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AASHTO

TESTIMONY OF

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INTRODUCTION

Chair Norton, Ranking Member Davis, and Members of the Subcommittee, thank you for the opportunity to appear today and speak to the important topic of automated transportation and what lies ahead with these critical technologies.

My name is Scott Marler, and I serve as the Director of the Iowa Department of Transportation, chair of the AASHTO Committee on Transportation System Operations, and tri-chair of the Cooperative Automated Transportation (CAT) Coalition, a partnership between the American Association of State Highway and Transportation Officials (AASHTO), Intelligent Transportation Society of America (ITS America), Institute of Transportation Engineers (ITE), and the Federal Highway Administration (FHWA). Today, it is my honor to testify on behalf of the State of Iowa and AASHTO, which represents the state departments of transportation (DOTs) of all 50 states, Washington, DC, and Puerto Rico.

I firmly believe, as do the other state DOTs, that the deployment of connected and automated vehicles (CAVs) will greatly improve the safety, equity, and sustainability of the nation's transportation system. CAVs represent an important part of a multimodal transportation ecosystem, which we broadly refer to as cooperative automated transportation, with a focus on integrating connected and automated vehicle technologies for all existing and emerging modes of surface transportation. AASHTO considers the best safety and mobility benefits are achieved when automated vehicles are integrated with key transportation infrastructure assets that state DOTs own and operate.

Iowa, like all state DOTs, are infrastructure owners and operators (IOOs)[1] that play a fundamental role in advancing, operating, and maintaining the physical and digital infrastructure necessary to support intelligent transportation systems. The state DOTs have been focused on preparing for a more automated future, a term we call 'readiness', by focusing on interoperable, reliable, and consistent infrastructure (both physical and digital), a cohesive vision, collaborative partnerships, funding, and clear policy.

One of the key reasons state DOTs are so interested in CAVs is because of safety. An estimated 38,680 people died in motor vehicle crashes in 2020. In the first half of 2021, an estimated 20,160 people died, up 18.4 percent compared to the first six months of 2020[2]. This is entirely unacceptable, as each life lost is one too many. The National Highway Traffic Safety Administration (NHTSA) estimates that safety applications enabled by CAV technologies could eliminate or mitigate the severity of up to 80 percent of non-impaired crashes, including crashes at intersections or while changing lanes[3]. Iowa DOT and every other transportation departments at the state and local levels are committed to improving the safety of the transportation system, with CAV technologies being another vital tool in our toolbox. Given the harsh realities on our nation's roads, we need to actively develop, test, and deploy these technologies for all users as quickly and safely as we can.

[1] Infrastructure Owners and Operators (IOO) are defined as the entity responsible for day-to-day operation and maintenance of the transportation assets and the long-term planning and investment required to manage the transportation system.
[2] U.S. Department of Transportation. *National Roadway Safety Strategy*. January 2022. Available at https://www.transportation.gov/NRSS. Accessed January 28, 2022.
[3] https://one.nhtsa.gov/About-NHTSA/Press-Releases/ci.nhtsa_v2v_proposed_rule_12132016.print. Accessed January 28, 2022. More information available here: https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety.

Despite the potential benefits CAV technologies may provide, there have been challenges in broadly deploying these technologies. The pathway and timeline to deployment remains unclear. Higher levels of vehicle automation, such as Levels 4 and 5[4], appear costly to develop and it may be years before those vehicles are commercially available. Also, state DOTs are uncertain of the physical and digital infrastructure needed to support higher levels of automation. It is reported that the public remains unfamiliar and skeptical of the technologies and the potential for shared ownership models. There has also been much uncertainty surrounding the 5.9 Gigahertz (GHz) safety spectrum for transportation. And the CAV industry continues to evolve, consolidate, and change.

With challenge also comes opportunity. In Iowa, my vision for deploying automated transportation technologies has taken a two-pronged approach focused on the drivers of today and the automated vehicles of tomorrow. In supporting the drivers of conventional vehicles including those with Advanced Driver Assistance Systems (ADAS) in production today, and the more fully automated driving systems of tomorrow, Iowa has several strategies to promote readiness for automated transportation and the deployment and integration of connected and automated vehicles and devices. These include:

[4] Level 4 and 5 refer to the SAE Levels of Driving Automation. More information is available here: https://www.sae.org/blog/sae-j3016-update. Accessed January 28, 2022.

