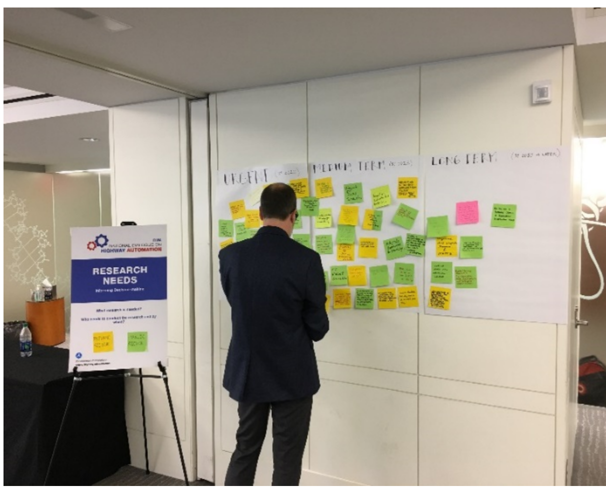
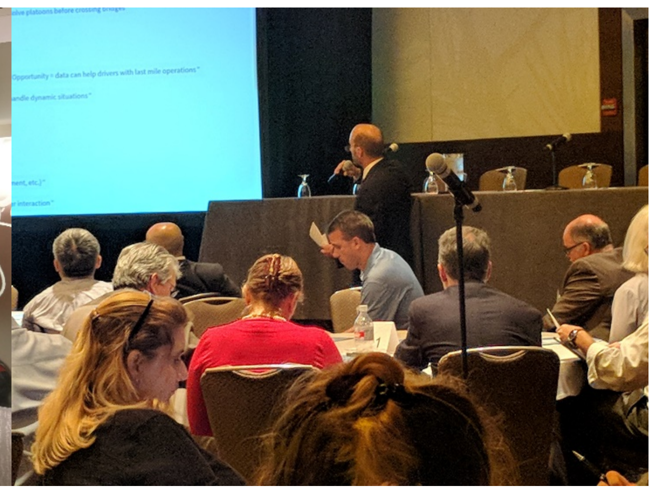
Federal Highway Administration

National Dialogue on Highway Automation: September 5-6, 2018 Freight Workshop Summary





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U.S. Department of Transportation
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The Federal Highway Administration (FHWA) initiated the National Dialogue on Highway Automation (National Dialogue) workshop series. The National Dialogue was a series of meetings held across the country to facilitate information sharing and to engage the transportation community in a conversation focused on how to safely and efficiently integrate automated vehicles into the road network. This document summarizes the key themes discussed among participants from the September 2018 National Dialogue workshop held in Chicago, IL.</td></tr>
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Acronyms and Abbreviations

ADS	Automated driving systems
AI	Artificial intelligence
AV	Automated vehicle
CACC	Cooperative adaptive cruise control
CAV	Connected and autonomous vehicle
CMV	Commercial motor vehicle
DOT	Department of Transportation (State, local)
DSRC	Dedicated short-range communications
FHWA	Federal Highway Administration
LIDAR	Light detection and ranging sensor
NHS	National Highway System
SAE	Society of Automotive Engineers
USDOT	United States Department of Transportation
V2X	Vehicle-to-everything

Overview

Automated vehicles (AVs) have the potential to transform the Nation's roadways. They could increase vehicle safety, improve transportation system efficiency, and enhance mobility for many people who may be unable to drive today. Although they offer a wide range of benefits, they may also introduce uncertainty for the agencies responsible for the planning, design, construction, operation, and maintenance of the Nation's roadway infrastructure.

In June 2018, the Federal Highway Administration (FHWA) initiated the National Dialogue on Highway Automation (National Dialogue), a series of meetings held across the country to facilitate information sharing and engage the transportation community in a conversation on how to safely and efficiently integrate automated vehicles into the road network. A diverse group of stakeholders provided input on key issues regarding automation. This input will help inform future and existing FHWA research, policies, and programs.

The National Dialogue series consisted of six national workshops, each held in a different location and focused on a unique topic: policy and planning, data and digital infrastructure, freight, operations, and infrastructure design and safety. The workshop series kicked off with an introductory webinar in May 2018. More information about the webinar and meetings is available on the FHWA National Dialogue on Highway Automation website.[1]

Workshop Objectives

The FHWA identified several objectives for the workshop series, as follows.

