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SAE On-Road Automated Driving (ORAD) Committee
ADS Standardization Activity

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May/June 2024

Agenda

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1. ORAD Overview
2. ORAD Projects
3. ADS Standards Summary
4. Future Projects
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1. ORAD Overview

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SAE On-Road Automated Driving (ORAD) Committee

Role/Responsibility:

- Develop and maintain SAE standards, recommended practices, and information reports related to motor vehicle driving automation system features, focused primarily on Automated Driving Systems (ADS) [L3-5]
- Coordinate with, and contribute to, activity for driver assistance technology.

ORAD Organization (current):

- **ORAD Committee**
  - **Definitions Task Force**
    - **ISO/SAE Automation Taxonomy & Definitions JWG**
  - **Reference Architecture and Interfaces (RAI)**
  - **Maneuver Task Force**
  - **Verification and Validation Task Force**
  - **Simulation Task Force**
  - **AV Testing Community of Practice Task Force**
  - **Identifying ADS-DV User Issues for Persons w/ Disabilities**
  - **Infrastructure Needs Related to Automated Driving**
  - **ADS Safety Management System Task Force**

ORAD Task Forces cover full range of matters related to automated driving. New projects and TFs can be added based on industry and user needs.

ORAD global membership including: ADS Developers, Automotive OEMs, Suppliers, Technology Companies, Academia, Government, Customer Advocacy Groups.

2. ORAD Projects - Released

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< ORAD Task Forces >	< Projects >
Definitions Task Force	
ISO/SAE Automation Taxonomy & Definitions JWG	J3016_202104 **Taxonomy and Definitions** for Terms Related to Driving Automation Systems for On-Road Motor Vehicles
Reference Architecture and Interfaces (RAI)	J3131_202203 **Definitions for Terms** Related to Automated Driving Systems **Reference Architecture**
Maneuver Task Force	J3164_202301 **Ontology and Lexicon** for Automated Driving System (ADS)-Operated Vehicle **Behaviors and Maneuvers** in Routine/Normal Operating Scenarios
Verification and Validation Task Force	J3206_202107 Taxonomy and Definition of **Safety Principles** for Automated Driving System (ADS)
Simulation Task Force	
AV Testing Community of Practice Task Force	J3018_202012 **Safety-Relevant Guidance for On-Road Testing** of Prototype Automated Driving System (ADS)-Operated Vehicles
	J3247_202403 Automated Driving System **Test Facility Safety** Practices
Identifying ADS-DV User Issues for Persons w/ Disabilities	J3171_201911 Identifying Automated Driving Systems-Dedicated Vehicles (ADS-DVs) **Passenger Issues for Persons with Disabilities**
Infrastructure Needs Related to Automated Driving	
ADS Safety Management Systems TF	

Current released projects establish the foundations in key areas of need.

2. ORAD Projects - Released

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< Document Scope >

Task Force	Document	Scope
AV Test Site Community of Practice Task Force	J3018_202012 Safety-Relevant Guidance for On-Road Testing of Prototype Automated Driving System (ADS)-Operated Vehicles	Safety-relevant guidance for in-vehicle fallback test driver training and for testing prototype automated driving systems (ADS) equipped on test vehicles operated in mixed-traffic environments on public roads
	J3247_202403 Automated Driving System Test Facility Safety Practices	Guidance for test facilities in identifying potential hazards, and safety risks, along with requirements and recommendations related specifically to testing of ADS and ADS-operated vehicles.
Identifying ADS-DV User Issues for Persons with Disabilities Task Force	J3171_201911 Identifying Automated Driving Systems-Dedicated Vehicles (ADS-DVs) Passenger Issues for Persons with Disabilities	Literature review, along with results from expert interviews, regarding universal design principles and guidance for the development of automated driving systems-dedicated vehicles (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.
ORAD Reference Architecture and Interfaces Task Force	J3131_202203 Definitions for Terms Related to Automated Driving Systems Reference Architecture	Reference functional architecture and describes the functional components and relationships between them of a typical on-road automated driving system (ADS) software architecture, as well as providing related terms and definitions.
On Road Automated Driving Maneuver Task Force	J3164_202301 Ontology and Lexicon for Automated Driving System (ADS)-Operated Vehicle Behaviors and Maneuvers in Routine/Normal Operating Scenarios	High-level ontology and lexicon for describing on-road ADS-operated vehicle behavioral competencies and driving maneuvers that comprise routine/normal performance of the complete DDT. It provides definitions of behavior, maneuver, scenario, and scene.
On-Road Automated Driving Definitions Task Force ISO/SAE Automation Taxonomy and Definitions Joint Working Group	J3016_202104 Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles	Taxonomy with detailed definitions for six levels of driving automation, ranging from no driving automation (Level 0) to full driving automation (Level 5), in the context of [motor] vehicles and their operation on roadways.
On-Road Automated Driving Verification and Validation (V&V) Task Force	J3206_202107 Taxonomy and Definition of Safety Principles for Automated Driving System (ADS)	Classifies and defines a harmonized set of safety principles intended to be considered by ADS and ADS-equipped vehicle development stakeholders.