1. **Planning & Visioning**—We have developed a common vision and plan to guide, support, and inform the Iowa DOT and our partners as emerging technologies are being developed and deployed on Iowa's public roads[5].
2. **Stakeholder Engagement**—We created the Iowa Advisory Council on Automated Transportation (AT Council)[6] to engage a broad cross section of Iowa stakeholders on the development and deployment of emerging technologies. Iowa's AT Council works to keep stakeholders informed, capture recommendations, and align initiatives for automated transportation in our state.
3. **Policy & Legislation**—Iowa has enacted state laws that support the adoption of CAV technologies such as a vehicle title and registration framework, an automated driving systems framework, personal delivery devices, and enabling statutes for automated truck platooning[7]. It is currently legal in Iowa for "driverless" vehicles to operate on Iowa's roads.
4. **Research, Development, and Testing**—In Iowa, research is a critically important element of our success, which is why we foster strong collaboration with our academic partners at the Iowa State University (ISU), Institute for Transportation (Intrans) and the University of Iowa (UI), National Advanced Driving Simulator (NADS).

[5] https://iowadrivingav.org/pdf/ATC-Vision.pdf. Accessed January 28, 2022.
[6] https://iowadrivingav.org/. Accessed January 28, 2022.
[7] https://www.legis.iowa.gov/legislation/BillBook?ga=88&ba=HF%20387. Accessed January 28, 2022.

Iowa's experience is not unique among the state DOTs. In October 2021, AASHTO adopted ten CAV Policy Principles[8] we believe are fundamental to the safe and effective deployment of connected, automated, and cooperative[9] vehicle technologies across our states and nation. Today, I would like to focus my testimony on five of these ten principles which are under the purview of this subcommittee:

1. A national strategy and vision are needed.
2. Advance equity, access, and quality of life for everyone.
3. The future is connected and automated.
4. Leadership is crucial to foster industry collaboration and community engagement.
5. Promote innovative Federal infrastructure investment.

1. A NATIONAL STRATEGY AND VISION ARE NEEDED

AASHTO believes there is an urgent need for a coordinated national strategy which includes a vision and roadmap for CAV deployment and integration into our nation's roadways. The vision and strategy must be developed collaboratively, with active input from Federal agencies, IOOs,

[8] American Association of State Highway and Transportation Offices (AASHTO). *AASHTO Connected and Automated Vehicle Policy Principles.* October 2021. Available at https://cav.transportation.org/wp-content/uploads/sites/61/2021/11/CAV-Policy-Principles-v4-press.pdf. Accessed January 28, 2022.

[9] There is no consistent and agreed to definition of connected, automated, and cooperative vehicle technologies. AASHTO uses the following as general definitions:

- Connected Vehicle (CV)—Technologies that enable two or more vehicles and/or roadway infrastructure elements to communicate with each other.
- Automated Vehicle (AV)—Vehicle-based technologies that enable automation of traditional drive operational functions to occur as defined by SAE J3016 Levels of Driving Automation.
- Cooperative Vehicle—The integration of CV, AV, and other technologies that enable users of the transportation system (vehicles, pedestrian, bicyclists, etc.) to cooperatively operate.

industry, communities, local governments, and other transportation stakeholders, representing the populations their respective transportation systems serve.

Connected and automated vehicles technologies will be disruptive to our society and surface transportation system, and it is accelerating. Because the safety and mobility benefits are potentially enormous, realizing those benefits requires clear strategic direction, sustained programs, ongoing cross-sector dialogue, and focused activities. In Iowa, this begins with visioning and planning to assess needs, make informed decisions, and focus investments while considering broad perspectives from key stakeholders and the public.

For example, the Iowa DOT has developed the Iowa AT Vision[10] and the Iowa DOT Cooperative Automated Transportation plan[11] which includes a variety of tactical activities such as the following:

1. Preparing our communities and infrastructure by making pavement markings wider and brighter to improve visibility for humans and automated systems.
2. Working with local agencies to develop planning guidance for CAV technology in comprehensive plans and zoning guidelines, as well as working to address environmental justice concerns by ensuring equitable access to transportation services.

[10] https://iowadrivingav.org/pdf/ATC-Vision.pdf. Accessed January 28, 2022.
[11] https://iowadot.gov/tsmo/service-layer-plans. Accessed January 28, 2022.

