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Autonomous Vehicle Law Report and Recommendations to the ULC Based on Existing State AV Laws, the ULC's Final Report, and Our Own Conclusions about What Constitutes a Complete Law

University of Washington Technology Law and Public Policy Clinic

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Introduction: This report was created by the University of Washington's Technology Law and Policy Clinic for the Uniform Law Commission (ULC). It was created at the request of Robert Lloyd, Professor of Law at the University of Tennessee and a member of the ULC's subcommittee for autonomous vehicles. The report aims to do three things: (1) present the existing autonomous vehicle provisions on the books in California, Michigan, Florida, Nevada, and Washington, D.C.; (2) analyze these provisions, address related questions raised in the ULC's Final Report, and make recommendations to the ULC; and (3) offer draft provision language to illustrate our recommendations.

Our analysis sometimes favors select state provisions that we think get it right and sometimes creatively suggests provisions that no state has adopted. Professor Lloyd asked us to be forward-looking and creative in our thinking, particularly as it relates to provisions surrounding the deployment, sale, and consumer-operation of autonomous vehicles (relatively uncharted territory). This report reflects this charge, while attempting to firmly ground itself in the wisdom of existing state provisions and surrounding scholarship. The report starts by addressing definitional provisions, moves to provisions related to the testing and certification of autonomous vehicles, and concludes with provisions covering deployed and salable autonomous vehicles.

I. Definitions of an "Autonomous Vehicle"

- **State definitions**
  - Nevada: "A motor vehicle equipped with autonomous technology. . . . 'Autonomous technology' means technology which is installed on a motor vehicle and which has the capability to drive the motor vehicle without the active control or monitoring of a human operator."[1]
  - California: "A vehicle operated without the active physical control or monitoring of a person." [2]
  - Florida: "Any vehicle equipped with autonomous technology. The term 'autonomous technology' means technology installed on a motor vehicle that has the capability to drive the vehicle on which the technology is installed without the active control or monitoring by a human operator."[3]
  - Michigan: "a motor vehicle on which automated technology has been installed, either by a manufacturer of automated technology or an upfitter that enables the motor vehicle to be operated without any control or monitoring by a human operator. The definition does not include a motor vehicle enabled with 1 or more active safety systems or operator assistance systems, … unless 1 or more of these technologies alone or in combination with other systems enable the vehicle on which the technology is installed to operate without any control or monitoring by an operator."[4]

[1] Nev. Rev. Stat. § 482A.
[2] Cal Vehicle Code § 38750.
[3] Fla. Stat. § 316.003.
[4] Mich. Comp. Laws § 257.2b.

- **Recommended definition:** An "autonomous vehicle" is a motor vehicle equipped with autonomous technology that can drive the vehicle without the active physical control or monitoring of a human for any duration of time.
    - **Addressing concerns raised in the ULC Report by adding "any duration of time":** This addition may address the concern raised in Section II of the ULC Subcommittee's November 15 Final Report – that some manufacturers might claim their vehicles are not "autonomous" because they require active monitoring most of the time, even while expecting consumers to use the car's autonomous capabilities in certain contexts (like freeway driving). By adding "any duration of time", the legislation would cover some Level II automated vehicles that combine lane-centering, lane changing, and/or speed modulation to allow automation without active human control and monitoring during limited highway driving. Such combined-function technologies present significant risks (possibly more risks than Level Three and Four AVs), and yet may fall outside regulation if the definition of autonomous vehicle is not appropriately nuanced.

      Alternatively, if the ULC would rather not capture combined-function, Level Two AVs under its primary "autonomous vehicle" regulatory framework, we suggest addressing the risks in a stand-alone provision for such technologies (discussed at the end of this report). This might require manufacturers to develop systems to warn users that they must *actively* monitor the road and vehicle while the technology is functioning. In general, we recommend the ULC anticipate a hodge-podge of automated vehicles on the road, from Levels One through Four, and that it draft legislation covering all four levels of automation. While it is possible that the term "autonomous vehicle" should be exclusively reserved for Level Three and Four AVs, the draft law should nevertheless address Level One and Two autonomous technology. This is in no small part because manufacturers will widely deploy such technology sooner than Level Three and Four technology.
- **Additional recommended definitional language**
    - The term "autonomous vehicle" does not include vehicles with independently-functioning automated systems, such as blind spot detection, emergency braking, adaptive cruise control, lane keeping, and lane changing.
    - The term does apply to a vehicle employing any combination of these automated systems that allows driving without active human monitoring and control for any duration of time.
    - Manufacturers deploying combined-function autonomous technology that allows a vehicle to function autonomously in limited contexts, but who do not consider the vehicle an "autonomous vehicles," must adequately warn users to *actively monitor* the road and system while the technology is engaged.
    - Common terms that should be defined (and are by most states with laws on the books):
        - "Autonomous technology" is technology installed on a motor vehicle that can drive without the active physical control or monitoring of a human operator for any duration of time.
            - Note: A car can have automated technology (such as Level One and Two automated vehicles) and yet not be an "autonomous vehicle".
        - A vehicle is in "autonomous mode" when its autonomous technology is engaged and operating the vehicle without the active control or monitoring of a human.

- Note: This term is likely to be highly relevant for the foreseeable future as Level Three autonomous vehicle operators switch their AVs in and out of autonomous mode. As will be discussed, potential liability between the manufacturer and driver shifts every time "autonomous mode" is engaged or disengaged.

- **Recommended categories for AVs at different stages in testing and certification**
  - **A "private-test autonomous vehicle"** is a vehicle that can operate in private, controlled environments without the active physical control or monitoring of a person.
    - Note: Such vehicles require no state permitting, but companies are subject to basic negligence and work-place-safety common law standards.
  - **An "unlimited public-test autonomous vehicle"** is a state-permitted vehicle that a manufacturer must reasonably conclude and certify can operate safely and lawfully on any public road under all foreseeable testing conditions without the active physical control or monitoring of a person.
  - **A "limited public-test autonomous vehicle"** is an autonomous vehicle with a limited state permit for testing on certain public roads on which the manufacturer must reasonably conclude the vehicle can be safely tested under certain testing conditions without the active physical control or monitoring of a person.
    - Note: This allows for a more gradated approach between controlled private testing and completely unlimited public testing. Permits can be granted for testing on only certain types of roads (e.g. residential roads) and under limited driving conditions (e.g. day driving). More on this below.
  - **A "certified autonomous vehicle"** is a state-certified vehicle that has demonstrated that it can operate safely and in compliance with state and federal laws without the active physical control or monitoring of a person. The vehicle is certified for deployment, sale, and use by consumers.

