PASSING THE PACE CAR: HOW AMERICA'S INSUFFICIENT AUTONOMOUS VEHICLE REGULATIONS THREATEN SAFETY AND U.S. GLOBAL ECONOMIC POWER

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Introduction

The race to develop artificial intelligence systems for civilian use, like the space race of the 1950s and 1960s, is a competition for global power—a way for nations to assert their economic and technological dominance in a new age.[2] Artificial intelligence has become prevalent in nearly all major civilian industries as AI systems aid in banking, medicine, policing, and transportation.[3] These uses are powerful, and undoubtedly worth their own analysis, but to the average citizen they are an intangible and thus inconsequential reality of modern life. To make the case for swift regulatory development, this note looks to a sector of daily life where artificial intelligence has already, in some ways, taken the wheel.

Self-driving vehicles have lived a vibrant life in popular culture from the sleek and impressively equipped Batmobile to *Total Recall*'s Johnny Cab.[4] Though the fully autonomous consumer vehicles of movies past are still years away, cars with automated advanced driver assistance features have cruised U.S. streets since 2010.[5] These features, which are increasingly standard in new U.S. vehicles, include partially automated lane keeping assistance, adaptive cruise control, and traffic jam

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2. Will Knight, *Report: AI is the New Space Race, and the US Needs a "Sputnik Moment"*, MIT TECH. REV. (July 25, 2018), *available at* https://www.technologyreview.com/2018/07/25/66677/report-ai-is-the-new-space-race-and-the-us-needs-a-sputnik-moment/ (last visited Sept. 16, 2022).

3. Bernard Marr, *The 10 Best Examples of How AI is Already Used in Our Everyday Life,* Forbes (Dec. 16, 2019, 12:13 AM), *available at* https://www.forbes.com/sites/bernardmarr/2019/12/16/the-10-best-examples-of-how-ai-is-already-used-in-our-everyday-life/?sh=7ca91a181171 (last visited Sept. 16, 2022).

4. Jamie Stevenson, *A Brief Pop Culture History of the Autonomous Car,* HERE360 BLOG (Sept. 14, 2016), *available at* https://www.here.com/company/blog/a-brief-pop-culture-history-of-the-autonomous-car (last visited Sept. 16, 2022).

5. *Id.*

assistance.[6] In 2021, Honda and Mercedes-Benz introduced vehicles that include integrated auto-pilot systems that *do not* require consistent driver monitoring.[7] The future in which our cars drive us is closer than it seems.

Yet in the United States, domestic regulation of autonomous vehicles has lingered in its early stages for nearly a decade while research and implementation of such vehicles have barreled ahead.[8] Regulating technological advancement is often a slow process, hindered by partisan issues, economic considerations, and ethical dilemmas.[9] Some consider AI regulation a barricade to innovation. Others see regulation as guardrail—a necessary protection from the boundless potential for new harms created by emerging technologies.

With over 90% of serious American car crashes caused by driver error, U.S. policymakers have taken a backseat approach to regulating the autonomous vehicle industry to promote automated advancements that could make the roads safer.[10] But as more semi-autonomous self-driving cars hit U.S. roads, questions about regulation become more pressing. In 2015, hackers remotely took over a Jeep and forced it to a complete stop on a St. Louis highway after gaining access to the vehicle's steering and braking mechanisms through the onboard entertainment system.[11] On

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6. *Id.*

7. *See* Colin Beresford, *Honda Legend Sedan with Level 3 Autonomy Available for Lease in Japan*, CAR AND DRIVER (Mar. 4, 2021), *available at* https://www.caranddriver.com/news/a35729591/honda-legend-level-3-autonomy-leases-japan (last visited Sept. 16, 2022); *see also* Joey Capparella, *Mercedes Drive Pilot Level 3 Autonomous System to Launch in Germany*, CAR AND DRIVER (Dec. 9, 2021), *available at* https://www.caranddriver.com/news/a38475565/mercedes-drive-pilot-autonomous-germany (last visited Sept. 16, 2022).

8. Jeremie Harris, *AI Advances, But Can The Law Keep Up?*, TOWARDS DATA SCI. (Mar. 31, 2021), *available at* https://towardsdatascience.com/ai-advances-but-cat-the-law-keep-up-7d9669ce9a3d (last visited Sept. 16, 2022).

9. Daniel Malan, *The Law Can't Keep Up with New Tech. Here's How to Close the Gap*, World Econ. F. (June 21, 2018), *available at* https://www.weforum.org/agenda/2018/06/law-too-slow-for-new-tech-how-keep-up/ (last visited Sept. 16, 2022).

10. Bryant Walker Smith, *Human Error as a Cause of Vehicle Crashes*, STAN. L. CTR. FOR INTERNET & SOC'Y (Dec. 18, 2013, 3:15 PM), *available at* http://cyberlaw.stanford.edu/blog/2013/12/human-error-cause-vehicle-crashes (last visited Sept. 16, 2022).

11. Thomas Brewster, *How Jeep Hackers Took Over Steering and Forced Emergency Stop at High Speed*, FORBES (Aug. 2, 2016), *available at* https://www.forbes.com/sites/thomasbrewster/2016/08/02/charlie-miller-chris-valasek-jeep-hackers-steering-brake/?sh=50b8e30c63f4 (last visited Sept. 18, 2022).

March 18, 2018, a self-driving Uber vehicle struck and killed a pedestrian who was walking her bike across the street outside of a crosswalk.[12]

Despite the overwhelming media focus on self-driving cars for individual use, the largest consumer market for autonomous vehicles in the U.S. will likely be corporate.[13] In 2021, a self-driving semitruck transported a load of watermelons from the Mexico-United States border in Arizona to Oklahoma.[14] The onboard autonomous driving system completed 80% of the journey, nearly 950 miles, and the total trip took only fourteen hours to complete—a 42% savings on the average human completion time for the same route.[15] And the watermelons? They arrived a whole day fresher.[16]

Removing the need for human drivers for domestic goods transit could have substantial economic and environmental advantages. Autonomous semi-trucks can move goods faster and reduce supply-chain issues resulting from labor shortages.[17] Faster transport of goods could reduce the number of necessary cross-country trips, reducing carbon-emissions. However, autonomous vehicle fleets pose significant security risks. In August of 2020, a hacker exploited a server vulnerability to gain control over the entire Tesla connected fleet.[18] That same year, in April, hackers reverse-engineered a telematic control unit from OEM's corporate fleet to infiltrate and take full control of its corporate network.[19] These incidents amplify the need for autonomous vehicle testing

12. Daisuke Wakabayashi, *Self-Driving Uber Car Kills Pedestrian in Arizona, Where Robots Roam,* THE NEW YORK TIMES (Mar. 19, 2018), *available at* https://www.nytimes.com/2018/03/19/technology/uber-driverless-fatality.html (last visited Sept. 18, 2022).

13. *See* Jim Motavalli, *Who Will Own the Cars that Drive Themselves?,* THE NEW YORK TIMES (May 29, 2020), *available at* https://www.nytimes.com/2020/05/29/business/ownership-autonomous-cars-coronavirus.html (last visited Nov. 7, 2022).

14. Vanessa Bates Ramirez, *A Self-Driving Truck Got a Shipment Cross-Country 10 Hours Faster Than a Human Driver,* SINGULARITY HUB (June 1, 2021), *available at* https://singularityhub.com/2021/06/01/a-driverless-truck-took-a-load-of-watermelons-cross-country-42-faster-than-a-human-driver (last visited Nov. 7, 2022).

15. *Id.*

16. *Id.*

17. Kayleigh Bateman, *Could autonomous trucks be the answer to the global supply chain crisis?,* WORLD ECON. FORUM (Nov. 23, 2021), *available at* https://www.weforum.org/agenda/2021/11/can-autonomous-trucks-fix-supply-chain (last visited Sept. 18, 2022).

18. UPSTREAM SECURITY, GLOBAL AUTOMOTIVE CYBERSECURITY REPORT (2021), at 18.

19. *Id.* at 11.

regulations by highlighting the significant cost of technological error and security failures.

In April of 2021, the European Union proposed a 108-page legal framework for the development, testing, and use of artificial intelligence by its member states.[20] The proposal, which drew heavily on the European Commission's 2020 White Paper on Artificial Intelligence, is the first viable international attempt at a unified legal framework for AI regulation.[21] Potentially spurred by the European proposal, in June of 2021 the city of Shenzhen, often referred to as the Silicon Valley of China, released plans to regulate the development of AI systems within the region.[22] In today's highly interconnected global economy, national and multinational regulatory frameworks have a significant impact on all nations engaged in international trade.[23] Put more simply, it pays to be first.

This note will [1] explore the challenges of regulating emerging technologies and the dangers of unregulated or lightly regulated autonomous vehicle testing, [2] argue for the creation of industry-specific regulatory sandboxes and mandatory conformity assessments similar to those suggested in the EU proposal, and [3] illustrate how the timely implementation of U.S. domestic autonomous vehicle regulation could help the nation remain competitive in the emerging global artificial intelligence industry.

I. Regulating Emerging Technologies—Too Fast or Too Slow

Technological advancement, from the atomic bomb to the fanciest phone cameras, has always fashioned itself as a race. Such "technology

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20. *See generally* Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts, COM (2021) 206 final (Apr. 21, 2021); [hereinafter EU COM/2021/206].

21. *New Draft Rules on the Use of Artificial Intelligence*, Baker McKenzie (May 12, 2021), *available at* https://www.bakermckenzie.com/en/insight/publications/2021/05/new-draft-rules-on-the-use-of-ai (last visited Nov. 7, 2022).

22. Alexander Chipman Koty, *Artificial Intelligence in China: Shenzhen Releases First Local Regulations*, China Briefing (July 29, 2021), *available at* https://www.china-briefing.com/news/artificial-intelligence-china-shenzhen-first-local-ai-regulations-key-areas-coverage (last visited Nov. 7, 2022).

