Automated Vehicle Liability and Insurance
Part 2: Vehicle Operators

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SUMMARY

Automated vehicles (AVs) will crash less frequently than human-driven vehicles, but they will still crash. These crashes will sometimes create victims, and these victims will justifiably demand compensation. Our legal system is well-equipped to handle non-automated vehicle crashes, but AVs will challenge our existing doctrine. It is not yet clear how liability will be assigned when an AV crashes.

Each part of this four-part brief series considers one of four possible defendants—AV manufacturers, operators, fleet owners, and dispatchers—in a lawsuit following an AV crash. This brief (Part Two) explores the liability and insurance outlook for AV operators.

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1 Background

This four-part series explores questions around AV liability and insurance. Our purpose is to highlight areas where the emergence of AVs will pose a challenge to existing legal doctrine. Uncertainty in liability is a major barrier to deployment of any new technology, especially one with such wide-ranging effects as AVs. A predictable, fair, and science-based approach to creating liability rules would assist in facilitating the rapid deployment of the safest AV business models.

Each part of this brief considers the liability burdens that a particular party to an AV crash could bear. This brief—Part Two of the series—explores the liability and insurance outlook for AV operators.

An AV operator, for the purpose of this brief, is the individual inside an AV who is responsible for any driving tasks the AV cannot perform. In partially automated vehicles, where computer self-driving is rare or non-existent, the AV operator is essentially identical to a non-automated vehicle driver. In more highly automated vehicles, where computer self-driving is typical, the AV operator may be more akin to a non-automated vehicle passenger. We use the term “operator” generally to describe the human occupant of the vehicle in both scenarios.

This brief will address the following simplified scenario in which:

- AVs will be individually owned, possibly (but not necessarily) by the AV operator.
- The AV manufacturer is also the manufacturer of the vehicle’s self-driving system.
- AV insurance, like conventional auto insurance, is available in a competitive market with different insurance products available.
- Parties choose to purchase insurance when it is economically rational for them to do so.

This brief is structured as follows. Section 2 describes challenges to determining liability for and insuring AV operators. Section 3 presents three possible liability and insurance frameworks for AV operator insurance and notes the advantages and drawbacks of each. Section 4 outlines anticipated outcomes of each framework at different levels of vehicle automation. Section 5 concludes.

2 Challenges

2.1 Operator liability

As described in Part One of this series, most conventional automobile accidents are caused by human driving error, such as driver inattention, tiredness, intoxication, and so on. Liability for these accidents is assigned to the human driver under a negligence framework. Accidents can also be caused by unintentional manufacturing errors, in which case liability is assigned to the manufacturer under a products liability framework.

AVs will complicate liability assessment and assignment. Automating driving tasks—that is, giving tasks over to the ability and judgment of a computer—blurs the line between human error and manufacturing defect. AV operators will not be held liable under a products liability framework because AV manufacturers, not operators, bear responsibility when a product is designed defectively. However, AV operators could still be liable when they are, or ought to be, in control of the vehicle at the time of a crash. Policymakers must decide whether and when to hold AV operators liable, and if so, whether to evaluate liability under a negligence or a strict liability framework. AV operators could also be liable under a respondeat superior framework if courts treat AVs as functionally equivalent to a human chauffeur.2

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1 Estimates from several studies place the percentage of accidents caused by human driving error between 90% and 99%. See Bryant Walker Smith, The Center for Internet and Society, Human Error as a Cause of Vehicle Crashes. (Dec. 18, 2013).
2 See supra Section 3.3.
An important factor in determining liability will be the extent of automation in a given vehicle. The Society of Automotive Engineers (SAE) has developed a widely used system for classifying vehicle automation (Table 1).