II. Regulation of the Testing of Autonomous Vehicles

- **Insurance requirements for testing**
  - **State provisions**
    - Three states - California, Nevada, and Florida - have the same requirement: Manufacturers must have a $5 million insurance policy, take out a $5 million bond, or make a $5 million deposit or bond with the DMV as proof of financial responsibility and the ability to cover possible liabilities for damage to persons and/or property.[5]
    - Michigan does not have a minimum dollar-value requirement, but requires the submission of proof to the Secretary of State that a test vehicle is insured.[6] Manufacturers need only buy the insurance other drivers would buy, but they must submit proof of having bought such insurance before testing (a higher burden than on other drivers).
  - **Recommendation:** We agree with the ULC's Final Report that there does not seem to be a clear need for a $5-million-minimum insurance requirement, or any specified minimum amount. There is no evidence that test vehicles will be more dangerous on the

[5] Nev. Rev. Stat. § 482A.060; Fla. Stat. § 316.86; Cal. Vehicle Code § 3875(b)(3).
[6] Mich. Comp. Laws § 257.665(1).

road than ordinary vehicles and their drivers. Nor is there evidence that an ordinary car insurance plan would be unable to cover the costs of an accident, should one occur. Insurance companies will also be in the best position to price their insurance premiums for specific manufacturers according to a myriad of risk factors.

The ULC draft should, however, include a provision making it clear that AV manufacturers must acquire some insurance before beginning testing on public roads. It may also want to require proof of insurance be submitted to the Secretary of State, as in Michigan. This would set a minimum standard that creates the potential for state review of the adequacy of insurance without setting a barrier to entrepreneurs had can't afford expensive insurance. We, therefore, support Michigan's approach.

- **Suggested draft language along Michigan's lines:** Manufacturers testing autonomous vehicles on public roads must purchase insurance capable of adequately covering foreseeable liabilities for damages to persons and/or property proximately caused by testing. Manufacturers must provide proof of purchase [to the Secretary of State or DMV] prior to beginning testing.

- **Requiring that test drivers can reassume control (driver's seat, steering wheel, etc.)**
  - **State provisions**
    - In California, Nevada, Michigan, and Florida, test drivers must be able to reassume immediate control at any time in the event of an AV failure or emergency, which requires two things[7]:
      - There must be a driver's seat with a steering wheel and pedals.
      - The driver must be in the driver's seat and monitoring safe operation at all times.
  - **Recommendation:** The ULC should adopt this logical provision. However, it may also want to provide an avenue for exceptions, vehicles without steering wheels (level four vehicles) can be tested on select or all public roads. Language such as, "unless otherwise permitted by state regulatory authorities," would create a range of possible future exceptions that the DMV might make to allow for completely driverless cars, without steering wheels and pedals, to be tested first on portions of public roads and eventually on any public roads. Because we believe such completely driverless cars are an eventuality, they should be contemplated in any draft legislation.
  - **Recommended provision language:** Unless otherwise permitted by state regulatory authorities, licensed test drivers on public roads must be able to immediately re-assume full control of the vehicle at any time in the event of an AV failure or emergency. This requires that the driver is actively monitoring the roadway and performance of the autonomous vehicle while seated in the driver's with immediate operational access to the steering wheel and pedals.
  - **[A more optional provision on when test drivers *must* re-assume control**
    - Test drivers must re-assume control of an autonomous vehicle if the autonomous technology appears to be failing, violating state and/or local traffic laws, endangering persons or property, or when such intervention is necessary to accommodate the efficient flow of traffic.
      - The purpose of this type of a provision is to counter any incentive for test drivers to not intervene in order to avoid the obligation to report an

[7] Cal. Regs. § 227.18; Nev. Rev. Stat. § 482A.060; Mich. Comp. Laws § 257.665(1).

intervention or to see if the autonomous vehicle can maneuver on its own in a dangerous situation. More on this below.]

- **Required reporting of evasive disengagement from autonomous mode, crashes, near misses**
  - **State provisions:** California requires that manufacturers must collect and report to the department data related to disengagement from autonomous mode by the test driver resulting from a failure of the autonomous technology.[8] Nevada regulations require the reporting of any accident or traffic violation occurring during autonomous vehicle testing.[9] The NHTSA recommends that states require manufacturers report incidences in which a test vehicle is involved in an accident or a near crash, or where the driver is required to take control due to an inability of the automated vehicle to function properly in certain conditions.[10]
  - **Recommendation:** Requiring the above reporting is important as it creates a safety check that the public will expect. But, states may not want too much reporting because it requires compiling the information and reviewing it, which implicates some potential burdens and costs for manufacturers and the state. California attempts to strike a balance by requiring reporting crashes within 10 days and near-misses and incidences of disengagement once a year. The 10-day requirement for crashes makes sense, as this is what DMVs should be most concerned about. But, we also think any traffic citations should be reported within 10 days as well. California's one-year reporting requirement for incidences of disengagement and near misses is also probably too lax – allowing potentially dangerous testing operations to continue on public roads for a year. A biannual or quarterly reporting requirement seems more appropriate if the state is truly interested in checking hazardous testing operations. It should also be noted that listing incidences of near-misses and disengagement from autonomous mode does not seem highly burdensome for manufacturers (this is data test drivers should be collecting anyway). Nor does it seem highly burdensome for the state to read a two or ten page list of these incidences a couple times a year and make a basic determination as to any abnormal hazard. We therefore recommend at least a biannual reporting requirement of disengagements and near-misses.
  - **Recommended provision language**
    - Manufacturers must report within 10 days any accident involving a public-test autonomous vehicle in autonomous mode that results in personal injury or property damage. Manufacturers must also report within 10 days any traffic citation involving a public-test autonomous vehicle in autonomous mode.
    - Manufacturers must continually collect and report biannually to the DMV data related to: disengagement from autonomous mode by the test driver resulting from a failure of the autonomous technology or the inability of the automated system to function in certain conditions; near accidents with other vehicles, bikers, or pedestrians; and any other incidents in which the autonomous vehicle put persons or property at risk.
    - Manufacturer can report this information in any appropriate form and can submit accompanying comments and explanations of incidents. Manufacturers

[8] Cal. Regs. § 227.46.
[9] Nev. Regs. § 10.4.
[10] NHTSA Study at 12.

must certify that all reports are complete and accurate under penalty of perjury. Based on submitted reports, the DMV reserves the right to make a determination as to whether a manufacturer's testing must be limited in scope as to geography or conditions or whether the manufacturer's permit must be suspended or permanently revoked.

- **Geographical and environmental categories – limited public-test permits**
  - **State provisions**
    - California, Michigan, and Florida have no geographical limits for testing. AVs can be tested on any public road, assuming they meet the standard for certification.[11]
    - Nevada is more nuanced, allowing unlimited permits and limited permits for testing on public roads in six different "geographic categories" and five "environmental types."[12] The idea is to "allow applicants to determine which locations they have proven testing experience in, and which locations they would like to apply for on their testing license."[13]
      - **Six geographical categories**
        - Interstate highways
        - State highways
        - Urban environments
        - Complex urban environments
        - Residential roads
        - Unpaved or unmarked roads
      - **Five environmental types**
        - Night driving
        - Rain
        - Fog
        - Snow/Ice
        - High crosswinds (gusts above 30 mph)
  - **Recommendation:** We recommend a hybrid between California and Nevada's approaches. It is (and should be) very challenging to meet the standards for an unlimited public-test permit that would allow an AV to, for example, drive in the worst downtown traffic, at night, and in pouring rain. Recognizing that there is a huge gap between such forms of unlimited public testing and controlled private testing, Nevada's approach allows manufacturers to apply for more limited testing permits with presumably less demanding requirements. This allows manufacturers to more quickly transition from controlled private testing to limited forms of public testing, facilitating experimentation and innovation at the same time as minimizing public risks. The downside is that it may involve a manufacturer applying for multiple modified permits over the course of a few years as its competency grows, thus creating greater state permit-review burdens. However, because states can expect only a handful of manufacturers to be testing AVs and thus only a handful of permit applications each year, these burdens seem manageable and worthwhile.