23. ANUPAM CHANDER, *Artificial Intelligence and Trade*, Big Data & Glob. Trade L. 115, 115-27, (2021).

races" often trigger rapid technological progress in a given sector.[24] When emerging technologies race past the boundaries of existing regulatory frameworks, lawmakers and policy specialists are forced into a backseat game of catch-up resulting in large gaps between technological and ethical capacity and industry standards.[25] Once beyond regulation, advancement can continue rapidly. In 2021, a team of Microsoft researchers estimated that the leading machine learning model had increased in size tenfold each year for the previous decade.[26] How can regulation ever match the breakneck pace of innovation?

Regulation typically catches up to technological advancement by slowing it down and adopting the precautionary, rather than innovative, principle.[27] If a technological advancement has potential to harm the environment or the public, the precautionary principle places the burden on the developers to prove it will not cause harm.[28] If its safety cannot be demonstrated to the satisfaction of regulators, the precautionary principle demands the government limit the use of the technology until it is sufficiently safe.[29] Opponents of artificial intelligence regulation perceive this "better safe than sorry" approach as a hinderance to the rate of progress and argue that such restrictive measures are suited only for technologies that risk catastrophic consequences, such as nuclear energy.[30]

The innovation principle, favored by tech developers and proponents of lighter regulatory frameworks, assumes that most technological advancement poses only a modest risk of harm and a significant benefit to society.[31] Thus, the government should prioritize innovation and provide guardrails only when necessary to protect against

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24. I.K. WANG et al., *From Technology Race to Technology Marathon: A Behavioral Explanation of Technology Advancement*, 35 Euro. Mgmt. J. 187, 187 (2017).

25. William D. Eggers et al., *The Future of Regulation: Principles for Regulating Emerging Technologies*, DELOITTE (June 19, 2018), *available at* https://www2.deloitte.com/us/en/insights/industry/public-sector/future-of-regulation/regulating-emerging-technology.html (last visited Sept. 13, 2022).

26. Harris, *supra* note 8.

27. Daniel Castro and Michael McLaughlin, *Ten Ways the Precautionary Principle Undermines Progress in Artificial Intelligence*, ITIF (Feb. 2, 2019), *available at* https://itif.org/publications/2019/02/04/ten-ways-precautionary-principle-undermines-progress-artificial-intelligence (last visited Sept. 13, 2022).

28. *Id.*

29. *Id.*

30. *Id.*

31. *Id.*

unique, case-by-case harms.[32] The innovation principle's punitive, rather than precautionary, methodology is intended to ensure that "speculative concerns [do] not hold back concrete benefits."[33] Where regulation is required, the innovation principle looks to tort law, existing regulation, and market forces to provide sufficient protections.[34]

These principles demonstrate the challenging spectrum of risk that regulators face when determining regulatory models. Choosing the precautionary principle risks rapid overregulation—the problem of "too fast."[35] In the fields of technology and engineering, the "too fast" problem often collides with a lack of regulatory knowledge on how a field has advanced.[36] The extensive regulation "tend[s] to reflect and understanding of *yesterday's technologies* instead of what [is] emerging at the time."[37]

Pennsylvania's 1896 "red flag" laws provide an early American example of problematically swift, unknowledgeable regulation.[38] In response to the rapid pace of automotive engineering, Pennsylvania legislators proposed a law requiring motorists encountering livestock to stop and "as rapidly as possible disassemble the automobile" and "conceal the various components out of sight, behind nearby bushes until . . . [the] livestock is sufficiently pacified."[39] Though the law was vetoed by the Governor, its proposal evidences how attempts to rapidly regulate emerging technologies can misfire when drafted with speed and a lack of technical understanding.[40]

Regulating in accordance with the innovation principle risks failing to regulate harmful and potentially catastrophic consequences of new technologies—the problem of "too slow."[41] Take, for example, the sale of the toy *Radiumscope* as late as 1942 though Hermann Joseph Muller recognized that radium was associated "genetic effects and increased

32. Castro and McLaughlin, *supra* note 27.
33. *Id.*
34. *Id.*
35. Eggers, *supra* note 25.
36. *Id.*
37. *Id.*
38. *Id.*
39. *Id.*
40. Eggers, *supra* note 25.
41. *Id.*

cancer risk" in 1927.[42] Despite its capacity for harm, regulation of radium was left largely to the states until 2004 when the International Atomic Energy Agency (IAEA) developed a code of conduct for nuclear safety.[43] Regulating artificial intelligence too slowly could threaten global security by unleashing new autonomous weapons systems, bioweapons, or droves of killer robots.[44] Beyond the catastrophic defense considerations, glacial AI regulation could expose the public to harmful algorithmic biases and endorse reliance on unsafe technologies and under-tested technologies.

II. Defining Autonomous

SAE International, a global association of over 138,000 engineers and technological experts, divides vehicle automation into globally utilized standard levels of autonomy: [0] no automation, [1] driver assistance, [2] partial automation, [3] conditional automation, [4] high automation, and [5] full automation.[45] The National Highway Traffic Safety Administration (NHTSA) uses identical levels to describe vehicles in the U.S. market.[46] These levels illustrate a spectrum of driver involvement. Levels zero and one retain the driver as the primary supervisor of the driving environment with the support of features such as lane centering *or* adaptive cruise control.[47]

Autonomy levels two and three include vehicles that function with the driver as the "captain of the ship" with the ability to surrender certain

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42. *See* Adrienne Crezo, *We Used to put Radium in Coffee*, THE ATLANTIC (Oct. 10, 2012), *available at* https://www.theatlantic.com/health/archive/2012/10/we-used-to-put-radium-in-coffee/263408 (last visited Oct. 9, 2022).

43. *Backgrounder on Radium*, U.S. NRC (last updated Jan. 6, 2021), *available at* https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radium.html (last visited Oct. 9, 2022).

44. Kayvan Alikhani, *Why It's Dangerous for AI to Regulate Itself*, FORBES (Mar. 22, 2019), *available at* https://www.forbes.com/sites/forbestechcouncil/2019/03/22/why-its-dangerous-for-ai-to-regulate-itself/?sh=4f027a4a7e54 (last visited Nov. 7, 2022).

45. SAE, International Releases Updated Visual Chart for Its "Levels of Driving Automation" Standard for Self-Driving Vehicles, SAE INT'L (Dec. 11, 2018), available at https://www.sae.org/news/press-room/2018/12/sae-international-releases-updated-visual-chart-for-its-"levels-of-driving-automation"-standard-for-self-driving-vehicles (last visited Sept. 18, 2022).

46. *Automated Vehicles for Safety*, NHTSA (last updated 2022), *available at* https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety (last visited Oct. 10, 2022).

47. *A Brief History of Autonomous Vehicle Technology*, WIRED (last updated 2016), *available at* https://www.wired.com/brandlab/2016/03/a-brief-history-of-autonomous-vehicle-technology/ (last visited Sept. 18, 2022).

controls in certain conditions.[48] Level two vehicles have combined automated features, such as lane centering *and* adaptive cruise control, that provide assistance but require the driver remains continuously engaged with the task of driving.[49] Vehicles in level three support autonomous driving features only in limited conditions, such as traffic jam chauffer programs that activate under forty miles per hour and when the proximity of other vehicles indicates heavy traffic.[50] The NHTSA often depicts level three as a driver with one hand (rather than two) on the wheel.[51]

In vehicles in levels four and five, the automated driving system, rather than the human driver, is the primary supervisor of the driving environment.[52] Level four vehicles have automated driving systems that do not require a human driver to take the wheel, but their use is limited only to certain types of roads, locations, or conditions.[53] Examples of level four vehicles might include driverless taxis in major cities or highway-only autonomous vehicle software.[54] Level five vehicles are fully autonomous, and can drive in any conditions, anywhere.[55] At present, there are no vehicles for sale on the U.S. market with level three, level four, or level five autonomous driving systems.[56]

III. U.S. Domestic Autonomous Vehicle Regulation

There are numerous points at which a history of autonomous vehicles (AVs) might begin, stretching as far back as da Vinci's sixteenth century self-propelled cart or the development of the Whitehead Torpedo in 1868.[57] For the sake of brevity, this section begins with a brief history

48. *Id.*

49. *SAE International Releases Updated Visual Chart, supra* note 45.

50. *Traffic Jam Chauffeur,* L3 PILOT, *available at* https://l3pilot.eu/applications/applications/news/traffic-jam-chauffeur (last visited Sept. 18, 2022).

51. NHTSA, *supra* note 46.

52. *A Brief History of Autonomous Vehicle Technology, supra* note 47.

53. *SAE International Releases Updated Visual Chart, supra* note 45.

54. *Id.*

55. *Id.*

56. Jessica Shea Choksey & Christian Wardlaw, *Levels of Autonomous Driving, Explained,* J.D. POWER (May 5, 2021), *available at* https://www.jdpower.com/cars/shopping-guides/levels-of-autonomous-driving-explained (last visited Mar. 6, 2022).

57. *A Brief History of Autonomous Vehicle Technology, supra* note 47.

that starts a great deal later, in 1984 at Carnegie Mellon University.[58] The history is followed by discussions on the American regulatory framework, the dangers of unregulated AV development, automotive cybersecurity, and how the lack of U.S. regulation may undermine is position in the global economy.

