



TOYOTA MOTOR NORTH AMERICA, INC.
Sustainability & Regulatory Affairs
325 Seventh Street, NW #1000 Washington, DC 20004

April 1, 2021

Dr. Steve Cliff
Acting Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

**RE: Framework for Automated Driving System Safety – Advanced Notice of Proposed Rulemaking
[Docket No. NHTSA-2020-0106]**

Dear Dr. Cliff:

Toyota Motor North America, Inc., on behalf of Toyota Motor Corporation (collectively, “Toyota”), is pleased to provide these comments to the December 3, 2020 *Federal Register* notice on the Framework for Automated Driving System Safety Advanced Notice of Proposed Rulemaking (ANPRM). Toyota’s vision of Mobility-for-All includes the successful development and deployment of automated driving systems (ADS) with the potential of improving safety, mobility, and accessibility. We support NHTSA’s consideration of methodical ways to support the safe testing and deployment of ADS, and we appreciate the opportunity to provide comments to this ANPRM. These comments supplement the comments submitted by the Alliance for Automotive Innovation (“Auto Innovators”).

Toyota and Mobility for All

Toyota has been researching and developing ADS technology for over a decade. In 2016, we created the Toyota Research Institute, Inc. (TRI), headquartered in Los Altos, CA, with additional facilities in Ann Arbor, MI and Cambridge, MA. TRI’s aim is to expand and accelerate Toyota’s research and development efforts in ADS with an emphasis on artificial intelligence, robotics, and materials design. TRI’s work has the potential to improve, enhance, and save lives by developing assistive indoor robotics and supporting the market introduction of vehicles with high levels of automation. TRI works closely and coordinates efforts with various Toyota affiliates across the country and the globe, including Toyota’s long-standing North American R&D facilities in Michigan, and Toyota Connected, Inc., which is located near our North American Headquarters in Plano, TX.

In 2018, Toyota Motor Corporation CEO, Akio Toyoda, announced that Toyota would be transitioning to a mobility company. This means investing and offering a wide range of mobility solutions for all people. This vision includes not only the movement of people, goods, and services throughout the outdoor environment, but also indoor access and mobility for all people.

Toyota is demonstrating how automated driving and robotics can help achieve this vision of Mobility for All through concepts which are planned to be used during the 2021 Tokyo Olympic and Paralympic Games like e-Palette, the LQ, T-HR3 Robot, Accessible People Mover, and our Walking Area Battery Electric Vehicles.

Toyota has also made a number of investments through various mechanisms such as the Toyota Mobility Foundation (TMF). TMF recently announced the first two deployments of the Future Mobility District Initiative, in collaboration with the Indiana Economic Development Corporation, which aims to foster innovation through industry partnerships and propel research and development in advanced mobility technologies in Indiana. TMF has established the Future Mobility District Initiative in support of Toyota's mission of Mobility for All and commitment to the United Nations Sustainable Development Goals. The Future Mobility District project focuses on researching overall movement of people and goods using automated driving technology to help understand the potential role of these systems in the changing mobility ecosystem. Designed with local community input, this human-centered framework will facilitate implementation activities and commercialization of an array of cooperative options.

Comments on the ANPRM

Toyota agrees with NHTSA's overall assessment of the current landscape of ADS development and testing, as well as the challenges identified with regulating this technology. Further data collection would be appropriate before commencing development of regulations for the ADS. This additional data collection would support developing regulations that can best address identified safety needs in a manner that supports industry innovation. In the interim, NHTSA can adopt voluntary mechanisms that could not only support safe AV testing and deployment, but also support and accelerate the collection of data which could inform future regulatory actions by NHTSA. These recommended mechanisms are outlined in the comments submitted by Auto Innovators.

As NHTSA considers the assessment of ADS, it should focus on the safety outcomes and performance of the system as a whole, rather than assessing at the component level. Components are integrated into the system and are interdependent. Depending on the system design, component-level performance may not be predictive of a system-level outcome with a safety impact. Further, different manufacturers may choose to integrate components differently to achieve similar overall system performance. A system evaluation may better capture the safety impact for the driver or other road users which is why the vast majority of current FMVSS apply to the vehicle and not a component. We do not see the uniqueness of ADS technology as fundamentally changing this fact. NHTSA should assess safety performance of the ADS as a whole and the metrics should be focused on system safety.

