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BEFORE THE

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HEARING ON

Challenges and Future of Federal Surface Transportation Research

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Chairman Bucshon, Ranking Member Lipinski, and Members of the Committee, thank you for the opportunity to appear before you today to discuss the challenges and future opportunities of the Department of Transportation's surface transportation research programs. We all recognize that transportation research, technology and data are critical tools for improving the safety, efficiency, mobility, capacity and state of good repair of America's transportation systems; and for reducing transportation's environmental and societal impacts. The Office of the Assistant Secretary for Research and Technology is pleased to continue to lead the Department of Transportation's research coordination efforts, driving cross-modal collaboration to meet 21st Century challenges.

Continual development and adoption of new processes and advanced technologies are improving safety, reducing project delivery times, improving system operations and capacity, extending the life of transportation infrastructure, and providing actionable information to travelers and transportation planners. As Secretary Anthony Foxx noted at January's Transportation Research Board's Annual Meeting, research and data have a significant role to

play in addressing America's infrastructure deficit by improving planning and adopting innovative best practices; stretching scarce resources with well-researched, data-driven innovation resulting in smarter capital projects which are built better and cost less. A good example of this is accelerated bridge construction, reducing the time for small bridge replacement – saving funds which can then be used for other work.

The future of the U.S. surface transportation system has the potential to be a safer, cleaner, more efficient, durable and resilient system if the necessary research is performed and results implemented to transform the current system into a system suitable to meet the nation's needs for personal mobility and goods movement for the 21st century. I see a system with highly automated vehicles of all types -- autos, trucks, trains and buses -- using alternative, non-fossil-fuel energy; and running on infrastructure that is constantly monitored, both for operational efficiency and infrastructure status, that is made of new, high technology materials that will last a century rather than decades.

We cannot create a transformational system by applying 21st century research to 20th century infrastructure. In other words, we cannot just keep finding better ways to fill pot holes. The National Academies, through the National Research Council, issued a report entitled "*Framing Surface Transportation Research for the Nation's Future.*" Funded by the state departments of transportation, one of the report's conclusions is that the USDOT needs to increase the amount of advanced research that it conducts or sponsors, to meet emerging challenges.[1] At the same time, we need to continue existing long-term research, and core

[1] "Framing Surface Transportation Research for the Nation's Future." Washington, DC: Committee on National Research Frameworks, Application to Transportation (Transportation Research Board Special Report 313), 2014.

research into human factors for safety. The Administration's surface authorization proposal, the GROW AMERICA Act, will improve vehicle and passenger safety by advancing intelligent systems in vehicles and in smarter infrastructure across all modes, and by exploring new ways to utilize real-time information to aid the flow of goods along America's freight corridors. The GROW AMERICA Act will accelerate deployment of surface transportation technologies and innovations in safety, infrastructure renewal, reliability, and capacity.

One example of successful advanced research is the Connected Vehicle program. Funded by the Intelligent Transportation Systems (ITS) Research program, the Department has completed the Connected Vehicle Safety Pilot program in Ann Arbor, Michigan. That research informed the resulting National Highway Traffic Safety Administration's (NHTSA) February decision to move forward with vehicle-to-vehicle (V2V) communication technology to enable significant accident avoidance and other safety applications in light duty vehicles.

Another opportunity for USDOT to execute advanced research is in reducing the greenhouse gases produced by the surface transportation sector. All modes of surface transportation produce greenhouse gases and other pollutants, with resulting public health and environmental impacts. The transportation sector was responsible for 28% of U.S. greenhouse gas emissions in 2012. Light vehicle use alone in the U.S. is responsible for 45% of the global production of vehicular CO_2 emissions.[2] An advanced program focused on reducing greenhouse

[2] Kahn Ribeiro, S., S. Kobayashi, M. Beuthe, J. Gasca, D. Greene, D. S. Lee, Y. Muromachi, P. J. Newton, S. Plotkin, D. Sperling, R. Wit, P. J. Zhou, 2007: Transport and its infrastructure. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. [Chapter 5 of the IPCC Fifth Assessment Report: Climate Change 2012, "Transport and its Infrastructure."

gas production in transportation would be a cross-modal effort involving all vehicular modes of travel in surface transportation, and is included in the proposals of the GROW AMERICA Act.

The Department of Transportation currently invests $804,726,000 (Fiscal Year 2014 enacted) in federal surface transportation research, development, and technology. Within the USDOT, and its various Operating Administrations, the allocation of this funding is based on DOT goals and defined missions or priorities within the Operating Administrations.