A. A BRIEF DETOUR INTO AUTONOMOUS VEHICLE HISTORY

In 1984, Carnegie Mellon won a grant from the United States Defense Advanced Research Projects Agency (DARPA) to help develop an autonomous land vehicle for combat use.[59] The grant funded the creation of Carnegie Mellon's Strategic Computing Vision (SCVision) project to "build vision and intelligence for a mobile robot capable of operating in the real world outdoors."[60] By 1986, SCVision produced its first Navlab vehicle, a robot van that utilized video input systems to transmit monochrome and color video into an onboard computer.[61] These systems analyzed video input to determine the location and variety of roads to guide the van accordingly.[62] This early technology processed data slowly, and had difficulty in variant lighting conditions.[63] SCVision's breakthrough came in 1987 when graduate student Dean Pomerleau designed a system for autonomous vehicles that utilized neural net processors.[64]

Neural networks, which serve as the groundwork for nearly all modern machine learning programs, mimic human processing by utilizing algorithm sets.[65] These algorithms predict outcomes by "solving" formulas comprised of "inputs, weights, a bias or threshold,

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58. Mike Pesarchick, *When self-driving tech was in its infancy, a road trip by 2 CMU researchers paved the way*, PITTSBURGH POST-GAZETTE (Aug. 3, 2020), *available at* https://www.post-gazette.com/news/transportation/2020/08/03/autonomous-self-driving-tech-infancy-CMU-researchers-no-hands-across-america-road-trip/stories/202008030004 (last visited Sept. 21, 2022).

59. TAKEO KANADE, CHARLES THORPE, ET. AL., CMU STRATEGIC COMPUTING VISION PROJECT REPORT: 1984 to 1985 31 (1985).

60. *Id.*

61. Pesarchick, *supra* note 58.

62. *Id.*

63. *Id.*

64. *Id.*

65. Eda Kavlakoglu, *AI vs. Machine Learning vs. Deep Learning vs. Neural Networks: What's the Difference?*, IBM (May 27, 2020), *available at* https://www.ibm.com/cloud/blog/ai-vs-machine-learning-vs-deep-learning-vs-neural-networks (last visited Jan. 6, 2023).

and an output."[66] Pomerleau's neural network, named RALPH (Rapidly Adapting Lateral Position Handler), used a trained camera system to identify road lanes and ignore objects like tire marks which would have triggered previous programs to stop.[67] Once connected to a steering system, RALPH could efficiently respond to road conditions and drive a car.[68]

In 1995, RALPH successfully drove a Navlab vehicle across the United States, traversing nearly 3,000 miles from Pittsburgh to San Diego in a project called "No Hands Across America."[69] The Pontiac minivan was operated semi-autonomously.[70] Researchers Dean Pomerleau and Todd Jochem controlled the vehicle's throttle and brakes while RALPH managed the wheel.[71] During the trip, RALPH semi-autonomously steered at speeds over seventy miles per hour and drove safely in tunnels, fog, bright sun, and during the night.[72] Some conditions required intervention from the car's human drivers, including locales with significantly deteriorated road markings and heavy rain.[73] Nevertheless, RALPH's semi-autonomous driving percentage averaged 95% over the trans-continental trip, peaking at 99.8% during one 323.5 mile segment.[74] Though the original RALPH is retired, the system's descendants make up many modern lane departure systems, particularly for commercial use.[75]

Autonomous vehicle development in the 2000s was a veritable sprawl of government-funded and independent research. From 2004-2013 DARPA sponsored competitions that challenging autonomous vehicles to safely navigate various environments such as a Mojave Desert roadway and a sixty-mile stretch in an urban environment.[76] In the 2010s, numerous major automotive manufacturers began testing self-driving

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66. *Id.*

67. Dean Pomerleau, *RALPH: Rapidly Adapting Lateral Position Handler*, CARNEGIE MELLON UNIV. (1995), *available at* https://www.cs.cmu.edu/~tjochem/nhaa/ralph.html (last visited Nov. 7, 2022).

68. *Id.*

69. *No Hands Across America Journal*, CARNEGIE MELLON UNIV. (1995), *available at* https://www.cs.cmu.edu/~tjochem/nhaa/Journal.html (last visited Nov. 7, 2022).

70. *Id.*

71. *No Hands Across American Official Press Release*, CARNEGIE MELLON UNIV. (1995), *available at* https://www.cs.cmu.edu/~tjochem/nhaa/official_press_release.html (last visited Nov. 7, 2022).

72. Pomerleau, *supra* note 67.

73. *No Hands Across America Journal*, *supra* note 69.

74. *No Hands Across America Journal*, *supra* note 69, at 12.

75. Pesarchick, *supra* note 58.

76. *A Brief History of Autonomous Vehicle Technology*, *supra* note 47, at 6-7.

vehicles and task-specific autonomous driving systems.[77] These included automatic breaking,[78] temporary auto pilot,[79] and lane maintenance software.[80]

By 2015, manufacturers including Infiniti, Honda, and Mercedes-Benz had released vehicles with autonomous driving functionality for public sale—with a caveat.[81] To mitigate the danger posed by self-driving systems, many of these vehicles "[r]equire[d] customers to keep their hands on the wheel. A few seconds without touching the wheel . . . and a warning [was] sounded; the cars then simply came to a stop."[82] The addition of safety systems to prevent actual autonomous driving kept these vehicles from "pushing into a regulatory void."[83] For most automakers, it seemed "hands-on" was preferable to "hands-off."[84]

In March 2015, the announcement of Tesla Motors' hands-free autopilot feature—delivered overnight later that year to Tesla Model S owners in a software update—raised renewed questions about the regulatory landscape.[85] Though Tesla assured there was "nothing in [their] autopilot system that [was] in conflict with current regulations," analysts found Tesla's compliance with the law was, at best, "unclear."[86]

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77. Dan Neil, *Who's Behind the Wheel? Nobody,* THE WALL STREET J. (Sept. 24, 2012), *available at* https://www.wsj.com/articles/SB10000872396390443524904577651552635911824 (last visited Nov. 9, 2022).

78. *Unique Volvo systems for automatic braking with full force at all speeds - responding to both vehicles and people,* VOLVO (Sept. 25, 2009), *available at* https://www.media.volvocars.com/us/en-us/media/pressreleases/30668 (last visited Nov. 9, 2022).

79. Richard Read, *Volkswagen Debuts An Auto Pilot For Cars,* MOTOR AUTH. (June 23, 2011), *available at* https://www.motorauthority.com/news/1062079_volkswagen-debuts-an-auto-pilot-for-cars (last visited Nov. 9, 2022).

80. *See A Brief History of Autonomous Vehicle Technology, supra* note 47, at 6-7.

81. Aaron M. Kessler, *Elon Musk Says Self-Driving Tesla Cars Will Be in the U.S. by Summer,* THE NEW YORK TIMES (Mar. 19, 2015), *available at* https://www.nytimes.com/2015/03/20/business/elon-musk-says-self-driving-tesla-cars-will-be-in-the-us-by-summer.html?hpw&rref=automobiles&action=click&pgtype=Homepage&module=well-region&region=bottom-well&WT.nav=bottom-well&_r=0 (last visited Nov. 8, 2022).

82. *Id.*

83. Aaron M. Kessler, *Hands-Free Cars Take Wheel, and the Law Isn't Stopping Them,* THE NEW YORK TIMES (May 2, 2015), *available at* https://www.nytimes.com/2015/05/03/business/hands-free-cars-take-wheel-and-law-isnt-stopping-them.html (last visited Nov. 9, 2022).

84. *See* Kessler, *supra* note 81.

85. *Supra* note 81.

86. *Id.*

The NHTSA responded to the announcement by stating that autonomous vehicles would be required to adhere to "applicable federal motor vehicle safety standards," and that the agency "[would] have the appropriate policies and regulations in place to ensure the safety of these types of vehicles."[87] At the time of writing, the NHTSA has yet to develop minimum safety and performance standards for autonomous vehicle technologies.[88]

B. THE AMERICAN REGULATORY "PATCHWORK"

The 2021 Dentons *Global Guide to Autonomous Vehicles* called the current U.S. regulatory structure "a patchwork of state-centric laws . . . made up of [forty] states and DC that have either passed autonomous vehicle regulation or are operating under executive orders."[89] These state laws fall along a wide range of permissions. Laws in Texas,[90] Arizona,[91] and Florida[92] allow autonomous vehicles to operate without the presence of a driver. Texas House Bill 3026, which became effective on September 1, 2021, holds that vehicles exclusively operated by autonomous driving software "[are] not subject to motor vehicle equipment laws or regulations of [the] state that . . . relate to or support motor vehicle operation by a human driver."[93] Instead, Texas requires only that autonomous vehicles be equipped with collision recording systems and that their owners possess the required insurance policies.[94]

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87. *Id.*

88. *See* Roberto Baldwin, *Government Agencies Clash Over How Much to Regulate Self-Driving Cars*, CAR AND DRIVER (Mar. 16, 2021), *available at* https://www.caranddriver.com/news/a35844915/ntsb-letter-nhtsa-self-driving-vehicles (last visited Nov. 7, 2022). *See also* David Shepardson, Hyunjoo Jin, and Joseph White, *FOCUS-Self-driving car companies zoom ahead leaving U.S. regulators behind*, REUTERS (Sept. 30, 2022), *available at* https://www.reuters.com/article/autos-autonomous-regulation-idCNL1N2UB258 (last visited Nov. 7, 2022).

89. *Global Guide to Autonomous Vehicles 2021*, DENTONS (Jan. 28, 2021), *available at* https://www.dentons.com/en/insights/guides-reports-and-whitepapers/2021/january/28/global-guide-to-autonomous-vehicles-2021#:~:text=The%202021%20Global%20Guide%20builds,security%3B%20and%20telecommunications%20and%205G.

90. Relating to the operation and regulation of certain autonomous vehicles, H.B. 3026, 87th Leg. (Tex. 2021).

91. H.B. 2813, 55th Leg. (Ariz. 2021).

92. State Uniform Traffic Control, FLA. STAT. § 316.85 (2018).

93. *Supra*, note 90.