3. Monitoring industry trends and advancements to identify how they might impact CAV usage on public roads, including the growing automation of farm equipment.
4. Engaging with economic and education leaders to assess how the future labor market may need to adjust in response to greater automation in vehicles for both passenger and freight movements.
5. Working with law enforcement, first responders, driver/vehicle licensing staff and other roadway safety community leaders to learn more about the impacts of the technologies on existing systems and processes such as our crash reporting procedures.

In similar fashion to the Iowa AT Vision and IOWA DOT CAT Plan, it is imperative that we develop a vision and strategy at the national level so that the entire transportation community knows what we are all striving for. Domestic and international models have shown how independent, collaborative non-governmental organizations can help lead these efforts. In addition, AASHTO and the state DOTs remain committed to working with the United States Department of Transportation (USDOT) and others in this area to help frame the enabling policies and regulatory environment necessary for CAV technologies to integrate seamlessly across jurisdictions and modes.

2. ADVANCE EQUITY, ACCESS, AND QUALITY OF LIFE FOR EVERYONE

CAV technologies have the potential to improve mobility, access, and equity and help engage disadvantaged and marginalized communities. IOOs and their partners recognize the role

transportation plays broadly in society, its ability to connect communities, as well as the historic inequities from the 20th century when building out the nation's transportation system.

In the United States, CAV technologies need to benefit all users of the transportation system regardless of their income levels or geographic location. We are addressing this head-on in Iowa where our research partners at the University of Iowa National Advanced Driving Simulator were awarded one of the eight Automated Driving System (ADS) demonstration grants from USDOT[12]. While 19 percent of Americans live in rural areas, 68 percent of our nation's total lane miles are in rural areas, and 45 percent of all traffic related fatalities occur on rural roadways[13]. Iowa's population is aging, and it remains paramount that older individuals have the ability to get to the important services they need, such as healthcare which is being regionalized. The ADS for Rural America project is a demonstration project that involves a highly automated shuttle bus with advanced sensors. This automated vehicle is now being driven on all types of rural roads in Iowa including gravel roads and paved unmarked roadways. The goal is to understand the unique challenges that rural roadways present for automated vehicles as well as identifying opportunities for advancing automation so that it improves safety and mobility for everyone, especially the mobility challenged populations in rural America.

Although we are learning a lot, this project is one example of where further research and understanding is needed. Future projects need to focus on supporting equitable investments,

[12] https://www.transportation.gov/av/grants. Accessed January 28, 2022.
[13] https://www.bts.gov/rural. Accessed January 28, 2022.

policies, and engagement strategies such that CAV technology investments advance community-driven needs and increase access to desirable mobility options. It is my hope that projects such as this one in rural Iowa, and others like it throughout the United States, will lead to the promotion of best practices and approaches for the deployment of CAVs that are equitable, with the benefits widely available to all members of our society.

3. THE FUTURE IS CONNECTED AND AUTOMATED

To fully realize the benefits of automated transportation, AASHTO member states believe that vehicles must be more than automated, they must also be connected. Connected vehicle technology is key to ensuring automated vehicles have the redundant safety measures in place to advance AASHTO's goals of a safe, mobile, equitable and efficient transportation system. AASHTO continues to strongly support the preservation of the 5.9 GHz spectrum to advance safety and realize the benefits of connected vehicle technologies. From our interactions with other nations across the globe, we are aware that others have set aside bandwidth in the 5.9 GHz spectrum. We are also aware that some nations appear to be further along with respect to readiness and integration of advanced technologies into the roadway environment. These developments have the potential to put the United States at a competitive disadvantage, a harsh reality that can be remedied with bold action.

In Iowa we strongly support strategies that connect vehicles to the infrastructure and one another. While the industry as a whole addresses the technical and engineering aspects of

making connected vehicle technology a reality, we are focused on two key areas that will enable a connected vehicle future:

