FORUM ON PREPARING FOR AUTOMATED VEHICLES AND SHARED MOBILITY

Guide for Participants

The National Academies of SCIENCES • ENGINEERING • MEDICINE
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WHAT IS A NATIONAL ACADEMIES-TRB FORUM?

A National Academies Forum (also known as a Roundtable) convenes representatives of government, industry, academia, and professional organizations on an ongoing basis for the identification and discussion of issues of mutual concern. Representatives of these organizations participate fully on a Forum, as members are not subject to the usual National Academies’ conflict of interest restrictions. Forum sponsoring organizations determine the Forum agendas. A Forum may commission authored papers and other resources for its use and for dissemination, and it may sponsor convening activities such as sessions and workshops to inform the Forum participants.

WHAT IS THE OBJECTIVE OF THIS FORUM?

The objective of this Forum is to bring together public, private and research organizational partners to share perspectives on the critical issues surrounding the deployment of automated vehicles and shared mobility. A key emphasis is on the discussion, identification, and facilitation of evidence-based research needed to deploy these technologies in a manner and timeframe that informs policy to best meet long-term societal goals. These goals include increasing safety, reducing congestion, enhancing accessibility, increasing environmental and energy sustainability, and encouraging economic development and equity.

WHAT IS THE WORK PLAN FOR THE FORUM?

The work plan for the Forum includes the following elements:

- Identifying Research Needs and Priorities
- Engaging the Broader Stakeholder Community
- Facilitating the Conduct of the Research
- Sharing Information and Perspectives
Sharing information and perspectives to help prepare Forum participants for automated vehicles and shared mobility

- Holding face-to-face meetings of Forum participants at least twice a year, supplemented by webinar/conference calls
- Sharing perspectives on issues and developments to help organizations prepare for incorporating automated vehicles and shared mobility services into the transportation system
- Sharing information on ongoing and recently completed activities and research that can help meet the long-term societal goals noted above
- Commissioning authored papers and conducting workshops to inform the Forum and/or to provide perspectives on Forum discussions
- Sponsoring a Forum webpage and an e-Groups community to provide information resources and discussion forums for Forum participants

Identifying research needs and priorities

- Supporting the development of a research roadmap that identifies the highest research priorities needed to meet the goals listed in the Forum Objective
- Supporting efforts to keep the research roadmap up-to-date on an ongoing basis
- Ranking and addressing the top critical issues of concern to Forum participants
- Preparing white papers providing the latest state of knowledge on each of the Forum’s top critical issues

Facilitating the conduct of the needed research

- Providing input for research to be conducted by TRB’s cooperative research programs and by other research organizations
- Raising issues that might be addressed through consensus policy and other studies conducted by the National Academies of Sciences, Engineering, and Medicine, and TRB
- Forming and pursuing research partnerships outside of the National Academies and TRB to conduct and support needed research

Engaging the broader stakeholder community

- Sponsoring sessions at the annual TRB Automated Vehicle Symposium and the TRB Annual Meeting
- Conducting webinars and other virtual events to share information with the broader stakeholder community
- Partnering with relevant TRB standing committees to support their activities in this area, including conferences, workshops, and/or webinars
- Participating in activities of other organizations and at other appropriate venues to keep Forum sponsors and others up-to-date on all of the above
WHAT ARE THE FOCUS AREAS FOR THE FORUM?

Forum participants collectively determine the priority areas to be addressed. Participants generated the following focus areas for the Forum during convening activities prior to and since the formation of the Forum, beginning in 2016:

IMPACTS ON SAFETY

- Potential safety scenarios during the transition to highly automated vehicles
  - Educating drivers on AV capabilities
  - Re-engaging drivers’ attention when human intervention needed
- Potential adverse impacts on safety due to AVs
- Liability in a world of AVs
- Minimum set of safety data needed for AV operations and crashes
- Safe operations of commercial vehicles

