South Carolina Journal of International Law and Business

Volume 17 | Issue 2 Article 8

2021

DIVERSITY IN AUTOMATION: HOW ARE DIFFERENT LEGAL REGIMES LOOKING TO REGULATE USERS OF AUTOMATED VEHICLES?

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I. INTRODUCTION

Bioengineering DNA tools,[1] artificial intelligence,[2] and computer-brain interface,[3] oh my… As architect Frank Lloyd Wright stated, "[i]f automation keeps up, man will atrophy all his limbs but the push-button finger.[4]" These futuristic technologies, accompanied by automated vehicles, are upon us. As is the case with the advancement of any technology, old problems may be solved while new ones are created. New waves of excitement are mirrored by the awesome weight of uncertainty.

This note will address several topics, such as a general introduction to automated vehicle technology and the potential benefits and risks; however, the main focus is to analyze how legislative attempts to regulate automated vehicles around the world impact users of this technology. As will be seen throughout this note, the novel question breaks down to:

What requirements and expectations will be put on drivers (users) of automated vehicles and how will governments seek to regulate those expectations?

Due to the various complexities and functionalities of this technology and the vast number of legal systems throughout the world, it can be expected that differing approaches will be taken to answer this question. This note seeks to analyze how current legal

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[1] Xinyi Wan, *DNA sponge as a versatile tool to fine tune gene circuits, Nature News* (2020), https://bioengineeringcommunity.nature.com/posts/synthetic-dna-sponge.

[2] Edd Gent, *Artificial intelligence is evolving all by itself*, Science (Apr 13, 2020).

[3] Leah Crane, *Elon Musk demonstrated a Neuralink brain implant in a live pig New Scientist* (2020), https://www.newscientist.com/article/2253274-elon-musk-demonstrated-a-neuralink-brain-implant-in-a-live-pig/.

[4] Phillip Adler, *Push Them as Hard as You Are Able in Bridge,* SUNDAY SPRINGFIELD NEWS-LEADER (Dec. 14, 2014).

regimes have begun addressing this notion, as well as a new proposal.

II. OVERVIEW OF AUTOMATED VEHICLE TECHNOLOGY AND POTENTIAL RISKS/BENEFITS

A. WHAT IS AN AUTOMATED VEHICLE?

In a way, all vehicles could be considered to have some level of automation. Whether it be a basic function such as a switch to start an engine or a pedal to slow down speed, automation within a vehicle completes a task that the user does not have to complete herself. When the user inserts a key into a car ignition and turns it, she is not physically causing the pistons to compress or creating combustion[5] with her fingers; she is simply completing a basic task to set the automated, more complicated task within the vehicle in motion.

As vehicles have advanced throughout history, so equally have the tasks automated.[6] Automation of vehicles allows users to operate the components of a machine without needing a full understanding of the underlying processes taking place. Turning on, driving, and parking a motor scooter do not require a user to have a complex understanding of thermodynamics or physics; however, it does require a user to understand how their tasks (or inputs) affect the scooter in real-time. For example, if the user moves her left arm forward, the front wheel turns right, moving the scooter in a different direction. The movement of the user's arm is the input, and the resulting movement of the tire is the output created by the vehicle. These inputs, commonly referred to as the "dynamic driving task"

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[5] *Internal Combustion Engine Basics*, ENERGY.GOV (2021), https://www.energy.gov/eere/vehicles/articles/internal-combustion-engine-basics.

[6] Blake Z. Rong, *The Evolution of the Combustion Engine*, POPULAR MECHANICS (2018), https://www.popularmechanics.com/cars/car-technology/a19854205/the-evolution-of-the-combustion-engine/ (last visited Jan. 12, 2021).

(DDT),[7] represent a lot of what the user is able to control such as steering, braking, accelerating, etc.

In this light, this note seeks to explore how the law intersects with different "levels" of user inputs in vehicles required to produce anticipated outputs, specifically relying on the levels created by SAE International.[8] These levels allow for common terminology used by all in the field and are defined on the following chart:

[7] *See* SAE INT'L, J3016: TAXONOMY AND DEFINITIONS FOR TERMS RELATED TO ON-ROAD MOTOR VEHICLE AUTOMATED DRIVING SYSTEMS (Jan. 16, 2014) (latest revision June 15, 2018) [hereinafter SAE J3016)].

[8] *See* SAE J3016, *supra* note 7.

Level	Name	Narrative definition	DDT		DDT fallback	ODD
			Sustained lateral and longitudinal vehicle motion control	OEDR		
Driver* performs part or all of the *DDT						
0	**No Driving Automation**	The performance by the *driver* of the entire *DDT*, even when enhanced by *active safety systems*.	*Driver*	*Driver*	*Driver*	n/a
1	**Driver Assistance**	The *sustained* and *ODD*-specific execution by a *driving automation system* of either the *lateral* or the *longitudinal vehicle motion control* subtask of the DDT (but not both simultaneously) with the expectation that the *driver* performs the remainder of the *DDT*.	*Driver* and *System*	*Driver*	*Driver*	Limited
2	**Partial Driving Automation**	The *sustained* and *ODD*-specific execution by a *driving automation system* of both the *lateral* and *longitudinal vehicle motion control* subtasks of the *DDT* with the expectation that the *driver* completes the *OEDR* subtask and *supervises* the *driving automation system*.	***System***	*Driver*	*Driver*	Limited
***ADS* ("*System*") performs the entire *DDT* (while engaged)**			*System*	***System***	*Fallback-ready user (becomes the driver during fallback)*	Limited
3	**Conditional Driving Automation**	The *sustained* and *ODD*-specific performance by an *ADS* of the entire DDT with the expectation that the *DDT fallback-ready user* is *receptive* to *ADS*-issued *requests to intervene*, as well as to *DDT performance-relevant system failures* in other *vehicle* systems, and will respond appropriately.				
4	**High Driving Automation**	The *sustained* and *ODD*-specific performance by an *ADS* of the entire *DDT* and *DDT fallback* without any expectation that a *user* will respond to a *request to intervene*.	*System*	*System*	***System***	Limited
5	**Full Driving Automation**	The *sustained* and unconditional (i.e., not *ODD*-specific) performance by an *ADS* of the entire *DDT* and *DDT fallback* without any expectation that a *user* will respond to a *request to intervene*.	*System*	*System*	*System*	**Unlimited**

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B. *BENEFITS AND RISKS OF AUTOMATED CAR TECHNOLOGY*

1. Benefits

There are many potential benefits associated with automated vehicles, such as reduced insurance costs,[10] travel time,[11] and fuel economy;[12] however, benefits are not only correlated with efficiency and cost-effectiveness but also safety. The United States Department of Transportation (USDOT) predicts that the furtherance of automated vehicles will contribute to a drastic decrease in traffic deaths, as the great majority (around 94%) of serious motor vehicle crashes are due to some element of human error.[13] Further, lots of research has indicated that automated vehicle technology could lower harmful emissions created by road traffic up to 60%.[14]

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[9] *Id.* at 17.