94. Dentons, Global Guide to Autonomous Vehicles https://www.dentons.com/en/insights/guides-reports-and- whitepapers/2021/january/28/-/media/ffd49a7d14d540efafa782233c1eb154.ashx (2021).

This loose regulatory framework has made Texas a popular location for autonomous vehicle testing and development.[95]

Other states have taken a far stronger approach to regulating self-driving vehicles.[96] Connecticut has one of the nation's strictest AV regulatory systems, subjecting vehicle operators to a multistage approval process and restricting vehicle testing to four municipalities.[97] California, another regulatory stronghold, requires companies verify that their autonomous vehicles meet Federal Motor Safety Standards and provide "proof of insurance or a bond equal to $5 million" to request a testing permit from the state's Department of Motor Vehicles (DMV).[98] Rigorous standards have not deterred companies from working in these states; as of February 7, 2022, the California DMV has issued fifty permits for testing with a driver, seven driverless testing permits, and three permits for autonomous vehicle deployment.[99]

Federal standards for autonomous vehicles are minimal, despite recent Congressional attempts to create federal security and safety standards for AV development, use, and testing.[100] Federal regulation remains at a standstill, in part, because autonomous driving systems pose a unique challenge to the existing regulatory structures. States are typically responsible for regulating operational standards for vehicles, such as driver licensure, while the federal government manages minimum quality and technical standards for vehicle design.[101] Current autonomous driving technologies, however, are software additions to normal vehicles, like the 2015 Tesla Model S update.[102] Federal Motor Safety Standards do not yet regulate any forms of driver-assistance software, including advanced driver assistance systems (ADAS)

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95. *Supra,* note 89.

96. *Supra* note 89, at 6.

97. *Id.*

98. DENTONS, U.S.: 50 STATE ROUNDUP (2020), *available at* http://www.thedriverlesscommute.com/wp-content/uploads/2020/12/US-50-State-Roundup-2020-Autonomous-Vehicles-12.18.10.pdf (last visited Nov. 7, 2022).

99. CA DMV, *Autonomous Vehicle Testing Permit Holders* (last updated Mar. 8, 2022), *available at* https://www.dmv.ca.gov/portal/vehicle-industry-services/autonomous-vehicles/autonomous-vehicle-testing-permit-holders (last visited Oct. 9, 2022).

100. Aarian Marshall, *Who's Regulating Self-Driving Cars? Often, No One,* WIRED (Nov. 27, 2019), *available at* https://www.wired.com/story/regulating-self-driving-cars-no-one (last visited Mar. 2, 2022).

101. *See generally Federal Vehicle Standards Database,* GSA, *available at* https://vehiclestd.fas.gsa.gov/CommentCollector/Home (last visited Mar. 2, 2022).

102. Marshall, *supra* note 100.

available in nearly 92% of new vehicles in the U.S.[103] This suggests that unless manufacturers begin removing steering wheels, regulation of autonomous driving technologies will remain with the states.[104]

C. THE DANGERS OF UNREGULATED DEVELOPMENT

The current, decentralized approach to AV regulation allows U.S. manufacturers to advance quickly and to implement new autonomous driving technologies with little resistance—racing towards a future "full of promise."[105] That future might be possible, and its benefits substantial, but it is not here today. Autonomous vehicles currently have a higher rate of accidents than human-driven cars, 9.1 and 4.1 accidents per million miles, respectively.[106] It is difficult to assess the accuracy of AV collision statistics because until June 29, 2021, operators and manufacturers of autonomous vehicles were not required to report crashes to the NHTSA.[107] The new guidelines require companies report all accidents resulting in injury or property damage and permit the NHTSA's deployment of Special Crash Investigations teams to accident sites.[108]

While mandatory crash reporting is an important step towards accountability, proactive measures are needed to ensure autonomous vehicles *increase* road safety. A study conducted by AAA in 2020 found that vehicles with onboard autonomous driver assistance programs experienced issues, on average, every eight miles of real-world driving.[109]

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103. Iiona D. Scully, Seann Scally, Ryan Clark et al., *Safety and Regulatory Considerations of Advances Driver Assistance Systems (ADAS)*, ABA: AUTOMOBILE LITIGATION COMMITTEE (2020), *available at* https://www.americanbar.org/groups/tort_trial_insurance_practice/committees/automobile-litigation/safety_regulatory_considerations (last visited Nov. 7, 2022).

104. *Id.*

105. NHTSA, AUTOMATED DRIVING SYSTEMS 2.0: A VISION FOR SAFETY (2017).

106. *The Dangers of Driverless Cars*, NAT'L LAW REV. BLOG (May 5, 2021), *available at* https://www.natlawreview.com/article/dangers-driverless-cars (last visited Sept. 18, 2022).

107. *NHTSA Orders Crash Reporting for Vehicles Equipped with Advanced Driver Assistance Systems and Automated Driving Systems*, NHTSA (June 29, 2021), *available at* https://www.nhtsa.gov/press-releases/nhtsa-orders-crash-reporting-vehicles-equipped-advanced-driver-assistance-systems (last visited Nov. 7, 2022).

108. U.S. Dep't of Transportation First Amended Standing General Order 2021-01. *Available at* https://www.nhtsa.gov/sites/nhtsa.gov/files/2021-08/First_Amended_SGO_2021_01_Final.pdf

109. Ellen Edmonds, *AAA Finds Active Driving Assistance Systems Do Less to Assist Drivers and More to Interfere*, AAA (Aug. 6, 2020), *available at*

On public roads, 73% of these errors involved lane position or dangerous proximity to other vehicles.[110] During closed-course testing, AAA observed that autonomous driving assistance programs struggled to respond to situations involving a disabled vehicle in the road, colliding with the vehicle 66% of the time at an average speed of twenty-five miles per hour.[111]

The lack of regulatory structure makes apportioning criminal liability a challenge when autonomous vehicle accidents result in death or serious injury. In 2018, an autonomous Uber car struck and killed Elaine Herzberg, a pedestrian walking her bicycle across the road at night.[112] The Volvo SUV was equipped with an Uber self-driving system, which was active at the time of the crash.[113] Dashcam video showed that the vehicle's driver, Rafaela Vasquez, spent almost a third of the drive looking at her phone.[114] The National Transportation Safety Board (NTSB) investigated and found the cause of the crash was "the failure of the vehicle operator to monitor the driving environment."[115] The driver was charged with Negligent Homicide and an Arizona prosecutor found that Uber could not be held criminally liable for Herzberg's death.[116]

The NTSB report, however, did find fault in Uber's automated driving technology.[117] The report noted that the SUV's sensors could not accurately identify whether Herzberg was a vehicle, a bicycle, or a pedestrian, and that it incorrectly predicted her path.[118] The vehicle's autonomous system was also not programmed to apply maximum breaking for crash mitigation upon detecting an emergency.[119] Finally,

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https://newsroom.aaa.com/2020/08/aaa-finds-active-driving-assistance-systems-do-less-to-assist-drivers-and-more-to-interfere (last visited Jan. 6, 2023).

110. *Id.*

111. *Id.*

112. Laurel Wamsley, *Backup Driver of Autonomous Uber SUV Charged with Negligent Homicide in Arizona,* NPR (Sept. 16, 2020), *available at* https://www.npr.org/2020/09/16/913530100/backup-driver-of-autonomous-uber-suv-charged-with-negligent-homicide-in-arizona (last visited Jan. 6, 2023).

113. *Id.*

114. *Id.*

115. *Id.*

116. *Id.*

117. *Collision Between Vehicle Controlled by Developmental Automated Driving System and Pedestrian: Tempe, Arizona,* NTSB (Mar. 18, 2018), *available at* https://www.ntsb.gov/investigations/AccidentReports/Reports/HAR1903.pdf (last visited Jan. 6, 2023).

118. *Id.*

119. *Id.* at 30.

the report states: "The Uber Advanced Technologies Group (ATG) did not adequately recognize the risk of automation complacency and develop effective countermeasures to control the risk of vehicle operator disengagement, which contributed to the crash."[120] ATG did have policies prohibiting cell phone use while operating their autonomous vehicle fleet, but they did not require individual acknowledgement of these, nor were they provided in a standalone document per industry standard.[121]

Uber settled with the Herzberg family, but the larger issue of liability remains.[122] Vasquez has yet to stand trial. Her defense team filed an eighty-three-page motion in July of 2021 claiming that Uber's insufficient safety practices, enumerated in the NTSB report, were ultimately to blame for the crash.[123] They requested the case be remanded to the grand jury for a new evaluation of probable cause.[124] According to Vasquez's defense team, it was the Uber who should have seen the crash coming.

D. AUTOMOTIVE CYBERSECURITY

Beyond the (un)reliability of their programming, unregulated autonomous vehicles pose a significant cybersecurity risk.[125] Concerns over automotive cyberattacks are not limited to newer autonomous driving programs as hackers can remotely control vehicles through any form of wireless connectivity such as Bluetooth, integrated cellular networks, and keyless entry programs.[126] The rate of automotive cyberattacks is rapidly increasing, with 94% year-over-year increase from 2016 to 2019.[127]

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120. *Id.* at 44.

121. *Id.*

122. Wamsley, *supra* note 112.

123. Ray Stern, *Was the Backup Drive in an Uber Autonomous Car Crash Wrongfully Charged?*, PHOENIX NEW TIMES (July 9, 2021), *available at* https://www.phoenixnewtimes.com/news/uber-self-driving-crash-arizona-vasquez-wrongfully-charged-motion-11583771 (last visited Jan. 6, 2023).

124. *Id.*

125. Araz Taeihagh & Hazel Si Min Lim, *Governing autonomous vehicles: emerging responses for safety, liability, privacy, cybersecurity, and industry risks*, TRANSPORT REVIEWS, 39:1, 103-128 (2019) DOI: 10.1080/01441647.2018.1494640.