Table 1. SAE classification system for automated vehicles

<table>
<thead>
<tr>
<th>SAE level</th>
<th>SAE name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No automation</td>
<td>All aspects of driving are fully human and manually controlled.</td>
</tr>
<tr>
<td>1</td>
<td>Driver assistance</td>
<td>Automation assists with only one aspect of driving (e.g., steering, speed, or braking control).</td>
</tr>
<tr>
<td>2</td>
<td>Partial automation</td>
<td>Automation assists with multiple aspects of driving, allowing for limited self-driving. Driver must monitor and be ready to take control of the vehicle at all times.</td>
</tr>
<tr>
<td>3</td>
<td>Conditional automation</td>
<td>Lowest-tiered system classified as automated driving. Automation controls routine driving, but manual override is required in challenging situations. Driver must monitor and be ready to take control of the vehicle at all times.</td>
</tr>
<tr>
<td>4</td>
<td>High automation</td>
<td>Automation controls all driving in most conditions. Manual override is possible but only required in very challenging situations.</td>
</tr>
<tr>
<td>5</td>
<td>Full automation</td>
<td>Automation controls all driving in all situations. Manual override is not necessary and may not even be possible.</td>
</tr>
</tbody>
</table>

Liability is presumably more likely where the AV operator has more control over the vehicle (i.e., at lower SAE levels) and therefore is more blameworthy for the vehicle’s actions. Intermediate levels of vehicle automation pose a particular challenge to the liability determination. In SAE Level Three and Four vehicles, self-driving is possible or common, but a human driver’s control may be necessary or at least possible under certain circumstances. At these intermediate levels, the liability determination may turn on whether the operator decides to take or cede control of the vehicle, and whether that choice was reasonable under the circumstances.

2.2 Operator insurance

Every U.S. state except New Hampshire requires drivers to carry auto insurance. If all vehicles become fully self-driving, personal auto insurance requirements may become obsolete. Until then, AV operators are likely to be held partially or entirely liable for accidents involving AVs where human control is necessary or possible under certain circumstances. Personal auto insurance will likely still be necessary, albeit in a form that may be different from today’s personal auto insurance products.

Part One of this brief series discussed the challenges associated with developing appropriate insurance products for AV manufacturers. These challenges include a lack of technical knowledge and data regarding AV operation and accident rate. Such challenges are perhaps even more salient when it comes to developing personal appropriate insurance products for AV operators.

If AV manufacturers will be liable for accidents involving AVs, manufacturers will likely insure all AVs they produce. These vehicles will presumably be built around a common self-driving system, meaning that the insurer will need to assess the safety of only that particular system to price insurance appropriately. Manufacturers may also be more willing to share their proprietary safety data with insurers since providing such data may result in a better manufacturer insurance price.

If AV operators are liable for accidents involving AVs, however, the situation changes. Some AV operators, particularly those operating an uncommon self-driving software, may struggle to find an insurer offering an
appropriate rate, or even to find an insurer at all. Manufacturers may also be less likely to share proprietary safety data with insurers if the data is used to price AV operator insurance rather than AV manufacturer insurance.

One solution is for insurance companies and AV manufacturers to identify opportunities for information-sharing that respect proprietary considerations. Another approach would be to create an industrywide, anonymized AV safety data repository that insurers could access. Auto Insurance companies can also collaborate with experts—such as academic researchers or current and former employees of AV companies—to develop comprehensive, appropriately priced policies. Finally, the market entry of boutique insurance firms specializing in particular AV technologies may provide superior insurance products for AV operators who might otherwise be subjected to disadvantageous terms.

3 Possible liability and insurance frameworks

3.1 Negligence

In a crash involving non-automated vehicles, drivers are usually evaluated under a negligence framework. Negligence liability is based on the defendant “breaching a duty of reasonable care.” The injured plaintiff must prove that (1) the defendant owed a duty of reasonable care, and (2) the defendant’s actions breached that duty. The “duty of reasonable care” for human drivers is sometimes statutory (for instance, obeying road signs) and sometimes based on the “reasonable person test.” In the latter, a court asks whether the “reasonable person”—a person who always acts prudently, legally, and with average skill and judgment—would have done what the defendant did.

