March 31, 2021

James C. Owens
Deputy Administrator, National Highway Traffic Safety Administration
M-30, U.S. Department of Transportation, West Building
Ground Floor, Room W12-140
1200 New Jersey Avenue SE
Washington, DC 20590

Re: Docket No. NHTSA-2020-0106

Dear Deputy Administrator Owens,

My name is Emani Marshall-Loving. I am a law student at the University of Iowa College

of Law. I am pleased to provide comments on the National Highway Traffic Safety (NHTSA)'s

development of a framework for Automated Driving System (ADS) safety.

A. Safety Framework

Question 1: Describe your conception of a Federal safety framework for ADS that encompasses the process and engineering measures described in this document and explain your rationale for its design.

<u>Sensing</u>

A federal safety framework for ADS technology must encompass robust "sensing"

capabilities that receive information about the vehicle's environment. NHTSA should develop a

safety framework requiring sensing technology for ADS to keep vulnerable road users safe.

Pedestrians and cyclists are vulnerable road users who are at significant risk.[1] This Comment

proposes that a federal safety system for ADS should include front crash prevention,[2] blind-spot

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[1] ANGIE SCHMITT, RIGHT OF WAY 2 (2020).
[2] *Advanced Driver Assistance*, IIHS, https://www.iihs.org/topics/advanced-driver-assistance#front-crash-prevention (last visited Mar. 15, 2021) (explaining that front crash prevention uses various sensors, such as cameras or light detection, to detect when a vehicle is getting too close to one in front of it).

prevention,[3] lane departure warning and lane departure prevention,[4] LIDAR,[5] and vehicle-to-everything devices.[6] These systems are proven to work. Lane departure warnings can reduce the fatal crash rate by 86 percent.[7] And blind spot detection can lower the rate of all lane-change crashes by 14 percent.[8] Although front crash prevention, lane departure warning and lane departure prevention, and blind-spot prevention are widely found in cars, they still should be included in any framework because they work.

Overall, any federal framework for ADS safety should have sensing capabilities that allow ADS to detect road users in vehicles and road users with disabilities, people of all races, people of all modes of transportation, and all people despite their age. Ultimately, NHTSA must focus on pedestrians' and cyclists' safety because they have been disproportionately injured and dying as vehicle safety has increased.[9]

Perception

In addition to robust "sensing" capabilities, any federal safety framework for ADS must encompass strong "perception" capabilities. The most robust sensing capabilities would be futile if ADS technology did not use the information gained from sensing to predict future behavior.

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[3] *Id.* (explaining that this technology uses sensors to monitor the vehicles' side for objects approaching blind spots).
[4] *Id. citing* Jessica B. Cicchino, *Effects of blind spot monitoring systems on police-reported lane-change crashes*, IIHS (Sept. 2018), https://www.iihs.org/topics/bibliography/ref/2143 (explaining that this technology uses cameras to track the vehicle's position within the lane, then alerts the driver if the car is in danger of inadvertently straying across a road marking when the turn signal is not activated).
[5] Kevin Shalvey, *Apple is reportedly talking to lidar suppliers for its self-driving vehicle project*, BUSINESS INSIDER (Feb. 21, 2021), https://www.businessinsider.com/apple-is-talking-with-lidar-suppliers-for-self-driving-vehicles-bloomberg-2021-2 (explaining that LIDAR sensors are used to determine a vehicle's distance from objects, people, and other vehicles).
[6] EMERGING TECHNOLOGIES FOR VEHICLE TO EVERYTHING (V2X), IEEE ACCESS, https://ieeeaccess.ieee.org/closed-special-sections/emerging-technologies-for-vehicle-to-everything-v2x/ (last visited Mar. 14, 2021) (explaining that Vehicle to Everything technology would connect all devices (motor-vehicle, non-motor vehicle, bicycle, pedestrian, etc.) on the road).
[7] *Lane departure warning, blind spot detection help drivers avoid trouble*, IIHS (Aug. 23, 2017), https://www.iihs.org/news/detail/stay-within-the-lines-lane-departure-warning-blind-spot-detection-help-drivers-avoid-trouble.
[8] SCHMITT, *supra* note 1.
[9] *Id.*

