vehicle, the manufacturer could be said to be in breach of an express warranty (2).

Implied Warranty

Implied warranties occur when someone places a good for sale, and a buyer can assume that unless there are explicit statements or modifications to the contrary, the "goods are sold under an implicit warranty as 'merchantable' " (2). In other words, absent notice of a defect, the goods being sold maintain an implicit warranty that they are fit for their intended purpose. If they are not, the seller may be in breach of an implied warranty.

In a hypothetical situation from the literature, an automated parallel parking system should aid a driver in parallel parking without causing collisions. If it did not, the purchaser could have a claim under breach of implied warranty.

Types of Defects

Design Defect

Design defects may have significant liability implications for AV manufacturers and developers. A design defect occurs when "the foreseeable risks of harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design, and failure to use the alternative design renders the product not reasonably safe" (5).

Cost-Benefit Test

Courts commonly use a test called the cost-benefit or risk-utility test to determine if a product design is defective (3). This test entails weighing the benefits of a particular design against its associated costs.

A RAND analysis argues that the inclusion of the cost-benefit test could lead to a socially optimal outcome when considering AV crashes (3). The RAND authors offer a plausible hypothetical situation as an example: an AV crash avoidance system is able to avoid 80 percent of crashes that would have occurred in a human-driven vehicle but still crashes 20 percent of the time. In such a scenario, consumers could sue, arguing that the vehicle is defective in its design. If courts consider the cost-benefit test, however, vehicle manufacturers could argue that even though the vehicle still crashes 20 percent of the time, the vehicle reduces overall crash costs, resulting in a socially beneficial situation.

A different perspective of the cost-benefit test could yield less favorable results for AV manufacturers. In the same hypothetical example, if the AV manufacturer could have spent

additional resources and time developing the AV system, the AV might have avoided an additional 10 percent of crashes. Depending on the expense of the development and the magnitude and value of the 10 percent of crashes, the courts could argue that the manufacturer should have spent the additional resources to further refine the product and reduce crashes. Using such a perspective, the courts could focus the cost-benefit test on the costs and benefits of further refining the technology, rather than the global costs and benefits of crash reduction. It is not clear which perspective courts would take on this issue.

Consumer-Expectation Test

An alternative and less frequently used test, the consumer-expectation test, designates a product design as defective if it is “more dangerous than an ordinary consumer would expect when used in an intended or reasonably foreseeable manner” (6). This test has fallen out of fashion in many areas, especially when considering technical or scientific information.

Still, the RAND analysis argues that a reliance on the consumer-expectation test could result in “substantial liability for the manufacturers... simply because consumers may have unrealistic expectations about the capabilities of these technologies” (3). The RAND analysis argues that manufacturers will need to manage consumer expectations to prevent consumers from over-relying on AV technologies, especially when AV technologies are less sophisticated and require human oversight of the driving task.

Manufacturing Defect

Under a manufacturing defect, the product “departs from its intended design even though all possible care was exercised in the preparation and marketing of the product” (6). This can occur in one of two possible ways:

- The product is manufactured using flawed raw materials.
- The raw materials are assembled erroneously.

The RAND analysis argues that this area may be less pertinent to AVs because modern manufacturing processes have greatly diminished the likelihood of errors occurring in the manufacturing process (3).

Warning and Instruction Defects

A warning or instruction defect occurs “when the foreseeable risks of harm posed by the product could have been reduced or avoided by the provision of reasonable instructions or warnings... and the omission of the instructions or warnings renders the product not reasonably safe” (6). Liability is often limited to warning of risks that can only be reasonably known when the product is sold.

Several legal analyses anticipate that this area of defect could be problematic for AVs, but early litigation will likely provide the best evidence (2, 3). Like all manufacturers, AV manufacturers will have an obligation to inform consumers of any known risks of product failure. Because of the newness of the concept of an AV, however, a manufacturer or designer may have to

anticipate a very wide range of potential risks. The dangers of using a laptop while driving, for example, might require a warning, since consumers may reasonably expect to be able to use a computer in the car if the car is driving itself (3).

The standard on recall-like communications may be raised as well. Connectivity and the availability of over-the-air vehicular software updates may raise the threshold for informing motorists of recently discovered risks. This means that manufacturers would be required to warn consumers of each new error that they discover through the vehicle's over-the-air update capabilities.

Tortious Misrepresentation

While not technically a defect, tortious misrepresentation is another tort claim attempting to hold a defendant liable for wrongly communicating about the product. Misrepresentation occurs when the manufacturer advertises or describes a product in misleading or inaccurate terms, which leads to harm through product usage consistent with the manufacturer's claims (2).

A hypothetical example cited in the literature describes a situation where an AV manufacturer advertises that a human driver very rarely needs to take control of the vehicle. If that claim was untrue and the user had to frequently take control and suffered harm as a result, the user could sue the manufacturer and argue on the grounds of the manufacturer's misrepresentation.

Misrepresentation claims can be brought under theories of negligence, strict liability, and fraud. Fraudulent misrepresentation occurs when a party "knowingly provides false or misleading information that causes harm" (2).

