

Project No. NCHRP 17-91

# **Assessing the Impacts of Automated Driving Systems (ADS) on the Future of Transportation Safety**

## **Technical Memorandum on Implementation Plan**

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# Introduction

NCHRP serves as a forum for coordinated and collaborative highway research of national importance. The focus of NCHRP is applied research to provide practical, ready-to-implement solutions for state DOTs and transportation professionals at all levels of government and the private sector. While the results of NCHRP research can help to advance the state-of-the-practice and address national priorities, the benefits of NCHRP research are realized only when the results are implemented. In addition to the final NCHRP research report, there is a need for continued efforts to create awareness of the safety assessment framework and facilitate a broad adoption of the framework.

This technical memo identifies the steps, action items, and champions to create awareness and enable state and local agencies to adopt the safety assessment framework developed as part of this research effort. The document highlights four sections: creating awareness, driving adoption, refining, and evaluating implementation of the framework.

## Creating Awareness of the Safety Assessment Framework

The following questions will help to create awareness of the safety assessment framework developed as part of this research:

- Who is the target audience?
- What will be disseminated to the target audience?
- Who will disseminate the safety assessment framework to the target audience?
- How will the framework be introduced to the target audience?

### **Who is the Target Audience?**

The primary audience of this framework includes transportation infrastructure owners and operators (IOOs), Metropolitan Planning Organizations (MPOs), safety industry and advocacy groups, and ADS manufacturers. Federal agencies may find this useful to understand gaps in data collection, management, and analysis tools. The outputs from the framework may support building trust in road users in ADS technology, and therefore the outputs have been framed in a way that is accessible to a broad audience. ADS developers and manufacturers may benefit from data sources and analysis methods to understand safety impacts of their technology as they seek to commercially deploy. For example, this framework may help industry determine and track target safety levels for commercial deployments. It also may help private and public sector stakeholders build public trust in deployments by quantifying safety impacts.

## **What will be Disseminated to the Target Audience?**

The primary product of this research is a framework to help state and local agencies assess the safety impact of ADS. It is designed to guide state and local agencies on how to adapt the framework for a variety of scenarios by providing a general overview and including several use cases as examples. Analysis of the impacts of ADS on safety, traffic flow, and other considerations depends on available data. Data sources revealing ADS safety performance are not publicly available and this lack of data makes this analysis challenging. However, there are other data sources (typically, SAE levels 1 and 2 automation) that can be used as a proxy in the analysis. To forecast safety impacts of ADS with limited data, it is important to understand the underlying factors that influence safety, such as enabling technologies (e.g., sensors, communications), human-machine interaction, and vehicle-to-infrastructure interactions. The framework can help state and local agencies assess when their traditional safety processes and procedures may be impacted and characterize the safety impacts of competing options. This framework also includes processes and procedures to facilitate the safe, phased integration of ADS under different contexts, timeframes, risks, and opportunities.

## **Who will Disseminate the Safety Assessment Framework to the Target Audience?**

Potential champions to help disseminate and promote the guidance include TRB, AASHTO, FHWA, State DOTs individually and through AASHTO, NCHRP Project 17-91 Panel, and private groups that promote safety (e.g., AAA Foundation for Traffic Safety and ITE). The following are specific AASHTO and TRB committees that can provide leadership for the dissemination of the results:

- Governors Highway Safety Association (GHSA)
- AASHTO Standing Committee on Safety,
- AASHTO Standing Committee on Planning (and the Task Force on Connected and Automated Vehicles),
- AASHTO Standing Committee on Design,
- AASHTO Standing Committee on Traffic Engineering (and the Connected Vehicles/Autonomous Vehicles (CV/AV) Subcommittee),
- AASHTO Standing Committee on Data Management and Analytics,
- TRB Standing Committee on Transportation Safety Management Systems (ACS10),
- TRB Standing Committee on Safety Performance Analysis (ACS20),
- TRB Standing Committee on Transportation Planning Policy and Processes (AEP10),
- TRB Standing Committee on Transportation Planning Analysis and Application (AEP15),
- TRB Standing Committee on Performance Effects of Geometric Design (AKD10),
- TRB Standing Committee on Vehicle-Highway Automation (ACP30),
- TRB Standing Committee on Data for Decision Making (AJE70),
- American Association of Motor Vehicle Administrators,
- International Association of Chiefs of Police Highway Safety Committee, and
- The National Sheriffs Association Traffic Safety Committee.

## **How Will the Framework be Introduced to the Target Audience?**

There are opportunities to disseminate the information through presentations, print media (e.g., flyers), and electronic media (e.g., marketing video). Potential venues to deliver presentations and showcase the marketing video include the AASHTO Spring Meeting and committee and subcommittee meetings, TRB annual and midyear committee meetings, and ITE Annual Meeting or Technical Conference. Potential electronic media outlets include TRB e-newsletter, TRB webinar, AASHTO Journal, and transportation-related websites (e.g., FHWA Office of Safety).