Safety continues to be the number one priority of the USDOT. Operating Administrations like the Federal Railroad Administration, the National Highway Traffic Safety Administration, and the Federal Motor Carrier Safety Administration have congressionally-mandated regulatory responsibility for safety within their individual modes. As a result, the majority of the research conducted by these modes always will be safety oriented. The same is increasingly true of the Federal Transit Administration. With the new responsibilities placed on that Operating Administration by MAP-21 for transit system safety oversight, more of the research funded by FTA will be focused on safety.

The Federal Highway Administration (FHWA) has by far the largest and widest-ranging research program of any of the surface modes. Research sponsored or conducted by the FHWA ranges from operations to safety to structures and many areas in between. The FHWA also has one of the few USDOT advanced research programs, the Exploratory Advanced Research program, which is relatively small (approximately $10 million per year in funding) but looks at means of applying new technologies, developed in other fields, to the transportation system.

The FHWA seeks and uses considerable stakeholder input when determining how research funds will be allocated. These stakeholders include the state Departments of Transportation, Metropolitan Planning Organizations, local and tribal governments, construction and consulting engineering firms, and the Transportation Research Board.

One key research program managed by the Office of the Assistant Secretary for Research and Technology is the University Transportation Centers (UTC) program. The UTC program is another way the DOT supports advanced research, by enabling universities to use their cross-disciplinary capabilities to conduct the advanced work for which they are well-suited.

Covering over 120 universities which bring expertise in multiple disciplines, both traditional (civil engineering) and not (public health, psychology and sociology, studying safety culture), UTCs enable the systemic, interdisciplinary, cross-modal research we need to address increasingly complex challenges that cross traditional boundaries.

UTCs do this while educating undergraduate and graduate students in the technical and problem-solving skills we need moving forward – a "win–win" if I've ever heard one. I always enjoy the opportunity to meet with the bright young students at our UTCs, to hear about what exciting new things they are developing in the laboratories and classrooms, and how their own lives are changing, even as they add to our transportation knowledge. I encourage the members of this Committee to take those opportunities as well.

At this point, I would like to provide a brief overview of DOT research investments, the subjects of which are linked to one or more of the Departmental strategic goals: Safety, State of Good Repair, Economic Competitiveness, Livable Communities and Environmental Sustainability.

In safety, the highest priority across the DOT is the reduction of transportation-related fatalities and injuries. This goal is being pursued by conducting research in many areas, including:

- Human behavior, operator distraction and fatigue.
- Connected Vehicles.
- Remote and wireless inspection of vehicles (trucks and trains).
- All types of vehicle crashworthiness (cars, trains, trucks, buses).

For state of good repair, some areas of emphasis are:

- Using of sensors for monitoring and non-destructive evaluation of infrastructure (bridges, roads, rails).
- Utilizing Asset Management tools to reduce maintenance costs.
- Reducing the frequency of infrastructure repair, rehabilitation, and re-construction.
- Building new structures that are more durable.

In the area of economic competitiveness, research is being conducted to:

- Improve traffic management to increase capacity and throughput.
- Create efficiencies in multi-modal freight movement.

- Use data to increase efficiency in freight logistics.
- Investigate the impact of financial policy on the efficiency of the overall transportation system.

For Livable Communities and Environmental Sustainability, research is being conducted to:

- Improve and increase access to transportation and human services for underserved populations.
- Help the traveling public make informed, multi-modal travel decisions.
- More safely integrate pedestrians and bicyclists into the system.
- Reduce energy consumption in operations, construction and maintenance.
- Increase the use of alternative fuel vehicles of all types.
- Adapt transportation infrastructure for resiliency to the effects of climate change and extreme weather events.

To summarize, research can reduce the gap that exists between the needs of the system and the funds available to operate and maintain the system, while improving the quality of life for the American public.

However, it takes time to implement new technologies, due to necessary approvals of the technology, environmental review, or other reasons. Review and approval of new technologies is often a federal responsibility, requiring a waiver from existing regulations or guidance, or the adoption of updated technical standards. Each Operating Administration endeavors to take

actions within available resources to streamline these reviews, including involvement in standards developing organizations, assessing technology readiness, and listening to Advisory Boards and stakeholder groups, all to allow the implementation of new technologies as rapidly as possible. The GROW AMERICA Act includes proposals to reduce environmental review time.

I would like to provide more detail to the Committee about the Intelligent Transportation Systems (ITS) Research Program – both because it is managed directly by my office, and because it touches on all of the strategic themes of the Department's surface transportation research.