How Could Liability and Insurance Change?

AVs could significantly change motor vehicle operator liability, products liability, and the motor vehicle insurance system in a few key ways, including by shifting crash liability from the driver to the vehicle manufacturer and by decreasing the number and cost of crashes (3).

Shifting Crash Liability from the Driver to the Vehicle Manufacturer

Automation may shift crash liability from the driver to the vehicle manufacturer, but the magnitude of the shift will roughly correlate with the distribution of responsibility for the driving task. In other words, low-level, partially automated vehicles will have different implications than high-level or fully automated vehicles.

At lower levels of automation, vehicles will still rely heavily on the motorist to monitor the roadway and be actively engaged in the driving task. As a result, these low-level systems will shift a small amount of the crash liability burden away from the driver and onto the vehicle manufacturer.

As automation matures and takes on an increasing role in the driving task, the level of responsibility and liability for the driving task will also shift from the driver to the vehicle. For example, if a motorist enables the autodriven function on an AV in an appropriate fashion, but the

vehicle erroneously crashes, it seems unusual to ascribe fault to the motorist who correctly used the vehicle's features. In these situations, it is likely that crash fault will shift from the motorist to the vehicle manufacturer.

While it seems likely that liability will shift away from the driver and onto the vehicle, several parties could potentially bear the liability for the vehicle, including the vehicle manufacturer, vehicle component manufacturers, and the developers and engineers who programmed the vehicle's software. Additionally, if AVs rely on roadside equipment for operational information, roadside equipment designers and operators could be held liable. While many entities could potentially bear the liability, plaintiffs will likely sue vehicle manufacturers, since they are responsible for the final product and often have the largest financial assets.

Decreasing the Number and Cost of Crashes

A second way AVs could disrupt the current liability and insurance system is by decreasing the number and cost of crashes. AVs will not make human errors, which currently cause the majority of crashes. As evidence of the reduced crash risk from AVs becomes available, insurers may discount policies for AVs, incentivizing their adoption. Eventually, as AVs become widely distributed, the overall number of crashes and cost of vehicular insurance may decrease. One analysis argued that, with insurance reform and a sufficient reduction in crashes, motorists might no longer require a specialized motor vehicle insurance policy (3). The author argued that automotive insurance could eventually fall under more generalized insurance policies, like homeowners or renters insurance.

While automation could nearly eliminate minor crashes (like fender benders) and decrease crashes overall, it is also possible that the rare remaining crashes result in greater injuries and damages. AVs can operate at higher speeds and densities than human drivers, and if an error occurred in such situations, it could result in a devastating crash. This sort of a scenario presents a challenge to insurance companies because insuring against common but low-cost crashes is actuarially less difficult than insuring against rare but high-cost crashes.

Policy Advice from the Literature

In previous interviews, representatives from major AV manufacturers and developers reported that liability is one of the largest concerns facing the industry, and some worry that these concerns could slow AVs' development and implementation. This concern is echoed throughout the literature and comes up in many policy discussions surrounding AVs. What exactly are the concerns, and why does it matter?

In short, AVs could provide significant benefits to society. They could reduce crashes, which cost society billions of dollars each year; they could provide significant environmental and mobility benefits; and they could boost the quality of life for many Americans. However, the industry is concerned that the liability costs from a very small number of AV crashes could slow

or prevent manufacturers from developing and selling AVs, which would deprive Americans of those benefits.

So what should be done about this issue? Several options are available for consideration, but each warrants careful consideration and reflection due to the potential implications. This section discusses possible policy approaches for the State of Texas. Those policy approaches requiring federal action or actions by entities or events outside the control of the State of Texas are not included in this report. The final subsection considers the issue of states limiting OEMs liability on converted AVs.

Option 1: Doing Nothing

Perhaps the most mundane sounding of the options, doing nothing is actually the favored approach from several analyses. Both the Brookings and RAND analyses argue that, while there are many questions and much uncertainty regarding liability, they do not warrant legislative action (2, 3).

The reason legislative inaction is such a preferential approach lies with the flexibility and adaptability of products liability law. Many new technologies have arisen in the last century, and products liability law has gradually evolved to meet these technologies and to address associated legal challenges and complexities. The Brookings report states, “Given this strong record of adaptation to new technologies, there is no reason to expect that the legal system will be unable to address the products liability issues that arise with respect to autonomous vehicles” (2).

The RAND analysis argues that while crash costs may shift to auto manufacturers, manufacturers could easily pass on these costs to consumers, who would then receive lower vehicle insurance costs. RAND also argues that despite concerns about a delay in AV development and implementation, states may wish to consider the complexity and difficulty of legislative interventions in the tort system. Indeed, the RAND team feels that the benefits of intervention in this system are unlikely to outweigh the disadvantages, stating, “The tort system serves important social goals of providing incentives for safety and compensating the injured, and interventions to reduce liability may do more harm than good” (3). They conclude, “In short, it is not clear that liability concerns justify any intervention at this point” (3).