2. ORAD Projects – In progress

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< ORAD Task Forces >	< Projects >
Definitions Task Force	J3259 Taxonomy & Definitions for **Operational Design Domain** for Driving Automation Systems
ISO/SAE Automation Taxonomy & Definitions JWG	J3016 (ISO 22736) **Taxonomy and Definitions** for Terms Related to Driving Automation Systems for On-Road Motor Vehicles
Reference Architecture and Interfaces (RAI)	
Maneuver Task Force	
Verification and Validation Task Force	J3237 **Operational Safety Metrics** for Verification and Validation of Automated Driving Systems
	J3208 Taxonomy and Definitions of ADS **Verification & Validation**
Simulation Task Force	J3279 Best Practices for Developing and Validating **Simulations** for Automated Driving Systems
AV Testing Community of Practice Task Force	J3018 Safety-Relevant Guidance for **On-Road Testing** of Prototype ADS-Operated Vehicles
Identifying ADS-DV User Issues for Persons w/ Disabilities	J3261 Resources for accommodating the **needs of persons with disabilities** when using ADS-DVs
Infrastructure Needs Related to Automated Driving	J### - Unique **infrastructure needs** for safe operation of ADS.
ADS Safety Management Systems TF	J3320 - ADS **Safety Management Systems** (SMS)

On-going and future projects build on previous efforts and are expanded to fill industry needs.

2. ORAD Projects – In progress

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< Document Scope >

Task Force	Project	Scope	Status
AV Test Site Community of Practice Task Force	J3018 Safety-Relevant Guidance for On-Road Testing of Prototype Automated Driving System (ADS)-Operated Vehicles	Update based on reflection on J3247, identified needs and opportunities for added value in guidance and recommendations for on-road testing of ADS-operated vehicles.	Scoping and needs definition
Identifying ADS-DV User Issues for Persons with Disabilities Task Force	J3261 Resources for accommodating the needs of persons with disabilities when using ADS-DVs	Recommendations for use in the design and development of ADS-DVs based on the identified needs of PWDs. Specific areas addressed include accessible information and communication technology (ICT), and mobility aid accommodations..	Balloting
On Road Automated Driving Simulation Task Force (ORAD Committee)	J3279 Best Practices for Developing and Validating Simulations for Automated Driving Systems	Best practices for developing and validating simulations in support of ADS for on-road motor vehicles, as well as validation of ADS models.	In progress
On-Road Automated Driving Definitions Task Force (ORAD Committee)	J3259 Taxonomy & Definitions for Operational Design Domain (ODD) for Driving Automation Systems	Terminology, definitions and taxonomy for use in describing an ODD for a driving automation system and is intended to be considered by driving automation system and driving automation system-equipped vehicle development stakeholders	In progress
ISO/SAE Automation Taxonomy and Definitions Joint Working Group	J3016 Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles	Update to J3016 based on feedback and proposals from industry and users to improve clarity and usability and prevent confusion.	In progress
On-Road Automated Driving Verification and Validation (V&V) Task Force	J3208 Taxonomy and Definitions of ADS Verification and Validation	Taxonomy and definitions for describing concepts related to V&V of ADS and ADS-operated vehicles. It provides a taxonomy and hierarchy based on data source and classification to assist in clarifying how data for the operational safety assessment (OSA) metrics can be obtained.	Near to ballot
	J3237 Operational Safety Metrics for Verification and Validation of Automated Driving Systems (ADS)	Definitions, taxonomy, and characteristics for driving safety assessment (DSA) metrics that can be used in quantifying the safety performance of ADS and ADS-operated vehicles.	Balloting