Pedestrians and cyclists are arguably the most vulnerable road users.[10] In 2018, in the United States, more pedestrians were killed than at any point in a generation.[11] Further, fifty percent more people die while walking or using a mobility device today than a decade ago.[12] Therefore, this Comment proposes that any federal safety framework for ADS requires a "vison test" to ensure that ADS can adequately detect and respond to pedestrians and cyclists in vulnerable groups. Vulnerable groups include young children, the elderly, and minorities. Additionally, many pedestrian deaths occur at night or on dimly lit streets.[13]

Any loss of human life is tragic; however, the deaths of young children and the elderly that are entirely preventable are especially tragic. According to KidsandCars.org, fifty children per week are injured or killed in backover collisions.[14] Additionally, pedestrians represent 20 percent or more of traffic deaths among 45 to 69-year-olds.[15] And the largest number of pedestrian deaths occur among 55 to 64-year-olds.[16]

Figure 1 below shows a breakdown of pedestrian deaths by race. It highlights that there is a great need to ensure that ADS recognizes people of all races. Overall, Figure 1 illustrates that both Black and Hispanic pedestrians are dying at a higher rate than white pedestrians. Such numbers highlight the great need for change.
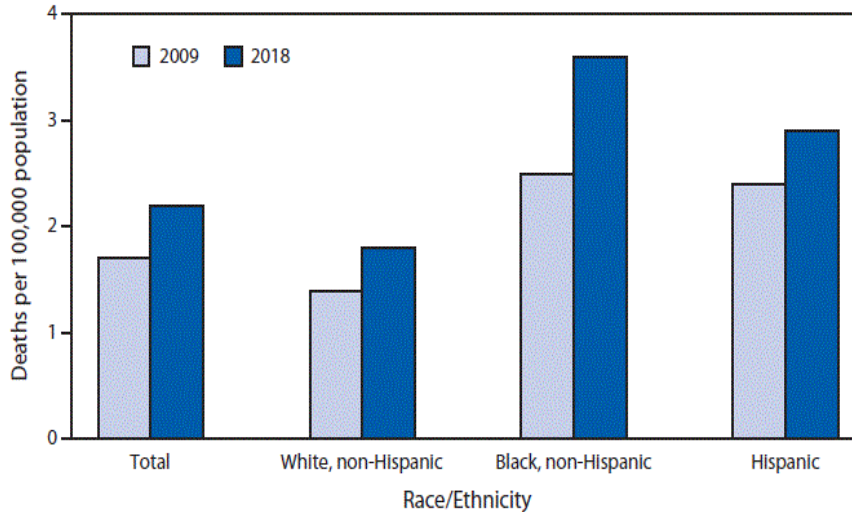
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[10] *See id.*
[11] *Id.*
[12] *Id.*
[13] SCHMITT, *supra* note 1, at 3.
[14] *Id.* at 80.
[15] *Pedestrians*, INJURY FACTS, https://injuryfacts.nsc.org/motor-vehicle/road-users/pedestrians/data-details/ (last visited Mar. 16, 2021) [Hereinafter "Pedestrians"].
[16] *Id.*

According to a study by researchers at the Georgia Institute of Technology, the technology used in self-driving cars may have a racial bias that makes autonomous vehicles more likely to drive into black pedestrians.[18] Specifically, the study found that the detection systems, such as the sensors and cameras used in self-driving cars, are better at detecting pedestrians with lighter skin tones.[19] The study tested eight image recognition systems.[20] It found the systems were 11 percent less accurate for those with darker skin tones.[21] Additionally, the study revealed that the time of day or obstruction of the sensor's view is not what causes the discrepancy.[22]

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[17] QuickStats: Age-Adjusted Pedestrian Death Rates, by Race/Ethnicity — National Vital Statistics System, United States, 2009 and 2018. MMWR Morb. Mortal Wkly. Rep. 2020;69:1434. DOI: http://dx.doi.org/10.15585/mmwr.mm6939a7.

[18] Anthony Cuthbertson, *Self-Driving Cars More Likely to Drive Into Black People, Study Claims*, INDEPENDENT (Mar. 06, 2019), https://www.independent.co.uk/life-style/gadgets-and-tech/news/self-driving-car-crash-racial-bias-black-people-study-a8810031.html, *citing* Benjamin Wilson et al., *Predictive Inequity in Object Detection*, https://arxiv.org/pdf/1902.11097.pdf.