TRANSPORTATION SYSTEM IMPACTS

- Infrastructure enablers for connected/automated vehicles and shared mobility
- Critical paths to level 4/5 automation for light and heavy-duty vehicles (use cases)
  - Timeline scenarios
- Synergy within the transportation ecosystem
  - Convergence between connected, automated, and traditional vehicles
  - Urban/suburban/intercity/rural environments
  - Heavy duty vehicles/light duty vehicles/transit/bikes/pedestrians
- Potential impacts of automated vehicles and shared mobility on traveler behavior and freight movement
- AV deployment in a shared mobility environment
SOCIAL, ENVIRONMENTAL, ENERGY, AND ECONOMIC IMPACTS

- The net positive and negative social impacts of AV deployment and shared mobility
  - Managing unintended consequences (e.g., security, privacy, labor impacts, insurance)
  - What are the right metrics and measurements that should be used to improve social outcomes?
  - Diverse planning tools to address key social and environmental transportation issues
- Alternative scenarios for synergy among AVs, shared mobility, and alternative fuels
- Addressing social inclusion and equity in shared mobility
- Impacts on land use, and how land use impacts AVs and shared mobility

DATA AND ANALYSIS CONSIDERATIONS

- How big will the data be?
  - Limitations and capabilities of future technologies and the cellular network
  - Document best practices in data curation, sharing, and management
- Public sector use of private sector data
- Meeting cybersecurity and privacy challenges
- Protocols for data sharing and management for evolving freight supply chains
- Framework for connected vehicle pilot and smart cities data analytics for policy guidance

CROSS-CUTTING TOPICS

- Cooperative national research planning for automated vehicles and shared mobility systems
  - Widely shared and continuously updated research roadmap
- Precursory policy analysis for these technologies and services
  - Impacts on the traditional roles of the public and private sectors
  - Policy framework for government intervention
- Scenario planning (with critical paths) and use cases
  - Inform future vision and planning
  - Rate of deployment of mixed fleet, and implications
  - Impacts on land use; density
  - Common set of deployment tools for freight operations
- What constitutes success/failure of pilots and deployments?
- Education
  - Training for all users
  - Clarifying the value of new systems/technologies
WHO ARE THE FORUM PARTICIPANTS?

Forum participants include representatives from Sponsor Organizations, key TRB Committees, and Partner Liaisons.

SPONSOR ORGANIZATIONS

National Academies' Forums are supported by financial contributions from Sponsor Organizations. Annual dues levels for this Forum are below.

<table>
<thead>
<tr>
<th>ORGANIZATION TYPE</th>
<th>ANNUAL DUES*</th>
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<tr>
<td>Federal/State Government</td>
<td>$25,000</td>
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<tr>
<td>Private For-Profit</td>
<td>$8,000 - $25,000</td>
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<tr>
<td>Universities/Non-Profit</td>
<td>$8,000</td>
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<tr>
<td>Regional/Local Government</td>
<td>$5,000</td>
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*Discounts ranging from 10% to 100% are available for TRB Global Affiliate organizations. For more information, go to https://www.nationalacademies.org/trb/support-trb.

Each Sponsor Organization may nominate its own representative to the Forum. Sponsor Organizations collectively determine the focus areas and priorities for the Forum and set the agenda for Forum convening activities.

Travel assistance to participate in Forum meetings is available to public agency Sponsor Organizations.

Sponsor Organizations have included the following:

**Federal, State, and Local Agencies**
- Federal Agencies
  - US Department of Transportation
  - US Department of Energy
  - Transport Canada
- State Transportation Agencies
  - Arizona DOT
  - Caltrans and California DMV
  - Florida DOT
  - Michigan DOT
  - Minnesota DOT
  - Ohio DOT
  - Virginia DOT
  - Washington State DOT
  - Washington State Transportation Commission
• Local Transportation Agencies
  o Jacksonville Transportation Authority
  o Maricopa Council of Governments
  o Maricopa County DOT
  o New York City Department of Transportation

**Academic and Research Institution Participants**
• AAA Foundation for Traffic Safety
• Southwest Research Institute
• Texas A&M Transportation Institute
• University of Arizona
• University of California System
• University of Michigan