- Gain an understanding of potential impacts of automated vehicles on national highway infrastructure, safety, policy, operations, and planning.
- Prioritize actions to inform the integration of automation into existing FHWA programs and policies.
- Create models for sustained information sharing among public agencies and the private sector. Support newly developed partnerships among these organizations and define a clear path of communication among FHWA and automation stakeholders.
- Gather insights from infrastructure owners and operators and inform the development of possible technical guidance actions at the Federal level.
- Validate or provide direction into highway research priorities and roles among FHWA, national partner organizations, industry, and State and local governments.
- Develop an engaged national community or coalition on integrating automated vehicles into the roadway system, using inputs from States, local governments, industry, and associations, alongside FHWA and other Federal agencies.

[1] https://ops.fhwa.dot.gov/automationdialogue/index.htm.

Freight Automation

The FHWA conducted a National Dialogue workshop on September 5-6, 2018, in Chicago, Illinois. This workshop focused on freight and automation. Over 160 individuals from industry, government, academia, associations, freight, and rail organizations participated.

This document summarizes key themes that participants raised throughout the breakout sessions. The views in this document reflect participants' inputs and do not represent official positions, policies, or statements on behalf of the FHWA or the U.S. Department of Transportation (USDOT).

Key Takeaways

Safety and Efficiency Are Key Priorities for the Freight Industry and Its Customers

Safety is a key priority for the freight industry, so automation technologies will need to be assessed within the context of safety. Automation has the potential to address major safety concerns such as commercial driver fatigue and distraction, but it is unclear whether automation could also introduce new safety risks. Automation could also improve the efficiency of the freight industry by enabling truck platooning and other applications. Participants recommended undertaking research to understand potential efficiency gains.

Data Can Enhance Efficiency of AV Operations in Certain Roadway Environments

Having access to accurate and secure information about complex roadway environments and hazardous conditions could be useful for automated commercial motor vehicles (CMVs). Real-time information regarding road closures, work zones, low bridges, and weight restrictions is critical for enabling safe and efficient freight operations. Automated CMVs could also leverage vehicle-to-everything (V2X) capabilities to support effective data exchange with the roadway infrastructure or other roadway users.

New Roadway Infrastructure, Such as Designated Truck Lanes, Modified Interchanges, and Transfer Facilities May Be Needed

Inevitably, there will be a mixed fleet of vehicles including automated, non-automated, heavy vehicles, light vehicles, buses, etc., over time. Some workshop participants suggested designated truck lanes as an option for accommodating automated CMVs on public roads. In addition, they identified a possible need for freight transfer facilities along highways to facilitate the movement of freight from automated, long-haul vehicles to smaller, non-automated vehicles for last-mile delivery.

Research on Structural Loading Patterns of Automated CMVs and Their Impacts on the Roadway Infrastructure Is Key

Automated CMVs and truck platoons could have significant impacts on the maintenance of the existing roadway infrastructure. For example, the precise lane keeping of automated CMVs could accelerate roadway rutting. Another potential area of concern was whether truck platoons could exceed existing bridge weight ratings. There may be a need to explore these types of use cases to understand potential impacts on roadways and bridges. Overall, participants called for more research to evaluate the possible implications of automated CMVs for the maintenance and design of road and bridge infrastructure.

Workshop Design

The workshop began with an overview presentation describing the National Dialogue and USDOT activities in automation. The overview presentation is available on the FHWA National Dialogue website. [2]

The workshop was divided into four sessions designed to gather input from stakeholders:

- *Breakout Session 1*: Small group discussions focused on roadway infrastructure and conditions for automation and freight.
- *Breakout Session 2:* Small group discussions focused on operational design domains and safe operations.
- *Collaboration Corner:* Informal interactive session where participants provided input at multiple stations, each focused on a distinct topic.
- *Breakout Session 3:* Small group discussion focused on developing an action plan for the transportation community on automation.

USDOT representatives facilitated breakout session discussions at individual tables. Attendees had 10-15 minutes to read and think about the discussion questions on their own, followed by group discussion. Information regarding the agenda, breakout session questions, and participants is included in the appendices of this document.

[2] https://ops.fhwa.dot.gov/automationdialogue/index.htm.

Breakout Session I: Roadway Infrastructure and Conditions

This section summarizes stakeholder discussion from the first breakout session. Questions asked during this discussion were:

- What are the biggest opportunities and challenges associated with freight operations as it transitions to an AV delivery model?
- What roadway design considerations are needed for automated CMVs and platoons to safely operate with traffic?
- How can automated CMVs navigate complex roadway environments and conditions and what strategies can help overcome them? Could communications technologies or roadway design features help overcome these operational scenarios?
- How does automation change the way CMVs are notified of load posted bridges, restricted routes, road closures, and detours? How could the dissemination of information change regarding permits, routing, mapping, etc.?
- What new considerations do truck platoons present for truck size and weight standards, particularly for bridge load ratings and pavement fatigue?

