



01 April 2021

To: Regulations.gov Docket #: NHTSA-2020-0106

Subject: SAE International's Comments to the Advance Notice of Proposed Rulemaking: Framework for Automated Driving System Safety

SAE International, a global voluntary consensus mobility standards development organization, appreciates this opportunity to respond to the request for comments.

The National Technology Transfer and Advancement Act (NTTAA) directs Federal agencies to adopt voluntary consensus standards wherever possible, thus avoiding development of unique government standards. OMB Circular A-119, revised by the Office of Management and Budget (OMB) in January 2016, spells out the government strategy for standards development promoting agency participation with standards bodies.

SAE committees include experts from industry, academia, research organizations, and government. US DOT subject matter experts from the various modal administrations participate in many of the SAE ground vehicle standards committees. The resources and input each sector provide are beneficial to both the process and the products. Having government participation, and in the subject area of automated vehicles, NHTSA staff, in the standards committees is encouraged by the SAE membership.

SAE standards committee members have a long history of developing voluntary consensus standards that have been incorporated by reference into legislation, rulemaking documents, and regulations. SAE ground vehicle standards are cited in the US DOT's National Highway Traffic Safety Administration's and Federal Motor Carrier Safety Administration's regulations.

Advancing the safety of mobility through safer vehicles, systems, and operation, is a priority of SAE members. New SAE standards are continually developed, published, and adopted. While many SAE committees are actively working on Automated Driving System issues, the On-Road Automated Driving (ORAD) Committee and the Truck & Bus Automation Safety Committee in particular focus primarily on automation.

In response to the Framework for Automated Driving System Safety ANPRM, SAE is providing through this letter an updated status of activities and corresponding documents originating specifically from the ORAD and the Truck & Bus Automation Safety Committees. We believe that information on the status and nature of these activities may be helpful to NHTSA in developing the Framework for Automated Driving System Safety. Details of the status are provided in the attachment to this letter.

Perhaps the most recognized document developed through the ORAD Committee is J3016, which defines terms associated with automation and defines levels of automation. SAE is greatly pleased that NHTSA has adopted J3016 and encourages the agency to continue to do so.

SAE Committee documents are created through the diligent efforts of SAE members. For document creation, the experience, knowledge, and skills of members is also supplemented by material produced by the SAE Automated Vehicle Safety Consortium (AVSC) and liaison relationships among SAE committees and other standards organizations. As an example, updates included in the latest version of J3018 (which concerns guidance for on-road testing of prototype ADS-operated vehicles) were mainly based on material from AVSC's best practice for in-vehicle fallback test drivers. In addition, ORAD Committee members are working with members from SAE's V2X Communications Committees in a newly established committee which is addressing cooperative driving automation. Finally, the ORAD and Truck & Bus Automation Safety Committees have established a liaison relationship to enhance consistency on issues for a wide range of vehicles.

Recognizing that an industry-wide coordinated approach to standards development may accelerate the safer deployment of ADS, SAE has developed and is maintaining an ADS Standards Roadmap. This interactive and regularly updated roadmap crowdsources input from industry experts in coordination with other standards development organizations, including IEEE, ISO, and ASAM, to track ongoing ADS safety-related standards activities, coordinate potential overlaps among SDOs, and prioritize efforts. For example, the ORAD Committee is using this roadmap as a planning tool for identifying new standardization topics to pursue. SAE will make this tool available to NHTSA upon request, and work with NHTSA to identify ways it can help with advancing an ADS safety framework.

SAE welcomes the opportunity to brief NHTSA leadership and staff subject matter experts regarding the current works in progress and published standards originating from committees. Conversely, input from NHTSA regarding priorities, needs, and gap analysis would be valuable to SAE committees as they develop their priorities so that published open consensus standards can continue to inform NHTSA's efforts and, as appropriate, be incorporated in US DOT policy and regulations expeditiously. As mentioned previously, NHTSA staff participation in SAE committee activities is encouraged.

Thank you for the opportunity to comment on the ANPRM.

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On-Road Automated Driving (ORAD) Committee

Overview

The ORAD Committee is responsible for developing and maintaining SAE standards, recommended practices, and information reports related to motor vehicle driving automation system features across the full range of levels of driving automation. "On-road" refers to publicly accessible roadways that provide driving environments for the users of motor vehicles of all classes and all levels of driving automation. However, the ORAD Committee focuses primarily on Automated Driving Systems (ADSs) as defined by SAE J3016. The Committee currently consists of nine Task Forces which perform the technical development of documents.

1. Definitions Task Force

Overview

This Task Force developed J3016 which provides a taxonomy for motor vehicle driving automation systems that perform part or all of the dynamic driving task on a sustained basis. The taxonomy ranges in level from no automation (Level 0) to full automation (Level 5). J3016 provides detailed definitions for these levels of driving automation in the context of motor vehicles and their operation on roadways. These level definitions, along with additional supporting definitions, can be used to describe the range of driving automation system features equipped on motor vehicles in a functionally consistent and coherent manner. This Task Force also developed the initial version of J3216 (issued in May 2020) which provides a taxonomy and definitions related to cooperative driving automation for on-road motor vehicles. Responsibility for future updates has been transferred to a recently formed SAE committee specifically addressing cooperative driving automation.