126. *Id.* at 115.

127. Sebastian Blanco, *Car Hacking Danger is Likely Closer than You Think*, Car and Driver (Sept. 4, 2021), *available at* https://www.caranddriver.com/news/a37453835/car-hacking-danger-is-likely-closer-than-you-think (last visited Sept. 19, 2022).

Upstream Security reported at least 150 vehicular cybersecurity incidents in 2020, including a Mobileye 630 PRO and Tesla Model X hack that "fooled the ADAS and autopilot systems [of the vehicles] to trigger the brakes and steer into oncoming traffic."[128] The hack utilized a depthless "phantom" object glued to the floor to manipulate the autonomous steering programs into recognizing the object as a physical obstacle.[129] To avoid collision, the programs applied emergency braking or sharply deviated the vehicles from their lanes.[130] The incident report noted concerns that phantom object manipulations could be perpetrated remotely using drones or by hacking digital billboards in close proximity to the road.[131] This type of manipulation is unique to autonomous driving systems, which rely on advanced sensors to monitor and respond to changing road conditions.

The NHTSA provides *voluntary* guidelines to autonomous vehicle manufacturers and programmers in accordance with global standards set by SAE international and the International Organization for Standardization (ISO).[132] These standards support a multifaceted approach to ensuring cybersecurity which includes "risk-based prioritization identification and protection process[es] for safety-critical vehicle control systems . . . timely detection and rapid response to potential vehicle cybersecurity incidents . . . cyber-resiliency [measures]," and methods for industry-wide intelligence sharing and cooperation.[133] Without mandatory cybersecurity requirements from the U.S. government, however, the degree of compliance to international standards remains variant and largely unknown.

In 2015, a team of hackers hired to discover security holes in Chrysler's automotive technologies remotely took control of a 2014 Jeep Cherokee through its onboard entertainment system.[134] The hackers were

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128. UPSTREAM SECURITY, GLOBAL AUTOMOTIVE CYBERSECURITY REPORT (2021) at 11.

129. *Hacking driver assistance systems using depthless objects*, UPSTREAM CYBERSECURITY DATABASE (Jan. 2020), *available at* https://upstream.auto/research/automotive-cybersecurity/?id=4870 (last visited Sept. 16, 2022).

130. *Id.*

131. *Id.*

132. Taeihagh & Hazel Si Min Lim, *supra* note 125.

133. *Vehicle Cybersecurity*, NHTSA (last updated 2021), *available at* https://www.nhtsa.gov/technology-innovation/vehicle-cybersecurity (last visited Sept. 16, 2022).

134. Blane Erwin, *The 2015 Jeep Hack that Changed Automotive Cybersecurity*, FRACTIONAL CIS (Feb. 25, 2021), *available at* https://fractionalciso.com/the-groundbreaking-2015-jeep-hack-changed-automotive-cybersecurity (last visited Sept. 16, 2022).

able turn on the vehicle's wipers, turn on music, and ultimately shut-off the engine, bringing the car to a complete stop.[135] When information about the hack was made public by *WIRED*, Chrysler Automotive issued a recall of 1.4 million vehicles with similarly exploitable cyber vulnerabilities.[136] The hack spurred the first Security and Privacy in Your Car Act (SPY Car Act), a bill aimed at establishing federal cyber-security standards for automotive technologies and uniform cybersecurity labeling for vehicles.[137] The act also proposed amending the Federal Trade Commission Act to allow the FTC to enforce privacy requirements limiting the use of personal driving data.[138]

The SPY Car Act has been reintroduced twice since its first iteration in 2015. In 2017, the bill was introduced with an amended directive to the NHTSA to "conduct a study to determine appropriate cybersecurity standards for motor vehicles."[139] The most recent reintroduction, the SPY Car Act 2019, attempts to establish a rating system for consumers to know how effectively vehicles protect against cyber threats, and directs the Federal Highway Administration to appoint a "cyber coordinator" to monitor and advise federal leadership on automotive-based cyber incidents.[140] Despite praise for the bill from the Center for Auto Safety and Advocates for Highway and Auto Safety, Congressional movement on automotive cyber-regulation remains at a standstill.[141] All three bills died in Congress without receiving a vote.[142]

E. GETTING LAPPED—AMERICA'S POSITION IN THE

135. *Id.*

136. *Id.*

137. *Senator Markey Introduces the SPY Car Act to Regulate Automotive Cybersecurity*, CROWELL (Aug. 2015), *available at* https://www.crowell.com/NewsEvents/AlertsNewsletters/all/Senator-Markey-Introduces-the-SPY-Car-Act-to-Regulate-Automotive-Cybersecurity (last visited Sept. 16, 2022).

138. *Id.*

139. SPY Car Study Act of 2017, H.R.701, 115th Cong. (2017).

140. SPY Car Act of 2019, S.2182, 116th Cong. (2019).

141. *Senators Markey and Blumenthal Reintroduce Legislation to Protect Cybersecurity on Aircrafts and in Cars*, MARKEY: U.S. SENATE (July 19, 2019), *available at* https://www.markey.senate.gov/news/press-releases/senators-markey-and-blumenthal-reintroduce-legislation-to-protect-cybersecurity-on-aircrafts-and-in-cars (last visited Sept. 19, 2022).

142. SPY Car Act of 2019, S.2182, 116th Cong. (2019).

GLOBAL AV MARKET

The market for autonomous vehicles is skyrocketing with global market shares for self-driving cars increasing at an estimated Compounded Annual Growth Rate of 63.1% from 2021-2030.[143] Most of this increase comes as a result of growing demand from businesses to fully automate their corporate fleets.[144] Car manufacturers are pouring significant funds into autonomous vehicle development. In 2021, Daimler automotive group alone signed off on a $67.88 billion dollar investment plan to support technological advancement for Mercedes-Benz passenger vehicles.[145] The U.S. currently holds a 40% share in the global autonomous vehicle market.[146] That supremacy, however, is under threat. In 2021, the U.S. market was estimated at 3.4 thousand units; China is estimated to reach 17.3 thousand units by 2026.[147]

Though the U.S. remains a leader in the development of autonomous vehicle technologies, it's beginning to lag behind its competitors in AV deployment.[148] Europe, Japan, and the United Kingdom passed legislation in 2021 regulating level three autonomous vehicle use.[149] Japan and Germany have approved "conditional eyes-off" deployment of level three vehicles on public roads.[150] The Honda Legend, capable of level three autonomous highway driving without human supervision, hit

143. Martin Gomex, *The Road Ahead: Examining the Outlook of Regulation for Self-driving Cars*, JD SUPRA (July 20, 2021), *available at* https://www.jdsupra.com/legalnews/the-road-ahead-examining-the-outlook-of-5847212/#Anchor%201 (last visited Sept. 19, 2022).

144. *Id.*

145. *Daimler supervisory board OKs $68B investment plan for Mercedes*, AUTOMOTIVE NEWS EUR. (Dec. 2, 2021), *available at* https://europe.autonews.com/automakers/daimler-supervisory-board-oks-68b-investment-plan-mercedes (last visited Sept. 19, 2022).

146. *Autonomous Vehicles - Global Market Trajectory & Analytics*, Research and Markets (Feb. 2022), *available at* https://www.researchandmarkets.com/reports/5302429/autonomous-vehicles-global-market-trajectory?utm_source=GNOM&utm_medium=PressRelease&utm_code=sxj6dc&utm_campaign=1645907+-+Global+Autonomous+Vehicles+Market+Report+2022%3a+U.S.+Market+is+Estimated+at+3.4+Thousand+Units+in+2021%2c+While+China+is+Forecast+to+Reach+17.3+Thousand+Units+by+2026&utm_exec=chdo54prd (last visited Sept. 19, 2022).

147. *Id.*

148. James Jeffs, *Barriers Fall Unleashing Autonomous Cars in 2021*, IDTECHEX (Sept. 17, 2021), *available at* https://www.idtechex.com/en/research-article/barriers-fall-unleashing-autonomous-cars-in-2021/24763 (last visited Sept. 19, 2022).

149. *The state of the autonomous vehicle space heading into 2022*, TECH HQ (Dec. 30, 2021), *available at* https://techhq.com/2021/12/the-state-of-the-autonomous-vehicle-space-heading-into-2022 (last visited Sept. 19, 2022).

150. *Id.*

Japanese streets in 2021 and vehicles with the Mercedes-Benz level three "Drive Pilot" system will be available in Germany in 2022.[151]

The U.S. remains stalled at level two, as the lack of federal safety standards hinders level three vehicle deployments.[152] Level three autonomy allows drivers to take their hands off the wheel *and* their eyes off the road, letting vehicles engage in entirely automated driving under specific conditions.[153] The current U.S. regulatory "patchwork" lacks consensus on liability frameworks for level three accidents, and inconsistencies in state policies could make such vehicles legal in one state and not in another. The NHTSA indicates that the U.S. will not support level three autonomous vehicle technologies until 2025 at the earliest.[154] Market entry after 2025 would put the U.S. at least three years behind Europe, China, and East Asia.[155] Without regulation, the U.S. will continue to lag and risks losing its supremacy in the global autonomous vehicle market.

IV. The Proposed EU Artificial Intelligence Regulation

Autonomous vehicle regulation is a topic of shared competency in the European Union—member states are at will to regulate where the EU has not yet regulated, or where they have chosen not to.[156] Recent collective attempts at inter-European autonomous vehicle policymaking were codified on May 17, 2018, in the European Commission strategy paper "On the road to automated mobility: An EU strategy for mobility of the future."[157] The paper reiterated the value of autonomous vehicles, but stressed the necessity for protection until the technology's "teething

151. *See* Colin Beresford, *Honda Legend Sedan with Level 3 Autonomy Available for Lease in Japan*, CAR AND DRIVER, (Mar. 4, 2021), *available at* https://www.caranddriver.com/news/a35729591/honda-legend-level-3-autonomy-leases-japan (last visited Nov. 05, 2022); *see also* Joey Capparella, *Mercedes Drive Pilot Level 3 Autonomous System to Launch in Germany*, CAR AND DRIVER, (Dec. 9, 2021), *available at* https://www.caranddriver.com/news/a38475565/mercedes-drive-pilot-autonomous-germany (last visited Nov. 05, 2022).