[11] Cal. Regs. § 227.00(b); Mich. Comp. Laws § 257.665(1); Fla. Stat. § 316.86.
[12] *Nevada Autonomous Vehicle Testing License,* NEVADA DEPARTMENT OF MOTOR VEHICLES, (Revised: December, 2013) http://www.dmvnv.com/pdfforms/obl326.pdf
[13] *Id.*

- **Suggested language:** Applicants can seek one of two forms of permits: (1) An Unlimited Public Test Permit allowing testing on any public road if an applicant reasonably believes, and can demonstrate in its application based on controlled tests, that its autonomous vehicle can safely operate on *any* public road in *any* conditions; (2) A Limited Public Test Permit, if the applicant reasonably believes, and can show in its application based on controlled tests, that its autonomous vehicle can safely operate in limited categories of public roads under limited environmental conditions. For a Limited Public Test Permit, manufacturers can apply to test within any combination of the following road-types and environmental conditions:
    - **Six road types**
        - Interstate highways
        - State highways
        - Urban environments
        - Complex urban environments
        - Residential roads
        - Unpaved or unmarked roads
    - **Seven environmental conditions**
        - Day driving
        - Night driving
        - Clear weather (no precipitation, visual limitations, severe wind)
        - Rain
        - Fog
        - Snow/Ice
        - High crosswinds (gusts above 30 mph)

  Manufacturers can later apply to expand the scope of their testing permit to include a greater number of road types and environmental conditions or to apply for an Unlimited Public Test Permit.

- **Autonomous vehicle and test-driver permitting requirements**
    - **Requirement of completion of controlled testing before permitting for public roads**
        - **State provisions:** California requires for permitting: Manufacturers must have completed prior controlled tests that simulate real-world conditions before putting their vehicles on public roads, and the manufacturer must reasonably conclude that the vehicle is safe to operate on public roads.[14] Nevada requires that a vehicle be driven in autonomous mode for "not less than 10,000 miles."[15] It also requires manufacturers "provide proof that such autonomous vehicle or vehicles of the applicant have been driven in various conditions for a number of miles that demonstrates the safety of the vehicle or vehicles in those conditions" for which they seek a permit.[16]
        - **Recommendation:** Use a hybrid of California's and Nevada's rules here. The "reasonably conclude" standard that California uses is a tort standard. It is likely included to hold manufacturers liable if an accident occurs during testing and a reasonable person in the same position looking at the results from the

[14] Cal. Regs. § 227.24(b).
[15] Nev. Rev. Stat. § 482A.110(3)(b).
[16] *Id.*

controlled tests would have concluded that it was unsafe to start testing on a public road. This will provide a substantial check on manufacturers rushing forward without adequate controlled testing.

- **Requiring manufacturer certification that AV is safe for public testing:** The ULC could go a step further than California and require that: A manufacturer must certify, based on the results of controlled testing, that it has reasonably concluded testing can be safely performed on public roads.

  Requiring that manufactures sign this type of a certification during permitting could provide an additional layer of assurances to deter manufacturers that have no business testing on public roads.
- **Requiring presentation of objective evidence to the DMV:** The ULC's draft could also require, like in Nevada, that manufacturer present proof, objective evidence based on controlled testing, that testing can be safely performed on public roads. Such proof requirement seems logical, as the DMV must approve or disapprove applications based on objective evidence.
- **Requiring 10,000 miles in controlled settings:** Nevada's requirement that manufactures test their AV models for no less than 10,000 miles in controlled conditions before applying for a public-test permit is certainly a significant hurdle for manufacturers. However, it also seems to be a reasonable one. Manufacturers should not be working out basic kinks on public roads, where lives are at risk. 10,000 miles seems a sound number to ensure a vehicle model is reasonably safe to test on public roads. An ambitious tester could log 10,000 miles in two or three months' time. The downside for smaller manufacturers may be that access to suitable private roads may be limited or costly. But, the alternative of allowing novice testers on public roads is not tolerable.
- **Requiring manufacturers submit a plan to minimize risks:** As suggested by the NHTSA, a manufacturer could be required to submit a specific plan to minimize the risks of their testing.[17] This seems to be a reasonable request of manufacturers, as it is something they should be contemplating in any case. While this is another document that the state must review, it would be highly relevant to any determination to grant or deny a permit for public-road testing. And, again, because we expect only a handful of manufacturers will apply for public-road test permits each year in any given state, DMVs should be able to review these application materials without great difficulty.

- **Requiring fees to cover costs of DMV reviewing manufacturers' applications:**
  - **State provisions:** California requires that manufacturers must pay a fee of $150 to submit their application, allowing the operation of up to 10 autonomous vehicles and up to 20 autonomous vehicle test drivers.[18] Manufacturers may

[17] NHTSA Statement at 11.
[18] Cal. Regs. § 227.26(a)(1).

add additional sets of 10 vehicles and 20 drivers by submitting a fee of $50 for each set of 1 to 10 vehicles and 1 to 20 drivers.[19]

- **Recommendation:** The ULC could follow a similar model to California, but possibly suggest that states create flexible fee structures for applications, test-vehicle permitting, driver licensing, and final certifications that could fully cover cost burdens to the state. This would respond to the Final Report's concerns regarding costs in cash-strapped states. The ULC could provide a model provision requiring that DMVs develop fee structures resulting in cost-neutrality to the state. Motivated for-profit manufacturers would likely be willing to pay such fee structures, assuming they are within reason.

- **Require Manufacturer Certificates of Compliance**
  - The ULC Final Report raised the issue that requiring state approval of each individual test vehicle might be too great a burden for the state. It pointed to Nevada's approach as a possible solution, where manufacturers are allowed to issue "certificates of compliance" for the autonomous technology they intend to test on one or more of its autonomous vehicles.[20] These certificates must affirm that the autonomous technology allows for safe operation on public highways and that it includes a switch to engage and disengage the autonomous technology and a system to alert the operator to take control if a failure is detected, among other requirements. The key is that the certificates of compliance are for the autonomous technology itself, which can be tested on multiple vehicles. The state would, therefore, merely review the autonomous technology, the certificate of compliance for it, and the results in controlled tests of this technology. The state would not review applications for each individual vehicle. This is a sensible approach that limits the burden on the state while holding manufacturers accountable.
- **Test-Driver Permit and Training Requirements**
  - **Test driver permitting:** California requires that test drivers must obtain a Test Vehicle Operator Permit from the state. This requires that the test driver complete the manufacturer's autonomous vehicle test-driver training program in order to obtain the permit.[21] The test driver must also have a clean driving record with no at-fault accidents resulting in injury or death and no convictions for driving under the influence of intoxicants in the past 10 years.[22] Florida and Michigan, by contrast, require only a regular driver's license to test.[23]
    - **Recommendation:** The ULC should probably follow California's approach, setting a requirement that test drivers must complete a manufacturer's training program, but not requiring that state government itself create a training program (an expense and challenge states are unlikely to accept). As in D.C., the law should require that applicant test drivers certify that they have completed the course.[24]

[19] Cal. Regs. § 227.24(a)(2).
[20] Nev. Rev. Stat. § 482A.110(2).
[21] Cal. Regs. § 227.20(a).
[22] Cal. Regs. § 227.20(b).
[23] Fla. Stat. §316.85(1); Mich. Comp. Laws § 257.665(2)(c).
[24] D.C. Regs. § 114.1.

