This comment pertains to the Advance Notice of Proposed Rulemaking titled **Framework for Automated Driving System Safety**, docket **NHTSA-2020-0106**, proposed pursuant to the Agency's authority under the Motor Vehicle Safety Act (49 U.S.C. Chapter 301).

It is clear that the Agency has carefully considered the issue of safety requirements for ADS-equipped vehicles and has correctly identified a number of concerns with how to effectively regulate them. I am a law student who will one day share the road with ADS-equipped vehicles. I have four recommendations based my understanding of the legal requirements and involved technology.

1. Although there are risks associated with promulgating rules before the precise nature of the regulated activity has materialized, those risks are outweighed by the potential consequences of regulating too late. Therefore, ADS regulations should be proactive, not reactive.
2. The exact form of both the hardware and software that will ultimately be involved in ADS is as-yet unknown, and even after widespread deployment is likely to continue to evolve. Therefore, relevant safety regulations should have built-in mechanisms to allow for regular review and amendment to keep pace.
3. ADS-equipped vehicles may be designed for limited purposes, and their automated nature means that their intended use and actual use will fully align. This is distinct from human-operated vehicles, where an operator may for instance take a vehicle intended for use on a highway off-roading. Therefore, regulations should be applied to vehicles according to their intended use, rather than requiring all vehicles to comport with all standards.
4. Road safety is a function of the design and operation of the regulated vehicle as well as the behavior of all others who share the road. It is important to maximize the communication of useful information to other drivers, pedestrians, cyclists, etc. Therefore, ADS-equipped vehicles should have an indicator of some kind identifying their status to others.

I. ADS regulations should be proactive, not reactive.

Left to its own devices, the industry will naturally adopt a certain degree of safety in designing and implementing ADS, but without strong regulatory standards, that level of safety will be unacceptably low. The history of American industry has provided ample evidence that without restraints, industries will accept a certain level of human loss (through injury, illness, hardship, and death), so long as acting otherwise will negatively impact profits. The market-based concern of the industry engineer is whether a system is safe enough to limit their liability. For an activity like driving, something the average American does nearly an hour a day just to go to work[1], that is an insufficient guarantee.

Voluntary mechanisms like the self-assessment described in the proposed rule would be useful to the agency in that ADS developers will have the clearest picture of the capabilities and limitations of their own technology. This type of reporting would be invaluable to the agency in gaining expertise in that matter, which would help the agency improve the quality and

[1] https://www.census.gov/content/dam/Census/library/publications/2021/acs/acs-47.pdf

effectiveness of future rules and regulations. This sort of reporting should supplement, but not replace, mandatory safety requirements determined by NHTSA.

There is a risk that proactive regulations may be too vague. Because of the unpredictable nature of the technology, it may be difficult to create objective, repeatable metrics as required. There are assuredly elements of ADS that will require regulation but which cannot presently be identified or tested. It is necessary to promulgate rules that the regulated entities are capable of following, so broad, nonspecific requirements will not do. In this early phase of deployment, safety standards should result in performance at least equivalent to current standards for human-operated vehicles. Any FMVSS created at this early stage should serve as a framework on which future, more concrete safety rules can be built.

II. ADS regulations should be adaptable to account for ongoing, unpredictable technological development.

Traffic accidents were the source of more than 36,000 deaths and almost three million injuries in the United States in 2019[2]. That year was not an anomaly. Because of the high number of accidents caused by human error, reliable ADS with widespread deployment have the potential to have a significant positive impact on this safety issue. ADS are complex, interconnected systems with numerous potential failure points and limited opportunity for human intervention in case of failure. This is especially true for fully automated vehicles.

This is an important distinction from previous technological developments in automobiles. When a driver's power steering fails, it becomes much more difficult to guide the vehicle but a skilled driver will both be (1) immediately aware of the mechanical failure and (2) able to adapt and get off the road to deal with the problem. A passenger in a fully automated vehicle, or a driver relying on numerous invisible drive assist technologies, will have little to no ability to do the same. A failure may go unnoticed until it is too late to correct, and a fully automated vehicle may have no manual controls at all. Because of this, it is essential that strong, thorough regulations exist to create an aggressive minimum safety standard for ADS.

