Intelligent Transportation Systems (ITS)
Program Advisory Committee (PAC)
2016 Report to Congress

1. **Overview**

   a. Pursuant to 23 U.S.C. § 515(h)(4) – "Advisory Committee – Report", as amended by sec. 6007 of the Fixing America's Surface Transportation (FAST) Act (P.L. 114-94; December 4, 2015), this report describes how the U.S. Department of Transportation (Department) has implemented recommendations made by the Intelligent Transportation Systems (ITS) Program Advisory Committee (ITS PAC or Committee).

   b. The Secretary was initially directed in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU; P.L. 109-59; August 10, 2005) to establish the Committee with no more than 20 members to provide advice to the Secretary on ITS aspects of the Department's strategic plan and on ITS research funding. The Secretary is directed also to make an annual report available to the public on a Department of Transportation website that includes the following:

      (1) all recommendations made by the Committee during the preceding calendar year;
      (2) an explanation of the manner in which the Secretary has implemented those recommendations; and
      (3) for recommendations not implemented, the reasons for rejecting the recommendations.

   c. In response to the legislative directive, the Secretary established the ITS PAC in 2006. Since its inception, the ITS PAC has met 24 times and has submitted seven advice memoranda to the Secretary.

2. **Summary of ITS PAC Activity**

   a. The Committee met three times in 2015 and discussed numerous topics related to the development of future ITS. These topics included the impact of shared mobility, the growth of public transportation ridership in and around our urban centers, data sharing policies for automated and connected vehicles, the declining investment in transportation infrastructure, and ITS trends in vehicle freight technology. After much deliberation, the Committee formed five subcommittees to explore the abovementioned subject areas.

   b. The five ITS PAC subcommittees shared their professional expertise, engaged with industry experts, and consulted with the ITS Joint Program Office (JPO) staff as needed. After careful deliberation, the subcommittees reported over 30 recommendations to the ITS PAC. The Committee reached consensus on five key topics: data, funding, public transport, shared mobility, and workforce development; and forwarded 17 recommendations.

3. ITS PAC Recommendations and U.S. DOT Response

a. **Data**. Automated and connected vehicle applications promise to transform our nation's transportation system through the use of wireless communications networks that will have the ability to generate, capture, and share real-time data about our environment, mobility, and personal safety. Increasing concerns about the vulnerability, security, reliability, and ownership of this information will likely have a dramatic impact on consumer adoption and the emergence of such vehicle applications. An assessment of how other industry sectors have addressed similar data issues could provide guidance for the handling of automated and connected vehicle data applications.

Recommendation 1. The Department's Chief Information Officer (CIO) should convene a connected vehicle forum with State representatives to drive consistent data policies across the States and with the Federal government.

Department's Response to Recommendation 1. The Department concurs with this recommendation and will partner with the Center for Open Data Enterprise to hold such a forum. The Department's Chief Data Officer is currently working on the Open Government National Action Plan and the adoption of the International Open Data Charter on key issues for Federal open data.

Recommendation 2. Based on data content, data source, and data destination, the ITS JPO should analyze the data available from connected and automated vehicles and categorize it in levels of sharing sensitivity.

Department's Response to Recommendation 2. The Department concurs. Data types are identified in the connected vehicle (CV) reference architecture. The reference architecture anticipates two fundamental data types: 1) data units that do not identify individuals or their activities but contribute to the overall understanding of the system state (e.g. Basic Safety Messages exchanged among vehicles for crash avoidance, Signal Phase and Timing messages broadcast to vehicles for safe and efficient intersection movement), and 2) data units that support specific transaction-based activities. This separation allows different levels of practice to be applied to the two distinct types of data so that fundamental system state data is available uniformly (equivalent to the data distributed according to the Manual for Uniform Traffic Control Devices) and transaction data is protected to the level of confidentiality appropriate for the transaction.

Recommendation 3. The ITS JPO should identify other industries that engage successfully in consumer data sharing and identify policies, procedures, and public outreach that have contributed to their success.

Department's Response to Recommendation 3. The Department concurs on this recommendation. An overall policy for data creation and sharing should be developed and leverage examples from other government agencies.

Recommendation 4. The ITS JPO should convene a forum to invite technology presentations from industry and academia on potential solutions to Global Positioning System (GPS) reliability assurance, including natural loss of signal or corruption, as well as intentional malicious denial of signal and accuracy. The ITS JPO should evaluate these solutions and develop a path to resolving the GPS vulnerability issue for connected and automated vehicles.