- **Test driver training program:** California requires that the test-driver training program must instruct on AV automated technology and provide behind–the-wheel instruction by an experienced driver on the capabilities and limitations of the vehicle. It also must provide defensive driver training, including practical experience recovering from hazardous driving scenarios.
  - **Recommendation:** The ULC should adopt this provision in its entirety.

- **Requiring two test drivers – a driver and co-driver**
  - **Recommendation:** Nevada requires two licensed drivers in a test vehicle.[25] This is an onerous and duplicative requirement – what is the co-driver doing that the primary test driver is not already doing? Only one driver can intervene if the AV system fails. If the test driver is required to be attentive, he or she should be entrusted to monitor the car alone without a co-driver. Requiring a second driver also dramatically increases the costs of testing. The ULC should avoid this approach.
- **Responding to ULC Final Report Inquiry on Test-Driver Permitting for Each AV**
  - The Final Report reads: "We further recommend that the drafting committee consider whether a person (an individual or entity) would be issued a blanket permit for all of the autonomous vehicle testing to be done by that person or whether they would be required to obtain individual permits for each individual autonomous vehicle or each model of autonomous vehicle to be tested."[26]
  - **Recommendation:** We believe a test driver's completion of a manufacturer's training program certifies the individual to drive any of that manufacturer's autonomous vehicles (assuming they deploy the same basic autonomous technology). The job function is the same in each vehicle – to monitor the operations and reassume the standard wheel/pedal controls in the event of an abnormal or unsafe occurrence. This relatively basic role suggests a single test-driver permit for any of that manufacturer's AVs is all that is required. If a test driver tests for multiple manufacturers (a contractor), it is probably reasonable to require them to receive training by each manufacturer for their specific technology and certify that they have received this training.

- **Who must conduct the testing – employees, contractors, designees**
  - **State provisions:** California requires the manufacturer itself must conduct the testing and test drivers must be employees, contractors, or designees that the manufacturer certifies and authorizes to operate the vehicle.[27]
  - **Recommendation:** This seems like a reasonable provision to ensure clear lines of responsibility and liability back to the manufacturer.
- **Requiring manufacturers to identify their test vehicles and license plates with the DMV**
  - **State provisions:** California requires that in order to test a permitted autonomous vehicle on public roads, a manufacturer must identify the vehicle, its make and model, and its license plate to the DMV.[28] The permit must be carried at all times in the vehicle.

[25] Nev. Regs. § 10.2.
[26] ULC Final Report at 5.
[27] Cal. Regs. § 227.34(a).
[28] Cal. Regs. § 227.16(a).

This does not mean that license plates or test vehicles must be marked in any way for visual identification (addressed later).

- **Recommendation:** This provision makes clear sense and should be included by the ULC. Any vehicle on public roads should be registered with the state and have a license plate.

- **Blanket lawful-driving requirement for test vehicles**
  - **State provisions:** California requires that the test vehicle and driver must obey all provisions of the state Vehicle Code and the local highway laws.[29]
  - **Recommendation:** This is a good blanket, gap-filler provision. But it also requires some exceptions – for example, from distracted-driver laws.
  - **Recommended provision language:** Operators of autonomous vehicles must obey all provisions of the state Vehicle Code and state and local highway laws, unless otherwise specified here.

III. Requiring Special License Plates for Test and/or Deployed AVs

- **State provisions:** Nevada provides for a special license plate for testing (red ones) and deployment (green ones)[30], as does D.C.[31]. Michigan, which only allows for testing, also requires special plates on test cars.[32]
- **Recommendation:** Colored plates for test vehicles (red) and for deployed vehicles (green) makes sense. But this alone is not sufficient. We recommend, in addition to colored plates, manufacturer-provided and correspondingly-colored lighting arrays surrounding AV license plates (again, red lights for a test vehicle and green lights for a deployed/certified vehicle). The lights would automatically turn on when the autonomous vehicle is in autonomous mode and turn off when the vehicle is in manual mode. The light indicator would be required by law and the costs borne by the manufacturer.

  This approach acknowledges that the majority of autonomous vehicles will not, for the next couple decades and possibly indefinitely, always operate in autonomous mode; drivers will frequently engage and disengage the technology as their preferences demand and as the circumstances require (more on this below). Therefore, an ideal visual identifier must indicate whether the vehicle is, at any given moment, operating in autonomous mode. A colored license plate does not achieve this goal. A simple colored lighting system around the license plate (and possibly also by the sensors on top of the vehicle) would achieve this goal.

  There are many merits to a colored-license-plate and lights-based model for identifying autonomous vehicles and whether they are operating in autonomous mode:

  - First, it puts law enforcement officers on notice as to what they are dealing with, which could be highly relevant during traffic stops and to an officer's understanding of whether the autonomous technology or the human operator were in control at the time of an incident (e.g., does the officer need to conduct a field sobriety test or was it the autonomous technology that was causing the swerving?). It would also be critical to an officer's testimony following accidents or crimes regarding whether they observed the vehicle in or out of autonomous mode.

[29] Cal. Regs § 227.18(c).
[30] Nev. Regs. § 6.3.
[31] D.C. Regs. § 436.
[32] Mich. Comp. Laws § 257.225.

- Second, it enables bystanders and victims to testify as to whether the autonomous-mode lights were on prior to an accident. This is critical to tort liability challenges surrounding AVs (addressed further below), where the manufacturer's liability or the driver's liability will depend on whether the vehicle was in or out of autonomous mode.
- Third, colored license plates with lighting arrays will put other drivers on notice that they should not drive erratically around the vehicle, and perhaps they will give autonomous vehicles extra berth as a result. With regard to concerns that other drivers might toy with or test an autonomous vehicle so identified, this would probably be a very rare occurrence – it is more likely that other drivers will be more cautious than otherwise out of concern for their *own* safety. Behavior designed to create hazards for autonomous vehicles would almost certainly be covered under reckless driving statutes. To make it explicit and to deter bad apples, however, the draft statute could clarify that meddling with the testing or operation of an autonomous vehicle is considered reckless driving or worse as the facts may dictate.
- Fourth, these indicators will alert other drivers that hand gestures or eye contact toward a driver in an AV in autonomous mode will be ineffectual. This allows other drivers to focus their attention on an autonomous vehicle's basic cues and to conduct their own driving in deliberate ways that the AV can readily understand (turn signals, pauses, clear forward motion, etc.).
- Fifth, it alerts pedestrians, construction workers, and traffic police that verbal communications directed at the driver may be ineffectual. For construction workers and police officers, the light indicator may suggest to them that they use very deliberate hand signals that the AV can interpret and respond to.