[10] Stanley, Karlyn D., Michelle Grisé & James M. Anderson, *Autonomous Vehicles and the Future of Auto Insurance*, Santa Monica, Calif.: RAND Corporation, RR-A878-1, https://www.rand.org/pubs/research_reports/RRA878-1.html.

[11] Eckhard Szimba & Martin Hartmann, *Assessing travel time savings and user benefits of automated driving – A case study for a commuting relation*, TRANSPORT POLICY, VOL. 98, 2020, 229-237, ISSN 0967-070X, https://doi.org/10.1016/j.tranpol.2020.03.007.

[12] Jooyong Lee, *Energy Implications of Self-Driving Vehicles*, THE UNIVERSITY OF TEXAS AT AUSTIN DEPARTMENT OF CIVIL ENGINEERING, Presented at the 98th Annual Meeting of the Transportation Research Board (Jan. 2019).

[13] *Automated Vehicles for Safety*, NHTSA (2020), https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety.

[14] *The Future of Driving in the United States*, OHIO U. (2020), https://onlinemasters.ohio.edu/blog/the-future-of-driving/.

2. Risks; Costs

As with all technological innovations, the potential benefits assocatiated with automated vehicles are met with increased costs and risks. The sheer extent of the technology implies a higher product cost to consumers for the immediate future[15] and the technical skills needed to perform maintenance on the vehicles will require further knowledge and education.[16] Along with the monetary setbacks, the data available to the vehicles will lack at the beginning and will grow over time.[17]

For example, if an automated vehicle is driving through snow without any inputs from the user, it will need to learn to do so for the first time before that data can be shared with the other vehicles. These first experiences without user interface create risks (which could potentially be avoided by data tracking of similar situations while users are still responsible for inputs).[18] Lastly, many professions that rely on user inputs in vehicles could be displaced by the furtherance of automated vehicles.[19] Truckers,[20] Uber

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[15] This is assuming a traditional car ownership model, not one based on a commercial, per-ride basis.

[16] *The Effect of Autonomous Vehicles on Education*, UPCEA (Dec. 2017).

[17] *Artificial Intelligence in the automotive industry*, ACEA (Nov. 2020), https://www.acea.be/uploads/publications/ACEA_Position_Paper-Artificial_Intelligence_in_the_automotive_industry.pdf.

[18] Grace Strickland, John McNelis, *Autonomous vehicle reporting data is driving AV innovation right off the road*, TECHCRUNCH (2020), https://techcrunch.com/2020/08/04/autonomous-vehicle-reporting-data-is-driving-av-innovation-right-off-the-road/ (last visited Jan 10, 2021).

[19] *Stick Shift: Autonomous Vehicles, Driving Jobs, and the Future of Work,* CENTER FOR GLOBAL POLICY SOLUTIONS (2017).

[20] *Id*.

drivers,[21] pilots[22] and train conductors[23] are all examples of potential lost job markets as this technology progresses.

C. ARE THEY LEGAL?

1. 1949 and 1968 Road Traffic Conventions

The 1949 Geneva Convention on Road Traffic (Geneva Convention) created minimum traffic regulations purposed to allow some sort of uniformity for international travelers.[24] As vehicle technology advanced rapidly in the past decade, the question arose as to whether higher levels (SAE Levels 3-5) of automated driving technology conformed to the Geneva Convention's rules.[25] Specifically, Article 8 of the Geneva Convention relies on human "control"[26] of a vehicle and "to control*"* annotationally means *"*to exercise restraint or direction upon the free actoin of; to hold sway over, exercise power or authority over; to dominate, command.[27]" One scholar, Professor Bryant Walker-Smith of the University of South Carolina School of Law, notes three conclusions about the nature of automated vehicle control as it pertains to Article 8 of the First Convention:

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[21] *Id.*

[22] Stephen Rice & Scott Winter, *Despite Passenger Fears, Automation is the Future of Aviation*, DISCOVER MAGAZINE (2019), https://www.discovermagazine.com/technology/despite-passenger-fears-automation-is-the-future-of-aviation.

[23] Jack Karsten, *Emerging technology can replace workers - or train them for new work*, BROOKINGS INSTITUTE (2019), https://www.brookings.edu/blog/techtank/2019/08/29/emerging-technology-can-replace-workers-or-train-them-for-new-work/.

[24] Convention on Road Traffic, Geneva, Sept. 19, 1949, 3 U.S.T. 3008, 125 U.N.T.S. 3 [hereinafter Geneva Convention].

[25] B.W. Smith, *Automated Vehicles Are Probably Legal in the United States*, 1 TEX. A&M L. REV. 411 (2013) [hereinafter Smith].

[26] Although the Convention relies on control, it refrains from defining it in any meaningful way.

[27] Geneva Convention, *supra* note 24.

1) The designation of a driver for liability purposes does not alone satisfy Article 8;
2) Being able to "control" does not mean actively exercising that control; and
3) Control is limited by the characteristics of that which is being controlled.[28]

After the First Convention, another treaty was passed at the 1968 Vienna Convention on Road Traffic (Vienna Convention) that continues to guide much of the world's traffic legislation today.[29] Also being a source as to the potential legality of automated vehicle technology, Article 13 of the Vienna Convention provides that, "[e]very driver of a vehicle shall in all circumstances have his vehicle under control so as to be able to exercise due and proper care and to be at all times in a position to perform all maneuvers required of him."[30] This "due and proper care" wording widens the parameters for what might possibly be considered control in this context. One possible defintion given by a United States court and reiterated Professor Bryant Walker-Smith is that "the essence of 'control' is nothing less than the power to determine the scope, range, or effect of a given activity."[31]

2. UNECE Global Forum on Road Traffic Safety

The only permanent intergovernmental body of the United Nations dedicated to road safety adopted a non-binding resolution (WP.1) in September 2018 that adapted principles set forth in both the 1949 and 1968 Conventions on Road Traffic.[32] The resolution

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[28] Smith at 439-440, *supra* note 25.

[29] Vienna Convention on the Law of Treaties, art. 31, May 23, 1969, 1155 U.N.T.S. 331, 8 I.L.M. 679.

[30] *Id.*

[31] *See* Smith, *supra* note 25, citing *Axcelis Techs. v. Applied Materials, Inc*., 66 U.S.P.Q.2d 1039, No. CIV.A 01- 10029DPW, 2002 WL 31761283, at *6 (D. Mass. Dec. 10, 2002).