Negligence works for non-automated vehicles because the driver retains total control of the vehicle. In these vehicles, all driving decisions—steering, braking, obeying road signs, maintaining a safe following distance, routing, etc.—are made by a human driver. Any crash caused by a driving error is fairly traceable to the human driver’s actions and decisions. This is not the case with highly automated vehicles. In an SAE Level Five vehicle, for instance, human control is not necessary and may not even be possible. If the operator of the vehicle cannot control any driving decisions, there is no way for the operator to breach a duty of reasonable care in driving. It is therefore theoretically impossible that the operator of an SAE Level Five vehicle would be held liable under a negligence framework.

Below SAE Level Five, some control by a human operator is possible and/or required. How much control the operator exerts depends on SAE level. The operator of a SAE Level One vehicle is almost always in control of the vehicle, while the operator of a SAE Level Four vehicle is in control only under special circumstances. When the operator is in control of the vehicle, negligence will likely apply in the event of a crash. But when the computer is performing most or all driving tasks, the result is harder to predict. Courts will likely ask whether the crash was foreseeable, whether the AV operator could have intervened and taken control, and whether the “reasonable person” would have intervened and taken control.

There is one situation in which the operator will likely be evaluated for negligence even when the AV is self-driving. SAE Level Three and Four vehicles are capable of self-driving in some, but not all, situations. These vehicles will sometimes confront challenging or novel conditions and may request driver intervention. Here, a driver’s failure to intervene could create negligence liability. Courts may find that a “reasonable person” would have retaken control of the vehicle after being warned to do so. Whether or not a driver is held liable in this scenario will likely also depend on the time elapsed between warning and accident. For instance, if an AV manufacturer specifies that a human driver must take control in less than a minute after being warned to do so, a driver who waits two minutes before taking control may be held liable for a subsequent accident.

3 See UC Davis Policy Institute for Energy, Environment, and the Economy. What to Demand in Response to this (and all Future) Fatalities.
3.2 **Strict liability**

If courts decide that AV use is an “unreasonably dangerous activity,” they could impose a strict liability framework. Under strict liability, a party is liable for all consequences that flow from a proscribed activity, even if the party did not act negligently. For a strict liability claim, the plaintiff does not need to establish a duty of care and breach of that duty, nor does the plaintiff need to show that the defendant acted unlike the “reasonable person.” When strict liability applies, the plaintiff merely needs to show that (1) the defendant was doing the proscribed activity, and (2) doing the activity caused the plaintiff harm.

Two examples of activities that courts have attached strict liability to are owning a wild animal and using dynamite. The rationale for strict liability for these activities is that they are so inherently risky that society can only tolerate their existence if the actor agrees up front to assume all risk. AV proponents will certainly argue that driving an AV is safer and more predictable than these types of activities. Driving a non-automated vehicle is not considered “abnormally dangerous” despite the fact that vehicle accidents injure more than two million Americans each year, and AVs are unlikely to reach market until they are demonstrably safer than human-driven vehicles.

However, given the documented public suspicion regarding AV technology, the public may demand a strict liability standard for highly automated vehicles. Imposing such a standard would require policymakers to develop precise and consistent definitions for what constitutes an “unreasonably dangerous” automated vehicle. Presumably, strict liability would be reserved for self-driving vehicles, since vehicles at lower levels of automation can be indistinguishable from non-automated vehicles in some or most driving situations.

The likely result of a push to attach strict liability to AV operators would be to create a hybrid standard. Driver negligence could apply whenever the human operator is driving, and strict liability could apply whenever the car is in self-driving mode. Thus, the operator would always be liable, but more strictly in vehicle self-driving scenarios. A framework that always holds operators liable would shield manufacturers from liability. This could result in lower vehicle costs and ease market entry, but at the expense of imposing a heavier liability and insurance burden on consumers. Such a hybrid standard would also reward human driving with a lower liability standard and punish computer driving with a higher liability standard. This is poor policy if AVs are in fact safer than human-driven vehicles.