IV. Requiring Crash Data Recorders on Test and/or Deployed AVs

- **ULF Final Report recommendation:** The subcommittee recommended that the drafting committee consider an optional (bracketed) provision setting forth requirements for an installed crash data recorder on test or deployed autonomous vehicles.[33] We have drafted below what such a provision might look like and offer our recommendations.
- **State provisions and NHTSA recommendations:** California requires crash data recorders for autonomous vehicles sold to the public with detailed requirements for their use, but it does not require them for testing.[34] Nevada requires recorders on autonomous vehicles used for testing as well as autonomous vehicles offered for sale to the public.[35] The NHTSA recommends test vehicles have crash-data recorders.[36]
- **Recommendations:** Recorders should probably be required for both testing and deployment, but at a minimum they should be required for deployment.

  The benefits of crash data recorders in deployed vehicles will be substantial in helping resolve tort and criminal liability questions (important public interests). The driver could be liable (because the vehicle was not in autonomous mode and crashed because the driver made a mistake) or the manufacturer could be liable (because the vehicle was in autonomous mode and the autonomous technology malfunctioned). Data recorders will help resolve these civil or

[33] ULC Final Report at 12.
[34] Cal. Vehicle Code § 38750(c)(1)(G).
[35] Nev. Regs. §§ 8.2(b) & 16.2(a).
[36] NHTSA Statement, page 14, paragraph III.D.

criminal liability issues by answering the question: "was the vehicle in autonomous mode when the collision or incident occurred?" It may also help assess precisely when the accident occurred and any abnormal events leading up to the crash – for example, whether the autonomous mode had been disengaged by the driver immediately before the accident or whether the autonomous mode had been engaged immediately before the accident. It may also be critical in assessing which part of the AV system failed and the need for any recalls or fixes.

The benefits of recorders in the testing phase are similar, but a little different. If an accident does occur with a test autonomous vehicle, the state will be in a position with the data recorder to assess what exactly when wrong, who was at fault, whether the manufacturer was liability, whether it was the technology or test driver's fault, and whether the failure requires suspending or revoking the manufacturer's permit to test on public roads. This data will also ultimately affect the decision of the state to certify the vehicle. The recorder will be less valuable in determining whether the test driver or manufacturer are liable (because they are one and the same, assuming a driver is acting within the scope of his employment when an accident occurs). Nevertheless, determining whether an accident or malfunction is the result of test-driver or vehicle error is valuable information both to the state and to the manufacturer. It will allow manufacturers to understand the malfunctions that cause accidents and to learn and respond, and, again, will allow the state to assess worthiness for certification.

V. Regulation of the Operation of Deployed AVs

- **Requiring that State DMVs Draft Requirements Regarding Deployment**
  - **State provisions:** Nevada requires that the DMV adopt specific regulations for the operation of autonomous vehicles on public roads prior to their deployment.[37]
  - **Recommendation:** This makes sense. State DMVs will be able to promulgate more specific provisions related to autonomous vehicles. However, the interest of uniformity does suggest that some level of detail be provided in the ULC's draft legislation itself. Moreover, state legislatures have an interest in passing a relatively detailed framework through its more democratic and accountable process.
  - **Suggested draft language:** The DMV shall make all necessary regulations of autonomous vehicles appropriate to carry out the purpose of this act within one year of enactment of this law. The DMV must adopt regulations authorizing AVs on public roads prior to their deployment and commercial sale.
- **Broad Requirement that the Operation of AVs Must Meet Federal and State Traffic Standards**
  - **State provisions:** Nevada requires that any deployed autonomous vehicle must meet federal standards and regulations for operation on public roads and comply with all state traffic laws.[38]
  - **Recommendation:** The ULC should include the same requirement, and may want to list some of the basic state and federal requirements with which any AV technology must comply (just as any human driver must comply). This will help clarify for manufactures the specific requirements their technology must meet to drive on public roads. It will also clarify for legislators and the broader public the minimum requirements for the technology. These requirements include that an autonomous vehicle must be able to:

[37] Nev. Rev. Stat. § 482A.100.
[38] Nev. Rev. Stat. § 482A.190.

- **Drive within the speed limit at all times in all speed zones**: Obeying 25 mph speed limits in residential areas, 35 mph speed limits on arterials, slower speed limits in school zones and around construction sites, speed limits around difficult turns, 55 mph speed limits on certain highways, 65 mph limits on others. This will demand that an Autonomous Vehicle's software have both continually updated information on these various speed zones and sensors aboard that can read road signs and adjust speed accordingly.
- **Read traffic lights, road signs, and road markings and respond appropriately:** Autonomous vehicles must be able to distinguish a green light from a red light, a blinking red light from a constant red light, a turn light from other lights, a yield sign from a stop sign, a merge sign from a turn sign, and markings on roads indicating a lane is for turning or indicating bikes have a right to the shoulder of the road.
- **Respond appropriately to temporary road signs to merge, slow, detour:** Not all road signs are permanent, so a simple database of expected road signage will not suffice. The vehicle must be able to respond to temporary and unexpected signage, following the instructions to slow, merge, take a detour, etc.
- **Respond to turn signals from other drivers:** An autonomous vehicle must be able to respond to turn signals from other drivers. This is essential at intersections, particularly where a turn signal from another driver indicates whether it is safe for a vehicle to proceed in the intended direction. It is also critical on freeways, where another driver may be signaling intent to merge.
- **Give turn signals with appropriate notification:** An autonomous vehicle must be able to signal at an appropriate time the vehicle's intention to turn or merge.
- **Yield to pedestrians:** AVs must be able to yield to pedestrians at crosswalks and recognize that they are intending to cross. They must also recognize when a pedestrian is in the road way outside of designated crosswalks and keep a safe distance.
- **Avoid collisions with bikers:** AVs must be able to avoid collisions with bikers, recognizing when they are near and keeping a safe distance. With bike commuting increasing in popularity, and cities accommodating such commuting, AVs must be able to recognize when bikers are present and to safely respond.

Additional requirements where AVs may need to actively give control back to a human

- **Respond appropriately to ambulance or police sirens and lights:** An autonomous vehicle must be able to respond appropriately to sirens and flashing lights or hand control back to a human driver to respond. If the sirens and lights are close enough, the vehicle must be able to safely pull over. Or, the vehicle must notify the driver that the autonomous technology needs human intervention to decipher the circumstances and respond appropriately.
- **Respond to signals from construction employees and traffic police:** AVs must be able to recognize temporary signage held by construction employees, such as "stop" and "slow" or safely hand back control to a human to respond. They must also be able to decipher signals from traffic police in the street, such as hand signals and light-wand signals, or notify the driver that the autonomous technology needs human intervention.