[32] *See generally UNECE adopts resolution on the deployment of highly and fully automated vehicles in road traffic*, UNECE (2018), https://unece.org/press/unece-adopts-resolution-deployment-highly-and-fully-automated-vehicles-road-traffic.

seeks to offer guideposts related to safe interaction of all vehicles, including automated vehicle technology, and the immense importance of human intervention and adaptability (either as drivers or users).[33] Luciano Iorio, Chair of the resolution, stated "[w]ith this resolution, we adapt the guiding principles of the 1949 and 1968 Conventions on Road Traffic to today's environment, paving the way for the safe mobility of the future, for the benefit of all road users."[34]

Although many commentators have acknowledged and called for the review of the previous Conventions under this new framework, the international community now seems to be in agreement that automated vehicle technology is not only legal, but a vital instrument in the future of safe transportation.

III. REGULATING USERS – SAE LEVELS 0-3

Over time, as both the number and outputs of vehicles have increased (faster acceleration/velocity, precision braking/turning, etc.), legislators enacted regulations of user expectations. Laws including user tasks such as turn signals, headlights, lane changes, and many others were passed to create a system of expectations on users to be followed to further notions of safety and efficiency.

Currently, the most common type of vehicles on roadways are deemed to be at SAE Level 0, in which the vehicle may only notify the user of extenuating circumstances and does not take corrective action; however, this is changing, as a report from the International Data Corporation (IDC) now forecasts that SAE Level 1 vehicles will grow at an 11.5% compound growth rate until 2024.[35] Further, the report estimates that more than 50% of all vehicles being

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[33] *Id.*

[34] *Id*.

[35] Hope Reese, *Level 1 autonomous vehicles will jump by more than 11% in five years, according to a new report*, TECHREPUBLIC (2020), https://www.techrepublic.com/article/level-1-autonomous-vehicles-will-jump-by-more-than-11-in-five-years-according-to-a-new-report/.

produced by 2024 will represent SAE Levels 1-5.[36] With the greatest increase in automated vehicles representing SAE Levels 1-3 in coming years, legislators are first charged with the task of addressing whether current laws and user expectations are adequately positioned to adapt with new technologies.

A. DRIVER LICENSING & TRAFFIC RULES

In 1903, Missouri and Massachusetts became the first US states to pass legislation regarding driver's licenses to operate motor vehicles.[37] Five years later in 1908, the year Henry Ford launched the Model T, Rhode Island became the first state to test potential drivers before issuing licenses.[38] Fast forward to today and it can be seen that most traffic regulatory bodies around the world enlist a driver's licensing requirement.

Under SAE Level 0, users perform all of the dynamic driving task, making it imperative that they retain the wherewithal to carry out these tasks. To provide a baseline presumption of that wherewithal, many governments use licensing as an opportunity to test user aptitude and skill for driving. Many regimes have vision requirements, pre-licensing supervised driving hours, rules of the road tests, age requirements, etc.

As vehicles move toward full automation, it may be possible that some or all of these requirements and expectations placed on users will no longer be advantageous to public safety goals. However, at SAE Levels 1-2 automated vehicles are only taking over dynamic driving task for a short period of time, usually to complete one specific function such as parking, staying in a lane at a certain speed or automatically engaging windshield wipers. Due to these reasons, it is unlikely that any legal regime would begin

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[36] *Id.*

[37] Elizabeth Nix, *When was the first U.S. driver's license issued?,* HISTORY.COM (2016), https://www.history.com/news/when-was-the-first-u-s-drivers-license-issued.

[38] *State Transportation Websites*, FHWA.GOV (2021), https://www.fhwa.dot.gov/ohim/summary95/dl230.pdf/.

looking to curb user licensing requirements until the vehicles reach at least SAE Level 3.

In Australia, the National Trasport Commission (NTC) issued a report in 2018 in which the Commission took a deep look at potential stakeholders and issues of the coming technological traffic transformation.[39] Much like the United States regulatory system, much of the legislation regarding traffic laws in Australia is driven by individual states and territories. The goal of the NTC report was to set a foundation for an end-to-end regulatory system, which at the time NTC hoped would be deployed by 2020.[40] Section 6.2 of the NTC's report discusses obligations on users operating a "conditional automated driving system" (likely meaning duties under SAE Level 3).[41]

The report coins the term 'fallback-ready user' to explain how users of automated vehicles are expected to act in scenarios when the vehicle is unable to perform the dynamic driving task required for safe travel.[42] The following are the expectations placed on fallback-ready users in the report:

1) Must remain sufficiently vigilant to acknowledge the transition demand and acknowledge vehicle warnings, mechanical failure or emergency vehicles (consistent with guidance under development by WP.29).
2) May avert their attention from the dynamic driving task and perform secondary activities but must remain sufficiently vigilant to regain control of the vehicle without undue delay, when required.

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[39] *Changing driving laws to support automated vehicles*, NATIONAL TRANSPORT COMMISSION (May 2018), https://www.ntc.gov.au/sites/default/files/assets/files/NTC%20Policy%20Paper%20-%20Changing%20driving%20laws%20to%20support%20automated%20vehicles.pdf [hereinafter NTC Report].

[40] *Id.* at 21.

[41] *Id.* at 48.

[42] *Id.*

3) Must take control when it is apparent that the automation is no longer working in a proper manner.
4) Must take control when requested by the ADS.
5) Must hold the appropriate licence for the vehicle type.
6) Must comply with drug, alcohol and fatigue driver obligations.[43]

The guide states that fallback-ready users "[m]ust hold the appropriate license for the vehicle type," signaling that there will be a hierarchy of licensing under the new regime. This concept is not foreign to most traffic laws, as different requirements already exist for different vehicle types. Commercial driver's licenses (CDLs), chauffeur's licenses and motorcycle licenses all provide examples of how regimes could look to differentiate expectations among drivers depending on the vehicle they hope to operate. Under the NTC guidelines, it may be possible that a license for a SAE Level 3 vehicle would require less or different expecations from a user. Instead of a "rules of the road" test, it may be important to assess a user's reaction time or technical operability. In this regard, education directives for licensing would also need altering, where an emphais would be placed on the user learning how to use inputs to accommodate the vehicle instead of the inverse.

B. EXPECTATION OF RESPONSIVENESS TO VEHICLE SIGNALS

A common theme between most global legislators seeking to tackle regulation of users in SAE Levels 0-3 vehicles is the requirement of user attentiveness and reaction. Although little traction has been made through legislation federally in the United States,[44] in recent years the U.S. Department of Transportation

[43] *Id.* at 49.

[44] In the 115th Congress, two bills that would have set a foundation for this industry were introduced (the SELF DRIVE Act and the AV START Act), but neither were enacted. Maggie Miller, *Wheels begin to turn on self-driving car legislation*, THE HILL (2019), https://thehill.com/policy/transportation/automobiles/472341-wheels-begin-to-turn-on-self-driving-car-legislation.