Labor Impacts from Freight Automation Require Further Study

Workshop participants noted the significant attention already being given to the potential impact of automation on jobs for commercial drivers. There are concerns that fully automated vehicles could lead to job losses, as well as harm businesses and communities that currently provide services for commercial drivers. Some discussion centered on how commercial drivers who are unable to make a transition to new technical jobs enabled by automation could be particularly impacted by automated CMVs.

Not all the discussion of how automation could affect the freight workforce was negative. Workshop participants exchanged views on how automated CMVs could positively impact the driver workforce. Automated CMVs could take over the driving task during at least some segments of a long-haul trip, thus providing long-haul drivers additional time to rest. Another possibility mentioned was that automated CMVs could travel the highway portion of a long-haul trip and human drivers would only be needed for the local driving at the beginning and end of a freight trip. This could allow human drivers to shift their time away from the driving task for additional rest or other tasks. Driver retention, which can be a challenge for trucking companies, could improve in either scenario.

Several attendees asserted that there will be a continuing role for humans in the operation of automated CMVs and in supporting the freight supply chain. For example, depending on the product being transported, it may be necessary to have a human onboard to perform necessary maintenance or to ensure that shipments are secured. Participants also identified hazardous materials as a type of shipment that may not be appropriate to transport without a human in the vehicle.

New Models in Truck Staging and Operations Could Lead to New Types of Roadway Facilities

The use of automated CMVs may give rise to new types of freight facilities on or near highways. There could be a potential need for new facilities to meet changing freight operations and needs. An increase in automated freight traffic may require additional facilities, such as truck staging areas where freight is transferred between automated long-haul trucks and human-operated delivery vehicles. Some in attendance noted the importance of a regional approach when planning new facilities based on the impacts of truck staging and parking on general land use. There were also questions from the audience about where the truck platoons would be assembled and disassembled and how this could impact current roadway design. Participants offered different views about how new staging facilities (if needed) would be funded and managed; they discussed both public- and private-sector options.

Infrastructure Requirements for Enabling Automated CMVs Are Unclear

A wide range of possible infrastructure modifications were suggested to facilitate the safe use of automated CMVs. For example, some attendees suggested dedicated facilities or lanes to enable automated CMVs to operate separately from other road users. Others noted, however, that it is unclear whether platoon-only or dedicated lanes would be worth the infrastructure investment and whether this was a long-term solution. Participants proposed that DOTs work with AV technology developers to determine which infrastructure elements are critical for safe operation of automated CMVs. Essential elements could include signage, lane markings, and other traffic control devices. Participants stressed that AV technology developers must be clear about what specific conditions (e.g., road type, road condition, weather, traffic, maneuvers, etc.) are included in an automated CMV's operational design domains (ODDs). The ODD is defined as the specific conditions under which a given driving automation system or feature is designed to function, including, but not limited to, driving modes.

Infrastructure Changes Will Be Gradual and Automated CMVs Should Be Able to Operate Safely Within the Existing System

Infrastructure improvements made to support automation will likely be made gradually and occur over many years. If automated CMVs will be used in the near future, many participants emphasized that they should be able to operate safely using the current infrastructure. In addition, infrastructure investments and improvements should benefit both human drivers and AVs. It was also noted that automated CMVs will have to operate in a mixed vehicle fleet, with different levels of AVs, non-automated vehicles, pedestrians, bicyclists, and other road users.

Automated CMVs Could Have Impacts for Infrastructure Maintenance and Design

Current pavement and bridge designs do not anticipate automated CMVs or platooning. For example, some participants suggested that the precise lane keeping of automated CMVs could accelerate pavement rutting and impact infrastructure maintenance schedules. Additionally, the structural capacity of bridges may not be able to support truck platoons because they may exceed existing bridge weight ratings. Others pointed to a possible need for more charging infrastructure and facilities to support the increasing electrification of vehicles and trucks.