Conduct and Support Research

At this stage, there is limited real world deployment data that identifies or demonstrates a safety need or appropriate performance criteria for a regulation for the ADS. As stated in the Auto Innovators comments, additional research is needed to sufficiently understand ADS safety performance in the context of the dynamic nature of driving in real world traffic environments with human drivers and other road users. NHTSA should also carefully consider and gain better understanding of the variables of ADS, including automation level and the operational design domain (ODD) as defined in Society of Automotive Engineers (SAE) J3016, so as not to apply the same criteria across differing systems and features where doing so would not be appropriate.

If NHTSA is considering promoting process standards (for developing or managing the field safety of ADS – rather than creating performance requirements for the ADS itself), a voluntary mechanism would be appropriate. However, additional research and discussion is needed to formulate appropriate best practices for analyzing the safety cases for ADS in these process standards. As NHTSA is aware, the automotive industry already has strong existing practices for developing a safe product and managing product safety in the field. Best practices implemented in any new process standards for ADS should take into account this existing automotive industry expertise. Further, key components of process standards or best practices that

assess ADS will depend on the ODD, level of automation, etc. Any process standard will need to take into account varying ADS by system types, which could mean using different process standards for different system types. For example, International Standards Organization (ISO) 34502 “Road Vehicles – Engineering framework and process of scenario-based safety evaluation” is a process standard under development which is scoped specifically for systems that operate on limited access highways.

In addition, should NHTSA promote voluntary process standards for the U.S., to the extent possible, it should strive for harmonization with the United Nations Economic Commission for Europe Functional Requirements for Automated and Autonomous Vehicles Informal Group under GRVA of WP.29. We support the principles and goals which are being used to establish these requirements.

Industry Consensus Standards & Activities

The automotive industry has a long history in research and development of vehicle systems and using these experiences and subject matter expertise to support and develop industry consensus standards through standards development organizations such as SAE International and ISO. In forums like these, experts from various backgrounds, companies, and sometimes industries come together to develop standards and recommended practices that can establish process standards, performance metrics, performance criteria, and test methods, which can then be adopted and used by manufacturers and suppliers. Regulators from around the world have leveraged the standards and recommended practices issued by SAE, ISO, and other similar organizations, because of the processes used to develop and publish them, but also because of the expertise and industry consensus element of it. We believe NHTSA should continue to consult with and obtain broad industry opinions as they consider the safety assessment of ADS.

There are a number of efforts, several of which NHTSA has pointed out in the ANPRM, addressing safety assurance for ADS. NHTSA, however, did not mention the work under way within the Automated Vehicle Safety Consortium (AVSC) to develop best practices which may help address some of the questions raised in this ANPRM.

The AVSC is a consortium of ADS developers (practitioners), including Toyota, that are working collaboratively to develop safety principles and best practices to support the safe testing and deployment of SAE level 4 and 5 ADS. As practitioners, AVSC members use their knowledge and experience in ADS development and testing to collaboratively inform these publications and uniquely enhance their value. As of December 3, 2020, the date this ANPRM was published in the Federal Register, the AVSC had published 5 best practice documents:

1. Safety Operator Selection, Training, and Oversight Procedures for Automated Vehicles Under Test
2. Describing an Operational Design Domain: Conceptual Framework and Lexicon
3. Passenger-Initiated Emergency Trip Interruption
4. Data Collection for ADS-DVs to Support Event Analysis
5. First Responder Interactions with Fleet-Managed Automated Driving System-Dedicated Vehicles (ADS-DVs)

Since then, the AVSC published the best practice “Metrics and Methods for Assessing Safety Performance of Automated Driving Systems” on March 25, 2021.

The AVSC organization was created under the SAE Industry Technologies Consortia (ITC) which is an affiliate of SAE International. Establishing the AVSC under SAE ITC allowed this group to expedite the development of best practices and recommendations, which could then be taken to SAE International standards development committees and/or tasks forces to use in the development of SAE J-standards and

recommended practices. As NHTSA has done in the past, we think they should continue to monitor and engage in these discussions at SAE.

In conclusion, NHTSA should continue to conduct and support research and leverage the work and activities happening globally and among industry. Whether through nearer term voluntary mechanisms or working towards the long-term goal of a regulation on the performance of the ADS, industry practitioners (such as those participating in SAE and in AVSC) bring a unique perspective that can help NHTSA understand how these systems are being developed and assessed. Toyota looks forward to collaborating with NHTSA in this regard.

Should you and/or your staff have any questions, please contact me or Jade Hill, Toyota's Program Manager for active safety regulations, at jade.s.hill@toyota.com or (202) 463-6836.

Sincerely,

A handwritten signature in black ink that reads "Tom Stricker". The signature is written in a cursive, slightly slanted style.

Tom Stricker
Group Vice President
Sustainability & Regulatory Affairs