(USDOT) and the National Highway Traffic Safety Administration (NHTSA) have published a series of reports that show a chain of federal legislative intent toward regulating users of automated driving technology.[45] The latest report touches upon a variety of domestic concerns tied to the automated vehicle industry, such as fostering collaboration within the government, supply chain integration, environmental quality, and data and intellectual property protection.[46]

From the foundation built by the previous NHTSA policies, USDOT released a new report in January 2021 titled the '*Automated Vehicles Comprehensive Plan*'.[47] Within the plan, the USDOT attempts to address potential scenarios involving automated vehicles both with and without user control. The USDOT plan addresses when and what a driver would be responsible for taking control of in SAE Level 3[48] automated vehicles. The USDOT states that in the case of individual ownership (in contrast to a commercial fleet

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[45] *USDOT Automated Vehicles Activities*, U.S. DEPARTMENT OF TRANSPORTATION (2021), https://www.transportation.gov/AV. In September 2016, USDOT (through NHTSA) published the 'Federal Automated Vehicles Policy' that established many general safety objectives and standards required by the innovation of this new technology. After public feedback, the agency updated the policy in September 2017, in October 2018 and again in January 2019. Each of the reports built upon its predecessor, with the latest rendition sporting the title 'Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0'.

[46] *USDOT Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0*, U.S. DEPARTMENT OF TRANSPORTATION (2021), https://www.transportation.gov/AV

[47] *Automated Vehicles Comprehensive Plan*, U.S. DEPARTMENT OF TRANSPORTATION (Jan. 2021).

[48] The USDOT plan discusses certain driving scenarios where Level 3 automation would most be useful, such as the recent traffic jam pilot programs. In these programs, "where traffic may be at a relative standstill, and the [automated vehicle] allows a driver to relinquish control and engage in other activities until the system reaches its design limits and hands back control of the [dynamic driving task] to the driver. If the driver cannot re-engage within a time period specified as reasonable by the companies, then companies suggest the vehicle would safely bring itself to a standstill."

service) the automated vehicle "would be capable of performing the dynamic driving task within a specific set of conditions, and the driver would be expected to be ready to take back control when the system requests it."[49]

Athough the plan refrains from specifically addressing a driver's license requirement,[50] the plan establishes many expectations about users of automated vehicle technology, both directly and indirectly. The plan suggests that automated vehicle systems at SAE Level 3 would only be able to carry out full functionality in a limited number of circumstances (interstate driving, parallel parking, etc.).[51] The USDOT plan states that further study is currently being undertaken as to what situations warrant driver intervention and how information and education could affect beneficial outcomes. The plan discusses a study regarding the length of time it takes a user to become aware of varying situation and the subsequent length of time to resume control of the vehicle, showing that information is constantly being gathered to inform new and updated policy.[52]

As seen previously in Australia's NTC report, fallback users "[m]ust remain sufficiently vigilant to acknowledge the transition demand and acknowledge vehicle warnings, mechanical failure or emergency vehicles (consistent with guidance under development by WP.29)."[53] The plan goes on to state that a user "[m]ay avert their attention from the dynamic driving task and perform secondary activities but must remain sufficiently vigilant to regain control of the vehicle without undue delay, when required.[54] The plan fails to define "secondary activities", although it can be assumed that these activities mean those that (1) are not a part of the dynamic driving

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[49] *Id.* at 17.

[50] This is most likely due to the fact that driver's licensing requirements are driven by state legislatures and USDOT being a federal regulatory body would want to refrain from circumventing that authority.

[51] *Id.*

[52] *Id.*

[53] NTC Report at 48.

[54] *Id.*

task, and (2) still allow a user to remain "vigilant" enough to acknowledge and act on vehicle commands.

Similar to both the USDOT and NTC plans, two of United Kingdom's Law Commissions recently published an extremely comprehensive report that covers a plethora of debated topics and case studies on automated driving technology.[55] The report is similar to the USDOT plan in substance, but expands upon and addresses many more concerns and situations. Section 12.1 of the report states, "[t]he main role of the user-in-charge would be to take over driving, either following a transition demand or because of a conscious choice."[56] A 'transition demand' incorporates similar reference to the user requirements in both the Arizona state legislation and USDOT "Passenger Vehicle Conditional Driving Automation" in that users must be in a state of consciousness that would allow them to react to some sort of vehicle notification that the user needs to take control.[57] The report refers to a user being conscious to receive a transition demand and subsequently retaining control of the vehicle as "the handover."[58]

Under the Law Commission's proposals, a user-in-charge would be allowed and able to "handover" the dynamic driving task of the vehicle at any time.[59] As stated before, users would be responsible for taking over tasks (the "handover") when the vehicle signifies, further mandating that the user-in-charge be "in or in direct sight of the vehicle" and in a position to operate the controls

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[55] Automated Vehicles: Consultation Paper 3 – *A regulatory framework for automated vehicle*s, Law Commission of England and Wales, Scottish Law Commission (Dec. 18, 2020). Available at https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2021/01/AV-CP3.pdf [hereinafter UKLC Paper 3].

[56] *Id.* at 194.

[57] This paper will dive deeper into what the UKLC "user-in-charge" looks like in future sections. There currently exists a large distinction in how users are defined in automated vehicles between the United States' Uniform Law Commission and the UKLC.

[58] NTC Report at 49.

[59] *Id.* at 197.

at all times.[60] Obviously, the simplest way to achieve this expectation would be for the user to sit in the driver seat, although the report also adds potential future ways to satisfy the requirement such as remote supervision. If the user-in-charge is not performing the dynamic driving task, the user cannot be held liable for any subsequent accidents involving that task.[61]

The Federal Ministry of Transport and Digital Infrastructure of Germany (BMVI) first passed law on automated driving in June 2017 as an amendment to the country's Road Traffic Act.[62] The vast majority of changes made in these amendments resulted in rights and obligations placed on a user of automated vehicles at SAE Level 3, meaning the user was responsible for assuming control under certain conditions.

The new law coined the term 'highly automated driving systems', being legislatively defined as systems in which the user would not need to monitor at all times and would alert the driver if she is to take over dynamic driving function.[63] Section 1b of the law addresses the rights and responsiblities of users as follows:

> § *1b Rights and responsibilities of the driver when using highly or fully automated driving functions*
>
> 1) The driver of the vehicle may turn away his attention from the traffic and the vehicle control when the vehicle is controlled by means of highly or fully automated driving functions according to § 1a; he must remain sufficiently responsive.
> 2) The driver is obliged to take over the vehicle control immediately:

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[60] *Id*.

[61] *Id.* at 199.