Documents

ISO PAS 22736/SAE J3016 – Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles.

- Document update performed jointly between SAE International and ISO is nearing completion. Issuance expected by mid-2021.
- Previous versions issued: Jun. 2018 (https://www.sae.org/standards/content/j3016_201806/), Sep. 2016, Jan. 2014

2. Verification and Validation Task Force

Overview

This Task Force provides information and guidelines for verification and validation (V&V) of Automated Driving Systems (ADS). The levels of driving automation addressed by this task force include conditional (Level 3), high (Level 4), and full

(Level 5), as defined by SAE J3016. Various test procedures, such as those performed on a test track for verifying and validating ADS functions are included. This Task Force does not address component-level V&V on broader top-down systems-level V&V practices.

Documents

SAE J3092 — Dynamic Test Procedures for Verification and Validation of Automated Driving Systems

- Development of this document will proceed subsequent to ORAD Committee issuance of several other documents addressing verification and validation topics.
- Previous versions issued: none

SAE J3206 – Taxonomy and Definition of Safety Principles for Automated Driving Systems (ADS)

- Classifies and defines a harmonized set of Safety Principles intended to be considered by ADS and ADS-equipped vehicle development stakeholders. Issuance expected by mid-2021.
- Previous versions issued: none

SAE J3208 – Taxonomy and Definitions of ADS Verification and Validation

- Definitions of terms and taxonomies related to ADS verification and validation. Issuance expected by mid-2021.
- Previous versions issued: none

SAE J3209 – Literature Review of Entities Engaged in Verification and Validation Activities Related to Automated Driving Systems

- Compilation of organizations engaged in ADS verification and validation related activities from around the world. Document in development.
- Previous versions issued: none

SAE J3237 – Operational Safety Metrics for Verification and Validation (V&V) of Automated Driving Systems (ADS)

- Definitions and lexicon for describing operational safety metrics for quantifying the operational safety performance of ADS and ADS-operated vehicles. Document in development.

- Previous versions issued: none

3. Reference Architecture and Interfaces Task Force

Overview

This Task Force addresses a reference functional architecture and describes the functional components and relationships between them for a generic on-road Automated Driving System (ADS) software architecture, as well as providing related terms and definitions. However, specifications and requirements are not imposed on the development of ADSs.

Documents

SAE J3131 — Automated Driving Reference Architecture

- The terms and definitions to describe the functions performed within an ADS, as defined in SAE J3016. Where possible, attempts to capture the language that is already in use within the automated driving development community. Where needed, added new terms and definitions, including clarifying notes to avoid ambiguity. Issuance expected by mid-2021.
- Previous versions issued: none

4. Identifying ADS-DV User Issues for Persons with Disabilities Task Force

Overview

This Task Force gathers and develops information on issues specific to users of Automated Driving System – dedicated vehicles (ADS-DVs). The Task Force has conducted a literature review, as well as consulted with advocates for persons with disabilities with the goal of producing a document that summarized ADS-DV user issues for this community.

Documents

SAE J3171 — ADS-DV User Issues for Persons with Disabilities

- Provides a literature review, along with results from expert interviews, regarding universal design principles for the development of ADS-DVs in order to accommodate users who are unable to obtain a driver's license due to visual, mild cognitive, or certain physical impairments. Issued November 2019. https://www.sae.org/standards/content/j3171_201911/
- Previous versions issued: none

5. Maneuver Task Force

Overview

The Task Force provides and defines information, best practices, and standards for maneuvers of on-road Automated Driving Systems (ADS) for automation Levels 3 (“Conditional Automation”), 4 (“High Automation”), and 5 (“Full Automation”).

Documents

SAE J3164 — Ontology and Lexicon for Automated Driving System (ADS)-Operated Vehicle Behaviors and Maneuvers in Operating Scenarios

- Provides a high-level ontology and lexicon for describing on-road ADS-operated vehicle behavioral competencies and driving maneuvers that comprise performance of the complete dynamic driving task (DDT) and/or DDT fallback. It also provides definitions of behavior, maneuver, fallback maneuver, scenario, and scene that may support ADS safety performance evaluation. Issuance expected by mid-2021.
- Previous versions issued: none

6. J3018 Task Force

Overview

This Task Force provides preliminary safety-relevant guidance for in-vehicle fallback test driver training and for on-road testing of vehicles being operated by prototype conditional, high, and full (Levels 3 to 5) ADS, as defined by SAE J3016. However, guidance is not included for evaluating the performance of post-production ADS-equipped vehicles.

Documents

SAE J3018 – Safety-Relevant Guidance for On-Road Testing of Prototype Automated Driving System (ADS)-Operated Vehicles.