Public Acceptance of Automated CMVs Will Require Education and Outreach

The issue of public acceptance and outreach was mentioned often during the workshop and was identified as a key concern. Public engagement should be a priority and that effort should be dedicated to educating the public on the nature of AV technology, its capabilities, and timing. Several participants recommended that messaging be delivered at the national level and that the Federal Government may have a role in convening members of government, academia, and industry to coordinate these messages. A suggestion was that any messaging and outreach should clearly articulate the safety and efficiency benefits of automated CMVs, while also highlighting the roles and responsibilities of the different stakeholder groups involved.

Breakout Session II: Operational Design Domain and Safe Operations

This section summarizes stakeholder discussion from the second breakout session. Questions asked during this discussion were:

- How could automated CMVs change the supply chain industry and what impacts could they have on freight traffic patterns?
- As automated CMVs may transition from automated mode on a highway to a human driver to make last-mile deliveries, what are unique issues around making a long-haul to urban-delivery transition? Will there need to be additional roadway facilities at freeway exits to allow for a transition from an automated system to a human driver?
- How could automation, combined with freight industry trends, impact congestion? Could automated CMVs make use of predictive route planning to identify routes around congested areas, helping to alleviate peak hour congestion?
- What are challenges for automated delivery vehicles in urban environments where vehicles must navigate heavy congestion, merging lanes, traffic control devices, loading zones, other road users, and traffic incidents?

Automated CMVs May Introduce Changes to Future Supply Chain Operations

Freight operations are not a single application to be automated, but rather a complex chain of events that include diverse vehicle types operating in a range of driving environments, from long-haul operations to last-mile deliveries. As a result, automated CMVs could introduce new freight delivery models and changes to the supply chain. Additional staging areas or transfer points may be necessary to transfer freight from automated CMVs to human-driven CMVs. If human drivers continue to handle last-mile operations in complex urban areas, staging infrastructure may be needed for the hand-off from automated CMVs to human-driven CMVs. The discussion focused on where these facilities might be built, who would pay for them, and whether some existing facilities could be retrofitted to meet new needs. Overall, participants noted that a one-size-fits-all approach will not be useful when thinking about the effects on the supply chain. Different use cases (e.g., types of products being shipped, delivery locations, and time-sensitivity of deliveries) may require different facilities, infrastructure, and approaches.

Automated CMVs Should Demonstrate Safe Interaction with All Road Users

Automated CMVs must be able to recognize the intent of human drivers, cyclists, and pedestrians, especially in urban settings, and to interact safely with vulnerable road users. Safe interactions with all road users was identified as a key element of enabling broad public acceptance. Several participants discussed the potential for defining standards regarding the interaction between automated CMVs and other road users to ensure that both CMVs and humans abide by an agreed-upon set of rules. Others discussed how automated CMVs in urban environments could conflict with Complete Streets initiatives, making urban and downtown areas less attractive and functional for people.

Impacts of Automated CMVs on Congestion and Efficiency Are Unclear

There was a range of opinions on how automated CMVs could affect congestion and the efficiency of the transportation system. Automation may decrease the incidence of vehicle crashes by reducing opportunities for human error. This could lead to a reduction in traffic incidents, disruptions, and delays. However, automation could lead to an increase in travel demand (i.e., vehicle miles traveled), worsening congestion across the transportation system. Workshop attendees questioned whether evidence exists to show that automation will lead to decreased congestion. They also discussed the potential increase in freight traffic and the number of factors that affect the efficiency of freight operations. Some speculated that automated CMVs may not dramatically improve the efficiency of freight operations, because current inefficiencies often result from loading and unloading activities rather than driving activities. Several participants cited their concerns that future transportation planning and policy decisions regarding automation should be considered carefully and not based on unfounded assumptions about congestion and efficiency.

Access to Standardized, Accurate, and Real-Time Data Regarding Roadway Conditions Is a Key Enabler for Efficient Operations

Standardization and availability of accurate mapping and routing information would be helpful for both human-driven and automated CMVs. Information on road closures, detours, traffic incidents, hazardous weather conditions, and work zones are important for enabling efficient freight operations. This type of information could benefit from standardization, improved accuracy, and regular updates. Several participants pointed to V2X capabilities to support the communication and exchange of real-time information. Although some companies in the freight industry currently use their own mapping systems to incorporate information from multiple sources, there are still opportunities to improve the fidelity and real-time nature of data to support freight operations. Data accuracy and consistency become more important with the introduction of automated CMVs. Some in attendance stated that a broader dialogue between public agencies and industry is needed on this topic.