[62] Straßenverkehrsgesetz in der Fassung der Bekanntmachung vom 5. März 2003 (BGBl. I S. 310, 919), das zuletzt durch Artikel 8 des Gesetzes vom 17. Juli 2017 (BGBl. I S. 2421) geändert worden ist". Road Traffic Act as amended on 5 Mar. 2003 (BGBl. I p. 310, 919), last amended by Article 8 of the Act of 17 July 2017 (BGBl. p. 2421).

[63] *Id.*

> 1. when the highly or fully automated system asks him to do so; or
> 2. if he recognizes or, on the basis of obvious circumstances, realizes that the prerequisites for the intended use of the highly or fully automated driving functions no longer exist.[64]

Once again, as expressed previously, an importance is put on user consciousness, this time through the term "sufficiently responsive." As this legislation was passed in 2017, it took place well before some of the other legal regimes noted in this paper. The notion of driver awareness and responsiveness is now a staple in SAE Level 3 policy, however, BMVI was one of the first federal legislatures to codify it.

C. REASONABLE CARE

In the United States, a supplement to user responsibilities in traffic laws and regulations is the common law standard of "reasonable care" and how it pertains to vehicles. Although this paper does not touch upon the liability conundrum that is created by automated vehicle technology, this common law standard, nevertheless, creates expectations on users and seeks to regulate their behavior. Jury instructions for civil cases involving vehicles in California read as follows:

> A person must use reasonable care in driving a vehicle. Drivers must keep a lookout for pedestrians, obstacles, and other vehicles. They must also control the speed and movement of their vehicles. The failure to use reasonable care in driving a vehicle is negligence.
>
> Directions for Use
>
> This instruction states the common-law standard of reasonable care in driving. It applies to negligent conduct that is not covered by provisions of the Vehicle Code: "Aside from the mandate of the statute, the driver of a

[64] *Id*. at 2422.

> motor vehicle is bound to use reasonable care to anticipate the presence on the streets of other persons having equal rights with himself to be there." (Zarzana v. Neve Drug Co. (1919) 180 Cal.32, 37 [179 P. 203].) [65]

In most jurisdictions, the notion of legal care amounts to comparing a driver's actions to that of what a "reasonable", average driver under those specific circumstances would or should have done. For example, if a posted speed limit sign states '55 miles per hour' in the middle of a blizzard, the expectation of a user driving in a SAE Level 0 vehicle would likely a lower, safer speed limit.[66] To contrast the same weather example, in a SAE Level 3 vehicle where the vehicle is performing the dynamic driving task for a specified time, 'reasonable care' for a user might simply mean staying awake, not being required to monitor the vehicle's speed. Keeping the liability conversation aside, simple logic suggests that if a vehicle is certified to be able to perform the dynamic driving task a user would be reasonable relying on that task. Here, a "grey area" of expectation is created due to the knowledge and training required for a user to understand when it is appropriate to allow the vehicle to perform the dynamic driving task.

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[65] CAL. JUD. QUAL. COMM'N R. JUR. INST. (Civ.) No. 700.

[66] *Black v. State*, 116 ARIZ. 234, 239, 568 P.2d 1132, 1137 (App. 1977).

IV. REGULATING USERS – SAE LEVELS 4-5

A. LICENSING VS. AUTOMATED DRIVING SYSTEM DRIVERLESS CERTIFICATION

In the United States, states such as Nevada,[67] California,[68] and Florida[69] were the first to promulgate regulations that specifically address "autonomous vehicles" (automated vehicles at least at SAE Level 3 or higher). Since that time, many states have instituted their own comparable rules, now going as far as not requiring an operator depending on the sophistication of the automated driving technology. Arizona is a prime example of a state legislature looking into the growth of automated car tehcnology. The largest and most comprehensive area of Arizona state law dealing with automated driving technology was introduced and planned to be passed on a bipartisan basis by the First Regular Session of 2021 by the Arizona House of Representatives.[70] In the Arizona Autonomous Driving Bill, 'Fully Autonomous Vehicle' is defined as following:

> A vehicle that is equipped with an automated driving system (ADS) designed to function as a Level Four or Five system under SAE J3016 and that may be designed to function either:
>
> (a) Solely by use of the automated driving system; or

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[67] Mary Slosson, *Google gets first self-driven car license in Nevada,* REUTERS (2012), https://www.reuters.com/article/uk-usa-nevada-google/google-gets-first-self-driven-car-license-in-nevada-idUSLNE84701320120508.

[68] Gretchenn Dubois, Douglas Shinkle, *Autonomous Vehicles: Self-Driving Vehicles Enacted Legislation,* NCSL, https://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx.

[69] *Id.*

[70] Arizona Autonomous Driving Bill, HB 2813, 55th Leg. § 1 (2021) [hereinafter Arizona Bill].

> (b) by a human driver when the automated system is not engaged.[71]

Section 28-9602(B) in Chapter 31 states that "[a] person may operate an autonomous vehicle with the automated driving system engaged on public roads in this state with a licensed human driver who is able to resume part or all of the dynamic driving task or resond to a request to intervene, if any."[72] This section creates a few obligations on drivers of SAE Level 4 or higher automated vehicles, both directly and indirectly. Under this definition, Arizona's statute still requires that users of SAE Level 4-5 vehicles retain a driver's license.

To contrast, the National Conference of Commissioners of Uniform State Laws wrote and approved model legislation titled "Uniform Automated Operation of Vehicles Act" (UAOVA)[73] in December 2019 which expressly states that users of automated vehicles under the model code are not required to hold a driving license "to take a completely automated trip."[74] Although the UAOVA does not expressly state which SAE Levels the model legislation pertains to,[75] it defines an "Automated Vehicle" as any

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[71] Arizona Bill, § 28-101 36(a-b).

[72] Arizona Bill, § 28-9602(B).

[73] Uniform Law Commission's Uniform Automated Operation of Vehicles Act (Dec. 3, 2019), ARCHIVE OF THE UNIFORM LAW COMMISSION, 2019, https://www.uniformlaws.org/viewdocument/final-act-no-comments-105?CommunityKey=4e70cf8e-a3f4-4c55-9d27-fb3e2ab241d6&tab=librarydocuments. The Act is a uniform code recommended for adoption by each state, which in turn would tailor provisions to specifically address the needs of that state. Topics covered within the Act include but are not limited to automated vehicle registration, driving licensing, and "rules of the road."

[74] *Id.* § 4(a).

[75] The Uniform Automated Operation of Vehicles Act (UAOVA) Final Act with Comments explains the reasoning for not using the SAE Levels as "changes for legal and functional clarity." As an example, the comments note that SAE J3016 defines an automated driving system by "its asserted capabilities rather than by its successful realization of those capabilities. This notion conflates the distinction between SAE Levels 3-4, as the UAOVA attempts to provide a more functional legal definition.

vehicle with an "Automated-Driving System", which is defined as "hardware and software collectively capable of performing the entire dynamic driving task on a sustained basis."[76] This defintion likely places the UAOVA policies at least at SAE Level 3 (but likely SAE Level 4), as that is the stage in which the dynamic driving task can be completely sustained by the vehicle, however, only in limited circumstances.

