

# Summary of AV Safety Forum Workshop (September 2022): AV Safety Management System (SMS) Framework Design and Proposed Partnership

The AV Safety Forum held a virtual workshop in two sessions on the afternoons of September 14 and September 15, 2022. Both sessions focused on the Forum's ongoing efforts to design an AV SMS Framework that addresses the entire AV value chain, including engineering, manufacturing, supply chain, service (maintenance), and operations. The second session also introduced a proposal to form a Safety Data-Sharing Partnership among AV developer organizations. This partnership would support collective safety analyses and risk mitigation initiatives on a scale not possible through the efforts of individual organizations.

The first session began with an introduction to the Forum and its members, who are safety management practitioners from ten participating AV developer organizations pursuing the following outcomes:

- effectiveness of managing safety compliance and risk
- efficiency in development of safety management capabilities
- transparency to assist regulators and other third parties in understanding how we are managing safety
- partnership to achieve improved safety interoperability with our motor vehicle equipment manufacturing partners and infrastructure owners.

The introduction was followed by a presentation and discussion of strategic objectives for the Forum's design of an AV SMS Framework. Among these objectives are to:

- effectively address risk within automotive equipment manufacturing functions and cover AV operations
- tailor the Framework to the AV-specific regulatory environment
- align safety, quality, and security as a single management system without duplicating functions
- derive the Framework from a comprehensive set of consensus standards
- document the Framework at a detailed level for practitioners and a high level for ease of communication to leadership and stakeholders

Members also agreed that the AV SMS Framework should leverage existing standards and best practices, including the AVSC best practice that adapts existing SMS practices from aviation and other industries to SMS for AV testing and evaluation.

Moving forward, these consensus objectives will be used to:

- align on high-level industry value chain terms
- align on key safety functions to address strategic objectives for AV SMS
- align with SMS standards bodies and regulators to develop an AV SMS standard tailored to the AV regulatory environment

To align on high-level industry value chain terms, the following five business functions were identified: engineering, manufacturing, supply chain, service (maintenance), and operations. Ten organizations participated in an exercise to indicate the business functions that they perform. Results showed that most of the organizations performed all five functions, but manufacturing and supply chain were not in scope for several organizations. This highlights the need for an AV SMS Framework that addresses the entire AV value chain while providing individual organizations with flexibility for implementation.

To align on key safety functions of the AV SMS Framework, the following 16 functional components were proposed for initial consideration:

- leadership and culture (key safety roles, org structure, culture mgt)
- planning (policy/objectives, compliance, resources, promotion/communication)
- risk management (system safety, e.g., ISO 26262)
- training and competency
- document and records management
- operational planning and control
- requirements management, process documentation
- design and development
- supplier (vendor/contractor) management
- provisioning (supply chain)
- release of products and services
- control of nonconforming outputs
- governance (assurance, monitoring/measurement, management review, continual improvement)
- employee engagement
- event reporting
- event management (response and investigations)

The first session of the workshop concluded with an exercise in which 22 participants rated their organization's level of maturity for each of the 16 functions. The second session discussed results of the exercise. The results showed that, for each function, there was significant variability in maturity between participants. Results also showed that, when averaged across participants, there was significant variability in maturity between functions. On average over all participants and functions, maturity was rated 3 on a scale of 1-5. These results suggest that AV organizations would benefit from a comprehensive SMS Framework that can help mature SMS practices across the entire AV value chain.

As part of the exercise, participants indicated that all 16 functions were relevant to AV SMS and no functions appeared to be missing. However, workshop discussions revealed differences in understanding among members and raised questions about what was included in each function. These questions highlight the need to describe and refine the functions such that members can reach consensus on a complete set of component functions.

Next steps for the AV SMS Framework design effort were identified as follows:

- describe functional components in more detail to enable understanding and consensus agreement across all members
- create a high-level depiction of the Framework by grouping component functions into a small set of composite functions for ease of communication
- perform a detailed mapping of existing standards to functional components contained in the Framework
- publish and promote the Framework in outreach to AV standard-setting bodies, regulators, and AV organizations not participating as members of the Forum.

The second session of the workshop also introduced the idea of a Safety Data-Sharing Partnership, which is separate but related to the Forum's pursuit of sharing leading safety practices. The proposed partnership would be formed among AV development organizations (and possibly USDOT) with MITRE serving as a trusted data steward and analyst. The partnership would use aggregated and anonymized partner data to perform collective analysis of safety at scale across the AV industry. Potential benefits would include accurate characterization and communication of overall AV safety performance, and at-scale identification and implementation of the most promising AV safety improvements. As an example, MITRE cited an existing partnership called PARTS (Partnership for Analytics Research in Traffic Safety) that is performing collaborative safety analyses of Advanced Driver Assistance Systems. Next steps for the partnership include a meeting for AV organizations to explore this idea further, including governing principles and candidate topics for a small-scale demonstration study.