1. **Digital Infrastructure and Data**—Iowa DOT continues to deploy fiber optic cable and wireless communications with our partners at the Iowa Communications Network and the private sector, and extend our communications network to inform the travelling public through connected infrastructure. We are also working with Iowa State University to study advanced wireless communications that hold the potential to take Vehicle-to-Everything (V2X) communications to the next level. We are also data centric and are implementing new data streams, like connected vehicle hard braking and hard acceleration data, that reveal real-time operations and flag potential safety issues. We are carefully evaluating our approach towards the design and operation of Iowa's transportation system to accommodate human mistakes and injury tolerances to avoid fatal and serious injuries.
2. **Work Zones & Maintenance Operations**—The management and maintenance of our surface transportation system is constant, and work zones and maintenance operations are occurring nearly 24/7 in our state. These operations can be a challenge not only for human operators but especially for vehicle systems that support drivers or those that are automated. In response to this, we are focused on improving our work zones through improved data, awareness, motorists' feedback, and performance analytics. In fact, we are providing more information to connected vehicles through adoption of the USDOT work zone data exchange and through data feeds that private companies (e.g,

Waze) are using to produce visual and audible warnings like “work zone ahead” or “snowplow ahead”. Standardized data streams like the work zone data exchange are anticipated to help commercial drivers avoid bottlenecks and improve operations, while assisting passenger vehicles with real time information about the driving environment ahead.

While vehicle connectivity is ideal, vehicle-to-infrastructure (V2I) and V2X technology poses challenges. AASHTO has recognized these challenges and has served as a leader to address them and bring the industry to consensus. It is critical that we continue to develop the needed connected vehicle technologies and supporting infrastructure because I believe, as well as many of the other state DOTs, that we cannot fully realize the benefits of automated vehicle technologies without vehicles being connected and cooperating with each other.

4. LEADERSHIP IS CRUCIAL TO FOSTER INDUSTRY COLLABORATION AND COMMUNITY ENGAGEMENT

Strong Federal leadership is critical to convening industry, the public sector (including IOOs, local governments, and planning organizations), and other stakeholders and partners to ensure strong coordination and collaboration and ensure the public and private sectors work together to safely deploy technologies that meet community needs. We need to engage across government, industry, academia, regions, and communities to ensure our efforts are interoperable and aligned. It is critical that we build off previous national dialogues, continue to collaborate, convene, and share information among IOOs, local governments, industry,

researchers, communities, planning organizations and other stakeholders. We must inform and engage communities to build trust and awareness of CAVs.

Leadership is critical at all levels of government and in both the public and private sectors. At the state level, Iowa is taking a leadership role to collaborate with other states and the federal government in national and regional efforts to prepare for and support the deployment of CAV technology. The Iowa DOT is one of several state DOTs that is also responsible for driver licensing, driver education and vehicle title and registration. We have been active with the American Association of Motor Vehicle Administrators (AAMVA) to work across state lines on matters of driver education, vehicle registration, and law enforcement. Iowa is one of the first states in the nation to update our title and registration system to identify the ADS capabilities of a vehicle and tie that to the official vehicle record.

At the regional level, I co-sponsor an effort for the Mid-America Association of State Transportation Officials (MAASTO), which includes 10 states of the upper Midwest (Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin) which has developed a ten-year regional strategy for CAV deployment and integration. The CAV Committee for this group works to support the regional strategy and has focused their tactical approaches on organizational readiness, data sharing, planning, coordination, and policy issues. Regionally, midwestern states are interested in leading the nation with advanced transportation technologies to help move our products to market faster and cheaper while ensuring our travelers are safe.

Finally, at the national level, I am a tri-chair of the Cooperative Automated Transportation Coalition, a partnership between AASHTO, ITS America, ITE, and FHWA. The CAT Coalition brings together the private sector, IOOs, and government agencies (federal/state/local) with the aim of coordinating our efforts to safely and efficiently deploy connected and automated transportation technologies[14].

It is vitally important that the federal government and specifically the USDOT continue to join in supporting these national, regional, state, and local efforts. The federal government and the USDOT are uniquely positioned to facilitate and sustain a technically informed and objective collaboration effort. Federal leadership can ensure national consistency in systems engineering and architecture to guarantee interoperability and standardized levels of safety across state lines. We value the participation of the USDOT agencies and will move forward as needed within states and local communities, because the technology continues to move ahead.