Instead of a user operating an automated vehicle, the UAOVA provides an alternative definition referred to as an "Associated Automated Vehicle'", a vehicle which is designated as such by an automated-driving provider to a state agency. This model legislation seemingly creates two distinct categories of users: (1) drivers defined by the state's vehicle code; and (2) automated-driving providers that designate associated automated vehicles. The latter category represents automated vehicles in which the entirety of the dynamic driving task is controlled by an automated-driving provider and the passenger (user) has no control.

As previously noted with other drivers defined by this legislation, Section 4(b) of the model legislation states that "[a]n automated-driving provider is not required to hold a [driving license] to drive or operate an automated vehicle under automated operation." Instead, an automated-driving provider must due the following to be considered as such:

> (1) have participated in a substantial manner in the development of an automated-driving system;
>
> (2) have submitted to the United States National Highway Traffic Safety Administration a safety self-assessment or equivalent report for the automated-driving system as required or permitted by the United States National Highway Traffic Safety Administration; or
>
> (3) be registered as a manufacturer of motor vehicles or motor-vehicle equipment under the requirements of the

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[76] *Id.*

United States National Highway Traffic Safety Administration.[77]

Automated-driving providers are responsible for vehicles complying with state traffic laws instead of traditional users;[78] this regime seemingly retains little to no existing user responsibilities. Users are simply passengers, wherefore an automated-driving provider supplies an associated automated vehicle and that vehicle performs the subsequent dynamic driving task. Under the UAOVA, if the vehicle is not an associated automated vehicle, all existing user responsibilities are retained.[79]

B. SHIFT FROM USER TO MANUFACTURER AND OWNER RESPONSIBILITIES

As is apparent from the UAOVA distinction between a state's statutory driver and an associated automated vehicle, the model legislation's intent is to transition traffic law responsibility to the producer of the vehicle instead of the passenger/user. This makes both practical and logistical sense; law has always attempted to center around the idea of control. If the user has no control over the dynamic driving task, why would they be made responsible to pass a driving test, follow traffic laws or use "reasonable care"?

Simlar to the UAOVA, the USDOT '*Automated Vehicles Comprehensive Plan*' also addresses the situation to where an automated vehicle would have a user, but that user would be unable to affect the dynamic driving task (or inputs) in any significant way.[80] This leap from SAE Level 3 to SAE Level 4 presents a practical inquiry in this scenario because of what expectations can be put on the user when intervention is not possible. The plan seems to focus entirely now on the manufacturing of the vehicles and the oversight required to ensure safety under this regime, possibly

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[77] *Id.* at § 4(b).
[78] *Id.*
[79] *Id.*
[80] *Id.* at 18.

signifying a drop-off of user responsibility at what it defines at SAE Level 4 automation.[81]

Many inside the "tech" community have hedged that this potential drop-off of user responsibility could coincide with a reciprocal increase in manufacturer and owner responsibility. With companies like Waymo and Lift teaming up in recent years to create automated rideshare vehicle fleets with completely driverless trips already taking place, many new issues are raised for legislators. [82] Specifically in regards to drivers, Waymo employs workers as "vehicle operators" who serve in a supervisory role.[83] Waymo requests the following of users/passengers: "[p]lease do not interact with vehicle operators. Our drivers are instructed not to engage with riders so you can focus on enjoying the self-driving experience. If you have any questions or concerns, you can always contact Rider Support through the in-car button or the app."[84]

These policy prerogatives being pushed by the private sector and companies like Waymo in Arizona are leading to legislative reactions. As stated previously, under the 2021 Arizona Bill on Autonomous Vehicles, a vehicle that is capable of performing the dynamic driving task but also has human driver capability requires

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[81] *Id.*

[82] Kirsten Korosec, *Waymo and Lyft partner to scale self-driving robotaxi service in Phoenix*, TECHCRUNCH (2019), https://techcrunch.com/2019/05/07/waymo-and-lyft-partner-to-scale-self-driving-robotaxi-service-in-phoenix/#:~:text=Waymo%20is%20partnering%20with%20Lyft,to%20Waymo%20CEO%20John%20Krafcik.

[83] *Learn about vehicle operators who supervise trips - Waymo Help*, GOOGLE (2021), https://support.google.com/waymo/answer/10078967?hl=en#zippy=%2Ccan-i-talk-to-the-driver (last visited Feb 2, 2021). Waymo reports that it has already completed over 100,000 successful driverless trips since its inception.

[84] *Id.*

the user to retain a driver's license.[85] However, automated vehicles without human driver capability are responsible for the following:

> C. A fully autonomous vehicle may operate on public roads without a human driver only if a person submits both:
>
> 1. A law enforcement interaction plan to the department of transportation and the department of public safety that is consistent with and addresses all of the elements in the law enforcement protocol that was issued by the department of public safety on May 14, 2018, before beginning the operation or if the operation has already begun, within sixty days after the effective date of this section.
>
> 2. A written statement to the department of transportation acknowledging all of the following:
>
> (a) when required by federal law, the fully autonomous vehicle is equipped with an automated driving system that is in compliance with all applicable federal laws and federal motor vehicle safety standards and bears the required certification labels including reference to any exemption granted by the national highway traffic safety administration under applicable federal law.
>
> (b) if a failure of the automated driving system occurs that renders that system unable to perform the entire dynamic driving task relevant to its intended operational design domain, the fully autonomous vehicle will achieve a minimal risk condition.
>
> (c) the fully autonomous vehicle is capable of complying with all applicable traffic and motor vehicle safety laws of this state and the person who submits the written statement for the fully autonomous vehicle may be issued a

[85] Arizona Bill, § 28-9602(B).

> traffic citation or other applicable penalty if the vehicle fails to comply with traffic or motor vehicle laws.
>
> (d) the fully autonomous vehicle meets all applicable certificate of title, registration, licensing and insurance requirements of this title.[86]

Section 28-9602(E) expands upon this:

> E. When engaged, the automated driving system is considered the driver or operator of the autonomous vehicle for the purpose of assessing compliance with applicable traffic or motor vehicle laws and is both:
>
> 1. Deemed to satisfy electronically all physical acts required by a driver or operator of the vehicle.
>
> 2. Exempt from the requirements of chapter 8 of this title.[87]

The Arizona legislature recognizes the practical distinction between a driverless and driver-capable automated vehicle. A vehicle that has the capability for a user to take control of the dynamic driving task calls for expectations on that driver if it chooses to do so. To the contrary, if a vehicle has no driver capability (or user control), there is little need for user regulation. This three-tiered system of (1) traditional drivers, (2) drivers of automated vehicles in which they are responsible to taking control of, and (3) driverless vehicles could be advisory to other differing approaches in this sector, such as legislatively defining a driver.