Strict liability would mandate operator insurance. This insurance may be more expensive because strict liability makes it more likely the operator will be held liable. On the other hand, if consumers bear all the liability and insurance costs, they will presumably demand extremely safe vehicles. A very safe AV that crashes very infrequently could be far cheaper to insure than a human-driven vehicle even if the human-driven vehicle is held to a lower liability standard.

3.3 **Respondeat Superior**

Respondeat superior—“let the master answer”—is a vicarious liability framework. Under this framework, supervisors or employers are strictly liable for the actions of their agents (supervisees and employees). Courts could apply this framework to AVs by treating self-driving AVs as agents of their operators. Courts across America have held that a person who employs a human chauffeur is vicariously liable for the chauffeur’s negligence under respondeat superior. If courts view advanced AVs as analogous to human chauffeurs, an AV operator could be forced to assume liability for the AV’s negligence.

Respondeat superior and strict liability will produce similar results in most cases: either way, the AV operator

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4 Association for Safe International Road Travel, Road Safety Facts.
5 According to the American Automobile Association (AAA)’s May 2018 AV survey, 73% of Americans now report that they are too afraid to ride in a fully self-driving vehicle, up 10% from 2017. See AAA, American Trust in Autonomous Vehicles Slips (May 22, 2018).
would be strictly liable for the AV’s bad actions. However, there is a key conceptual difference between the two. Under strict liability, an AV operator is liable for any harm that occurs as a result of the AV’s activity. For instance, the operator would be liable for harm caused if an AV tire blew out and caused the vehicle to spin out of control, even if there was no way for the operator or vehicle to anticipate and forestall the blowout. Under respondeat superior, an AV operator is liable only when the vehicle commits a negligent act. This framework requires the court to undertake a negligence analysis (as described in Part 2.1) of the vehicle’s performance, i.e., by comparing the performance to the performance of the “reasonable person.” Hence a tire blowout would not result in operator liability.

A respondeat superior framework would implicitly grant quasi-human status to a vehicle computer for its autonomous actions. This could be a significant step towards a broader legal framework that differentiates autonomous robots and ordinary machines. No such framework yet exists, but as we enter an era of machine learning and computer autonomy, it is wise to prepare now for the inevitable legal challenges that these technologies will present.

Although a respondeat superior framework is potentially viable, it may be unpalatable to society. Some may bristle at the idea of a machine being treated as a human on philosophical grounds. Others may simply not wish to hold humans liable for the actions of computers. Still others may prefer a liability scheme that holds AV manufacturers, not operators, liable for highly automated vehicle errors. While the appropriate legal approach to resolving injuries caused by a computer is the subject of intense academic debate, it remains largely unresolved in real courts.

Under a respondeat superior framework, operators of highly automated vehicles would likely opt to purchase insurance because there is some likelihood the operator will bear liability. The liability burden is not as high under respondeat superior as under strict liability, however, because the AV could defend against a negligence claim by demonstrating conformity with the reasonable person standard.

4 Anticipated outcomes of framework application

4.1 Negligence

If policymakers do not impose new rules, liability for AV accidents will likely be assigned to AV operators under a negligence framework. We anticipate the following outcomes:

- **SAE Level One and Two** vehicles appear to fit within existing liability and insurance structures. Level One vehicle drivers retain nearly all driving control, which is conducive to a negligence analysis. Level Two vehicles can drive more autonomously, but in such limited conditions and circumstances that human negligence will still be a major factor in most accidents. Traditional, driver-held insurance is probably sufficient to cover these AV classes.

- **At SAE Level Three and Four**, increased autonomous driving means that AV operators will not drive as frequently and are thus less likely to act negligently. However, there will still be instances where the human must drive, which could create negligence situations. There will also sometimes be negligence claims when the human does not take control of the vehicle when prompted. Because there is some likelihood of liability, AV operators will still likely insure. Since increased automation means less likelihood of human error, AV insurance may be less expensive or more specialized than traditional auto insurance.