3. ADS Standardization Summary*

Released | WIP

*Note: non-exhaustive

< Standards >

SAE

- J3016-Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles
- J3206-ADS Safety Principles
- J3018-Safety-Relevant Guidance for On-Road Testing of Prototype Automated Driving System (ADS)-Operated Vehicles
- J3131-Automated Driving Reference Architecture
- J3164-Taxonomy and Definitions for Terms Related to ADS Behaviors and Maneuvers for On-Road Motor Vehicles
- J3171-ADS-DV User Issues for Persons w/ Disabilities
- J3247-Automated Driving System Test Facility Safety Practices
- J3208-Taxonomy and Definitions of ADS Verification & Validation
- J3237 – Operational Safety Metrics for Verification & Validation of Automated Driving Systems (ADS)
- J3279 - Best Practices for Applying Simulations in Driving Automation System Development
- 3259-Taxonomy & Definitions for ODD for Driving Automation Systems
- 3261-Resources for accommodating the needs of persons with disabilities when using ADS-DVs
- J3216-Taxonomy and Definitions for Terms Related to Cooperative Driving Automation for On-Road Motor Vehicles
- 3300/3-Automated Driving System Fallback Test Driver Skill Certification

ISO

- ISO/TR 4804 Road Vehicles – Safety and security for automated driving systems – Design, verification and validation methods
- ISO/DTS 5083 Road Vehicles – Safety and security for automated driving systems – Design, verification and validation
- ISO/TR 34501 Road vehicles - Test scenarios for automated driving systems — Vocabulary
- ISO/TR 34502 Road vehicles - Test scenarios for automated driving systems — Scenario based safety evaluation framework
- ISO/TR 34503 Road vehicles - Test scenarios for automated driving systems — Specification for operational design domain
- ISO/TR 34504 Road vehicles - Test scenarios for automated driving systems - Scenario categorization
- ISO/TR 34505 Road vehicles - Test scenarios for automated driving systems — Scenario evaluation and test case generation

UL

- UL4600 Standard for Safety for the Evaluation of Autonomous Products

IEEE

- 2846_2022 Assumptions for Models in Safety-Related Automated Vehicle Behavior
- P2846a Assumptions in Safety-Related Models for Automated Driving Systems Amendment: Additional scenarios and road users
- P3321 Recommended Practice for the Application of Assumptions on Reasonably Foreseeable Behavior of Other Road Users

BSI

- PAS 1881 Assuring the operational safety of automated vehicles
- PAS 1882 Data collection and management for automated vehicle trials for the purpose of incident investigation
- PAS 1883 Operational Design Domain (ODD) taxonomy for an automated driving system (ADS)
- PAS 1884 Safety operators in automated vehicle testing and trialing
- BSI Flex 1889 Natural language description for abstract scenarios for automated driving systems
- BSI Flex 1890 - CAM Vocabulary A dynamic and interactive vocabulary of key CAM terms, abbreviations and acronyms

3. ADS Standardization Summary

Released | WIP

< Best Practices, Other >

SAE AVSC

- AVSC00001201911-Best Practice for in-vehicle fallback test driver (safety operator) selection, training, and oversight procedures for automated vehicles under test
- AVSC00002202004-Best Practice for Describing an Operational Design Domain: Conceptual Framework and Lexicon
- AVSC00003202006-AVSC Best Practice for Passenger-Initiated Emergency Trip Interruption
- AVSC00004202009-AVSC Best Practice for Data Collection for Automated Driving System-Dedicated Vehicles (ADS-DVs) to Support Event Analysis
- AVSC00005202012-AVSC Best Practice for First Responder Interactions w/ Fleet-Managed Automated Driving System-Dedicated Vehicles (ADS-DV)
- AVSCAVSC00006202103-AVSC Best Practice for ADS Safety Assurance – Metrics & Methods
- AVSC00008202111-AVSC Best Practice for ADS Safety Assurance – Behavioral Competencies
- AVSC00007202107-AVSC Best Practice for Safety Management Systems (SMS)
- AVSC00009202208-AVSC Best Practice for Interactions Between ADS-DVs and Vulnerable Road Users (VRUs)
- AVSC00010202304-AVSC Information Report for Change Risk Management
- AVSC00011202307-AVSC Best Practice for Continuous Monitoring and Improvement after Deployment
- AVSC00012202308-AVSC Best Practice for Developing ADS Safety Performance Thresholds Based on Human Driving Behavior

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Standardization Goal:

- **Develop and release documents that provide value to the end user and industry.**

Key Challenges:

1. **Maintaining consistency and alignment across projects (across and within SDOs).**
2. **Balancing speed to publication of standards considering completeness, quality and urgency.**

3. ADS Standardization Summary

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To help facilitate consistency and alignment in standardization, Committee/TF members are often engaged across SDOs and related topics.