In ITS research, some of our team's progress has been attracting public attention – most notably through the ITS-funded Connected Vehicle Safety Pilot, the largest such test program in the world, conducted through the University of Michigan Transportation Research Institute (UMTRI) in Ann Arbor, Michigan. The Department tested safety applications with everyday drivers under both real-world and controlled test conditions. These test results led to the National Highway Traffic Safety Administration's (NHTSA) February decision to move forward with vehicle-to-vehicle (V2V) communication technology for light duty vehicles. This technology will improve safety and has the potential to reduce non-impaired crashes by 80%. It would do so by allowing vehicles to "talk" to each other and ultimately avoid many crashes altogether by exchanging basic, anonymous safety data, such as speed and position, ten times per second. This major decision was based largely on the research, technology developments, test deployments, and data collections and analyses conducted under the ITS Research Program. Research indicates that safety applications using V2V technology can address a large majority of

crashes involving two or more motor vehicles. With safety data such as speed and location flowing from nearby vehicles, vehicles can identify risks and provide drivers with warnings to avoid other vehicles in common crash types such as rear-end, lane change, and intersection crashes.

But that's certainly not all. The Department continues to work collaboratively across the Operating Administrations towards connected vehicle applications for heavy duty vehicles, and our colleagues at the Federal Highway Administration are preparing to issue guidance in 2015 for installing vehicle-to-infrastructure applications for roadway safety and improved traffic operations and maintenance, drawing on the connected vehicle data that will be made available. ITS research has enabled multimodal Integrated Corridor Management (in part through demonstration projects in Dallas and San Diego), and Next Generation-911. Additionally ITS is using connected vehicle technology research to reduce congestion, improve road weather information and real-time data capture, and reduce emissions.

To enable the deployment of this technology, additional research is needed to address the technical and policy challenges. The ITS program continues to assess the legal and policy structures needed to make these safety, operational and environmental improvements a daily reality, with an emphasis on ensuring data privacy and on the technologies enabling security of cyber-physical systems. And, we continue to work actively with our partners in the standards developing organizations to ensure that the many private sector actors involved in ITS deployment – from Original Equipment Manufacturers to suppliers to technology firms to infrastructure and construction firms – all produce interoperable equipment and systems that can

seamlessly share the data that enables safety and other applications. We are conducting specific research on cyber-physical systems in collaboration with National Institute of Standards and Technology to ensure that these Connected Vehicle systems have sufficient security protections against any malicious cyber-attacks.

Finally, I note that all of this success, and the standards that support it, are based upon the availability of the 5.9 GHz Dedicated Short Range Communications (DSRC) spectrum. Allocated in the U.S. and internationally for transportation safety, the 5.9 GHz band was specifically selected to enable the ten-times-per-second exchange of information needed to bring to reality the safety improvements that remain the primary goal of ITS research. We recognize that spectrum is a scarce national resource and that it is important to find ways to expand wireless broadband capacity. We are actively involved in the ongoing discussions related to the FCC's proposal in its Notice of Proposed Rulemaking (NPRM) to permit Unlicensed National Information Infrastructure devices (e.g., broadband WiFi) to operate in the 5.9 GHz spectrum currently licensed for DSRC. The Department also intends to participate in the National Telecommunications and Information Administration's (NTIA) upcoming technical analysis related to understanding interference and sharing of the 5.9 GHz spectrum. We believe that the FCC and the NTIA must ensure that unlicensed devices do not compromise safety through harmful interference to the ITS architecture, operations, or safety critical applications if permitted to operate in the 5.9 GHz band. We have very serious concerns about any spectrum sharing that prevents or delays access to the desired channel, or otherwise preempts the safety applications. At this time, the Department is unaware of any existing or proposed technical solution which guarantees interference free operation of the DSRC safety critical applications while allowing WiFi enabled devices to share the 5.9 GHz spectrum.

With regard to full implementation of this technology in the U.S., the success of the Ann Arbor Safety Pilot has provided clear momentum toward Connected Vehicle deployment. The Department is planning to participate in additional Connected Vehicle pilot deployments in 2016. USDOT expects that state DOTs and local governments will have multiple operational pilot deployments of Connected Vehicle infrastructure operating in local environments by the end of this decade. A significant implementation of Connected Vehicle technology in vehicles, fleets, infrastructure, and aftermarket devices would follow soon thereafter. Please keep in mind that vehicles are just one exciting application for connected technologies. Indeed, applications can be found across the range of modes of transportation.

In closing, I am excited about the research being conducted at the U.S. Department of Transportation. We are addressing serious issues in serious ways for the benefit of the travelling public. I look forward to answering your questions.