**Private Sector Participants**
• Alliance for Automotive Innovation
• Alta Planning & Design
• Cubic Transportation Systems
• Econolite
• Emerging Transport Advisors
• Foretellix
• Lyft
• Stanley Consultants
• Toyota
• Uber
• Waymo
• WSP USA

**TRB COMMITTEES**

Selected TRB committees are represented on the Forum. TRB committee representatives bring to the Forum the knowledge, activities, and contacts generated by their committees. In addition, these representatives provide their committees with information and contacts that could help support committee activities in this area, including the development of conferences, sessions, workshops, and/or webinars. Each TRB standing committee representative reports back to his/her committee on the outcomes of Forum activities and discussions as they pertain to the interests of the committee.

• TRB Executive Committee
• TRB Standing Committees
  o Emerging Technology Law
  o Innovative Public Transportation Services and Technologies
  o Intelligent Transportation Systems
  o Subcommittee on Emerging Ridesharing Solutions
PARTNER LIAISONS

Liaisons from other units of the National Academies and partner associations also participate in the Forum. Each liaison organization is included on all Forum correspondence and materials and is invited to designate a representative to participate in each Forum open meeting and conference call. Liaison representatives contribute to the Forum discussions as time permits. Liaison representatives report back to their organization and members on the outcomes of Forum activities and discussions.

Individuals with expertise that would be beneficial to the other Forum participants may also be invited to participate as Partner Liaisons.

Partner Liaisons
- National Academies’ Divisions and Boards (4)
- Partner Associations
  - AASHTO
  - APTA
  - Eastern Transportation Coalition
  - ITE
  - ITS America
  - SAE International

FORUM CO-CHAIRS

Three individuals co-chair the Forum – one each from the public sector, private sector, and academia/research. The co-chairs facilitate discussions during Forum meetings and conference calls. In addition, they work with the TRB staff between meetings and calls to develop agendas and set priorities for the Forum, in accordance with the direction provided by the Forum sponsors and other participants.

Jane Lappin
Independent Consultant

Catherine McGhee
Director, Virginia Transportation Research Council

Gregory Winfree
Director, Texas A&M Transportation Institute
TRB STAFF

Forum participants should feel free to contact the following at any time with questions or comments relative to the Forum.

- Neil Pedersen: TRB Executive Director (npedersen@nas.edu)
- Katherine Kortum: Senior Program Officer (kkortum@nas.edu)
- Richard Cunard: Senior Program Officer (rcunard@nas.edu)
- Mark Norman: Resident Scholar (mnorman@nas.edu)

WHAT ARE THE FORUM ACCOMPLISHMENTS?

The following lists the accomplishments of this Forum to date, and the planned next steps. The accomplishments and next steps reflect the agendas and priorities as set by the Forum participants.

LAUNCHING THE FORUM

Accomplishments to Date

- Kick-off meeting held February 2018 in Washington, DC
- Forum objective set
- Forum participants developed a work plan that includes:
  - Sharing information and perspectives on an ongoing basis
  - Identifying research needs and priorities
  - Facilitating partnerships to carry out the needed research
  - Engaging the broader stakeholder community

Continuing Activities

- Review the objectives, participants, Forum objectives, and focus areas on a regular basis and revise as appropriate

MAKING THE CASE FOR A STRATEGIC RESEARCH EFFORT

Accomplishments to Date

- TRB Circular E-C236 National Academies-TRB Forum on Preparing for Automated Vehicles and Shared Mobility that makes the case for a strategic research effort prepared for the Forum by Mark Norman and Katherine Kortum of TRB staff
  - Peer reviewed by Forum participants, revised, re-reviewed by a Forum working group, and published by TRB
- Selected four “cross-cutting issues” for further discussion among Forum participants
- White paper used as a basis for presentations to a broad audience of stakeholders

Continuing Activities

- Periodically review white paper for possible updates
IDENTIFYING CRITICAL RESEARCH NEEDS

Accomplishments to Date

- Forum participants produced a Research Needs Catalogue to prepare for automated vehicles and shared mobility.
- Identified more than 100 critical research needs in the following five categories
  - Impacts on safety
  - Transportation system impacts
  - Social, environmental, energy, and economic Impacts
  - Data and Analysis Considerations
  - Cross-cutting topics
- Submitted to research organizations for consideration, including TRB’s National Highway Cooperative Research Program (NCHRP), U.S. DOT, and others
  - The NCHRP 20-102 panel on Impacts of CVs and AVs on State and Local Transportation Agencies has selected and funded numerous research projects from the Forum’s research needs catalogue.