Stakeholders Seek a Clear and Consistent Regulatory Framework

Participants described the importance of a having a clear and consistent regulatory framework to ensure safe and efficient operations of automated CMVs. Current inconsistencies in State and local regulations can hinder industry innovation and make it difficult for companies to operate across jurisdictions. There were several ideas proposed on how to address broader policy and regulatory needs for automated CMVs. Some discussed the need for standardizing regulations across States and municipalities, while others noted the need for a central database or inventory of relevant regulations for automated CMVs. Participants seemed to agree that having access to accurate information regarding Federal, State, and local regulations regarding automation is necessary. At a minimum, participants sought clarity around potential impacts of automated CMVs on size and weight regulations and other operating guidelines. They also discussed how best to document and disseminate this type of information to ensure that all stakeholders can participate in the conversation about AV policy and regulation.

Collaboration Corner

Format

The Collaboration Corner was an interactive session designed to gather input from stakeholders on a range of topics. It consisted of a career-fair-style setup with six stations for collecting different types of information from stakeholders. USDOT staff members were located at each station to encourage participation, clarify the exercise, engage in discussion, and ask follow-up questions. Information was collected at each station through two methods:

- **Sticky note exercise**—Attendees used sticky notes to respond to a specific prompt, which was presented on a wall-hanging poster at each station. This was a public form of communication that allowed attendees to view and engage with submitted suggestions.
- **Suggestion box**—Participants wrote their questions, suggestions, or other input on an index card and placed it into a suggestion box. This was a more private form of communication that allowed attendees to provide information that they may not have been comfortable sharing in a public forum.

Stakeholders provided input across the following stations:

- **Future of Freight:** Operational environments and use cases
- **Traffic Operations:** Opportunities and challenges
- **Infrastructure:** Design considerations and impacts
- **Connectivity:** Enhancing information exchange and cooperation
- **Terminology:** Developing a lexicon around highway automation
- **Research Needs:** Collecting research needs statements
- **Parking Lot:** Important questions and comments that do not cleanly fit at any of the other posts

The next section offers details about the station prompts and summarizes the key themes that emerged at each station. These themes reflect the stakeholder input received.

Future of Freight

This topic focused on potential opportunities and challenges for automation in the context of three categories of roads: Interstate/NHS (National Highway System), local streets, and intermodal connections. The following guiding questions were provided to gather input:

- What is the new landscape of freight movement with the introduction of automated CMVs?
- What are different use cases and operational design domains for automated CMVs (roadway type, applications, etc.)?
- How can automated freight vehicles improve intermodal connections?
- How does the use of automated delivery vehicles affect demands on local street networks?

Table 1. Participant Input: Future of Freight

Interstate/NHS
Freight workforce—Automation could help mitigate driver shortages in the freight industry, but much of the supply chain will still require a human presence, at least in the near-term. To ensure the freight workforce is prepared for automation, new training and recruitment strategies should be considered.
Local Streets
Local interests—There is concern about how well local interests (e.g., curb use, noise) will be addressed regarding AVs.
Flexibility and skill—It is uncertain how AVs will be able to navigate situations that human drivers have mastered (e.g., yielding to emergency vehicles, reacting to jaywalkers, nosing into traffic). Will AVs be able to operate with an acceptable level of flexibility?
Uncertainty of urban impact—The impact of freight automation on congestion and curb use in urban areas is unclear.
Intermodal Connections
Transferability—A variety of transferability considerations arise when exploring intermodal connections in the future of freight (e.g., interoperability of containers among different modes, establishment of transfer facilities, new mechanisms for transferring freight).
Other
Diversity—Vehicle and modal diversity is important in designing a transportation system for automation.
Efficiency—Automation could contribute to efficiency gains by enabling a broader range of vehicle types, reducing hours-of-service limitations, and improving throughput.
Standardization—Standardization (e.g., of data types, packages, equipment, regulations, road classification, etc.) could help enable freight automation.

Traffic Operations

This topic focused on opportunities and challenges of freight automation. The following guiding questions were provided to gather input:

- What opportunities and challenges exist with integrating safe and efficient automated CMVs into the transportation network?
- What should industry, communities, and infrastructure owners and operators consider regarding the operations of truck platoons across certain environments, such as heavy traffic corridors?
- How should traffic operations and management strategies adapt to address automated CMVs in the near-term versus the long-term?

