

1. Consumer Information:

Consultation paper 3 acknowledges the importance of providing clear guidance to the users of automated vehicles. In response, we provide our User's Guide to Vehicle Automation Modes that clearly defines the roles and responsibilities of the user. Additionally, our four modes: Assistive, Supervised, Automated, and Autonomous align with the terminology of the Law Commission. See the link for the full blog and available graphics.

<https://edge-case-research.com/project/a-users-guide-to-vehicle-automation-modes/>

Additionally, here is a talk that will be shown during the EE Times Conference on 24-March that provided extended content related to the modes:

[https://www.dropbox.com/s/4dbxvc6pepimwst/2021-03-24-ADAS AV Safety 20min EETimes.mp4?dl=1](https://www.dropbox.com/s/4dbxvc6pepimwst/2021-03-24-ADAS%20AV%20Safety%20min%20EETimes.mp4?dl=1)

2. 5 Elements of Safety for NHSTA

During our call, we shared five elements that we are providing in response to NHSTA's for industry Comments on the Framework for Automated Driving System Safety.

Even though they are in response to NHSTA, it is a message that we share with all governments. In addition, we advocate for a safety case approach.

1. Industry standards. NHSTA should encourage conformance to safety standards written by the automotive industry and stakeholders themselves, and issued as full standards by accredited standards organizations (e.g., ISO, ANSI/UL, SAE). This includes but is not limited to ISO 26262, ISO 21448, ANSI/UL 4600, and safety-relevant security standards.

a. This should include full self-disclosure of standard conformance status for every highly automated vehicle operating on public roads. (The sole exception should be test vehicles under the immediate control of a qualified safety driver as part of a publicly declared testing effort.) This is not a requirement for conformance, but rather a requirement to be transparent and forthcoming about conformance with industry-created standards (or lack thereof). If no safety standards are conformed to, that should be so stated.

b. It is important to note that such self-disclosure does not require public disclosure of sensitive proprietary technical information. For example, conformance to UL 4600 does not require disclosing any technical information to any organization external to the organization declaring conformance.

2. Transparency. NHSTA should act to increase transparency with regard to safety in the automated vehicle industry.

a. Specific steps should include updating the NHTSA-defined VSSA guidance scope to include all major aspects of UL 4600 compared to the current subset of topics covered. (In fairness, the VSSA guidance was created before the April 2020 issuance of UL 4600, so this should be considered an evolution of the VSSA guidance to track evolving industry standards.)

b. NHTSA should also increase industry participation in releasing technically substantive VSSAs. A properly formed VSSA document should in fact be a high level but technically substantive disclosure of the relevant safety case, and should be issued by any company putting a vehicle on public roads. This should include companies testing on public roads publishing a VSSA scoped to address the safety of the testing effort.

c. The release of some recent, technically substantive VSSAs and the public Web posting of the Uber ATG safety case framework demonstrate that significantly more transparency is viable without undue disclosure of sensitive proprietary information.

d. NHTSA should define and strongly encourage reporting safety outcomes (lagging metrics) in a uniform and transparent manner to demonstrate via data that ADS technology results in safer roads. This information should be supplied by manufacturers and operators rather than solely relying upon, for example, police reports. (Note that the industry itself could drive this standardization; it need not be a NHTSA-defined standard.)

3. Safety First. Governments should encourage the industry to collaborate on safety and compete on factors other safety.

a. Safety should be a given. As with the airline industry, achieving industry-wide safety should involve cooperation among all stakeholders. NHTSA is in a unique position to foster such cooperation, potentially with support from neutral organizations such as MITRE.

b. A starting point can be a shared repository of potential hazards to be addressed when relevant to an ADS-equipped vehicle's ODD.

c. A longer term goal should be a set of ODD-specific lagging metric safety performance indicators and baseline minimum targets based on human driver performance to set a level playing field for safety performance reporting and outcome assessment.

4. Human Operators. NHTSA should ensure that the division of tasks between human operators and automated vehicles results in acceptable safety.

a. This should include monitoring deployed vehicles for an unsafe division of responsibility (e.g., systems overly prone to automation complacency that results in elevated mishap rates) as well as longer term research into driver monitoring effectiveness at ensuring operational safety.

b. NHTSA should encourage the industry to develop standards for measuring driver engagement in the context of driver monitoring systems and their effectiveness in naturalistic driving situations.

5. Safety Cases. Longer term, NHTSA should transition from a test-based posture to a safety case-based posture that includes testing as a component.

a. For some aspects of safety, a test-centric approach is appropriate. However, in essentially all areas of large-scale computer-based system safety, testing is necessary but insufficient to ensure acceptable safety. Given the unique nature of machine-learning based technology incorporated into typical ADS equipment, process-based metrics and leading indicator metrics based on field engineering feedback will be essential to demonstrate and improve safety over the course of deployment.

b. A safety case-based NHTSA posture should involve asking ADS-equipped vehicle makers to use safety cases and (a) define what they mean by safe, (b) explain what reasoning is being used to argue they are safe, and (c) explain the basis of evidence to support that reasoning.

c. A critical part of this will be to ensure not only that ADS equipped vehicles send back field data to ensure that the safety case is valid in practice, but also that a metric-based approach ensures that the ADS design and deployment organizations are actually paying attention to and taking action upon data that indicates potential safety issues before loss events occur.

d. While good engineering, sound data collection practices, simulation, closed course testing, and safe road testing will all play a part in ensuring safety, the precise role of each of these is still open for ADS technology. Therefore, NHTSA should concentrate on ensuring that manufacturers have a coherent story to tell about safety rather than mandating what that story actually is. ADS equipped vehicles should only be deployed when they are demonstrably safe, but the form of the demonstration (which will need to include more than driving an actual vehicle) should be informed by the specific safety case involved.

3. Resources with our position on Safety Cases and Metrics

For additional resources on safety cases and metrics, I am including multiple links to talk on Safety Performance Indicators. Please consider anything in this written material as our statement, and feel free to quote anything in these links to your call for your responses.

Safety Cases and Highly Automated Vehicle Safety

[\(LINK to Video\)](#)

Safety Performance Indicators

[\(LINK to Podcast\)](#)

Safety Performance Indicators for Self Driving Cars

[\(LINK to Video and Slides\)](#)

Safety Case + SPIs for Self Driving Cars

[Link to Video](#)

[Link to Slides](#)

Self Driving Car Metrics

Additional information on our position to what to measure, we have additional podcats that cover twelve different metrics that are helpful for self driving cars

[\(LINK to Podcasts\)](#)

Safety Argument Considerations for Public Road Testing of Autonomous Vehicles

[\(Link to Publication\)](#)

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