        - **Park safely and legally:** An autonomous vehicle must be able to park itself safely and legally or safely hand back control to a human to do so. The vehicle must be able to, as the circumstances require, park parallel, at an angle, or straight in, or notify the driver that human intervention is required. An autonomous vehicle must obey the speed limit in parking lots and garages and be capable of responding to sudden changes, such as a vehicle pulling out of a spot, a door opening and obstructing the way, or a person darting across the way in a parking space, or it must be able to notify the driver that their assistance is required to navigate these challenges.
    - **Why summarize and list these basic as well as advanced requirements?** It creates a clear and transparent expectation among both legislators and manufacturers about the challenges AVs must surmount in order to become commercially salable either as Level Three autonomous vehicles (autonomous, but allowing human intervention) or Level Four autonomous vehicles (fully autonomous and allowing no human intervention). In this sense, it will help guide AV innovations toward certification and commercial sale.
    - **What this list says about the challenges facing full level 4 automation:** We believe the above list highlights the immense hurdles AVs must overcome to achieve full, Level Four automation, where human intervention is not required and not even allowed. We conclude, therefore, that fully autonomous vehicles (with not steering wheels, etc.) are at least a decade away. We also believe that the market for fully autonomous Level Four AVs will be limited even once the technology is ready. This is because consumers will continue to enjoy aspects of manual driving and will prefer the ability to choose between manual and autonomous driving. In addition, drivers will always have compulsive intermediate destinations (e.g., because their kids in the back seat ask to stop at the ice cream store or because they remember they need to get milk at the grocery store). Drivers will likely prefer the ability to reassume control and make these quick route changes. Lastly, drivers will probably distrust fully autonomous vehicles for the next decade or two, particularly on roads remaining dominated by human drivers.

      For these reasons, we believe it is critical that any ULC law focus on provisions that accommodate Level Three autonomous vehicles that can switch between autonomous mode and manual mode. "Autonomous mode" is likely to be the most important term surrounding autonomous vehicles, and the law must include provisions that manage its implications.

      Part of the challenge will be deciphering between circumstances an AV must be able to handle in "autonomous mode" and ones it is permitted to hand back over to a human driver. The law should allow deployment of autonomous vehicles that *cannot* handle *all* circumstances on the road, but that *can* properly identify the situations they *cannot* handle and notify the driver that human intervention is required. The law must, however, require a *baseline of requirements* that any autonomous vehicle must meet without any human intervention (basic road-safety requirements, as outlined above), and decipher those requirements from circumstances where the vehicle can notify the driver that human assistance is needed.
- **Whether to require operators to actively monitor AV (no, but require passive monitoring)**
    - **Recommendation**: Drivers should not be required to actively monitor an autonomous vehicle while it is in autonomous mode, and this should be explicitly stated in the draft legislation. But, drivers should be required to *passively monitor* the roadway, including

staying awake, alert, upright, maintaining at least peripheral eye contact with the road, and occasionally checking that the autonomous vehicle is operating correctly. While we may be able to rely on autonomous vehicles with one-hundred percent confidence in the medium-to-long-term, the below provisions should be required in the interim. By adding "until state or federal regulations permit otherwise," the state creates flexibility to adopt laws in the future allowing for zero human monitoring and full Level-Four automation.

- **Recommended provision language:** Drivers need not actively monitor an autonomous vehicle and the roadway while the vehicle is in autonomous mode. However, until state or federal regulations permit otherwise, a driver of an autonomous vehicle must passively monitor the roadway and vehicle at all times. This requires, at a minimum, that the driver:
  - Faces the roadway in an upright position
  - Remains awake, alert, and unimpaired
  - Maintains at least peripheral eye-contact with the road in front during forward driving. [This means the driver can view cars and objects before them even if not focused on them].
  - Maintains an unobstructed field of view out from the vehicle to the road in front and sides as well as behind the vehicle with the aid of side and rearview mirrors. [This means the driver cannot place a newspaper in front of the individual so that they cannot see the roadway or a TV screen up on top of the dashboard].
  - Maintains an unobstructed area around the steering wheel as well as gas and brake pedals to allow for immediate driver intervention.
  - Occasionally checks that the autonomous vehicle is operating correctly and has not encountered a situation it is incapable of handling.
  - Actively intervenes whenever the safety of other drivers or efficient use of the roadways requires.

- **Amending Distracted Driving Laws:**
  - **ULC final report questions:** "The subcommittee recommends that the drafting committee consider provisions that would amend the state's distracted driving laws."[39]
  - **Recommendation:** Existing distracted driver laws should be amended to simply read "except as otherwise provided in state and federal laws governing the operation of autonomous vehicles in autonomous mode." The above passive-monitoring requirement then defines the scope of attentiveness required by operators of AVs while in autonomous mode.
- **Requirement that drivers intervene when safety and efficiency so requires:**
  - **Recommendation:** Without a requirement that drivers intervene when the autonomous vehicle fails and/or when the safety and/or efficient use of the roadways requires, drivers may have a perverse incentive to avoid intervening. This is in no small part because the manufacturer will be liable in such instances. The law may need, therefore, to require intervention when safety and efficiency so requires.
  - **Suggested provision language:** The driver of an autonomous vehicle must actively and physically intervene and disengage the vehicle from autonomous mode whenever roadway safety or efficiency so requires.

[39] ULC Final Report at 13.

- **Required gauges and functionalities on consumer AVs:**
  - **State provisions**
    - Nevada requires the following of AVs operated by consumers on public roads:
      - Must be equipped with an accessible way to engage/disengage AV technology.
      - Visual indicator when autonomous technology is active.
      - Capable of alerting drivers to take control if AV technology fails.[40]
    - California requires as a prerequisite to deployment (but not for testing) that the manufacturer certify: "[t]he autonomous vehicle has a mechanism to engage and disengage the autonomous technology that is easily accessible to the operator."[41] It also requires that manufacturers certify that "[t]he autonomous vehicle shall allow the operator to take control in multiple manners, including, without limitation, through the use of the brake, the accelerator pedal, or the steering wheel, and it shall alert the operator that the autonomous technology has been disengaged."[42]
    - Florida requires "a means to engage and disengage the autonomous technology which is easily accessible to the operator"[43]
    - D.C. requires as a prerequisite for registration of the vehicle that the operator be able to take control of the vehicle in multiple ways.[44]
    - Each jurisdiction requires for deployed vehicles an indicator of whether or not the vehicle is operating in autonomous mode. The Final Report also outlines that all states require for both testing and deployment some indicator that the AV system has failed.
  - **Recommendations:** Start with Nevada's provisions and expand on them. While it is certainly possible that some of these provisions will be preempted by the NHTSA as "safety-related", some also may be viewed as more operational and consumer-information related. In addition, it is important to remember that these provisions can provide valuable certainty and guidance to manufacturers in the interim of longer-term NHTSA regulations.
  - **Recommended provision language:** All autonomous vehicles, whether undergoing testing or deployed for consumer use, must be equipped with the following features:
    - An accessible means to immediately engage or disengage the autonomous technology, such as a button, knob, or lever.
    - A means to immediately disengagement the autonomous technology when a human driver reasserts control by turning the steering wheel or depressing the gas or brake pedal.
    - A prominent and immediate visual indicator that the autonomous technology has been activated or deactivated and a continuing indication that the technology remains active or inactive. The indicator must be viewable by any visually-enabled individual in the driver's seat.