If states wish to address these issues legislatively, they could pursue several policy options, discussed in options 2 and 3.

Option 2: Irrebuttable Presumption of Driver Control

One option states could consider to mitigate liability on the AV industry is through legislatively mandating that a single person maintain legal responsibility for controlling a vehicle (3). This individual could delegate the functional responsibility for driving to the vehicle but would maintain the legal responsibility in the event of a crash. In essence, the human driver would always maintain legal responsibility for controlling the vehicle, even if not in direct control of

the vehicle. Such a system would relieve the liability burden on AV original equipment manufacturers (OEMs) but would also remove the financial incentive to improve safety and further refine their product.

Option 3: No-Fault Insurance

An alternative automotive insurance system used in 12 states called no-fault insurance “allows crash victims to recover damages from their own auto insurers after a crash instead of having to seek recovery from another driver” (3). Initially, proponents hoped no-fault insurance would reduce costs and ease the process of recovering damages from crashes; unfortunately, this has not occurred, and costs remain high.

The RAND report argues that states could pursue a no-fault insurance model as a means to address the liability issue surrounding AVs. This insurance model, coupled with AVs that reduce the responsibility of drivers, would retain the existing financial responsibility model where individuals retain legal and financial responsibility for their vehicles, while eliminating the difficult process of determining fault between drivers and vehicle manufacturers. This may reduce the liability burden on manufacturers but would also remove the financial incentive to improve safety and further refine their product. Additionally, this would constitute a major overhaul of Texas’ insurance system, which may be politically unfeasible.

Limiting Liability for OEMs on Converted AVs

A final, unrelated liability policy area states may wish to consider is in limiting the liability of manufacturers of non-automated vehicles whose vehicles have been converted by third parties. Some previous law in some states holds manufacturers liable for third-party modifications if the modification is deemed reasonably foreseeable (2). Such a policy would remove the liability from OEMs for a third party modifying their vehicle, even if it were reasonably foreseeable that a third party would want to install AV systems.

This relatively uncontroversial position has already been adopted in Florida, Michigan, and Washington, D.C., under their respective AV legislation, but California and Nevada’s AV legislation did not include this tenet. The Brookings report endorses this position, while the RAND report remains silent on this particular issue (2, 3).

CV Systems and Texas Liability

The CV system provides a communication platform through radios (DSRC) or other wireless communications that enable V2V, V2I, and V2X communication. This communication system can prevent vehicle crashes, improve mobility, and provide environmental benefits.

State and local governments will likely take an active role in the CV program because they will bear the responsibility of installing and operating the requisite roadside infrastructure for V2I applications. Because of this responsibility, lawmakers may worry that the state takes on additional liability for such systems.

To address these liability concerns, this section discusses the concept of state sovereign immunity, congressional abrogation to overcome sovereign immunity, and third-party liability considerations for CVs.

Sovereign Immunity

An analysis of Texas law indicates that the State of Texas has sovereign immunity from liability when erecting a warning device (which V2V or V2I may be considered) because the act is one of discretion (7). CV systems could be considered a warning device because the system is designed to send out warning information to vehicle operators about dangerous situations. The operator must make a decision about how to use the information.

When making a discretionary decision to erect a warning device (which V2V or V2I may be considered), the State of Texas has immunity and does not waive sovereign immunity because such a decision involves the exercise of discretion (7).

The National Highway Traffic Safety Administration, which is the regulatory body responsible for mandating the CV program, published a report in August 2014 assessing the readiness of V2V for deployment (8). This document includes a discussion of liability issues, but these issues are specific to the V2V program. Despite the differences, there are some salient portions from the analysis. The agency argues that the CV system is not substantially different from warning systems on current vehicles, and the agency “does not see a current need to develop or advocate the liability limiting agenda sought by industry in connection with potential deployment of V2V technologies via government regulation” (8).

Congressional Abrogation

One way state sovereign immunity can be overcome is by congressional abrogation (that is, where Congress acts under its constitutional powers to rescind the state’s immunity). This differs from a waiver because the decision to abrogate lies with Congress, while a waiver is more or less under the state’s control.

Under current U.S. Supreme Court analysis, Congress may only abrogate state immunity pursuant to its power under the 14th Amendment, and the only qualifying statute is 42 United States Code §1983, which addresses violations of people’s civil rights under color of state law. This statute was initially used to remedy the use of excessive force by state police but has later been interpreted to address other wrongful acts by state agents. Applying §1983 to AV liability is unlikely but not inconceivable if state agents are alleged to have acted with extreme disregard for safety or other concerns affecting life or property.

Third-Party Liability Considerations

A third party operating a CV system may be liable, and the State of Texas needs to take care to not waive sovereign immunity when entering into a contract with a third party. The actual

distribution of risk and liability with V2V/V2I technology is unknown at this time. One of the biggest concerns for the State of Texas will be if its agents lose sovereign immunity by entering into a contract with a private party and thus agreeing to abide by the terms of the contract. The liability of third parties appears to be limited from a products liability perspective, but fear of unknown future lawsuits and court decisions can occur.

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