[19] *See* Wilson et al., *supra* note 18, at 2 (finding that the technology is better at detecting skin types within the 1-3 range on the Fitzpatrick skin type scale).

[20] Cuthbertson, *supra* note 18.

[21] *Id.*

[22] *Id.*

Overall, the study revealed that it is harder for the technology to detect black pedestrians and stop before crashing into them.[23] Therefore, it is imperative that any federal safety framework for ADS seriously considers this study and ensures that ADS technology has robust perception capabilities allowing for the detection of people of color. If ADS' goal is to make the roads safer for all, the federal safety framework should include black people in that group.

If NHTSA ensures that the technology's alleged difficulty detecting pedestrians of color is corrected, one advantage of ADS is that it could reduce potentially biased driver behavior that occurs today. A recent study conducted by Tara Goddard, Kimberly Barsamian Kahn, and Arlie Adkins highlighted that racial bias might factor in driver yielding behavior at crosswalks.[24] A federal safety framework for ADS that requires adequate detection and safe reactions to minorities could counteract this unfortunate trend.

Figure 2 shows the percentage of pedestrian fatalities by the time of day and the day of the week:

Percentage of Pedestrian Fatalities, by Time of Day and Day of Week, 2017
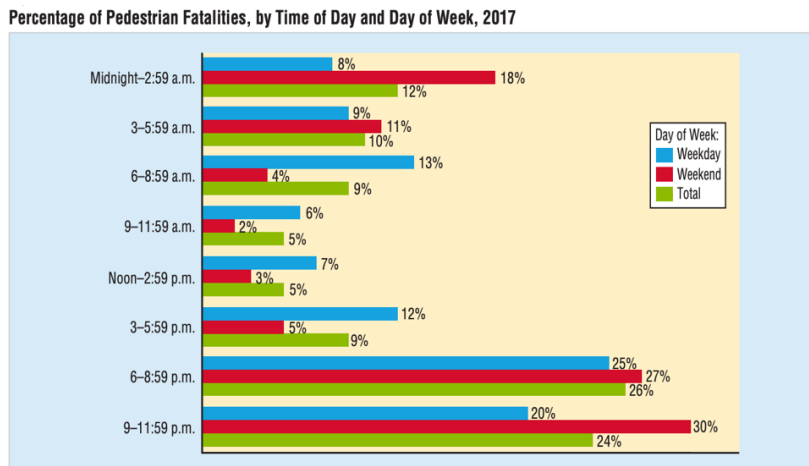
Source: FARS 2017 ARF[25]

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[23] *Id.*

[24] Tara Goddard et al., *Racial bias in driver yielding behavior at crosswalks*, 33 TRANSPORTATION RESEARCH PART F: TRAFFIC PSYCHOLOGY AND BEHAVIOUR 1 (2015).

[25] FARS 2017 ARF.

This chart highlights that pedestrians are at the most risk between 6:00 PM–6:00 AM. Therefore, ADS should be equipped to adjust to any time of the day/ lighting so that a vehicle can adequately detect a pedestrian.

As such, ADS technology must be able to detect by sensors, young children, the elderly, minorities, and adjust for the time of day to predict future behavior and prevent the risk of a collision with the vehicle.

Additionally, ADS should be equipped to detect pedestrians and cyclists no matter where they are walking. ADS should detect and respond accordingly to pedestrians and cyclists who are not within a designated pedestrian area. Almost three-quarters of pedestrian fatalities occur outside of intersections.[26] This oversight in an automated vehicle had deadly consequences in 2018 when a self-driving Uber SUV driver killed Elaine Herzberg.[27] In that situation, Uber's self-driving cars did not "include a consideration for jaywalking pedestrians," which was arguably a huge oversight.[28] To prevent a future similar incident, any federal framework for ADS must respond to pedestrians and cyclists outside of the designated pedestrian zones.