AASHTO and other organizations and agencies facilitate the implementation of research results through updates to their standards and manuals. While the above venues and media outlets provide an opportunity to inform the target audience of the availability of the safety assessment framework, updates to manuals, policies, procedures, and guidelines will help to formalize the implementation of results in practice. For instance, the research results could be integrated into future updates/editions of the AASHTO *Highway Safety Manual*, and state/local planning and project development policies and practices.

## Driving Adoption of the Framework

For successful adoption, the framework should address the common challenges faced by state and local agencies when planning for or deploying ADS applications. The framework was developed based on input from state and local agencies and was designed to be flexible to adapt as newer technologies and data becomes available. However, there are some potential challenges that may hinder adoption of the framework. These may include:

- Lack of awareness of the safety assessment framework for ADS,
- Uncertainty of the value of the framework processes, and/or
- Lack of confidence in methodologies presented in the framework.

To facilitate implementation, we have identified the following opportunities to overcome these challenges.

### **Lack of Awareness of the Safety Assessment Framework for ADS**

The project team developed and delivered presentations during the project as the first step to raising awareness of the framework and the various steps involved in evaluating ADS. The presentations reached a wide audience and included both public and private entities in transportation. Public entities included state departments of transportation (DOTs), research institutions, IOOs, MPOs, and organizations responsible for developing standards. Private entities included original equipment manufacturers (OEMs), technology companies, and traffic control device manufacturers. The project team also provided updates to the NCHRP 20-102 Panel (Impacts of Connected Vehicles and Automated Vehicles on State and Local Transportation Agencies) to share progress and summarize accomplishments of the project.

Apart from these presentations, the research team has developed a marketing video in collaboration with three state DOTs and a technology provider. This video aims to create awareness of the safety assessment framework among IOOs. The team also created a presentation that can be presented by TRB leadership in various venues to help create awareness.

Potential future venues to deliver presentations and share the marketing video include AASHTO committee and subcommittee meetings, TRB annual and midyear committee meetings, and ITE annual meetings or technical conferences. The activities described in the previous section of this implementation plan will be a critical component of raising awareness.

To further market the safety assessment framework, it would be useful to develop a one-page infographic that explains what the framework steps are and how it can be used for assessing the safety impact of ADS applications.

## **Uncertainty of the Value of the Framework Processes**

Demonstrating the value of research can be difficult. The primary benefit of the framework is a means to assess (qualitatively and quantitatively) the safety impacts of ADS on transportation within the deployment region. While the framework includes examples to demonstrate the application of the steps described, there will likely be skeptics. To appease the skeptics, and further demonstrate the value of the research, it may be useful to develop case studies based on early adopters. The case studies could describe an agency's traditional approach to assessing safety impacts of emerging technologies and then demonstrate how the agency employed the safety assessment framework to enhance its traditional approach. It may be appropriate to utilize NCHRP Implementation Funding Assistance to provide technical assistance to an early adopter and then develop a case study report.

## **Lack of Confidence in Methodologies Presented in the Framework**

The research team collaborated not only with two state DOTs to pilot and refine the framework but worked closely with the Panel to develop reliable and flexible steps to assess the safety impact of ADS on transportation. This helps to ensure the results will be acceptable, defensible, and useful to practitioners. The research team has presented results of the pilot studies and three other examples in the report to help readers better understand the value of the research. Though connected and automated vehicle data is not readily available to quantify the benefits, the framework provides a reliable way to measure and estimate potential impacts and benefits. Beyond the soundness of the methods and the indication of objective measures of quality, it may be useful to develop case studies based on early adopters as described in the previous challenge. Further, the research team has documented potential future research needs as it relates to this framework.

# Refining the Framework

The framework provides a comprehensive process (series of steps) to help agencies assess the impacts of ADS on the future of transportation safety. This process currently relies on several assumptions related to the expected ADS deployment rate, performance, and ability to influence the sequence of crash contributing events. Given the limited number of ADS deployments and related safety evaluations, there is not an abundance of research to support these assumptions. There is also not an abundance of ADS related crash data or performance data readily available to use in assessments / evaluations.

As identified in the future needs' technical memorandum, there are several opportunities to conduct future research in support of the framework, particularly as technology continues to evolve. The results of the research can be used to directly inform the underlying assumptions and refine the framework steps as necessary. Furthermore, state and local agencies should use any new ADS related data and technology updates to revisit the framework and update steps as needed to keep the framework relevant as the ADS market landscape changes. Finally, as state and local agencies adopt the framework, they should look for opportunities to tailor the steps based on specifics that may apply only to their geographies (e.g., adverse weather conditions in Northern states can impact ADS functionality thereby impacting safety as well). As the framework gets refined over time, the results become more reliable and the decisions it supports become more informed.

# Evaluating Implementation

The primary criterion for judging progress in implementation of the results will be the extent to which agencies are using the safety assessment framework to understand the safety impacts of planned ADS deployments. This criterion may be difficult to measure, but interviews or surveys could be conducted to determine awareness and application of the framework. Other measures related to dissemination can serve as a surrogate, including the number of related outreach activities (e.g., number of presentations delivered, number of articles published), and the number of guidance documents and NCHRP reports distributed or downloaded.