Example: ORAD Committee

< Within SAE >

- Driving Automation Systems Committee
- Advanced Driver Assistance Systems (ADAS) Committee
- Active Safety Systems Standards Committee
- Cooperative Driving Automation (CDA) Committee
- Driving Skills Standards Committee - Automated Driving WG
- V2X Technical Committee
- Functional Safety Committee
- Event Data Recorder Committee
- Automated Vehicle Safety Consortium

ORAD Committee

< External>

- ISO TC22 SC32 WG13 Safety for driving automation systems
- ISO/TC 22/SC 33/WG 9 Test scenarios of automated driving systems
- ISO TC204 WG14 Intelligent transport systems
- IEEE AV Decision Making WG
- UNECE WP29 - Working Party on Automated/Autonomous and Connected Vehicles
- UL4600 - Standard For Evaluation Of Autonomous Products

4. Future Projects

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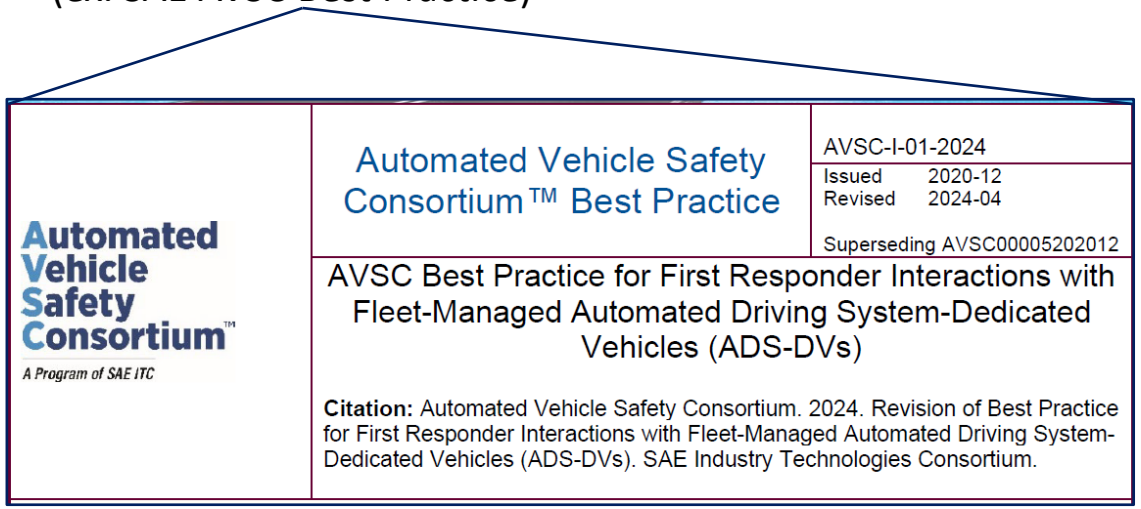
ADS Interaction w/ First Responders

- New project proposal within *ORAD Infrastructure Needs Related to Automated Driving TF*.
- Purpose: Help first-responders establish protocols, procedures, and plans for interaction with ADS-DVs.
- Action: Develop Recommended Practice including: clearly defined roles, expected use cases, interaction recommendations.
- Build on existing efforts to enhance activities (ex. SAE AVSC Best Practice)



Automated Vehicle Safety Consortium
A Program of SAE ITC

Automated Vehicle Safety Consortium™ Best Practice

AVSC-I-01-2024
Issued 2020-12
Revised 2024-04

Superseding AVSC00005202012

AVSC Best Practice for First Responder Interactions with Fleet-Managed Automated Driving System-Dedicated Vehicles (ADS-DVs)

Citation: Automated Vehicle Safety Consortium. 2024. Revision of Best Practice for First Responder Interactions with Fleet-Managed Automated Driving System-Dedicated Vehicles (ADS-DVs). SAE Industry Technologies Consortium.

ADS Usage Specification

- New project proposal within *ORAD Definitions TF*.
- Purpose: Improve and facilitate stakeholder understanding and definition of ADS operational usage.
- Actions:

  ST: Establish terminology and definitions for “usage specification” and related elements, with relationships between elements.

  MT: Associate use cases with reasonably foreseeable scenarios

  LT: Develop database for stakeholder usage specification definition.

5. Summary

- SAE ORAD Committee scope covers a broad range of topics related to automated driving, with a diverse membership of experts from the full range of stakeholders in ADS development and deployment.
- ORAD has developed and released documents across a broad spectrum of automated driving topics, with multiple projects on-going to fill holes in the needs of industry as well as updating and enhancing existing documents.
- Future projects are being considered to expand and fill holes identified in the industry.

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