Again, robust sensing capabilities are essential as sensing serves as the "eyes" of the ADS. However, as NHTSA noted, perception performs the associated cognitive recognition of information detected through the sensor's eyes. ADS has many potential benefits like saving lives, preventing injuries, and reducing economic costs due to road traffic crashes. However, there could be detrimental consequences if ADS technology is not equipped with solid perception capabilities. According to court documents from a 2018 crash involving a Tesla on Autopilot in Japan, a Tesla Model X's sensors and forward-facing cameras did not recognize the parked motorcycles,

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[26] SCHMITT, *supra* note 1, at 13.
[27] *Id.* at 125.
[28] *Id.*

pedestrians, and van directly in its path.[29] It continued accelerating forward until striking the motorcycles and Mr. Umeda, thereby crushing and killing Mr. Umeda as the Tesla Model X ran over his body.[30]

Control

ADS should have robust control functions to effectively execute the driving functions necessary to get the vehicle and others on the road from point A to point B safely. A strong control system would have automatic emergency braking enabled and would have a manual override system that would allow the passenger to take over the driving function if necessary. These control mechanisms are essential if the sensing or perception aspects of the ADS were to fail.

According to the Insurance Institute for Highway Safety (IIHS), automatic emergency braking can decrease front-to-rear crashes with injuries by 56 percent.[31] Robust ADS control systems could help prevent pedestrian deaths. In a 2018 Tempe, Arizona crash, Uber turned off the manufacturer-installed automatic braking feature in a self-driving Uber Volvo SUV and programmed its own software not to stop so as to avoid a disengagement.[32] The choice was deadly, and the pedestrian hit by the car—and despite the presence of a safety driver—passed away.

Planning

A federal framework for ADS should ensure robust mechanisms to ensure that ADS can adequately plan and navigate the route it will take on the way to its intended direction. If the ADS system is built from the sensing and perception mechanisms discussed above, it could use the information gained to predict objects' future state to create a path that reduces crash risks. It is

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[29] Lance Eliot, *Tesla Lawsuit Over Autopilot – Engaged Pedestrian Death Could Disrupt Automated Driving Progress*, Forbes (May 16, 2020), https://www.forbes.com/sites/lanceeliot/2020/05/16/lawsuit-against-tesla-for-autopilot-ENGAGED-pedestrian-death-could-disrupt-full-self-driving-progress/?sh=7bfe55a571f4
[30] *Id.*
[31] Center for the Study of Responsive Law, *Safer Vehicles and Highways: 4.2 Million U.S. Lives Spared Since 1966.*
[32] SCHMITT, *supra* note 1, at 131.

vital that ADS can plan routes that consider high-risk areas such as areas with a high elderly population,[33] and that ADS is equipped to avoid areas that pedestrians and cyclists typically are, such as crosswalks and sidewalks. Due to driver error, there have been pedestrian deaths due to driver negligence within sidewalks and crosswalks.[34] Therefore, it is imperative that ADS' planning mechanisms must not allow for detours in traditionally pedestrian-occupied spaces. Of course, this step would require robust sensing and perception mechanisms to work correctly.

Question 2: In consideration of optimum use of NHTSA's resources, on which aspects of a manufacturer's comprehensive demonstration of the safety of its ADS should the Agency place a priority and focus its monitoring and safety oversight efforts and why?

Safety Tests

The agency should place a priority on safety tests for ADS technology. These safety tests should demonstrate that the technology can detect pedestrians and cyclists of all races, genders, ages, and disabilities. The safety tests should also confirm that the ADS technology can detect pedestrians and cyclists in all environments, included, but not limited to, at night, on high-speed arterial roads, in all marked and unmarked crosswalks, and driveways. The agency should prioritize and focus its monitoring and safety oversight efforts in this area because, as demonstrated, these groups are at a disadvantage and need to be protected. ADS technology can

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[33] *Id.* at 40–41.

[34] Stella Chan et al., *Man who allegedly drove onto San Diego sidewalk is accused of three counts of vehicular manslaughter, police chief says*, CNN (Mar. 16, 2021), https://www.cnn.com/2021/03/15/us/san-diego-city-college-pedestrian-deaths/index.html; *Washington state man killed by vehicle on Las Vegas* Sidewalk, AP (Jan. 17, 2020), https://apnews.com/article/752260b35126e7e94d94dba395876db4; EXAMINING THE INCREASE IN PEDESTRIAN FATALITIES IN THE UNITED STATES, 2009–2018, Research Brief, AAA (Jan 2021), https://aaafoundation.org/wp-content/uploads/2021/01/20-1319-AAAFTS_Pedestrian-Fatalities-Brief_FINAL-122220.pdf (explaining that between 2009 and 2018, there were 10, 184 pedestrian deaths in intersections); *Pedestrians*, *supra* note 15 (noting that 26 percent of pedestrian traffic deaths in 2019 occurred in intersections); *Crash Data and Statistics*, UTAH DEPT. OF PUBLIC SAFETY, https://highwaysafety.utah.gov/crash-data/ (last visited Mar. 29, 2021) (noting that 11 percent of pedestrians involved in a crash during 2020 were located at an intersection in a marked crosswalk); Perry Vandell, *Pedestrians in Arizona are more likely to be hit and killed than nearly any other state. Why?*, AZ CENTRAL (Sept. 28, 2020), https://www.azcentral.com/story/news/local/arizona-traffic/2020/09/28/arizona-has-4th-highest-pedestrian-death-rate-country-why/3511850001/ (explaining that ten percent of fatal pedestrian crashes in Arizona occur in marked crosswalks).