Table 2. Participant Input: Traffic Operations

Opportunities
Operational efficiency—New data sources can lead to improvements in traveler information, incident response, and maintenance.
Challenges
Uncertainty—The rapid pace of technology development creates uncertainty when planning for automated freight.
Multi-modal operations—Interactions at grade crossings could pose safety challenges. Safe interactions with rail crossings should be considered.
Strategies
Use cases—Identifying appropriate operational design domains and use cases will be an important first step in enabling automation in the freight industry.
Process improvements—Inspection and enforcement processes may need to be modified to accommodate AVs.
Collaboration—Both the private and public sectors will play important roles. Opportunities for data sharing and other forms of collaboration should be explored.

Infrastructure

This topic focused on infrastructure. Information was collected across three pre-defined categories: planning and design, impacts and maintenance, and truck size and weight standards. The following guiding questions were provided to gather input:

- How do automated commercial vehicles impact infrastructure design and maintenance?
- What are the important infrastructure elements for enabling safe and efficient operations for automated CMVs (e.g., lane markings, traffic control devices)?
- What are key issues regarding truck size and weight standards with respect to automated CMVs on the National network (e.g., platoons)?

Table 3. Participant Input: Infrastructure

Planning and Design
Machine readability and overall improvements to the roadway system—While many stakeholders focus on the need for clear lane striping to support AV operations, some emphasize the need to make all road markings clear and machine-readable. Such improvements may benefit both human drivers and AVs.
Designated environments—Opinions differ about whether designating dedicated lanes and areas for automated freight vehicles is desirable, or whether automated freight vehicles need to integrate into the system without dedicated environments. If automated CMVs are only allowed to operate in designated environments, who will make those decisions and what criteria will be used?
Impacts and Maintenance
Data and infrastructure—Data-sharing is important for navigating, maintaining, and supplementing infrastructure.
Degradation concerns—Roadway degradation, specifically rutting, emerged as a potential impact of automated trucking and specifically truck platooning. Research on new roadway materials and maintenance practices may be needed.
Financial concerns—Highway automation challenges us to rethink financial flows (e.g., business models of freight companies, road access fees proportionate to road degradation).
Equity concerns— There are equity concerns regarding who will fund infrastructure investments and who will reap the benefits.
Truck Size and Weight Standards
Bridge navigation—Bridge navigation is a common challenge for automated freight vehicles. Automated trucking platoons might have to adjust their following distances when traversing bridges.
Rutting concerns—There is concern that all automated CMVs might be programmed similarly with respect to lane keeping, and consequently exacerbate rutting. However, others suggested that automated CMVs could be programmed to allow a small amount of deviation in their paths of travel, thus mitigating rutting concerns.

Connectivity

This topic focused on how connectivity could enhance information exchange and cooperation. The following guiding questions were provided to gather input:

- What roadway and traffic information is needed for safe and efficient freight flow?
- How could automated CMVs receive information regarding size and weight regulations?
- What opportunities does connectivity bring for automation in freight (e.g., hazardous conditions, road weather, routing, and cooperative automation applications)?

Table 4. Participant Input: Connectivity

Information and Data
Safety and Mobility—Real-time information can provide safety and mobility benefits if it is provided in a usable and consistent format.
Connectivity and Technology
Communications—It is unclear what communication mechanisms will be used in the future (e.g., dedicated short-range communications [DSRC] vs. 5G cellular).
Institutions and Policy
Equity—Network availability and communications infrastructure could lead to a greater urban/rural divide. How will the benefits of public infrastructure investments be distributed across the different modes? Across jurisdictions with varying levels of resources?
Standardization—Standardization and harmonization of communications, data, and regulations will remove barriers to automation.
Cybersecurity and Privacy—Increased data sharing and connectivity can result in privacy and cybersecurity concerns.

Terminology

At the Terminology station, workshop participants were encouraged to post examples of terms related to highway automation that they found to be clear and those they found confusing. As demonstrated in the table below, participants listed terms they found to be more or less confusing than others.

Table 5. Participant Input: Terminology

More Confusing Terminology
Operational design domain
Autonomous vs. automated vs. self-driving
Light detection and ranging (LIDAR)
Platooning: some people think there is only a driver in the lead truck; the number of vehicles in a truck platoon is also unclear.
Telematics (dated); connectivity; infotainment
Artificial intelligence (AI)
Numerous acronyms
Cooperative adaptive cruise control (CACC): public will never understand; splitting hairs
Vehicle-to-everything (V2X): X means everything? Or does X mean "other" like bicycle?
Differences between driver-assistive truck platooning vs. CACC platooning
Commercial motor vehicles (CMVs)
Connected and automated vehicle (CAV): people usually mean only AV
Automated may mean AI, or it may only be simple controls
Safety: the term is usually used as a goal for automated driving systems (ADS) and intelligent

transportation systems (ITS); system safety and software safety are not used within the context of system development; real safety is designed into the system
Geo-fencing
"Terms" (or symbols) for ADS to communicate intent to pedestrians and manually operated vehicles
Latency (data transmission)
Optionality: making a choice now that does not provide benefit but opens up more high-value choices down the line
More Clear Terminology
SAE levels of automation
Platooning

Research Needs

This topic focused on potential research areas for freight automation and discussed who should conduct the research and in what timeframe. Research needs were divided into two categories based on whether the research would be driven by the public or private sector.