V. DIFFERENCES IN DEFINING A USER OF AN AUTOMATED VEHICLE

As is the case with any legislation, many of the expectations and assumptions created by a law are derived from how the terms in

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[86] Arizona Bill, § 28-9602(C).

[87] Arizona Bill, § 28-9602(E).

that law are defined. As evidenced from this paper, there are many interchangeable terms used to describe those who interact with automated vehicles. Drivers, users, providers, passengers, manufacturers and owners are just a few. This last section seeks to explore the differences between how two reputable approaches, the United Kingdom Law Commission[88] and the Uniform Law Commission, are choosing to define users of automated vehicles and a potential middle ground approach that could be used to help bridge the gap.

A. UNITED KINGDOM LAW COMMISSIONS – THE CASE FOR USER-IN-CHARGE

1. User-in-Charge-Vehicles

The UK Law Commissions (UKLC) first coined the term "user-in-charge" in its first consultation paper to propose that an individual in a highly automated vehicle should be able to operate the controls of the vehicle (perform the dynamic driving task), unless the vehicle is otherwise authorized to operate without one.[89] In the glossary of terms, user-in-charge is defined as follows:

> A human who has access to the controls of an automated vehicle, and is either in the vehicle or in direct sight of it. The user-in-charge is not a driver while the automated driving system is correctly engaged but must be qualified and fit to drive. Their main role is to take over following a transition demand. They would also have obligations relating to non-dynamic driving task requirements including duties to maintain and insure the vehicle, secure loads carried by the vehicle and report accidents. An

[88] Two law commissions within the United Kingdom, the Law Commission of England and Wales and the Scottish Law Commission, have interjected proposals for a comprehensive legislative framework of AVs. https://www.lawcom.gov.uk/comprehensive-regulatory-framework-for-self-driving-vehicles-proposed-to-government/.

[89] UKLC Paper 3 at 2.

> automated vehicle would require a user-in-charge unless it is authorised to operate without one.[90]

On face value, this description aligns closely with the requirements placed on drivers under the Arizona Bill. A user-in-charge would be responsible for "handovers", in which the automated vehicle will signify to the user that it needs the user to take control of the dynamic driving task.[91]

The UKLC proposal states that a user-in-charge would be able to take over driving controls at any time, with the only limitation being that an "offer" and "confirm" would need to take place to prevent mistaken handovers.[92] One expectation that the proposal puts on users-in-charge that is not seen in other legislation is to remain "in direct sight" of the vehicle, while using the auotomated driving system or after a handover.[93] Practically, the effect of a handover means that a user-in-charge becomes a traditional driver, being subject to all general traffic laws.[94] The driver would be liable for all criminal and civil infractions while undertaking the dynamic driving task, whether taken manually or prompted by the vehicle to do so.[95]

The UKLC report acknowledges hope for a future where transition demands and handovers will not be necessary.[96] A user-in-charge may still have other duties that do not include dynamic driving task such as making sure minors are wearing seatbelts, carrying insurance and that the vehicle is appropriately parked and maintained.

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[90] UKLC Paper 3 at vii.

[91] NTC Paper at 44.

[92] UKLC Paper 3 at 194.

[93] Vehicles with remote operation are defined separately, as the UKLC believes that the regulatory concerns of those vehicles are differentiated.

[94] UKLC Paper 3 at 194.

[95] *Id.*

[96] *Id.* at 217.

2. No User-in-Charge Vehicles (NUICs)

The UKLC report further attempts to define vehicles that require no user-in-charge by stating that over time some automated vehicles will not need human intervention at any stage of a trip; aptly named, they coin the term 'No User-in-Charge Vehicles' (NUICs).[97] An NUIC can travel "empty", meaning that it needs no physical human control to operate and that any users of the vehicle are simply passengers.[98] The report specifically states that "[passengers] have no legal responsibility for the way that the vehicle drives and are under no obligation to intervene."[99]

3. Automated Driving System Entity (ADSE)

To bridge the gap of control and, in turn, liability created between the definitions drivers, users-in-charge and NUICs, the UKLC proposal offers that an automated driving system would be backed by an Automated Driving System Entity (ADSE).[100] An ADSE could be a non-driver such as a manufacturer or producer of an automated vehicle that would be "subject to regulatory action under the safety assurance scheme."[101] All vehicles that are deemed to have automated driving systems would retain an ADSE, meaning that it would apply to both vehicles with user-in-charge capabilities and NUICs.

In a way, the UKLC creates a hierarchy of user control and responsibility as technology advances: (1) traditional vehicles, (2) automated vehicles with a user-in charge, (3) remote operators with a user-in-charge, (4) complete remote operation (NUICs), and (5) highly automated vehicles with no human interface. This apparent hierarchy seems to correspond closely with the technological differences set out in the SAE Levels, possibly attempting to address concerns of all forms of automated vehicles under one

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[97] *Id.* at 213.
[98] *Id.* at 223.
[99] *Id.*
[100] *Id.* at 134.
[101] *Id.*

comprehensive report. The creation of ADSEs helps fill in lines of uncertainty regarding liability of this hiearchy.

B. UNIFORM LAW COMMISSION – THE CASE FOR AUTOMATED DRIVING PROVIDERS

The Uniform Law Commission's (ULC) model legislation (UAOVA) differentiates definitions of users in a way that is unlike the UKLC report. In the comments of the UAOVA legislation, the drafters state that the term "automated vehicle" exludes a vehicle "that a human driver will still monitor the road even as the system steers, brakes, and accelerates. A vehicle is an automated vehicle even if it is not currently under 'automated operation'—that is, even if a human driver rather than the vehicle itself is currently steering, braking, accelerating, or simply monitoring the road."[102] Instantly, this places the legislation at least at SAE Level 3, most likely at SAE Level 4.[103]

Under the definition sections, here are how some of the common terms associated with automated driving are defined:

> (1) "Associated automated vehicle" means an automated vehicle that an automated driving provider designates under Section 7…
>
> (2) "Automated-driving provider" means a person that makes a declaration recognized by [the relevant state agency] under Section 6…
>
> (4) "Automated operation" means the performance of the entire dynamic driving task by an automated-driving

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[102] Uniform Automated Operation of Vehicles Act (UAOVA) Final Act with Comments at 5.

[103] The Uniform Automated Operation of Vehicles Act (UAOVA) Final Act with Comments explains the reasoning for not using the SAE Levels as "changes for legal and functional clarity." As an example, the comments note that SAE J3016 defines an automated driving system by "its asserted capabilities rather than by its successful realization of those capabilities. This notion conflates the distinction between SAE Levels 3-4, as the UAOVA attempts to provide a more functional legal definition.

