

## ***Identifying the Challenges, Opportunities, and Current State of Practice***

AMPO Connected and Autonomous Vehicles Working Group

Meeting 1: April 4-5, 2017 in Arlington, Texas

Approximately 100 years ago, automobiles were a revolutionary transportation option. The deployment of this technology drove infrastructure development, the development of transportation policies and regulations, and altered land use and travel patterns. The deployment of the automobile resulted in considerable economic benefits and improved the quality of life for the majority of the American population. Today, we are faced with what some see as the connected and autonomous vehicle (C/AV) revolution. While some C/AV technologies are already in use, there is considerable debate on the exact timeline for full scale deployment of these technologies and the impacts they will have on the transportation system and society. Regardless of these unknowns, C/AV has the potential to bring major changes as well as considerable benefits for the American population.

Metropolitan planning organizations (MPOs) are stewards of the transportation system within their metropolitan planning areas. They work with other stakeholder agencies to ensure its safe operation, and therefore are focusing on the safe deployment of C/AV technologies with minimal disruptions or negative impacts to the transportation system and its users. MPOs are also leaders in the field of transportation. They must keep pace with, leverage, and support emerging technologies, like C/AV, and their potential to improve the transportation system. In addition, MPOs must maintain communications with their stakeholders to inform them about C/AV and other transportation related issues while understanding stakeholder values related to these topics.

With this in mind, the Association of Metropolitan Planning Organizations (AMPO) has assembled a Technical Working Group to identify how to best leverage the benefits of C/AV development and deployment. In early 2017, AMPO mobilized the C/AV Technical Working Group to support MPOs as they incorporate C/AVs into their planning process and products. The Working Group will hold four meetings over the course of approximately one year with its efforts culminating in a national symposium. The goals of the Working Group are to be a mechanism to:

- Build technical, institutional, and policy capacity
- Leverage C/AV benefits
- Address knowledge gaps
- Advance C/AV in planning
- Support the United States Department of Transportation's (USDOT) C/AV efforts

The AMPO C/AV Technical Working Group held its first meeting from April 4-5, 2017 in Arlington, Texas. The group was hosted by the University of Texas at Arlington's College of Architecture, Planning, and Public Affairs (CAPPA) and the North Central Texas Council of Governments (NCTCOG). This meeting identified current policy, practice, and activities at MPOs, as well as challenges and needs, opportunities, and next steps. Its discussions focused solely on the MPO perspective. Subsequent meetings will incorporate coordination with other C/AV stakeholders, such as State DOTs and industry.

Many MPOs have encountered challenges as they try to incorporate C/AV into their scenario planning and long range planning processes and MPO products. A summary of these challenges is presented below. It is important to recognize that within each of these challenges lies opportunity.

Throughout the national discussion there is a tendency to refer to C/AV and other transportation related emerging technologies as *disruptive*, carrying a negative connotation. Yet, the future of C/AV deployment and impacts is not set in stone. MPOs have a great opportunity to influence how these challenges are handled, and to shape the future of our nation's transportation system. The private sector has been moving quickly towards development and implementation of C/AV technologies, so the efforts and products of this Working Group are critical for MPOs to have as soon as possible.

Many of the challenges with C/AV relate to the unknowns surrounding their implementation and deployment. The unknowns make it difficult to have confidence in how to represent a future with C/AV technology in the long-range planning process, in scenario planning, and in MPO products, such as the Metropolitan Transportation Plan and Transportation Improvement Program (TIP). How can an agency or organization plan for something when there is so much uncertainty? Despite the many unknowns, MPOs can still make confident decisions by focusing on what we do know about these technologies, understanding what kinds of things MPOs and other transportation agencies can influence (or might want to), exploring the desired future (and perhaps the undesirable) through scenario planning, and building the MPOs capacity to develop suitable technical, institutional, and policy responses as the C/AV technologies emerge.