Department's Response to Recommendation 4. The Department concurs that a forum may be valuable, recognizing that while we have identified techniques to address multiple GPS reliability concerns, we are best-served by remaining current on available techniques. For example, the Department is aware of several concepts (e.g. Autotalks) that would use terrestrial techniques to augment or confirm satellite-based location awareness. The Department will encourage them to participate in our Connected Vehicle (CV) Pilots Deployment projects to learn more about their capabilities, and to encourage a discussion of certain concepts. In order to assure that vehicle devices meet basic performance requirements, the locations for the first wave pilots will likely need certification tests. A sound approach would have multiple techniques contributing to location awareness for overall system robustness.

Recommendation 5. The ITS JPO should develop a comprehensive plan for evaluation of benefits and performance of the connected vehicle system and, once operational, include the data and analytical procedures required for such evaluation.

Department's Response to Recommendation 5. The Department concurs with this recommendation; we already know the potential benefits of a CV system, which is the basis for the planned National Highway Traffic Safety Administration (NHTSA) CV rulemaking. The Department is developing a "USDOT Guidance Summary for CV Site Deployers: Evaluation Support" report. The document is intended to provide guidance to CV Pilot Deployers in developing their Performance Measurement and Evaluation Support Plans, identifying evaluation-support related needs in their systems engineering Concepts of Operations and corresponding requirements in their System Requirements Specification documents, and other activities related to providing support to evaluation of CV Pilot Sites. In addition, this report provides the context and the Department's framework for conducting an effective and practical independent evaluation of the CV Pilot Deployment Program and CV Pilot Sites. An evaluation of a project or a program is essential to discover how well it attains its goals. A similar evaluation program will be implemented during the deployment phase of the Department's Smart City Challenge, once the winning city is selected.

In addition, the Department uses NHTSA's crash data systems to determine the effectiveness of technologies in the field; deployment of a CV system may require new metrics to measure how crashes are avoided.

Recommendation 6. The ITS JPO should conduct a study, in cooperation with NHTSA, of opportunities for onboard systems data collection to analyze and potentially predict safety-related vehicle defects.

Department's Response to Recommendation 6. The Department partially concurs with this recommendation. The topic of predictive maintenance already is being investigated by the automotive industry; and NHTSA has studies of the topic underway, including one to be completed later this year on battery systems, so that adding a new study is not necessary. Communication while the vehicle is in normal operation (as opposed to in a repair or test setting) would allow potential defects to be studied and trigger conditions to be identified so vehicle operators could be notified before a defect could progress to the point where the vehicle should be serviced.

b. **Funding.** The level of transportation funding has not kept pace with system needs, creating a significant challenge for financial resources at all levels of government. There is broad consensus that funding challenges are occurring at a time when the transportation system needs more investment. Many mobility, safety, environmental concerns, and public investments in ITS continue to compete directly with critical core maintenance and capacity needs. It is clear that greater public and private investment in ITS strategies will be necessary to realize the potential benefits.

Recommendation 7. The ITS JPO should continue awarding deployment grants and the Department should support these at a minimum of $100 million annually, over and above dedicated research funding.

Department's Response to Recommendation 7. The Department concurs with this recommendation as stated, recognizing that all Departmental deployment grant programs may be used for ITS projects if additional funding is made available over and above dedicated research funding. A vibrant ITS research program is essential to maturing ITS technology to the point where other deployment resources can be used to begin deployment to the public. The Fixing America's Surface Transportation (FAST) Act includes a new $60 million deployment program and ITS JPO will contribute to the program (FAST Act sec. 6004, "Advanced Transportation and Congestion Management Technologies Deployment"). This new program is reducing dedicated research funding for the ITS Research Program.

Recommendation 8. The ITS JPO should conduct research and stakeholder engagement to assess the role public-private partnerships (P3s) can play in filling the funding gap for ITS.

Department's Response to Recommendation 8. The Department concurs with this recommendation and will conduct such research if funding is made available. P3s are contractual agreements formed between a public agency and a private sector entity that allow for greater private sector participation in the delivery and financing of transportation projects. The Federal Highway Administration's (FHWA) Office of Innovative Program Delivery has conducted extensive research, and developed and tested analytical tools to utilize P3 mechanisms, and works closely with the Build America Transportation Investment Center (BATIC) to provide technical assistance and financing

options for P3s. The ITS JPO may be able to build off of these P3 technical assistance efforts, dependent upon budget reprioritization.

c. **Public Transport.** Public transit ridership is growing. In 2014, transit ridership in the U.S. was at a 50-year high. This growth in ridership has been a constant and is projected to continue as our nation's population increases, especially in and around our urban centers, as our senior citizen population grows and as millennials have de-prioritized driving a car in favor of walking, biking, shared modes (e.g., carsharing, bikesharing, and ridesharing), and public transportation. Public transportation is one of the safest modes of travel and has the ability to significantly increase the capacity of our transportation system in a positive way that promotes efficient land use, enhances air quality, and addresses environmental justice concerns.