benefit drivers; however, the agency should not allow this technology to put vulnerable communities at risk for benefitting drivers. Instead, thorough, well-designed safety tests should be required, demonstrating a vehicle's ADS technology's safety capabilities.

One specific way to do this would be to add an ADS obstacle course to the New Car Assessment Program. This addition to the program would also ensure that NHTSA does not waste unnecessary resources because it would be simply adding to an existing program rather than creating an entirely new safety test program. Because the NHTSA has previously researched pedestrian safety and developed procedures to test new cars, it should also include these tests in its New Car Assessment Program. Both of these inclusions in the New Car Assessment program could ensure that pedestrians are kept safe. It is imperative that the standard by which NCAP tests cars are upgraded to incorporate new tests and safety technology because there has not been an update in more than a decade.[35]

Monitoring and safety oversight is also critical because certain vehicles, such as SUVs, are becoming more dangerous to pedestrians and cyclists.[36] Reducing or eventually eliminating driver control over the car could create a more difficult situation where dangerous vehicles, such as SUVs, cause more pedestrian deaths.[37]

Additionally, the alternative to safety tests would be companies taking things into their own hands and using their customers as test drivers with this technology. For instance, unlike other driverless car developers, Tesla is "beta testing" its driverless technology on public roads, using

[35] Aaron Gordon, *The US Invented Life-Saving Car Safety Ratings. Now They're Useless.*, VICE (Mar. 4, 2021), https://www.vice.com/en/article/4ade9p/the-us-invented-life-saving-car-safety-ratings-now-theyre-useless.
[36] Schmidt, *supra* note 1, at 82 (explaining that between 2009 and 2016, there was an 81percent increase in the number of pedestrians killed in crashes with SUVs).
[37] Gregory Shill, *Should Law Subsidize Driving?*, 95 N.Y.U. L. Rev. 498, 558 (2020) (explaining that research shows that a pedestrian is 3.4 times as likely to be killed if struck by an SUV or other light truck than if hit by a passenger car).

its customers as test drivers rather than using professional safety drivers.[38] As things currently stand, "the absence of federal leadership, including mandatory safety standards, contributes to an inherently risky and unaccountable [autonomous vehicle] testing environment."[39]

Data Sets

Like safety tests, any federal framework for ADS must require companies to demonstrate that it maintains adequate data sets of pedestrian images to train autonomous cars. These data sets should consist of the whole spectrum of the human race. Meaning it should include a fair balance of light-skinned people and dark-skinned people. Currently, manufacturers do not make these data sets readily available.[40] This practice should change. At the very least, companies should be required to share their data sets with regulators so they can determine if the data set adequately trains the technology to detect people of all races.

Understandably, companies want to keep their data sets close for a competitive advantage. However, a federal safety framework maintaining that companies share their data sets with regulators could increase consumer confidence and not interfere with their competitive advantage. Alphabet's self-driving vehicle unit, Waymo, made some of its data gathered by its vehicles available to researchers to help fully autonomous cars cross the finish line.[41] Sharing data sets with regulators could also help fully autonomous vehicles cross the finish line. Consumers will hardly