152. Jeffs, *supra* note 148.

153. *A Brief History of Autonomous Vehicle Technology*, *supra* note 48.

154. *See* NHTSA, *supra* note 46.

155. Jeffs, *supra* note 148.

156. Sahin Ardiyok & Armanç Canbeyli, *The legal framework for autonomous vehicles in the European Union*, BUS. GOING DIGIT. (Feb. 2020), *available at* https://www.businessgoing.digital/the-legal-framework-for-autonomous-vehicles-in-the-european-union (last visited Sept. 14, 2022).

157. *Id.*

problems" had been adequately addressed.[158] This protection, the Commission claimed, could "already be validated . . . under the EU vehicle approval framework," but it promised to "start working on the development of a new approach . . . more adapted to the evolutionary nature of [autonomous] vehicles."[159]

While AV-specific regulation began to take shape, the European Commission faced the broader question of how the European Union should protect its citizens from rapidly evolving artificial intelligence capabilities.[160] In opposition to the American hands-off attitude, the EU has traditionally maintained a precautionary, "when in doubt regulate" approach to emerging technologies.[161] The European approach also places high value on the ethical considerations of AI development, requiring autonomous vehicles, for example, to be "safe, [and] respect human dignity and personal freedom of choice."[162] Beginning with the publication of the European Commission's White Paper on Artificial Intelligence in 2020, the EU set out to develop an overarching regulatory framework that would impact AI rules within the European Economic Area (EEA) and beyond.[163] If passed, the 2021 proposal *Laying Down Harmonised Rules on Artificial Intelligence*, has the potential to set the international standard and control the rules in the great global race for technological supremacy.[164]

A. THE RISK-BASED APPROACH

The European proposal defines artificial intelligence as "software that is developed with one or more of the techniques and approaches

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158. Eur. Comm'n, *Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee, the Committee of the Regions*, 2018 O.J. (283) 1.

159. *Id.*

160. Eve Gaumond, *Artificial Intelligence Act: What European Approach for AI?*, LAWFARE (June 4, 2021), *available at* https://www.lawfareblog.com/artificial-intelligence-act-what-european-approach-ai (last visited Nov. 7, 2022).

161. *Id.*

162. Eur. Comm'n, *Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee, the Committee of the Regions*, 2018 O.J. (283) 16.

163. Mark MacCarthy & Kenneth Propp, *Machines Learn that Brussels writes the rules: The EU's new AI regulation*, BROOKINGS (May 4, 2021), *available at* https://www.brookings.edu/blog/techtank/2021/05/04/machines-learn-that-brussels-writes-the-rules-the-eus-new-ai-regulation (last visited Sept. 19, 2022).

164. *Id.*

listed in Annex I [of the proposed regulation] and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with."[165] Annex I includes machine learning approaches, knowledge and logic based approaches, and statistical approaches—encompassing a substantial swathe of new and old technologies.[166] The proposal applies to all providers "placing on the market or putting into service AI systems in the Union, irrespective of whether those providers are established within the Union or in a third country."[167] This clause extends the European Union's enforcement authority globally, encompassing any corporation wishing to sell their products for use in the EEA.[168]

The EU utilizes a risk-based approach to categorize AI technologies into three categories based on their capacity to harm health and safety: Unacceptable risk, high risk, and low or minimal risk.[169] The proposal prohibits AI systems in the unacceptable risk category.[170] This category includes any programs with a "significant potential to manipulate persons through subliminal techniques . . . or exploit vulnerabilities of specific vulnerable groups . . . in order to materially distort their behavior in a manner that is likely to cause them or another person psychological or physical harm."[171] Other prohibited uses include social scoring algorithms utilized by public authorities, and the use of real-time biometric identification systems by law enforcement in public spaces, with limited exception.[172]

Artificial intelligence systems are placed in the high-risk category when they are designed for use as a safety component of a product, if their particular use is regulated under EU harmonized legislation (such as machinery, toys, and medical devices), or if they pose significant risks to

165. Eur. Comm'n, *Regulation of the European Parliament and of the Council - Laying down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending certain Union Legislative Acts*, 2021 O.J. (0106) art. 3.

166. *Id.*

167. *Id.* at art. 2.

168. MacCarthy & Propp, *supra* note 163.

169. Eur. Comm'n, *Regulation of the European Parliament and of the Council - Laying down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending certain Union Legislative Acts*, 2021 O.J. (0106).

170. *Id.*

171. *Id.* at 13.

172. *Id.*

fundamental rights.[173] Systems listed in this category include those vital to critical infrastructure, educational and employment systems, remote biometric identification programs, emergency services, public services, credit scoring, and automated vehicle technologies.[174] Of particular relevance to autonomous vehicle systems, the proposal requires high-risk programs possess design features that "enable human users to avoid overreliance on system outputs . . . and must allow a designated human overseer to override system outputs."[175] Further, high-risk AI programs "should perform consistently throughout their lifecycle and meet an appropriate level of accuracy, robustness and cybersecurity in accordance with the generally acknowledged state of the art."[176] Artificial intelligence providers must submit conformity assessments conducted by a qualified independent party to demonstrate compliance with the proposed regulation, even if their AI systems are subject to safety assessments under existing law.[177]

Though strict, the categorical system gives the EU latitude to determine how specific AI systems should be classed, and thereby control how they must be regulated. Limited risk AI systems are subject to transparency requirements under the proposal, ensuring that individuals communicating with AI chatbots or observing manipulated "deep fake" content are made aware.[178] Developers of minimal risk AI are subject to existing regulation and may "choose to join others and together adopt a code of conduct to follow suitable requirements, and to ensure their AI systems are trustworthy."[179]

Enforcement of the proposal's provisions rests with existing national regulatory authorities unless countries wish to establish AI-specific supervisory bodies.[180] Domestic regulators would bear responsibility for reviewing conformity assessments, ordering the removal of prohibited systems, and monitoring health and safety risks.[181]

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173. *Id.*

174. EU COM/2021/206 Annexes at 4.

175. MacCarthy and Propp, *supra* note 163.

176. EU COM/2021/206 at 30.

177. MacCarthy and Propp, *supra* note 163.

178. Heather Sussman, *The New EU Approach to the Regulation of Artificial Intelligence*, ORRICK (May 7, 2021), *available at* https://www.orrick.com/en/Insights/2021/05/The-New-EU-Approach-to-the-Regulation-of-Artificial-Intelligence (last visited September 19, 2022).

179. EU COM/2021/206 at 10.

180. MacCarthy and Propp, *supra* note 163.

181. *Id.*

If one member state objects to a regulatory decision made by another, an EU-wide consultation commences to determine the proper course of action.[182]

B. PRESERVING SPACE FOR INNOVATION

To prevent substantial regulatory hinderances to technological progress, the proposed EU regulation includes three articles dedicated to measures in support of innovation.[183] Article 53 provides support and guidance regarding the use of AI regulatory sandboxes to encourage safe development.[184] Regulatory sandboxes mitigate civil liability for AI developers by allowing them to conduct supervised experiments and pseudo "real-world" testing in controlled environments.[185] Though the EU proposal employs strict liability frameworks for "non-sandboxed" trials, it is unclear whether that same liability would apply to "sandboxed" experimentation. Article 53 leaves member states with discretion regarding sandbox construction but encourages inter-state coordination regarding sandbox use and best practices.[186]

Effective sandbox management is vital to safety and productive use. Article 54 provides detailed instructions on the use and processing of personal data for developing AI systems that benefit the public interest.[187] Article 55 requires member states to provide small-scale AI providers and start-ups with priority access to regulatory sandboxes and dedicated channels of communication to provide guidance and respond to questions.[188] The proposal indicates that further guidance on regulatory sandbox development will be set out in implementing acts.

Previous regulatory sandbox models, employed primarily in the financial sector, have served as a "'safe space' in which businesses can test innovate products . . . without immediately incurring all the normal regulatory consequences of engaging in the activity in question."[189]

182. *EU COM/2021/206*, *supra* note 20, at 67.

183. *Id.* at 69.

184. *Id.*

185. Jon Truby et al., *A Sandbox Approach to Regulating High-Risk Artificial Intelligence Applications*, EUR. J. OF RISK REG. 1-29 (2021), *available at* https://doi.org/10.1017/err.2021.52 (last visited Nov. 13, 2022).

186. EU COM/2021/206, *supra* note 20, at 69.

187. *Id.* at 70.

188. *Id.* at 71.

189. Truby, *supra* note 185, at 9.

Sandboxes also aid in policy development.[190] Regulators tasked with supervising sandboxed trials begin to understand the regulated product better and feel less "regulatory uncertainty" as a result.[191] Previously risk-adverse regulators who spend time observing successful sandboxes may become more flexible and develop more effective policies.[192] Regulatory sandboxes can also safely increase the average speed to market for emerging products—a benefit when developing technologies with lifesaving capabilities.[193]

C. GLOBAL RAMIFICATIONS

The European Commission's 2020 White Paper on Artificial Intelligence made clear the EU's desire to use AI regulation to "export its values across the world."[194] The EU has succeeded in such a mission before. When the General Data Protection Regulation (GDPR) became the global data protection standard, it drew the world beneath the European Law umbrella.[195] Desiring to compete in the European market, global companies such as Google, Uber, and Airbnb adopted standard privacy policies in accordance with the GDPR.[196] Anu Bradford, an international trade specialist and law professor at Columbia, calls this unilateral global regulatory power "The Brussels Effect."[197] She argues that market forces alone convince the international community to adopt the EUs standards as their own.[198]

The extraterritorial jurisdiction of the new European AI proposal has the power to reproduce the GDPR's expansive regulatory influence.[199] If the EU succeeds in establishing AI guidelines before the United States can codify its own, trans-Atlantic partnerships will rely on conformity to

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190. *Id.*

191. *Id.* at 10.