> system. Automated operation begins on the performance of the entire 6 dynamic driving task by the automated-driving system and continues until a human driver or human operator other than the automated-driving provider terminates the automated operation…
>
> (9) "Driver" has the meaning in [the state's vehicle code], except that an automated driving provider that designates an associated automated vehicle under Section 7 is the exclusive driver of the vehicle under automated operation…[104]

Under this model legislation, a driver is defined as nothing other than what is required under a specific state's traffic laws.[105] There is no distinction between a user of an automated vehicle with an assisted-driver system and that of a traditional vehicle. However, once an automated vehicle reaches the defined category of an 'associated automated vehicle' under Section 7, the automated driving provider becomes the statutorily defined driver.[106] This category of vehicles to which an automated-driving provider must designate creates an inherent threshold for user responsibility:

> If the vehicle does not meet the criteria under Section 7, driver is defined by the state's traffic law.
> If the vehicle meets the criteria under Section 7, the automated-driving provider is then deemed the driver and users simply become passengers.

ULC's UAOVA takes a much broader approach to defining drivers/users of automated vehicles, perhaps purposely to avoid the burdensome issues raised by the significant number of vehicle categories in UKLC's report. Under UAOVA, the created threshold allows for a state to retain its prior traffic law regime through driver expectations, while also expanding regulation to the new phenomenon of automated-driving providers. Although the ULC

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[104] *Id.* at 5-6.

[105] *Id.*

[106] *Id.* at 18. "An automated driving provider designates its associated automated vehicles by giving acceptable notice to the relevant state motor vehicle agency."

definition of an automated driving provider seems similar to the UKLC proposal's ADSE, it is distinguished in a key way. Automated Driving Providers are strictly correlated to what the UKLC would consider an NUIC, not covering automated vehicles that would require a user-in-charge.[107]

C. WHY NOT BOTH?

At the outset, state driver definitions, user-in-charge requirements and automated-driving providers are all mutually exclusive ideas.[108] There is no practical reason as to why all three would be unable to be included into one comprehensive legislation. The following definitions proposal uses the UAOVA as a baseline terminology, incorporating reference to a middle-tier category of users that are expressed by both the Arizona legislature and the UKLC report.

1. Automated Driving Definitions Proposal:

SECTION 1. DEFINITIONS. In this [act]:

1. "Automated-driving provider" [109] means a person that makes a declaration that is recognized and approved by [the relevant agency].
2. "Associated automated vehicle" means an automated vehicle that is designated by an automated-driving provider.
3. "Automated vehicle" means a motor vehicle with an automated-driving system.

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[107] This distinction seemingly creates a two-tiered approach by the ULC compared to a several-tiered approach retained by the UKLC proposal.

[108] All three ideas are somewhat represented in the 2021 Arizona Bill.

[109] Under this hybrid approach, this term could also be coined "Automated Driving System Entity", as both definitions would encompass the same goals under this regime.

4. "Automated-driving system" means the hardware and software collectively capable of performing the entire dynamic driving task on a sustained basis.
5. "Dynamic driving task" means controlling lateral and longitudinal vehicle motion, monitoring the driving environment, executing responses to objects and events, planning vehicle maneuvers, and enhancing vehicle conspicuity, as required to operate a vehicle in on-road traffic.
6. "Minimal-risk condition" means a condition to which a vehicle user or an automated-driving system may bring a vehicle to reduce the risk of a crash when a trip cannot or should not be continued.
7. "Automated operation" means the performance of the entire dynamic driving task by an automated-driving system.
    a. Automated operation begins on the performance of the entire dynamic driving task by the automated-driving system and continues until a user-in-charge terminates the automated operation by performing a handover.
8. "User-in-Charge" means a human driver or operator who has access to control the dynamic driving task of an automated vehicle through a transition demand and is either in the vehicle or in direct sight of it.
9. "Handover" means the transfer of dynamic driving task from an automated-driving system to a user-in-charge.
10. "Transition Demand" means an alert issued by an automated driving system to the user-in-charge to take over the dynamic driving task, communicated through visual, audio and haptic signals, which gives the user-in-charge a transition period within which to respond. Absent a response, the automated driving system performs a risk mitigation maneuver bringing it to a stop.
11. "Completely automated trip" means travel in an automated vehicle that, from the point of departure until the point of arrival, is under automated operation by means of an automated-driving system designed to achieve a minimal-risk condition.
12. "Dedicated automated vehicle" means an automated vehicle designed for exclusively automated operation

when used for transportation on a [road open to the public].

13. "Driver" has the meaning in [the vehicle code], except:
    a. A user-in-charge is a driver in an automated vehicle only after a "handover" has taken place.
    b. An automated-driving provider that designates an associated automated vehicle is the exclusive driver of the vehicle under automated operation.
14. Drive" has the meaning in [the vehicle code], except that:
    a. A user-in-charge drives an automated vehicle only after a "handover" has taken place.
    b. An automated-driving provider that designates an associated automated vehicle exclusively drives the vehicle under automated operation.
15. "Operator" has the meaning in [the vehicle code], except that:
    a. A user-in-charge is an operator in an automated vehicle only after a "handover" has taken place.
    b. An automated-driving provider that designates an associated automated vehicle is the exclusive operator of the vehicle under automated operation.
16. "Operate" has the meaning in [the vehicle code], except that:
    a. A user-in-charge operates an automated vehicle only after a "handover" has taken place.
    b. An automated-driving provider that designates an associated automated vehicle exclusively operates the vehicle under automated operation.
17. "Person" [has the meaning in the vehicle code] [means an individual, estate, business or nonprofit entity, public corporation, government or governmental subdivision, agency, or instrumentality, or other legal entity].

VI. CONCLUSION

Whether it be Interntional Convention efforts, German federal law or US state law, world legal regimes are changing what it means to travel in a vehicle. Automated vehicle technology is upon us, and it is not going anywhere. The many benefits including positive environmental impacts, reduced traffic and travel times, and safety

are too great of outcomes for humanity not to pursue. As with all innovative technologies, the law must attempt to keep up.

Automated vehicle technology is changing the expectations of what it means to be a "driver" and legal challenges are created because of it. What laws are still necessary? Are new laws necessary? Who bears the burden of liability? When does automated become "automated enough" to not need a "driver"? These are all questions that may not have definitive answers, but questions needing answers nonetheless.

Legislators around the world seem to acknowledge the decrease of driver responsibility and subsequent increase of producer responsibility as automated vehicle technology progesses. Creating legislation for non-automated vehicles and fully-automated vehicles seem to be simpler tasks than addressing the canundrum that is created during the transition. Some legislators have chosen to be very specific in addressing what will be expected of users in every possible variation of automated vehicles. Others are taking a broader approach by creating overarching legislation that seeks to be functional and adaptable to local application. As with most great things in life, a good balance may be exactly what is needed.