5. PROMOTE INNOVATIVE FEDERAL INFRASTRUCTURE INVESTMENT

AASHTO supports more flexible and dedicated funding to advance CAV technologies. We need to fund both the digital and physical infrastructure that enhances safety while also supporting technologies that advance CAVs. The Infrastructure Investment and Jobs Act (IIJA) provides a significant investment in the deployment of broadband technologies which could be used to

[14] More information about these efforts are document at the CAT Coalition website: https://transportationops.org/CATCoalition. Accessed January 28, 2022.

support a CAV ecosystem throughout the United States. And, other parts of the law enable state DOTs to spend federal funding on CAV technologies. However, as states begin or continue to pursue connected infrastructure initiatives, it is important that federal infrastructure and transportation funding continue to give states the flexibility to invest in planning and improvements to support CAV deployment, whether through the new provisions in the IIJA or through traditional federal transportation programs.

Federal funding for advanced transportation technologies are frequently dispensed through discretionary grants. As the technologies become more widespread and as all states seek to invest in their physical and digital infrastructure, the federal funding mechanisms will need to be reexamined. The national focus on electric vehicles and the needed vehicle charging infrastructure in the IIJA is representative of the level and focus of investment necessary to advance CAV technologies. Smart, efficient investment in these technologies will help save lives and will have a dramatic effect on the economic prosperity of our communities and our nation.

CONCLUSION

In conclusion, I want to emphasize some key messages that are the foundation of my testimony. First, state DOTs are preparing for a future with connected and automated vehicles, but there is a lot of uncertainty of what the future will ultimately be. The path and timeline to deployment is unclear for many different reasons with the CAV industry continuing to evolve, consolidate, and change on an almost daily basis. Steadfast to these uncertainties is the fact that state DOTs, as critical surface transportation IOOs, are absolutely dedicated to supporting

the safe deployment of a connected, automated, and cooperative vehicle ecosystem where benefits are seen across all of the states and throughout the population.

Second, safety is absolutely paramount. CAV technologies must be deployed so that they improve the safety of our roadway system and the users of it. On January 27, 2022 USDOT announced the National Roadway Safety Strategy which outlines the Department's comprehensive approach to significantly reducing serious injuries and deaths on our Nation's highways[15]. Two important aspects to achieving success of the strategy are Safer Roads and Safer Vehicles. I believe that CAV technologies must be an integral part of this effort and can be another tool for our industry to achieve success in improving the safety of our transportation system.

Third, numerous challenges remain that range from technological to economic to political. These are significant challenges, but ones that we can overcome as an industry if we all work together. Thus, we need the federal government as an integral partner. We need the technology developers, vehicle manufacturers, and IOOs collaborating with each other to get the safety technology deployed. We need the IOOs at the state and local level to ensure equity in how the technology get used. Finally, we need to work together to determine how deployment will be funded.

[15] https://www.transportation.gov/sites/dot.gov/files/2022-01/USDOT_National_Roadway_Safety_Strategy_0.pdf. Accessed January 28, 2022.

Finally, I want to end my testimony with three actions the federal government can initiate today to uniquely assist all state DOTs and other IOOs in the successful deployment of connected and automated vehicle technologies:

1. **Continue to Foster Collaboration and Partnerships**—The federal government plays a crucial role to ensuring the safe and efficient deployment of these technologies. AASHTO, ITE and ITS America are right now actively examining how a coalition organized around automation and emerging technologies could function. It is critical that USDOT continues to support such an effort.
2. **Develop a National Strategy and Vision**—Engage the public, private, and academic sectors to develop a vision for CAV and a national strategy for achieving that vision. Congress can foster progress by calling/directing USDOT to facilitate activities which lead to this vision and strategy, and fund programs to support these purposes, including gap closing research, development, and technology. AASHTO's CAV Policy Principles include recommendations on this topic and we stand ready to work with this committee to achieve this action.
3. **Preserve the Needed Communication Spectrum**—AASHTO continues to advocate for reserving the entirety of the 5.9 GHz safety spectrum for transportation use. Congress could provide much needed certainty by working within their authority to continue to reserve the safety spectrum to ensure the deployment of life-saving connected vehicle technologies. Reserving this spectrum for consistent use would put our country on par

with what is happening in Europe and Asia so that we can continue to lead in this critical space.

In Iowa we will continue to grow our leadership in this space and continue our strong collaborations around the United States and the world so that we will have the safest vehicles and roads for all transportation users. Nationally, AASHTO will continue to engage key public and private stakeholders towards development of a vision for CAV and a national strategy for realizing such a vision.

Thank you again for the honor and opportunity to testify today on behalf of AASHTO and the Iowa DOT, and I am happy to answer any questions.