    All deployed autonomous vehicles must be equipped with the following features:

[40] Nev. Rev. Stat. § 482A.190.
[41] Cal Vehicle Code. §38750(c)(1)(A).
[42] Cal Vehicle Code. §38750(c)(1)(D)
[43] Fla. Stat. § 319.145.
[44] D.C. Regs. § 401.20(h).

        - An immediate auditory indicator that the autonomous technology has been activated or deactivated.
            - [Comment: Having both a visual and auditory indicator ensures that the driver is fully aware that the technology is engaged. Without both, a driver might inadvertently activate or deactivate the AV technology without knowledge – particularly a concern for disengagement, where the driver might accidently nudge the steering wheel or a pedal and disengage the autonomous technology without seeing the visual indicator.]
        - Both visual and auditory alerts if the autonomous technology malfunctions.
            - [Comment: Both types of alerts are important if autonomous technology fails – it is critical that the driver be made aware and a visual or auditory alert alone may be insufficient].
- **Federally-mandated safety features must remain operative while in autonomous mode**
    - **State provisions**
        - California requires manufacturers certify that the vehicle meets federal safety standards and that the autonomous technology does not make inoperative any federally-mandated safety equipment.[45]
        - The NHTSA recommends that regulations allowing automated vehicles on public roads should prevent manufacturers from disabling federally-mandated safety features.[46]
    - **Recommendation:** This makes sense, particularly for AVs that allow for human driving and intervention – when a human is driving, that human should certainly benefit from federal safety regulations and standards. However, it is likely in the future that these federal standards will change to allow for fully autonomous Level Four vehicles without certain safety standards that are highly specific to human control (e.g., pedals and ABS brakes, a steering wheel, etc.). This won't affect the language in state laws (requiring that manufacturers follow federal standards inherently allows for changes in federal law), but it is important to recognize that some changes in these federal safety requirements are likely over time.
    - **Suggested provision language:**
        - A manufacturer must certify that a deployed and salable vehicle meets all federal safety standards and that its autonomous technology does not make inoperative any federally-mandated safety equipment.

VI. Endorsements of AV Operators' Driver's Licenses:

- Nevada requires that the local DMV shall establish an endorsement system for AV operator driver's licenses.[47] In other words, the DMV can "endorse" an individual's existing driver's license for the operation of an autonomous vehicle. The District of Columbia requires a special endorsement by operators certifying they have been trained by the manufacturer or dealer in the operation of the autonomous vehicle.[48] The NHTSA recommends a form of D.C.'s approach,

[45] Cal. Vehicle Code §§38750(c)(1)(D)&(E).
[46] NHTSA Statement at page 13, paragraph III.B.
[47] Nev. Regs. § 10.2(a).
[48] D.C. Regs. § 114.1.

that a license or endorsement should be conditioned on completion of a manufacturer-provided training course and that the curriculum be approved by the state.[49] In Florida and Michigan, operators need only have a regular driver's license to operate an AV.[50]

- **Recommendation:** The ULC should outline and bracket for state consideration a form of Nevada and D.C.'s provisions requiring AV operators obtain an endorsement on their driver's licenses. This should require that they certify *receiving* and *understanding* manufacturer-provided *instructions* on the safe and lawful operation of the vehicle. To keep costs to a minimum, and as recommended by the NHTSA, manufacturers should be required to provide this instruction on the safe and lawful operation of AVs and owners should be required to certify that they have read or watched that instruction. A step further would require that operators pass a manufacturer-provided "course", but forcing manufacturers to create such a course seems an onerous burden. More practical is requiring operators to certify that they have read or watched the manufacturer's instructions (which could be reviewed and approved by the state). On the same certificate, the state could list the basic requirements for the lawful operation of an AV and require operators certify that they have read and understand those requirements.

  In general, an endorsement/licensing regime make sense because we anticipate drivers will frequently switch in and out of autonomous mode. It is, therefore, very important that they have a basic understanding of when and how it is safe to do so and their potential liability under different circumstances. It would also be important for them to certify acknowledgement that they must (as we've recommended) passively monitor the roadway and vehicle while it is in autonomous mode: requiring staying awake, sitting upright in the driver's seat, keeping at least peripheral vision on the roadway, maintaining an unobstructed view with nothing on the dashboard, and ensuring nothing obstructs the driver from assuming immediate physical control. If states adopt such provisions, or similar ones, it is critical that drivers know and understand them and certify acknowledgment.
- **Recommended provision language:** Drivers of autonomous vehicles must obtain a state endorsement on their driver's licenses in order to demonstrate that they can safely and lawfully operate an autonomous vehicle on public highways. The DMV shall establish detailed requirements for a driver to obtain an endorsement. In order to obtain an endorsement, drivers must:
  - Certify with the DMV that they have received and understand manufacturer-provided instructions.
  - Certify with the DMV that they acknowledge the legal requirements for monitoring an autonomous vehicle while it operates in autonomous mode. These include that the driver must passively monitor the vehicle and roadway at all times, which requires: (see the above list of passive monitoring requirements)
  - Certify that they will intervene and physically reassume control of an autonomous vehicle in the event that public safety or the efficient use of the roadways so requires.
  - Certify that before re-selling an autonomous vehicle, the holder of the endorsement will obtain a certificate of compliance from a licensed certification agency.

  Manufacturers must provide with the sale of an autonomous vehicle instructions on the safe and lawful operation of the vehicle.

[49] NHTSA Statement at 11.

[50] Fla. Stat. §316.85(1); Mich. Comp. Laws § 257.665(2)(c).

VII. Tort Liability Provisions:

- **Provision stating manufacturers not liable for damages caused by 3rd-party modifications:**
  - Nevada, Florida, and Michigan require: If a third party makes changes to an AV and those changes cause harm, the manufacturer is not liable for damages unless the defect was present when originally manufactured.[51]
  - **Recommendation:** While this provision merely restates applicable tort law, it also may provide some useful clarity and certainty to manufacturers. It also places third-party modifiers on notice about the liability implications of their modifications.
- **Broader tort law issues and recommendations:** We agree with the ULC's Final Report and its general recommendation that no major changes to tort law should be made. But, there may be a role for regulation to clarify potential liability under the common law for both the driver and the manufacturer, depending on if the vehicle is in or out of autonomous mode.