Continuing Activities

- Continue to share these through publications, websites, and presentations
- Update on an regular basis

IDENTIFYING AND ADDRESSING THE MOST CRITICAL ISSUES

Accomplishments to Date

- Ranked the Top Ten Critical Issues that are of concern to Forum participants
  - This document contains the list of research needs, along with next steps, strategic research questions, and cross-cutting issues.
- Shared these with other stakeholders
- Submitted these issues to TRB’s National Cooperative Highway Research Program (NCHRP) for consideration for funded research
  - The NCHRP 20-102 panel selected all or parts of four of these critical issues to pursue further
- Prepared the following Topical White Papers for each of the top critical issues in 2020. Each paper includes a description of the issues, key findings, research completed/underway/planned, and remaining research gaps
  - Models for Data Sharing and Governance
  - Safety Scenarios and Engagement during Transition to Highly Automated Vehicles
  - Infrastructure Enablers for Automated Vehicles and Shared Mobility
  - Maximizing Positive Social Impacts of Automated Vehicle Deployment and Shared Mobility
  - Prioritizing Equity, Accessibility and Inclusion Around the Deployment of Automated Vehicles
  - Potential Impacts of Highly Automated Vehicles and Shared Mobility on the Movement of Goods and People
  - Impacts of Automated Vehicles and Shared Mobility on Transit and Partnership Opportunities
  - Implications for Transportation Planning and Modeling
o Impacts and Opportunities Around Land Use and Automated Vehicles and Shared Mobility

• Made Topical White Papers available to Forum participants and shared with other stakeholders

Continuing Activities
• Use white papers as a basis for further refining research needs to address each of these top critical issues

PROVIDING DIRECTORY OF INFORMATION RESOURCES

Accomplishments
• Developed the Directory of Information Resources that relate directly to the objectives of the Forum. This directory provides direct links to more than 150 reports published in 2017 or later, and groups these into the following five categories
  o Scenarios for automated vehicles and shared mobility
  o Guidance for state and local agencies
  o Federal agencies notices, guidance, and information
  o Safety and security
  o Role of shared mobility

Continuing Activities
• Supplement the existing directory with new information resources as they become available

CONDUCTING WORKSHOPS AND PRODUCING REPORTS ON KEY ISSUES

Accomplishments to Date
• Conducted Forum workshops addressing the following key issues during 2019:
  o The transition toward shared automated vehicles
  o Importance and role of connectivity
  o Potential impacts on roles of different levels of government and private sector
  o Economic implications of AVs and shared mobility
  o Impacts on traditional research processes
• Produced reports summarizing the discussions and key takeaways from each of these workshops

Continuing Activities
• Share key takeaways from these workshops and reports with transportation stakeholders
DEVELOPING AND PREPARING FOR FUTURE SCENARIOS

Accomplishments to Date
• During 2020, initiated exercises among Forum participants to create high-quality, credible alternative views to the future, and identify issues and forces

Continuing Activities
• Further refine scenarios work initiated in 2020
• Identify options available to stakeholders to prepare for these scenarios
• Publish report(s) for use by Forum participants and ultimately the larger TRB community

SHARING INFORMATION ON AN ONGOING BASIS

Accomplishments to Date
• Created website for the Forum that includes an overview of the Forum, a list of Forum participants, meeting schedules/agendas/presentations, Forum white papers, the directory of information resources, and other Forum materials
• Launched an online e-Group community to enable Forum participants to post resources, notices, questions, topics for discussion, events, funding opportunities, and other information between meetings
• Made presentations on Forum activities and products at numerous conferences and meetings sponsored by TRB and other organizations

Continuing Activities
• Update information on the Forum website to ensure that it serves as the go-to resource for current and potential Forum participants
• Regularly post items of interest to Forum participants on the e-Group community for information and discussion

WHAT TYPES OF PRODUCTS ARE GENERATED BY THE FORUM?