- Document updated to incorporate content from Automated Vehicle Safety Consortium publication “AVSC Best Practice for In-Vehicle Fallback Test Driver Selection, Training, and Oversight Procedures for Automated Vehicles Under Test”. Issued December 2020.
https://www.sae.org/standards/content/j3018_202012/
- Previous versions issued: Sep. 2019, Mar. 2015

7. Infrastructure Needs Related to Automated Driving

Overview

The Task Force is working to identify, prioritize, and define roadway infrastructure characteristics that benefit vehicles with automated driving technologies. The Task

Force plans to develop performance-based documents that can be used to cost-effectively evolve roadway infrastructure standards and specifications to support automated technologies, while continuing to support human driver needs.

Documents

In process of being established

8. Simulation Task Force

Overview

The Task Force is working to document guidance on various factors to consider for using simulations to assist in the development, implementation, and verification & validation of ADS for on-road motor vehicles.

Documents

In process of being established

9. AV Test Site Community of Practice Task Force

Overview

The Task Force is working to review best practices and develop test site operations safety practices and linking these to on-road testing. This is intended to result in performance-based information reports, frameworks, recommended practices, and guidance documents that can be used to assist test sites in the development of ADS testing within real-world representative conditions and environments.

Documents

SAE J3247 – Automated Driving System Test Facility Safety Practices

- This document is in the early stages of development. Its scope will include the following topics: definitions, risk assessment, insurance, test requirements, organization, safety, and cyber/physical security.
- Previous versions issued: none

Truck and Bus Automation Safety Committee

Overview

The Truck & Bus Automation Safety Committee of the Truck and Bus Brake and Advanced Driver Assistance Systems Steering Committee is responsible for developing, reviewing, and approving standards, recommended practices and information reports related to the safety of heavy vehicle automation systems. Systems falling within the scope of the committee include both momentary warning and intervention (i.e., active safety systems) and sustained operation of the dynamic driving task (i.e., ADS). The committee focuses on operations of technology that interface with professional drivers and onboard operators, fleet management systems, periodic interactions with inspectors and law enforcement, and vehicle cooperative systems (e.g., platooning). The committee currently consists of four task forces.

1. Taxonomy and Definitions Task Force

Overview

This task force focuses on developing a taxonomy for heavy and commercial vehicle driving automation systems including single-unit and combination-vehicle trucks and buses. The taxonomy ranges in level from no automation (Level 0) to full automation (Level 5). The task force recognizes the taxonomy provided in SAE J3016 while seeking to identify the differences on how heavy vehicles operate. For instance, J3016 does not address operation by professional drivers within regulated hours of service or vehicles that typically tow trailers or articulated bodies.

Documents

J3150 - Taxonomy and Definitions for Automated Truck and Bus Systems

- This document is in the early stages of development. This document will provide a taxonomy and definitions for trucks and buses with GVWR of more than 10,000 pounds with driving automation systems that perform part or all of the dynamic driving task on a sustained basis.
- Previous versions issued: none

2. Lane Departure Warning Task Force

(Note: While this Task Force does not directly address automation, its information is provided for completeness.)

Overview

Lane-departure crashes represent the crash-type which results in the greatest number of annual highway fatalities. The Lane Departure Warning Task Force focuses on technologies, techniques, and performance of commercial vehicle truck and bus lane departure warning systems.

Documents

SAE J3045 — Truck and Bus Lane Departure Warning Systems Test Procedure and Minimum Performance Requirements

- Provides working definitions, test procedures, and a set of minimum performance requirements for lane departure warning systems for commercial vehicle trucks and buses. This document was updated in August 2018 with the addition of minimum performance requirements.
- Previous versions issued: July 2015

3. Forward Collision Task Force

(Note: While this Task Force does not directly address automation, its information is provided for completeness.)

Overview

Forward collisions involving trucks and buses are often catastrophic because of the mass of the vehicle and the energy carried by them at the point of the collision. The Forward Collision Task Force focuses on technologies, techniques, and performance of commercial vehicle truck and bus forward collision and mitigation systems.

Documents

SAE J3029 — Forward Collision Warning and Mitigation Systems Vehicle Test Procedure and Minimum Performance Requirements

- Provides working definitions, test procedures, and a set of minimum performance requirements for forward collision warning and mitigation systems for commercial vehicle trucks and buses. The document is presently under five-year review and update; the update adds minimum performance requirements. Issuance expected by mid-2021.
- Previous versions issued: Oct. 2015

4. Multi-vehicle System Task Force

(Note: While this Task Force does not directly address automation, its information is provided for completeness.)

Overview

This task force addresses many of the issues which arise with the operation of multiple heavy vehicles (e.g., platoons). Many safety and operational issues arise for the coordination and performance of these vehicles. This task force started by looking at “real-world” fuel efficiency metrics in platoons, and as automation proliferates, work is underway to align commercial vehicle concerns, operations, and definitions with passenger car operations and definitions.

Documents

J3147 - Assessment of Evaluation Method Types to Determine Operational Efficiency of Multi-Vehicle Systems

- This document provides an assessment of engineering test and simulation methods that utilize industry accepted data collection and statistical analysis methods to determine the efficiency of multi-vehicle systems comprised primarily of trucks and buses with GVWR of more than 10,000 pounds. The document also provides guidance on the applicability and use of each method discussed. This document is in development.
- Previous versions issued: none