Table 6. Participant Input: Research Needs

Private Sector
Environmental impacts and emissions considerations
Communications technologies
Human factors
Public Sector
Safety impacts
Potential revenue sources for public investments
Equity considerations
Infrastructure design and maintenance
Workforce and labor impacts
Standardization and harmonization of regulations, communications, and data
Public acceptance

Parking Lot

At the parking lot station, participants shared any remaining questions and comments that did not cleanly fit into the other topic areas. Topics included:

- The impacts automation could have on insurance and liability.
- The different considerations for automation in different contexts (e.g., highway vs. urban).
- The need to plan for both human and automated drivers.

Breakout Session III: Action Planning Discussion

This section summarizes participant feedback on action planning and next steps regarding freight and automation. Participants were asked to identify specific actions or recommendations for either FHWA or other stakeholders to address some of the challenges and opportunities brought up during the previous breakout discussions. Key recommendations are summarized below:

- Convene a multimodal discussion to ensure AV technologies are compatible across the transportation system (e.g., rail, truck, ports).
- Establish a stakeholder advisory group to share information between the public and private sectors. This could enable stakeholders to forge consensus on basic principles and safety considerations. Results should be made available for public input.
- Work cooperatively with stakeholders to educate consumers and address public concerns.
- Develop strategies among State and local DOTs and the USDOT to support automated CMV operation on the existing infrastructure. Manage expectations that roadway infrastructure be modified to meet the needs of automated CMVs.
- Lead the development of a framework for setting standards for vehicles, roadway systems, and communication systems.
- Create a framework that clarifies why we are integrating automation into our transportation system, where automation is anticipated, what entity is responsible for the integration, and the steps necessary to support successful integration.
- Collaborate with State DOTs to establish a national network of automated freight corridors.
- Maintain an inventory of automation policies by jurisdiction and identify differences and similarities to support policy harmonization.
- Conduct research to determine the impacts that automated CMVs will have on highway safety and invite public response in coordination with the appropriate agencies.
- Develop in coordination with stakeholders a new way to measure and validate safety performance, as well as address existing regulations for commercial vehicle equipment and operations. This could include assessing Federal Motor Vehicle Safety Standards, Federal Motor Carrier Safety Regulations, and State and local regulations.

Conclusion

The National Dialogue on Highway Automation Workshop revealed stakeholders' diverse interests related to automated vehicles. Overall, stakeholders desired further discussion and information sharing around automation. The FHWA plans to use the input provided from the workshop series to help inform future policies, research, and programs. Additional information regarding the workshop series and related initiatives is available on the FHWA National Dialogue website. [3]

[3] https://ops.fhwa.dot.gov/automationdialogue/

Appendix A: Participants

Nearly 160 participants from 104 organizations attended the workshop.

3M	Governor Bruce Rauner's Office	Oak Ridge National Laboratory
AASHTO	HDR Inc.	OOIDA
Accenture	HERE Technologies	PELOTON TECHNOLOGY
Advocates for Highway and Auto Safety	IL Autonomous Vehicles Association	Pie Valley Consulting LLC
AECOM	Illinois DCEO	Proflexive
Alliance for Transportation Innovation	Illinois DOT	Property Casualty Insurers Association of America
Amazon	Illinois Tollway	Purdue University
American Planning Association	Independent Consultant	RK Deering & Associates
American Trucking Associations	Indiana Department of Transportation	Sam Schwartz Consulting
Anacostia Rail Holdings	Intelligent Transportation Society of America	Sam Schwartz Engineering
Ann L. Schneider & Associates LLC	InTrans	SANDAG
ARA	INVENSITY	SCG, LLC
Arcadis U.S.	Irdeto	SEWRPC
Argonne National Laboratory	Iteris	Shared Use Mobility Center
Arizona DOT	JACOBS Engineering	St. Louis Regional Freightway
ATRI	Louisiana DOTD	Texas DOT
Battelle	Macatawa Area Coordinating Council	The University of Iowa - National Advanced Driving Simulator
BNSF Railway	Marble	TMW Systems
BOSCH	Mercer Strategic Alliance	Toyota
CALSTART	Merriweather Advisors	TranSmart/EJM Corporation
CDM Smith	MG Britt Inc.	TranSystems
CERTH-HIT	Mid America Freight Coalition	TuSimple
Chicago Metropolitan Agency for Planning	Mid-West Truckers Association	Uber
City Tech Collaborative	Minnesota DOT	University of California, Berkeley
Civic Committee of the Commercial Club of Chicago	NARC	University of Wisconsin, Madison
Columbia University	National Renewable Energy Laboratory (NREL)	UPRR
Connecticut DOT	National Research Council Canada	USDOT/Volpe Center
ELPC	Navistar, Inc.	USDOT/FMCSA