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[38] Mercedes Streeter, *NHTSA Has A Lot of Catch-Up Ahead*, JALOPNIK (Feb. 4, 2021), https://jalopnik.com/nhtsa-has-a-lot-of-catch-up-ahead-1846201331.
[39] SCHMITT, *supra* note 36, *citing* National Association of City Transportation Officials, "NTSB Finds Inadequate Safeguards in Place for Self-Driving Vehicle Testing across U.S.," NACTO (Nov. 21, 2019), https://nacto.org/2019/11/21/ntsb-finds-inadequate-safeguards-in-place-for-self-driving-vehicle-testing/.
[40] *See* Jack Stewart, *Why Waymo is sharing some of its self-driving car data*, MARKETPLACE (Aug. 21, 2019), https://www.marketplace.org/2019/08/21/waymo-sharing-some-self-driving-car-data/; Brad Templeton, *Waymo Gives Away Free Self-Driving Training Data - - But With Restrictions*, FORBES (Aug. 22, 2019), https://www.forbes.com/sites/bradtempleton/2019/08/22/waymo-gives-away-free-self-driving-training-data-but-with-restrictions/?sh=776bbb123bdc.
[41] Stewart, *supra* note 40.

want to drive in or share a road with a vehicle they believe cannot adequately detect pedestrians and cyclists of color.

Any framework must cover this area because autonomous vehicles may fail to detect people of color without balance in data sets. While ADS technology has great potential to reduce overall pedestrian deaths, it could potentially disproportionality kill darker-skinned pedestrians. Therefore, it is crucial that ADS technology can minimize biases as much as possible.[42] A robust safety framework requiring companies to show that they maintain balanced data sets would help reduce any potential bias.

Overall, it is essential that NHTSA gets ahead of this technology and does not wait until it is in the mainstream and accepted by the industry before it acts. This technology can make the roads safer. However, it also has the potential to make the streets more dangerous for vulnerable road users.[43] Therefore, any federal safety framework for ADS should strongly emphasize a company's necessity to demonstrate that their ADS technology works and is safe.

Question 3: How would your conception of such a framework ensure that manufacturers assess and assure each core element of safety effectively?

My conception of such a framework would ensure that manufacturers assess and assure each core element of safety effectively in several ways:

1. Having robust sensing mechanisms would ensure that ADS can "see" those outside the car to keep vulnerable road users safe through blind spot detection, lane departure warning, lane departure prevention, front crash prevention, and vehicle to everything technology.

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[42] *See* Sam Huang, *The Racist(?) Autonomous Driving Car and the Dangers of Bias in Artificial Intelligence*, PREDICT (Oct. 16, 2018), https://medium.com/predict/the-racist-autonomous-driving-car-and-the-dangers-of-bias-in-artificial-intelligence-9bfca178e658.

[43] *See* Angie Schmitt, *Autonomous Car Industry's Frightening Vision for Cities*, STREETSBLOG (Aug. 2, 2019), https://usa.streetsblog.org/2019/08/02/autonomous-car-industrys-frightening-vision-for-cities/.

2. A robust perception system would allow ADS to detect and respond to vulnerable road users adequately.

3. Robust control mechanisms would enable drivers to quickly take over the driving function if needed to respond swiftly to the outside environment.

4. Through the robust sensing and perception function, ADS could safely plan routes.

Currently, U.S. vehicle-safety regulation only considers an automobile's occupants' safety rather than the potential impacts on pedestrians and other vehicles.[44] Therefore, a federal framework for ADS does consider pedestrians and other vehicles.

Question 4: How would your conception of such a framework assist NHTSA in engaging with ADS development in a manner that helps address safety, but without unnecessarily hampering innovation?

My conception of such a framework would not hamper innovation. Instead, it would bolster road user safety, which would ultimately enhance customer satisfaction and trust. They will not be worried about potentially putting themselves or other road users at risk. ADS technology has great potential to allow for innovation; however, any new design needs to ensure that people are safe. This notion is especially true because the rationale behind ADS is that it will be safer than conventional driving. However, if innovation in this area instead leads to more accidents, the technology's intended aim would be futile. Overall, companies should want to take any reasonably necessary measures to show their customers that their products are safe.

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[44] Shill, *supra* note 37, at n. 395.

Question 8: At this early point in the development of ADS, how should NHTSA determine whether regulation is actually needed versus theoretically desirable? Can it be done effectively at this early stage, and would it yield a safety outcome outweighing the associated risk of delaying or distorting paths of technological development in ways that might result in forgone safety benefits and/ or increased costs?