While MPOs will not be able to know the future of C/AV implementation with certainty, existing tools such as scenario planning can help MPOs initiate discussions in the metropolitan transportation plan with decision makers, policy makers, and stakeholders about the range of possible outcomes, as well as strategies for identifying and implementing timely responses when these are needed. Scenario planning can be challenging because the data, processes, and questions we are seeking to answer are formulated in terms of our past experience and priorities. Using scenario planning to assess plausible future outcomes and the consequences of different scenarios will help MPOs understand which elements of the system may change, which may remain constant, and which are most critical with respect to adjusting the types of investment and investment priorities the MPO is considering. The scenarios can also reveal the "levers" that might speed or delay the emergence of C/AV technology, as well as decisions that C/AV technology might affect. Using the outcomes of these exercises, MPOs can independently and collaboratively with other transportation agencies and stakeholders identify the desired future for C/AV deployment and implementation from the perspective of transportation needs, desired outcomes, and the feasible levers of influence. The above process will need to be done in planning cycles to revisit what we know, what has changed, and how this affects our strategy as transportation agencies. This information will enable MPOs to plan and make investments for a C/AV future that optimizes the benefits of this technology for the transportation system and users.

Some of the specific challenges the Working Group identified are the following:

Challenge: Unknowns and Uncertainty – What is the timeline for deployment? There are vehicles with connected and autonomous vehicle technology features in the fleet today. However, it is difficult to predict when full fleet penetration will occur and how deployment will be phased in. It is also difficult to predict how deployment will be phased in on a nationwide scale. There are currently numerous pilots, but they mainly focus on a regional scale.

Challenge: Unknowns and Uncertainty – What are the implications of C/AV deployment for safety and security? There is much speculation that the deployment of C/AVs will

drastically improve safety by reducing user error. There are concerns about ensuring safety during deployment and especially under the conditions of a mixed fleet environment and that existing standards, guidance, and requirements keep pace with the deployment to maintain the safety of the transportation system. There are also concerns about ensuring security to prevent vulnerabilities and intrusion that could disrupt the transportation system.

Challenge: Unknowns and Uncertainty – How will C/AV technology impact capacity and congestion? A possible outcome of C/AV implementation and deployment is reduced incidents related to user error and a more efficient traffic flow thereby increasing capacity, reducing congestion, and encouraging an increase in vehicle miles traveled. Project development for large scale transportation projects can often encompass a ten-year time frame. Transportation agencies can use the scenario planning process described earlier to help understand future transportation needs to help prevent the projects they are planning or implementing today from being obsolete when C/AVs are more fully deployed.

Challenge: Unknowns and Uncertainty – How will C/AVs impact mobility and mode options for transportation system users and the transport of goods? C/AVs may expand mobility for those currently unable to drive. Related specifically to the transit mode, there are a wide range of scenarios: at one end, C/AVs could increase transit efficiency through better first and last mile connections, while at the other end, C/AVs could eliminate the need for transit systems entirely by providing shared mobility on demand everywhere at affordable prices. For freight transport, it is possible that C/AV technology will have a positive effect on throughput using applications such as freight platooning.

Since C/AVs have the potential to drastically change mobility and mode options, what impact will they have on land use and equity? There are some concerns that without strong land use planning and policy, C/AVs could induce sprawl and encourage “super-commutes” or conversely that C/AVs could promote gentrification, but in doing so disproportionately impact the availability of low income housing. While C/AVs could enhance equitable access to transportation, some fear that building or adapting facilities specifically for such vehicles will systemically disadvantage some users of the system, such as youth, low income, minority, and elderly populations, households who primarily use public transportation, and rural communities.

Challenge: Unknowns and Uncertainty – What are the implications to funding and the operation, structure, roles, and responsibilities of transportation agencies? What is the estimated cost for the infrastructure required to support this technology? Who will pay for its implementation? How will C/AV technology impact current funding and financing mechanisms? MPOs develop long range plans which forecast needs, priorities, revenue, and sometimes projects using a twenty-year horizon. How will the roles and responsibilities of transportation agencies, the federal government, and industry evolve? How will existing standards and policies evolve with C/AV implementation? Technology can move at a fast pace so there will be a need to provide consistency in deployment of C/AV infrastructure. Existing standards and guidebooks, such as the Manual on Uniform

Traffic Control Devices and A Policy on Geometric Design of Highways and Streets, will need to be updated to be relevant to and provide guidance on a transportation system designed to accommodate C/AVs. How will C/AV technology fit into the performance management provisions required by USDOT, which are currently being implemented? While C/AV may assist transportation agencies with meeting targets, adjustments to the measures and processes may need to be made once C/AVs are more fully deployed.