- **At SAE Level Five**, fully autonomous driving will make human negligence unlikely, if not impossible. Operators of SAE Level 5 vehicles will no longer need to purchase insurance against negligent driving since operator inability to control any driving tasks means there is simply no opportunity to commit a negligent act (when in autonomous mode).
Table 2. Anticipated outcomes under a negligence framework

<table>
<thead>
<tr>
<th>SAE level</th>
<th>Liability</th>
<th>Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Traditional, driver-borne negligence for human error.</td>
<td>Traditional, driver-held insurance.</td>
</tr>
<tr>
<td>2</td>
<td>Driver-borne negligence when in control of driving tasks (which is often). Negligence for failure to heed a request for intervention.</td>
<td>Traditional, driver-held insurance.</td>
</tr>
<tr>
<td>3</td>
<td>Driver-borne negligence when in control of driving tasks (which is infrequent). Negligence for failure to heed a request for intervention.</td>
<td>Driver-held insurance possibly provided by a new market entrant with specialized knowledge of AV technology.</td>
</tr>
<tr>
<td>4</td>
<td>Driver-borne negligence when in control of driving tasks (which is rare). Negligence for failure to heed a request for intervention.</td>
<td>Driver-held insurance possibly provided by a new market entrant with specialized knowledge of AV technology.</td>
</tr>
<tr>
<td>5</td>
<td>Liability is theoretically impossible because the driver cedes all control of driving tasks.</td>
<td>Driver-held insurance unlikely because liability unlikely.</td>
</tr>
</tbody>
</table>

4.2 Strict liability

Here, we assume that a legislature or the court system imposes a strict liability framework on AV operators on the theory that AV use is an unreasonably dangerous activity. We further assume that this legal framework would only apply when the computer is driving, and that a negligence standard will apply otherwise.

- **SAE Level One** vehicles will be largely unaffected by the imposition of strict liability for self-driving vehicles. Since the human maintains nearly complete control over driving tasks, negligence (and thus traditional driver-held insurance) will remain the standard. Traditional auto insurance is necessary and sufficient.

- **SAE Level Two and Three** vehicles will begin the shift towards strict liability, as computers assume control of more and more driving tasks. Negligence will still apply when the human is in full control of the vehicle, but strict liability will apply in the limited situations where self-driving is possible. Operators of Level Two and Three vehicles will likely continue to carry traditional auto insurance for when human-driving negligence scenarios arise, but will also seek more tailored, strict-liability insurance products. New market entrants may emerge to create such products.

- **SAE Level Four and Five** vehicles will be primarily or entirely assessed under a strict liability framework. Operators of Level Four and especially Level Five vehicles may eschew traditional auto insurance against human-driving negligence because human driving is rare, but strict liability insurance against computer-caused accidents will be necessary. Liability insurance products will mature along with AV technology. New market entrants will likely play a key role in facilitating development of such products.

Table 3. Anticipated outcomes under an ALWAF framework

<table>
<thead>
<tr>
<th>SAE level</th>
<th>Liability</th>
<th>Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Negligence when human driving (which is almost always), strict liability (SL) when computer driving.</td>
<td>Traditional, driver-held insurance.</td>
</tr>
<tr>
<td>2</td>
<td>Negligence when human driving (which is infrequent), SL when computer driving.</td>
<td>Traditional, driver-held insurance, possibly in addition to a new, SL-based specialized insurance product.</td>
</tr>
<tr>
<td>3</td>
<td>Negligence when human driving (which is occasionally), SL when computer driving.</td>
<td>Likely a new, SL-based specialized insurance product.</td>
</tr>
</tbody>
</table>
Table 3. Anticipated outcomes under an ALWAF framework