The NHTSA can determine whether regulation is needed by looking at what has occurred without robust regulation. For instance, several crashes have occurred in the absence of a comprehensive regulatory scheme. In 2016, Joshua Brown was killed when his Tesla Model S, operating in "Autopilot" mode, failed to recognize a truck that crossed his path.[45] Brown became the first American to die in an "autonomous" vehicle accident.[46] After the accident, the New York Times reported that the accident was likely due to the vehicle's lack of additional sensors such as LIDAR.[47]

Further, in 2018, a Tesla Model X allegedly using Autopilot struck and killed a pedestrian.[48] It was the world's first pedestrian fatality associated with a Tesla while it was on Autopilot.[49] Other issues, such as the apparent difficulty for autonomous vehicle technology to detect people of color,[50] must be dealt with and regulated early on to allow every American to reap the benefits of this technology.

Moreover, regulation is not merely theoretically desirable. It is necessary. A 2018 study conducted by the AAA showed that American trust in autonomous vehicles slipped following

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[45] Joshua Schoen, *Discrimination in Autonomous Vehicles? AI Ignores Black Lives*, LINKEDIN (June 5, 2020), https://www.linkedin.com/pulse/discrimination-autonomous-vehicles-ai-ignores-black-lives-schoen/.
[46] *Id.*
[47] Anjali Singhvi and Karl Russel, *Inside the Self-Driving Tesla Fatal Accident*, NY TIMES (July 12, 2016), https://www.nytimes.com/interactive/2016/07/01/business/inside-tesla-accident.html; Schoen, *supra* note 45. The Tesla had a forward radar system, 12 long-range ultrasonic sensors, and a single forward-looking camera.
[48] Eliot, *supra* note 29.
[49] *Id.*
[50] *See generally* Wilson et al., *supra* note 18.

high-profile accidents involving AV technology.[51] The study showed that 73 percent of those polled said they would be too afraid to ride in a fully self-driving vehicle.[52] Additionally, 63 percent of those polled reported they would feel less safe sharing the road with a self-driving car while riding a bicycle or walking.[53] Finally, the survey found that 64 percent of Millennials surveyed were afraid to ride in a fully self-driving car.[54]

Therefore, yes, it is early in the development of ADS. However, companies are increasingly putting ADS technology in consumers' hands,[55] and as more accidents occur, consumer trust is eroding. According to Greg Brannon, AAA's director of Automotive Engineering and Industry Relations, "consumer trust is a critical component to the widespread acceptance of autonomous vehicles."[56] Therefore, as companies continue to improve in allowing less driver control, there must be a robust federal framework to combat any potential hazards all road users may face.

Though the agency wants to promote good behavior without stifling innovation, holding companies who utilize ADS technology to a higher standard will ensure that all road users are safe, which will increase consumer satisfaction and trust in ADS and will likely lead to greater innovation. As noted by AAA's director of Federal Affairs, Megan Foster, "[T]o ease fears, there must be safeguards in place to protect vehicle occupants and the motorists, bicyclists, and pedestrians with whom they share the road."[57] Therefore, by promoting good behavior, NHTSA can help ensure consumer satisfaction and foster innovation.

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[51] Ellen Edmonds, *AAA: American Trust in Autonomous Vehicles Slips*, AAA NEWSROOM (May 22, 2018), https://newsroom.aaa.com/2018/05/aaa-american-trust-autonomous-vehicles-slips/.
[52] *Id.*
[53] *Id.*
[54] *Id.*
[55] Faiz Siddiqui, *Tesla is putting 'self-driving' in the hands of drivers amid criticism the tech is not ready*, WASH. POST. (Oct. 22, 2020), https://www.washingtonpost.com/technology/2020/10/21/tesla-self-driving/.
[56] Edmonds, *supra* note 51.
[57] *Id.*

Question 10: Which safety standards would be considered the most effective as improving safety and consumer confidence and should therefore be given priority over other possible standards? What about other administrative mechanisms available to NHTSA?

NHTSA should prioritize federal standards requiring ADS to detect vulnerable road users and respond accordingly. Of course, federal standards requiring superior control systems are desirable. However, robust standards requiring safety tests showing that ADS can detect and respond to all communities will ensure that everyone on the road is safe. Only if there are robust sensing and perception functions will there be strong planning functions.