Challenge: Data. There is already a prolific amount of data relating to roadway condition and operations from a diverse range of sources. Transportation agencies collect data relating to the physical condition and operation of their assets. Private companies, such as Inrix, Waze, and TomTom, collect data that support planning as well as traffic management and operations. The piloting and deployment of C/AVs provides yet another data source. While this is an opportunity to use the data to help with the management of the transportation system, develop partnerships, and even provide a potential source of funding, it is also a challenge to share and best utilize data coming from different data owners. How will MPOs handle the exponential increase in data quantity from C/AVs? How can new types of data be used by MPOs (i.e., windshield wiper use, brake use, etc.)? How much will C/AV data cost? How will privacy concerns be addressed and will there be pushback from travelers on using this data? Given the organizational structure of MPOs, there is an opportunity to serve as the regional clearinghouse for data. However, collecting, cleaning, maintaining, and utilizing such a massive amount of data will require significant staffing and financial resources and is often not typically a function performed by MPOs or other transportation agencies. There are also challenges in extracting useful information from the available data, and fully understanding its implications for planning.

Challenge: Coordination with Stakeholders. MPOs are required to coordinate with their stakeholders. This includes sharing information to inform them of issues, gathering feedback to understand stakeholder concerns and values, and including them in the development of the metropolitan transportation plan and TIP. MPO stakeholders have a wide range of knowledge and views towards C/AVs. Regarding knowledge of C/AVs, some stakeholders are not aware that there are cars in the current fleet with C/AV technology features, while others follow the issue closely and are well versed on the subject. Regarding perceptions towards C/AVs, some MPOs have encountered stakeholders who view C/AV technology as having more negative impacts than positive and believe the deployment should be prevented, while other stakeholders whole-heartedly support C/AV technology and feel it will be the solution to all challenges facing the transportation system. MPOs have an opportunity to share information regarding the current reality of C/AV deployment and manage perceptions so stakeholders are able to understand the plausible benefits, challenges, and limitations of the technology, as well as uncertainties about how these will develop as the technology is deployed. Gaining support from stakeholders and building or strengthening partnerships can serve as important strategies to help maintain confidence in MPOs as they prepare for C/AV technology deployment and implementation.

Challenge: Staying Informed. C/AV technology is a fast-paced issue. There are pilots, test beds, and research, legislation and policy formation, and industry progress occurring

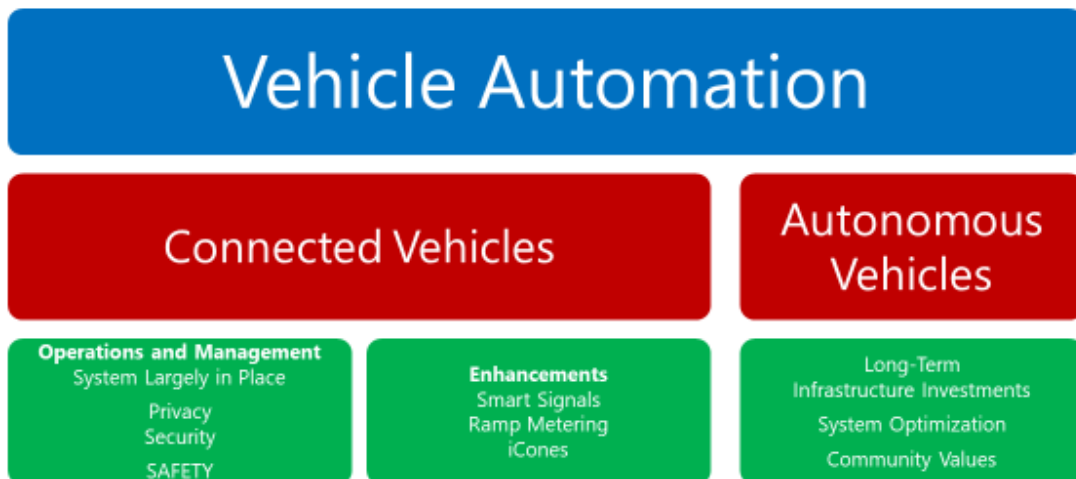
nationwide. This can make it challenging for MPOs and their stakeholder agencies, who are tasked with numerous other responsibilities, to keep up with the plethora of information available, to evaluate it effectively, and incorporate it into their investment decisions. In addition, MPOs focus on medium and long term (i.e., 5 years, 20 years) while C/AV technologies change monthly.