<table>
<thead>
<tr>
<th></th>
<th>Anticipated Outcomes</th>
<th>Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Negligence when human driving (which is rarely), SL when computer driving.</td>
<td>Likely a new, SL-based specialized insurance product.</td>
</tr>
<tr>
<td>5</td>
<td>SL exclusively.</td>
<td>Likely a new, SL-based specialized insurance product.</td>
</tr>
</tbody>
</table>

4.3 *Respondeat Superior*

Here, we assume that a legislature or the court system imposes a respondeat superior framework on AV operators. This framework can only apply when the computer is self-driving; when the human is driving, traditional negligence will apply. We anticipate the following outcomes:

- **SAE Level One and Two** vehicles will be largely unaffected by a respondeat superior approach. Since the human is almost always driving a Level One vehicle, and the human is always fully responsible for monitoring the driving task in a Level Two vehicle, liability will be assessed under a negligence framework. Traditional auto insurance is necessary and sufficient.

- **SAE Level Three and Four** vehicles will be affected by respondeat superior. Any negligent act committed by an AV in self-driving mode—disobeying road signs, failing to keep a lane, etc.—will be imputed to the operator. Operators will maintain traditional auto insurance for when they control the vehicle, but will also likely purchase a new, specialized insurance product for when they do not. Pricing of the new product will be based not on the driver’s history and traits, but on the traits of the vehicle’s software.

- Incidents involving **SAE Level Five** vehicles will be exclusively assessed under respondeat superior, making essential the development and purchase of the new, specialized insurance product described above.

Table 4. Anticipated outcomes under a respondeat superior framework

<table>
<thead>
<tr>
<th>SAE level</th>
<th>Liability</th>
<th>Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Negligence when human driving (which is almost always).</td>
<td>Traditional, driver-held insurance.</td>
</tr>
<tr>
<td>2</td>
<td>Negligence when human driving (which is frequently); operator liable for computer negligence when computer driving.</td>
<td>Traditional, driver-held insurance.</td>
</tr>
<tr>
<td>3</td>
<td>Negligence when human driving (which is occasionally); operator liable for computer negligence when computer driving.</td>
<td>Traditional, driver-held insurance, possibly in addition to a new, SL-based specialized insurance product.</td>
</tr>
<tr>
<td>4</td>
<td>Negligence when human driving (which is rarely); operator liable for computer negligence when computer driving.</td>
<td>Traditional, driver-held insurance, likely in addition to a new, SL-based specialized insurance product.</td>
</tr>
<tr>
<td>5</td>
<td>Operator liable for computer negligence when computer driving (which is always).</td>
<td>New, SL-based specialized insurance product.</td>
</tr>
</tbody>
</table>

5 **Conclusion**

The AV revolution will challenge the tort liability scheme, but some existing legal rules and doctrines may prove sufficiently flexible to address the unique features of AV manufacturing. Legal policymakers should consider both the benefits and shortcomings of AVs to strike the appropriate balance between innovation and victim compensation. Regardless of the scheme policymakers adopt, liability assignment must be clear. If all parties
have a clear understanding of if, when, and how they may be liable, they will be better informed and make better choices about using (and insuring their use of) AVs.

If policymakers choose to assign liability to AV operators, the critical questions that must be resolved are:

- What will be the market impact of holding AV operators liable? Will assigning liability in this way disincentivize consumer use of AVs?
- Should AV operators be evaluated under negligence, strict liability, or a different form of liability? Does (or should) the standard change at different SAE Levels?
- Is a self-driving car legally akin to a human chauffeur? If so, should this type of vehicle be evaluated as the operator’s agent?
- Are there other forms of state or federal AV governance that will complement the chosen liability standard?

To answer these questions, policymakers should collaborate with legal experts who are doing important research in this field. This brief only touches on a few of many liability concepts that legal academia is currently debating. Legal experts can support good policy development by providing useful historical insight and practical analysis to help guide policymakers through the conceptual challenges of liability reform. This type of collaboration will ensure that all parties can realize the safety goals of AV technology.