  Products liability law is sufficiently advanced to assign liability for damages resulting from the failure of an autonomous vehicle, whether by manufacturer negligence, design defect, manufacturing defect, failure to warn, or breach of express or implied warranty.[52] All of these product liability theories are highly developed, given the advance of technology in and out of cars for well over a century, and are capable of covering autonomous vehicles.[53]

  Current tort law is also sufficiently advanced to assign liability for damages resulting from AV-driver negligence, for example when a driver causes an accident when the vehicle is not in autonomous mode, inappropriately reassumes control of an autonomous vehicle and then causes an accident, or engages the autonomous mode in a negligent manner (perhaps right before colliding with another vehicle).

  Despite the capacity of the highly-agile common law system to adapt and respond to this technology, the ULC may want to clarify that manufactures and drivers can both be liable under the common law. It might also want to provide a bracketed alternate summary for states with no-fault laws (more below). The ULC could also recommend a model provision for completely autonomous vehicles of the future, which would not allow human-intervention, invariably making the manufacturer liable.
- **Suggested provision for states with ordinary negligence laws on public roads (not no-fault):** Drivers are subject to liability under the common law for negligent or reckless driving while operating an autonomous vehicle when it is not in autonomous mode. Drivers may also be subject to liability for the negligent engagement or disengagement of autonomous technology, when a reasonable person would view it as unsafe to do so.
  - Manufacturers are subject to liability under the common law for accidents that are proximately caused by an autonomous vehicle operating in autonomous mode. They may also be liable under the common law under theories of manufacturer negligence, design defect, manufacturing defect, failure to warn, or breach of express or implied warranty.
- **Recommendations on no-fault liability laws in some states:** Twelve states have no-fault liability laws that relieve drivers from personal liability in the event of minor accidents, with drivers' insurance paying out to the injured party regardless of fault.[54] Such laws would certainly affect

[51] Nev. Rev. Stat. § 482A.090; Fla. Stat. § 316.86(2); D.C. Code § 50-2353; Mich. Comp. Laws § 257.817
[52] *See* John Villasenor, *Who Is at Fault When a Driverless Car Gets in an Accident?*, THE ATLANTIC, (April 25, 2014).
[53] *Id.*
[54] See *Autonomous Vehicle Technology – A Guide for PolicyMakers*, RAND, (2014)

the above recommended provisions, and the ULC could provide bracketed provision recommendations for such states. Under such a regime, it is certainly possible that the driver's insurance should pay out for any minor damages, even if they are caused while the car is in autonomous mode. For "serious accidents" (already statutorily defined in these no-fault states), the question of manufacturer vs. driver negligence may then become more relevant, with manufacturers generally liable and their insurance paying out if the vehicle was in autonomous mode and driver's and their insurance paying out if the vehicle was in manual mode (with exceptions for when a driver negligently engages or disengages the autonomous technology). Drawing these lines may be where state regulators can play a role.

- **Recommendations on strict liability and design defect liability questions:** In its 2014 report on autonomous vehicles, RAND discusses strict liability as "the theory most often used by plaintiffs in suits against manufacturers involving the design of automobiles."[55] It suggests, therefore, that it "will play a central role in litigation over responsibility for crashes associated with AV technologies."[56] The courts will generally decide the applicability of any strict liability standard and associated manufacturing defect, design defect, and failure to warn theories of liability. But legislatures may have a role here too because the "existing liability regime does a poor job of aligning private incentives with the public good," according to RAND.[57] That is, even while autonomous technology may be safer for drivers and society overall, it may present greater liability risks for manufacturers that deter them from investing in the technology's development. RAND sees a role for the state in cost-benefit balancing to address these barriers:

  > To maximize the social benefits of this technology, policymakers need to structure the liability and regulatory regime to encourage the development of this technology without undermining marginal incentives for safety. Careful thought and further research may be necessary to determine which costs and benefits should be included in the cost-benefit analysis that accompanies product liability.[58]

  While this does not answer the question, it does help frame the problem and a potential role for legislators or agencies.

  To solve the problem in a flexible manner, state legislators could simply acknowledge in AV legislation the benefits of AV technology, the need to incentivize deployment, and the need to incentivize safety. They could then leave it to the courts to perform cost-benefit balancing tests. Courts are fully capable of performing such tests and determining which standards to adopt, but they often rely on legislative intent and history in doing so. To the extent that legislation can provide courts with a cue or mandate to perform such balancing, courts will be more willing to integrate such tests in developing legal standards for AV-manufacturer liability. Such cues can be provided in the legislative history or in the recitals section of legislation with a "whereas" clause. It could also be done with a stand-alone provision that simply acknowledges the need for courts to perform forward-looking balancing tests.

VIII. Allowing Operation without a Driver Aboard:

- **Recommendation:** Allowing the operation of an autonomous vehicle without a driver aboard is risky this early in the development of the technology. While the goal may be to enable things

[55] *Autonomous Vehicle Technology – A Guide for PolicyMakers*, RAND, (2014)
[56] *Autonomous Vehicle Technology – A Guide for PolicyMakers*, RAND, (2014)
[57] *Id.*
[58] *Id.*

like the parking of the vehicle after a human has been dropped off, there are many foreseeable situations in which the vehicle will incorrectly interpret road signs, parking-garage signs, or subtle communications with another driver in the tight quarters of a parking garage – all situations in which human intervention may be required. While these challenges are likely surmountable in the medium to long-term, regulators should be wary of allowing AVs to operate without humans aboard in the near future. The ULC draft, however, should keep the door open to modification in the future with "unless otherwise permitted" language.

- **Suggested language:** Unless otherwise permitted by state or federal regulation, autonomous vehicles must be operated with a human aboard and in the driver's seat.

VI. Regulating Level Two, Combined-Function Automation:

- **Recommendation:** Level Two combined-function automation presents unique and immediate risks (the technology is being sold in cars that are already on public roads[59]). Combined-function lane centering, lane-changing, and adaptive cruise control create the potential for a driver on a highway to turn full control over to the vehicle, tune out, read a book, text message, or perhaps fall asleep. This is even while the technology cannot operate completely autonomously without active human monitoring. This presents significant risks that the ULC draft law should address.
- **Suggested provision language:** Vehicles that combine automated functions such as lane centering, lane changing, and adaptive cruise control for limited automation on public roads must be accompanied by the driver's active monitoring when these systems are engaged. Drivers may not read, text, email, sleep, or otherwise distract themselves. Existing distracted-driving laws apply to the operation of vehicles with such combined-function automation and which do not qualify as "autonomous vehicles" under this statute.
    - Manufacturers introducing such combined-function automation must provide sufficient warning to drivers that they are lawfully obligated to actively monitor the road and system while the technology is engaged.
    - Manufacturers introducing such combined-function automation must include sensors that can detect when a driver is falling asleep and alert the driver with auditory warnings.
        - [Note: The risk that a driver engages combined-function technology, relaxes, and falls asleep are very high. This is particularly true during nighttime driving. This would leave the vehicle in a stranded state of limited automation, presenting potentially great danger to other drivers. The risk is significant enough that manufacturers should be obligated to provide accompanying sleep-detection technology and an auditory warning system. Manufacturers]

[59] Michael Casey, *Want a self-driving car? Look on the driveway* FORTUNE (December 6, 2014) http://fortune.com/2014/12/06/autonomous-vehicle-revolution/