This is a field that is likely to change rapidly, and it may be the case that rules promulgated now become meaningless next year because new paths of development have opened and changed the course of the technology. Even so, the agency should act now to create rules generally encouraging safety. As the technology develops, the agency can refine those rules, eliminate those which lose their value, and ultimately create a regulatory framework suited to the systems that end up on the road.

To that end, rules adopted to ensure the safety of ADS should have built-in annual or bi-annual review provisions. This will ensure that the agency will regularly consider the value of any given rule and be able to make adjustments as necessary, enabling the agency to keep pace with the rapidly developing technology.

[2] https://www.bts.gov/content/motor-vehicle-safety-data

III. ADS standards should be flexible based on the intended function of the vehicle.

Standards of performance are important, but a vehicle designed to function as a taxi should not be forced to comply with the same requirements as a vehicle designed to haul freight. Objective assessments such as stopping distance, performance on certain types of roads or in certain levels of traffic, etc., should be applied as needed, rather than across the board. This will allow manufacturers to sell more affordable, purpose-built vehicles because they will not be required to design and build safety mechanisms that ultimately serve no purpose for that specific vehicle.

Unlike manually-operated vehicles, certain ADS-equipped vehicles – especially fully automated vehicles – may be completely unable to operate outside their operational design domain. It is therefore unnecessary to assess or regulate a vehicle's performance under circumstances sufficiently outside of its intended ODD. Certain standards may be universal – crash safety, for instance – while others should only be considered where the circumstances warrant.

Self-assessments like those mentioned above would be useful because they could identify the specific conditions in which a given ADS would be intended to operate.

IV. ADS-equipped vehicles should be readily identifiable to other drivers.

Traffic safety is a function of numerous factors such as mechanical failure, environmental conditions, and driver error. Because drivers share the road with one another, these factors are multiplied for each other driver within range. One driver may experience a blown-out tire and be fully able to maneuver safely onto the shoulder, but if a nearby driver is distracted and fails to notice, there may still be an accident. Competent drivers must be aware of both their own vehicle's performance as well as the state of nearby drivers.

A competent driver must therefore be conscious of their vehicle's performance as well as the state of nearby drivers. This competent driver may see a vehicle swerving, and in so observing enter a state of higher alertness enabling them to avoid an accident.

It is important to maximize the useful information available to nearby drivers to help them make such assessments. Therefore, I believe ADS-equipped vehicles should be required to display an indicator of some kind that alerts nearby drivers (1) that the vehicle is equipped with ADS and (2) whether that system renders the vehicle fully or partially automated. **When** an ADS-equipped vehicle experiences a mechanical or software failure, it is likely to exhibit that failure in an altogether different way than the human errors drivers are currently looking for. An ADS-equipped vehicle will not swerve drunkenly, because its software operator will not be drunk. It may reveal its malfunction with a sudden change in direction or a failure to stop or slow down.

Requiring ADS-equipped vehicles to display that fact to nearby drivers will put them on alert that they should be looking for different failure signals than usual, which will help reduce the frequency and severity of accidents. It will also help human drivers decide where to focus their attention. If one driver sees another texting or carrying on a conversation with a rear-seat passenger, the first driver may reasonably identify the second vehicle as a hazard. If the first driver sees the same but the second vehicle is clearly identified as using an ADS, the first driver

can trust that the second driver's distraction will not cause harm, and refocus their attention on other hazards.

It is true that at this early stage, the general public may not know precisely how an ADS-equipped vehicle will behave when it malfunctions. As the technology develops, the specific manifestation of ADS failures will become better known and other drivers and pedestrians will be able to more effectively react, but only if they are aware that a nearby vehicle is so equipped.

A requirement like this is similar to other requirements NHTSA has previously imposed, such as rules covering reflective devices. These devices serve the similar purpose of reducing danger by providing information to people other than the vehicle subject to the requirement such as pedestrians and other drivers.

Requiring such indicators will improve the interactions of ADS-equipped vehicles with other drivers and pedestrians, and help develop consumer confidence by including all those who share the road in the safety scheme.

I am looking forward to living in a country where traffic accidents are a thing of the past. ADS technology is a significant piece of that future. Like all advances in automation, ADS will result in significant social and economic changes, and its development deserves careful scrutiny and control. This technology is likely to have as significant an impact on the next century as the Model T on the last one, and the decisions we make now will have the potential to guide it toward the best possible outcome for all people.

Thank you for considering the public's opinion on matters such as this.

Joe Cooperstein