Additionally, perhaps an educational program about the federal safety framework would be helpful. If drivers do not trust ADS systems or do not believe the ADS will keep them or others outside of the car safe, they will not use them. Additionally, if pedestrians and cyclists do not think the technology will keep them safe, they will feel left out of the discussion. Further, suppose drivers experience confusing warnings from ADS technology that they will hit another vehicle or pedestrian, or cyclist. In that case, the systems will be ineffective and fail to achieve its stated goal of keeping the roads safe from driver error.[58]

Additionally, a specific educational program explaining the difference between autonomy and driver assistance could be helpful.[59] As companies begin to roll-out more driver assistance systems, consumers may become confused and assume that the system allows full autonomy.[60] One IIHS study showed that the names companies use for ADS technology can send drivers the

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[58] *Advanced Driver Assistance*, *supra* note 2.

[59] *PAVE Statement on Safe Public Road Testing and Nomenclature*, PAVE, https://pavecampaign.org/pave-statement-on-safe-public-road-testing-and-nomenclature/ (last visited Mar. 28, 2021). The statement noted that, "[M]oreover, it is extremely important to clarify the line between driver assistance and autonomy. Systems requiring human driver oversight are not self-driving and should not be called self-driving."

[60] Siddiqui, *supra* note 55 (explaining that Tesla has faced criticism for giving users the impression its Autopilot system is capable of driving the car without supervision).

wrong message regarding how much attention they have to pay to the road.[61] Specifically, names such as Autopilot,[62] indicate to drivers that they can "turn their thoughts and their eyes elsewhere."[63] For instance, forty-eight percent of drivers polled responded that it would be safe to take their hands off the wheel when using Autopilot.[64]

Overall, NHTSA must require that ADS technology be designed to be as easy to use and foolproof as possible.[65] Additionally, the federal safety framework should include a mechanism for consumer education. If drivers know when the technology is available, how to use it, and how to take control when the technology fails, the technology is helpful. According to IIHS, system misuse has been implicated in fatal crashes.[66] Therefore, any federal safety framework for ADS must include an educational component.

B. Additional Research

Question 14: What additional research would best support the creation of a safety framework? In what sequence should the additional research be conducted and why? What tools are necessary to perform such research?

NHTSA should support additional research on the interaction between ADS and pedestrians. Again, pedestrians are at heightened risk of being killed or injured by drivers.[67] It is crucial NHTSA conducts further research on whether pedestrians and cyclists of all ages, races,

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[61] *New studies highlight driver confusion about automated systems,* IIHS (June 20, 2019), https://www.iihs.org/news/detail/new-studies-highlight-driver-confusion-about-automated-systems. [Hereinafter "Driver Confusion"].

[62] Autopilot is a level 2 system that is used by Tesla

[63] *Driver Confusion*, *supra* note 61.

[64] *Id.*

[65] *Advanced Driver Assistance*, *supra* note 2., *citing* Alexandra S. Mueller et al., *Effects of training and display content on Level 2 driving automation interface usability*, TRANSPORTATION RESEARCH PART F: TRAFFIC PSYCHOLOGY AND BEHAVIOUR (Jan. 2020).

[66] *See Collision Between a Sport Utility Vehicle Operating With Partial Driving Automation and a Crash Attenuator*, NTSB, https://www.ntsb.gov/investigations/AccidentReports/Pages/HAR2001.aspx. (last visited Mar. 15, 2021); *Collision Between Car Operating With Partial Driving Automation and Truck-Tractor Semitrailer*, NTSB, https://www.ntsb.gov/investigations/AccidentReports/Pages/HAB2001.aspx. (last visited Mar. 15, 2021).

[67] SCHMITT, *supra* note 1.

income level, or disability are put at less risk by ADS technology. Additionally, NHTSA must conduct further research to ascertain whether ADS technology has more difficulty detecting people of color. This research could inform what work needs to be done to ensure that ADS is safe for all road users and that no one is left behind as the technology evolves.

Additionally, NHTSA should conduct additional research regarding the capability of the vehicle to everything technology. This technology is in its earlier stages but could have immense value to any future federal safety framework for ADS.

Summary

Failure to have robust sensing, perception, and control mechanisms could have real-life consequences. Several serious crashes that involved cars equipped with AV technology have been subject to National Transportation Safety Board (NTSB) investigations.[68] Any federal safety framework for ADS must include robust sensing, perception, control, and planning mechanisms that can sense, detect, and protect vulnerable road users of all ages, races, genders, income levels, and regardless of the mode of transportation or disability.

Respectfully,

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[68] *Safer Vehicles and Highways*, *supra* note 31, at 14.