As Forum participants are not subject to bias/conflict-of-interest reviews by the National Academies, roundtables/forums that operate under the auspices of the Academies may not produce “products” attributed directly to the Forum itself. However, there are a number of products that are generated by the Forum that can attributed to individuals and others.

WHITE PAPERS

The Forum may commission individually authored white papers to inform discussions of the Forum. The Academies’ rules for these papers are as follows:

Subject to the availability of funds, a Forum may commission the preparation of individually authored documents, including documents emanating from the work of a cluster or collaborative established by a
roundtable, to explore and stimulate discussion of a topic or issue for use by the roundtable and dissemination to interested members of the public. An individually authored document commissioned by a roundtable must meet the following requirements:

1. The authors of the document must be identified by name and affiliation.

2. The document must be subject to scrutiny by an editorial process designed to assure the absence of inappropriate content. This review is the responsibility of TRB under whose auspices the Forum is operating.

3. The document must be released in a distinctive form that clearly distinguishes it from a report of the institution.

4. The document must prominently display the following disclaimer concerning responsibility for the content. Normally this must appear on the front cover. If a logo is applied to the document, the disclaimer must appear on the same page as the logo.

"The views expressed in this document are those of the author(s), and are intended to help inform and stimulate discussion. The document is not a report of the National Academies or TRB, and has not been subjected to its review procedures."

**RESEARCH ROADMAPS**

The Forum participants are provided with an opportunity to help generate research roadmaps on connected-automated vehicles and shared mobility. As the Forum itself cannot author these types of products, TRB has arranged for this to be accomplished through separate NCHRP projects. A contractor has the responsibility to develop the research roadmap and to keep it up to date through the normal NCHRP process.

**CONFERENCE WORKSHOPS, SESSIONS, AND WEBINARS**

The Forum may sponsor workshops, sessions, or webinars to inform the Forum and share information with other stakeholders. Most of the roundtables/forums in other Divisions of the Academies cover the costs for the workshops as part of the dues for organizational sponsors. However, TRB has the advantage of being able to leverage other convening activities that it already sponsors. As such, the Forum is given opportunities to sponsor sessions or tracks of sessions at the TRB Annual Meeting, the annual TRB Automated Vehicle Symposium, and other meetings/conferences as appropriate.

**RECOMMENDATIONS FOR ACADEMIES/TRB POLICY STUDIES**

Forum discussions may lead to proposals for specific consensus policy studies to be undertaken by TRB and/or other units of the National Academies, resulting in institutional reports. Such studies, if undertaken, will be conducted independently from the Forum and in accordance with all National Academies’ policies and procedures governing such study activities.
TR NEWS ARTICLES

TRB’s bi-monthly TR News magazine will include periodic updates on the work of the Forum. Katherine Kortum is in charge of producing these updates. Dr. Kortum is part of the TRB staff support team for the Forum, and also serves on the TR News Editorial Board.

FORUM WEBSITE

The Forum’s webpage [https://trb.org/AVSMForum](https://trb.org/AVSMForum) includes an overview of the Forum, a list of Forum participants, meeting schedules/agendas/presentations, Forum white papers, a directory of information resources, and other Forum materials.

RESEARCH PARTNERSHIPS

Organizations participating in the Forum may wish to form partnerships with other organizations to conduct some of the research discussed by the Forum.

PERSPECTIVES

Perspectives are individually authored by Forum members and outside experts in the field. Perspectives are intended to help inform and stimulate Forum discussions. The views expressed in these papers are those of the authors and not necessarily of the authors’ organizations, the National Academies, or TRB. They are not reports of the National Academies.

The representatives from the non-paying organizational Forum sponsors and the Forum “liaisons” may be called upon to prepare Perspectives for the Forum and for their audiences as a condition of their participation in the Forum.