192. *Id.*

193. *Id.*

194. *White Paper on Artificial Intelligence-A European approach to excellence and trust*, EUR. COMM'N. (Feb. 19, 2020), *available at* https://ec.europa.eu/info/sites/default/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf (last visited Nov. 17, 2022).

195. Gaumond, *supra* note 160.

196. *Id.*

197. ANU BRADFORD, THE BRUSSELS EFFECT: HOW THE EUROPEAN UNION RULES THE WORLD (Oxford Univ. Press 2020).

198. *Id.*

199. Gaumond, *supra* note 160.

EU regulations or require lengthy negotiations to establish a unique bilateral exemption.[200] The proposal will likely take years, and multiple revisions, for the European Parliament, the European Commission, and the Council of Europe to form a consensus allowing its adoption.[201] In the interim, the U.S. has an opportunity to formulate AI regulation that aligns, at least in part, with the EU proposal.

V. A New Model for U.S. Autonomous Vehicle Regulation

Under the Biden administration, the U.S. shows movement towards developing artificial intelligence regulation. In 2022, the Federal Trade Commission published notice that it is considering a rule "to curb lax security practices, limit privacy abuses, and ensure that algorithmic decision-making does not result in unlawful discrimination."[202] The National Institute of Standards and Technology, in July of 2021, filed a request for information to "help inform, refine, and guide the development of the [Artificial Intelligence Risk Management Framework]," for voluntary use.[203]

Proactive regulatory actions are heartening, but ultimately insufficient to address the current safety concerns on America's roads. For the U.S. to move forward, it must enact immediate measures to ensure safe autonomous vehicle development and deployment. These measures should include the construction of supervised regulatory sandboxes, and the creation and collection of mandatory conformity assessments assuring self-driving systems meet minimum safety and cybersecurity standards. Getting unsafe autonomous vehicles off the roads will put the U.S. back in the race and help develop technologies suitable for the global market.

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200. MacCarthy & Propp, *supra* note 163.

201. *Id.*

202. Devin Coldewey, *FTC may consider rule curbing algorithmic discrimination and 'commercial surveillance'*, TECH CRUNCH (Dec. 15, 2021), *available at* https://techcrunch.com/2021/12/15/ftc-may-consider-rule-curbing-algorithmic-discrimination-and-commercial-surveillance (last visited Jan. 6, 2023).

203. Artificial Intelligence Risk Management Framework, 86 Fed. Reg. 40810, 40810-40813 (July 29, 2021).

A. COMMON LAW INSUFFICIENCY

If the United States does not create new regulatory frameworks to address autonomous vehicle development and deployment, regulators will be forced to fall back on common law solutions to answer legal questions. Proponents of common law "gap filling" look to existing products liability frameworks to address harms caused by autonomous driving systems.[204] Products liability law combines tort and contract law standards to award remedies for civil claims including negligence, breach of explicit and implicit warranties, and misrepresentation.[205] While product liability law has proven highly adaptive to technological changes in its history, autonomous vehicles post a new type of liability question: Who is responsible when automotive artificial intelligence technologies fail to perform as intended?[206] Harkening to the case of Elaine Herzberg: Who is to blame when self-driving cars kill?

In 1984, the Third Circuit stated that "robots cannot be sued."[207] Courts have resolved recent cases involving autonomous vehicle related harms by holding the person behind the wheel liable. With the present level two autonomous vehicles on the U.S. market, this form of liability is still appropriate as driver supervision remains a necessity. However, if the U.S. market is to open itself to vehicles with autonomous technologies level three and beyond, existing tort law becomes insufficient.

The basis of most tort liability claims are human notions of intent and reasonableness. Certainly, these notions could be applied to programmers and developers of AV technologies, but with the advent of sophisticated machine learning technologies, autonomous systems might make decision of their own design.[208] Ryan Calo, a professor at the University of Washington Law School, provided Forbes with the following scenario to demonstrate this complicated intersection of tort law and technology:

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204. *See* John Villasenor, *Products Liability and Driverless Cars: Issues and Guiding Principles for Legislation, Brookings* (Apr. 24, 2014), *available at* https://www.brookings.edu/research/products-liability-and-driverless-cars-issues-and-guiding-principles-for-legislation (last visited Nov. 17, 2022).

205. *Id.*

206. *See Id.*

207. United States v. Athlone Indus., Inc., 746 F.2d 977, 979 (3d Cir. 1984).

208. Daniel Fisher, *Self-Driving Cars, Thinking Machines Will Test Limits of Tort Law*, FORBES (Apr. 19, 2018), *available at* https://www.forbes.com/sites/legalnewsline/2018/04/19/self-driving-cars-thinking-machines-will-test-limits-of-tort-law/?sh=3c62e3964d88 (last visited Nov. 17, 2022).

Your self-driving hybrid vehicle is equipped with machine-learning technology that allows it to "teach" itself the most efficient way to operate, a priority set by the designers. And utilizing that amazing technology, it teaches itself to always start the day with a full battery. One day, the car's owners forget to plug it in for the night and the car decides it would be most efficient to run its gasoline motor to charge the batteries instead. Unfortunately, the car is in a garage and the family is asphyxiated. Who's to blame? The vehicle manufacturer? The software provider? The car itself?[209]

Tort law would struggle with a case like the one Calo suggested because it requires that an injury be foreseeable to hold a defendant liable.[210] The vehicle's programmers and manufacturers are likely to claim they "didn't even foresee the entire category of asphyxiation as being possible."[211] The car cannot exactly speak for itself.

Calo suggests that tort law can adapt existing doctrine to fill gaps relating to artificial intelligence technologies.[212] This approach has worked in the transportation industry before. The rise of the doctrine of negligence, for example, addressed new concerns sprouting from the locomotive industry in the nineteenth century.[213] Negligence could be modified again to suit autonomous vehicles, apportioning degrees of fault to both the human and the autonomous technological actors.[214] However, in tasks like driving where AI's may eventually be more reliable than humans, a negligence approach could result in the presumption that human actors are at fault and raise uncomfortable questions about the rights of an AI defendant.[215] Worker's compensation and products liability frameworks might also be applied to the autonomous vehicle industry, although not without significant doctrinal gymnastics. Adaptation of existing tort law also risks diminishing the integrity of its intended use—worker's compensation claims from a self-driving BMW are likely raise a few eyebrows.

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209. *Id.*

210. *Id.*

211. *Id.*

212. Fisher, *supra* note 208.

213. *Id.*

214. Matthew O. Wagner, *You Can't Sue a Robot: Are Existing Tort Theories Ready for Artificial Intelligence (Part 3 of 3),* FROST BROWN TODD (Feb. 7, 2018), *available at* https://frostbrowntodd.com/you-cant-sue-a-robot-are-existing-tort-theories-ready-for-artificial-intelligence (last visited Nov. 17, 2022).

215. *Id.*

Instead of folding existing tort law on its head, new regulation can provide legal frameworks tailored to the unique needs of the autonomous vehicle industry. The argument that drafting new regulations specific to autonomous vehicles will unnecessarily hinder innovation is unpersuasive. Industry specific regulatory frameworks have been shown to increase trust in emerging technologies *and* foster innovation.[216] Take, for example, the passage of the 1974 Fair Credit Billing Act.[217] In its early stages, the credit card industry held cardholders liable for transactions made with lost or stolen cards.[218] Congress passed the Fair Credit Billing Act to mitigate cardholder liability. The act fostered increased trust in the burgeoning credit card industry and forced banks and card servicers to develop "one of the first commercial application of neural networks to detect out-of-pattern card usage [to] reduce their fraud losses."[219] Providing industry-specific liability frameworks and regulatory guidelines for autonomous vehicles will protect drivers and force manufacturers and programmers to make their vehicles safer.

B. REGULATORY SANDBOXES

To foster swift and safe autonomous vehicle innovation, the United States should issue formalized standards for the creation of regulatory sandboxes and limit high-risk AV testing to sandboxed trials. The use of regulatory sandboxes will mitigate the current rate of autonomous vehicle accidents by ensuring that vehicles permitted to travel on U.S. roads have demonstrated a pattern of safety under regulator supervision.[220] Fin-tech sandboxes have been established in ten U.S. states as method of promoting innovation and making these states more attractive to start-ups and developers.[221] Despite increasing use amongst the states, the federal government has yet to embrace regulatory sandboxes as catalyst for growth and safe development. Although insurance companies could

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216. Mark MacCarthy, *AI needs more regulation, not less*, BROOKINGS (Mar. 9, 2020), *available at* https://www.brookings.edu/research/ai-needs-more-regulation-not-less (last visited Jan. 6, 2023).

217. *Id.*

218. *Id.*

219. *Id.*

220. Truby, *supra* note 185.

221. Patrick Gleason, *Regulatory Sandboxes Give States an Edge Attracting Innovation and Investment*, FORBES (Dec. 31, 2021), *available at* https://www.forbes.com/sites/patrickgleason/2021/12/31/regulatory-sandboxes-give-states-an-edge-attracting-innovation-and-investment/?sh=6c27471e7003 (last visited Jan. 6, 2023).

incentivize the use of sandboxes by offering reduced premiums for sandboxed vehicles, without regulation restricting development to sandboxes under-tested, unsafe vehicles will continue to hit the roads.