Embark	Nebraska Dept. of Transportation	Utah DOT
Environmental Law & Policy Center	New Jersey DOT	Virginia Tech Transportation Institute
EPA	North Central Texas Council of Governments	Will County
FHWA	Northwestern Indiana Regional Planning Commission	Will County Board
FHWA/Illinois Division	NREL	Will County Division of Transportation
Gannett Fleming Inc.	Wisconsin DOT	WSP
George Mason University	Oak Lawn EMS-Fire Rescue	

Appendix B: Workshop Agenda

Day 1: Wednesday, September 5, 2018

Time (CT)	Agenda Item	Name
12:30 PM	**Registration & Sign-In**	
1:00 PM	**Introduction**	**Catherine Batey, Division Administrator** *FHWA Illinois Division*
1:10 PM	**Opening Remarks**	**Justine Sydello, Deputy Secretary** *Illinois Department of Transportation*
1:25 PM	**National Dialogue Overview**	**Vince Mantero, Team Lead** *FHWA Research and Analysis, Office of Freight Management and Operations*
1:45 PM	**Small Group Instructions**	**John Corbin, Connected Automated Vehicle Program Manager** *FHWA Office of Transportation Management*
1:50 PM	**Small Group Session 1:** ***Roadway Infrastructure and Conditions***	All Participants
3:00 PM	**Small Group Session 1 Report-Out**	All Participants
3:30 PM	**Break**	
3:45 PM	**Collaboration Corner** ***Participants rotate around to different stalls to provide input on various topics***	Topics: 1. **Future of Freight:** Operational environments and use cases 2. **Traffic Operations:** Opportunities and challenges 3. **Infrastructure:** Design considerations and impacts 4. **Connectivity:** Enhancing information exchange and cooperation 5. **Terminology:** Developing a lexicon around highway automation 6. **Research Needs:** Collecting research needs statements 7. **Parking Lot:** Important questions and comments that do not cleanly fit at any of the other posts
5:00 PM	**Wrap Up and Preparation for Day 2**	John Corbin, FHWA
5:30 PM	**End of Day 1**	

Day 2: Thursday, September 6, 2018

Time (CT)	Agenda Item	Name
7:30 AM	**Registration & Sign-In**	
8:00 AM	**Kick-Off Day 2**	**Caitlin Hughes, Director** *FHWA Office of Freight Management and Operations*
8:15 AM	**Instructions for Small Groups**	John Corbin, FHWA
8:20 AM	**Small Group Session 2:** ***Operational Design Domain and Safe Operations***	All Participants
9:20 AM	**Small Group Session 2 Report-Out**	All Participants
10:00 AM	**Break**	
10:20 AM	**Preparing for Automated Vehicles:** ***Freight Perspectives***	*Facilitated by **Caitlin Hughes,** FHWA* Panelists: • Stephen Boyd, Founder and VP of External Affairs, Peloton • Carlos Braceras, Executive Director, Utah Department of Transportation • Nate Wells III, Vice President of Operations Planning and Engineering, FedEx Freight • Tom Murtha, Senior Planner, Chicago Metropolitan Agency for Planning
11:30 AM	**Lunch (not included)**	
1:00 PM	**Small Group Session 3: What's Next?** ***Each table develops next steps***	Topics: 1. Developing the Moonshot 2. Near-Term vs. Long- Term Actions 3. Federal, State, Local Roles 4. Other topics
2:30 PM	**Wrap Up and Next Steps**	All Participants

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https://ops.fhwa.dot.gov

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