Challenge: Role of the Private Sector. The private sector, including automobile manufacturers, automotive aftermarket suppliers, and technology companies, has been focused on developing and implementing C/AV technologies for the last several years. MPOs should work to include these new stakeholders in the planning process to ensure regional plans and projects are coordinated with private sector plans and to help MPOs stay informed.

Challenge: MPO Technical, Institutional, and Policy Capacity. Since C/AV technology is an emerging issue and the many unknowns make it difficult to incorporate into the planning process, MPOs are still building technical, institutional, and policy capacity. MPOs have been vocal about the need for training about the technology and about planning strategies to address it, for increased availability of best practices or case studies, and for peer exchanges.

In order to better understand the role that MPOs will serve in the deployment and development of C/AV technology the Working Group developed the following graphic, which shows how C/AV technology may impact the metropolitan planning process and provides insight as to how C/AV technology can be incorporated into planning products.

## How to Envision the Planning Opportunity



Based on the AMPO C/AV Working Group Meeting #1, the following recommendations were developed to help MPOs build their technical, institutional, and policy capacity related to C/AV technology implementation and deployment.

*Training and Technical Assistance:* The Working Group recommended that training and technical assistance in the form of best practices, case studies, research, peer exchanges, workshops, and coordination with U.S. DOT and university transportation centers or research institutes be developed to assist them in incorporating C/AVs into their planning processes and products. Specific focus areas discussed are listed below. For a compilation of existing resources, see the C/AV Working Group Meeting #1 Read-ahead Packet and Resources attachment. In addition, the U.S. DOT is developing additional resources especially related to deployment timelines and scenario planning for C/AV. The following areas of concern will need to be discussed (and revisited as C/AV technologies become more widespread):

- Analysis of the potential impacts of C/AV on travel demand, travel patterns, land use, housing location choices, and mode share.
- Case study demonstrating the funding and piloting of a C/AV related project through the metropolitan transportation plan and TIP
- Data collection, management, analysis, and reporting
  - Roles and responsibilities for transportation agencies and others in the C/AV field
  - Data needs determination
  - Funding data needs
  - Incorporation of data into scenario planning and transportation demand models
- Existing and possible future expansions or development of new funding sources
- Identification of infrastructure needs and cost estimates for these needs.
- Deployment of C/AVs beyond the regional scale
- Incorporation of C/AV technology into the metropolitan transportation plan and TIP, including development and use of criteria related to C/AV for project evaluation, prioritization, and performance assessment.
- Incorporation of C/AV technology into scenario planning, including how to use scenarios to handle future uncertainty
- Identification of a spectrum of plausible scenarios for C/AVs using scenario planning
- Risk assessment for C/AV—specific areas discussed within this topic include overbuilt infrastructure and the potential implications of altered travel patterns, such as vehicle occupancy of less than one and potential increased vehicle miles traveled and wear and tear on roads.
- Timeline for realistic phased deployment of C/AVs

*Information Exchange:* The Working Group recommended developing a mechanism, such as a clearinghouse or digest through a partnership with a university transportation center or a newsletter, to help facilitate their ability to gather and interpret information related to C/AV status and research. They also recommended the development of a template, which they coined “C/AV 101,” to help them educate and share information with stakeholders. They advised that several templates would need to be developed to target various stakeholder groups, including board members and other decision and policy makers and the public.

*Regulations and Guidance:* The Working Group emphasized the need for consistent guidance at the national level from the U.S. DOT and its operating administrations to ensure consistent implementation and deployment of C/AV technology nationwide. They also stressed the importance of coordination and consistency at the regional and state levels.

This is the first in a series of four whitepapers that will be developed by the Working Group over the course of 2017-18. Each of the four whitepapers and related meeting materials will be made available on the AMPO website and can be found at [www.ampo.org](http://www.ampo.org).