Regulatory sandboxes could offer U.S. regulators a much-needed boost in technological competency surrounding new autonomous vehicle technologies. Through supervision of sandboxed research trials, regulators can view the full range of AV development, including problem identification, correction, and implementation and gather a substantial evidence base for regulation.[222] This evidence base is particularly needed in the United States, where regulatory requirements are unclear, nonexistent, or vary widely. Strong evidentiary bases for regulation could also aid in consensus building amongst regulators, allowing the legislative process to move quicker to respond to the pace of autonomous vehicle development.

Contrary to the strict liability model of the current EU proposal, the U.S. should offer decreased liability during sandboxed trials to defray compliance costs and ensure usability for smaller companies with reduced capacity to absorb strict liability expenses.[223] Strict liability for autonomous vehicle technologies in public use is a vital protection against the dangers of unregulated development.[224] However, fear of triggering strict liability consequences can hinder development by deterring companies as the cost of compliance becomes too high to balance the value of innovation. To give developers much-needed breathing room, U.S. regulatory sandboxes should adopt new liability policies that promote development and mitigate the costs of failure. These sandboxes will encourage autonomous vehicle developers to fervently test all facets of emerging technologies until they reach the safety and performance standards necessary for entry into the U.S. market. Once permitted for public use, autonomous vehicle companies should be subject to a standardized liability scheme, such as the EUs strict liability model.

Rapid and effective regulatory development is necessary for the U.S. to remain competitive in the global autonomous vehicle market. The

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222. *Briefing on Regulatory Sandboxes*, UN SECRETARY-GENERAL'S SPECIAL ADVOCATE FOR INCLUSIVE FINANCE FOR DEVELOPMENT, (2017), *available at* https://www.unsgsa.org/sites/default/files/resources-files/2020-09/Fintech_Briefing_Paper_Regulatory_Sandboxes.pdf (last visited Jan. 6, 2023).

223. *Id.*

224. Herbert Zech, *Liability for AI: public policy considerations*, ERA Forum 22 147-158 (Jan. 07, 2021), *available at* https://doi.org/10.1007/s12027-020-00648-0 (last visited Jan. 6, 2023).

current lack of regulatory support for level three autonomous vehicle technologies will keep the U.S. years behind its competitors and discourages advancing AV corporations from developing their vehicles in the United States.[225] The construction of federally supported regulatory sandboxes for autonomous vehicle development will aid innovation by creating knowledgeable regulators, evidentiarily supported regulatory structures, and give companies safe spaces to test emerging automotive technologies. Supervised development under lowered liability standards will also invite smaller companies and those less equipped to manage the terms of a strict-liability regime into the development process, creating a robust, diversified, and competitive U.S. autonomous vehicle market.

C. MANDATORY CONFORMITY ASSESSMENTS

To establish compliance with minimum safety standards and facilitate easier entry into the European market, the United States should require mandatory conformity assessments for autonomous vehicle technologies. The European Union's draft AI regulatory proposal borrows from EU product safety legislation and consumer protection law.[226] The basic function of conformity assessments is to ensure product integrity—prohibiting products that do not meet certain industry requirements from entering the European market.[227] Assessments are conducted either in-house, or by a qualified independent party depending on the level of risk a product poses.[228] EU conformity assessments for physical products typically include product testing, inspections, and evaluations of efficiency. [229] The terms of such conformity assessments remain undefined in the EU proposal, but they may include bias evaluations to gauge the discriminatory impact of emerging technologies or examine software reliability relative to harm potential.[230]

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225. *See* Jeffs, *supra* note 148.

226. *European Commission's Proposed Regulation on Artificial Intelligence: Conducting a Conformity Assessment for High-Risk AI - Say What?*, Dechert LLP (Nov. 16, 2021), *available at* https://www.dechert.com/knowledge/onpoint/2021/11/european-commission-s-proposed-regulation-on-artificial-intellig.html (last visited Nov. 17, 2022).

227. *Id.*

228. *Id.*

229. *Id.*

230. Nikolaos Ioannidis & Olga Gkotsopoulou, *The Palimpsest of Conformity Assessment in the Proposed Artificial Intelligence Act: A Critical Exploration of Related Terminology*, EUR. L. BLOG (July 2, 2021), *available at*

The United States has analogous conformity systems under the Food and Drug Administration (FDA).[231] The FDA defines a conformity assessment as "a demonstration, whether directly or indirectly, that specified requirements relating to a product, process, system, person, or body are fulfilled."[232] Manufacturers are encouraged to submit conformity assessments to demonstrate compliance with voluntary consensus standards or to prove acquiescence with regulatory requirements.[233] Conformity assessments serve to protect consumers and to foster trust in makers and in supervisory bodies.[234] They can additionally serve a gap filling function, demonstrating the relative safety and legitimacy of products when no mandatory standards exist.[235]

If the United States develops standardized autonomous vehicle regulations, it should institute mandatory conformity assessments to ensure compliance and transparency. In the interim, while U.S. regulation remains inconsistent or non-existent, the Department of Transportation and the National Highway Traffic Safety Administration should require conformity assessments in accordance with minimum consensus safety standards.

A voluntary U.S. framework for AV safety was provided in 2017, in *Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 2.0*.[236] The report notes that safety assessments are "intended to demonstrate to the public . . . that entities are: (1) considering the safety aspects of [automated driving systems]; (2) communicating and collaborating with DOT; (3) encouraging the self-establishment of industry safety norms for ADSs; and (4) building public trust . . . through transparent testing and deployment of ADSs."[237] The

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https://europeanlawblog.eu/2021/07/02/the-palimpsest-of-conformity-assessment-in-the-proposed-artificial-intelligence-act-a-critical-exploration-of-related-terminology (last visited Nov. 17, 2022).

231. *Id.*

232. *Standards and Conformity Assessment Program,* FDA (last updated Mar. 4, 2021), *available at* https://www.fda.gov/medical-devices/premarket-submissions-selecting-and-preparing-correct-submission/standards-and-conformity-assessment-program (last visited Nov. 17, 2022).

233. *Id.*

234. Ioannidis & Gkotsopoulou, *supra* note 230.

235. Dechert, *supra* note 226.

236. *Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0,* NSTC and USDOT (Jan. 2020), *available at* https://www.transportation.gov/sites/dot.gov/files/2020-02/EnsuringAmericanLeadershipAVTech4.pdf (last visited Nov. 17, 2022).

237. *Id.* at 16.

NHTSA identifies twelve priority design safety elements spanning from automotive cybersecurity to post-crash ADS behavior.[238] The NHTSA website provides a template for one safety element as a model for potential voluntary self-assessments.[239] More extensive guidance is not provided.

The lack of a standardized conformity framework makes voluntary self-assessments reported to the NHTSA ineffective as a tool for consumers and regulators to gauge vehicle safety. Companies are at will to include or withhold any information relative to the safety of their autonomous vehicles. The twenty-seven voluntary safety self-assessments currently available from the NHTSA vary widely in substance and design, forcing potential buyers to wade through each individually.[240]

To effectively foster trust in the safety of automated driving technologies, particularly absent specialized federal regulation, the NHTSA and DOT must require conformity assessments to demonstrate compliance with minimum safety standards like the twelve outlined in *Automated Vehicles 2.0*. If the European AI proposal succeeds, government-mandated conformity assessments could allow the U.S. to negotiate a policy of mutual recognition—allowing U.S. autonomous vehicle companies to bypass European requirements if their vehicles conform to domestic safety standards.[241]

VI. Conclusion

The original trip journal from Dean Pomerleau and Todd Jochem's "No Hands Across America" tour is still available on the website for Carnegie Mellon's School of Computer Science.[242] It reads more like a vacation blog than a research paper, complete with grainy pictures of the Indianapolis Motor Speedway and a photo of a dashboard Pocahontas bobblehead from a Burger King children's meal. The journal's first

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238. *Id.*

239. *See Voluntary Safety Self-Assessment Template,* NHTSA, *available at* https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/voluntary_safety_self-assessment_for_web_101117_v1.pdf (last visited Nov. 17, 2022).

240. *Voluntary Safety Self-Assessment,* NHTSA, *available at* https://www.nhtsa.gov/automated-driving-systems/voluntary-safety-self-assessment (last visited Nov. 17, 2022).

241. DECHERT LLP, *supra* note 226.

242. *No Hands Across America Journal,* CARNEGIE MELLON UNIV. (1995), *available at* https://www.cs.cmu.edu/~tjochem/nhaa/Journal.html (last visited Nov. 17, 2022).

paragraph, dated July 23, 1995, ends with the following: "The states are going by quickly! During this stretch we traversed our first (of many) construction zones. RALPH handled them admirably, for a one-eyed four month old."[243]

Today's autonomous vehicles, and the artificial intelligence systems that drive them, are still young and full of promise. When developed safely, these technologies could yield economic, environmental, and safety advantages far beyond their human-controlled counterparts. However, the present U.S. regulatory "patchwork" governing autonomous vehicles is insufficient to address the industry's significant safety and security concerns. Regulatory inadequacies have pushed the U.S. years behind its competitors in the global autonomous vehicle market and now risk forcing the U.S to conform to European regulations if the 2021 EU Artificial Intelligence proposal succeeds.

To promote safe autonomous vehicle development and remain competitive in the global AV market, the U.S. should adopt two regulatory mechanisms from the European proposal: industry-specific regulatory sandboxes and mandatory conformity assessments. Together, these mechanisms will foster innovation in autonomous vehicle development while ensuring the safety and reliability of testing and deployment. Over twenty-five years after RALPH's great American road trip, the U.S., again, has the opportunity to lead the race towards fully autonomous vehicle development. It must regulate before it gets lapped.

243. *Id.*