Recommendation 9. The ITS JPO should increase the priority of public transit testing and researching of Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) CV technologies.

Department's Response to Recommendation 9. The Department concurs with this recommendation, as funds are available. The ITS JPO is continuing its efforts to support the deployment and adoption of CV applications. Current research work addresses multimodal safety and mobility applications. In addition, the ITS JPO is identifying follow up research for V2I and it will include the recommendation in this effort.

Recommendation 10. The ITS JPO should conduct research on developing "best practices" for transportation industry tools that increase speed and efficiency, outlining the advantages both for public transit customers and single occupancy motorists. The goal for this research is to develop incentives for such tools being integrated into more highway system projects.

Department's Response to Recommendation 10. The Department concurs with this recommendation. As stated in the 2014 Report *Use of Incentives to Encourage ITS Deployment*, knowledge and technology transfer (KTT) is identified as a key factor in encouraging the deployment of ITS. If funding is available, the Department will continue to work to accelerate deployment and partner with the early adopters, industry stakeholders, and agencies to promote voluntary adoption through KTT activities such as training, workshops, technical assistance, guidance, stakeholder forums or coalitions, and other mechanisms. Development and sharing of best practices is a requirement of the implementation plan for the Department's Smart City Challenge.

d. **Shared Mobility.** Shared mobility—the shared use of a vehicle, bicycle, or other low-speed mode—is an innovative transportation strategy that enables users to have short-term access to transportation modes on an "as-needed" basis. Shared mobility includes—but is not limited to—carsharing; personal vehicle sharing (peer-to-peer carsharing and fractional ownership); bikesharing, scooter sharing; shuttle and micro transit services; ridesharing (carpooling/ vanpooling); and ride sourcing/transportation network companies (TNCs), which are also known as ride-hailing. Given the current state of

shared mobility and its potential to dramatically impact the U.S. surface transportation system, public policy needs to evolve alongside these shared mobility modes to support its growth and innovation without compromising safety and accessibility. Research could also accompany this policy work.

Recommendation 11. The ITS JPO should direct research at providing Federal policy guidance regarding governance (Federal, State, and regional levels); best practices; model legislation; and definitions.

Department's Response to Recommendation 11. The Department concurs with this recommendation, if funding is available. The Federal Transit Administration (FTA) has initiated a Mobility on Demand (MOD) research initiative which intends to leverage emerging shared use mobility services and connected travelers. Among the many enablers for shared use mobility, policy and practice will be key focus areas of the research initiative.

Recommendation 12. The US DOT should focus research on creating a framework for recognizing shared mobility in the context of FTA's role and relationship with public transit agencies. This framework should be integrated with FTA and the ITS JPO's current research program (e.g., MOD).

Department's Response to Recommendation 12. The Department concurs with this recommendation inasmuch that the Department's mobility mission includes all modes operating within this framework. For instance, enhancements related to network bike-sharing may include advancements across other modal equities. The ITS JPO and FTA are working closely to advance shared use mobility services. The FTA's MOD demonstration program will develop a long-term strategic vision for a connected, shared, and integrated transportation system. Although the program is still in its initial stages, we recognize the importance of policy at the Federal level and it is considered an important research area for the MOD program.

Recommendation 13. The ITS JPO should conduct research on how we could best incentivize and mainstream shared mobility services to a broader group of individuals in a range of environments (i.e., urban, rural, suburban) through crosscutting public policies (e.g., tax credits, pilot programs, crediting systems, incentives/discounts, use of transportation benefit credits, best practices, etc.). This research should also include developing model policy guidance on how best to address accessibility and Americans with Disabilities Act concerns in conjunction with the FTA and public transit authorities, along with local/regional stakeholder input, as appropriate.

Department's Response to Recommendation 13. The Department concurs with this recommendation. Our Accessible Transportation Technologies Research Initiative (ATTRI) is working with people from the disabilities communities, transportation system managers, State, local, and Federal Government officials, academia, and private and public partnerships to identify user needs of travelers with disabilities to develop new transformative applications to increase their mobility. In addition, the MOD Program has

identified a number of enablers driving change within the transportation industry that align with the committee's recommendation, including policy, practice, mobile technology and payment systems, and strategic business models and partnering. If funding is available to mature the program, we will consider an expansive group of users and identify the cross-cutting enablers for shared use mobility services.

Recommendation 14. The ITS JPO should conduct research on the role of models and metrics to capture shared mobility with a multi-agency approach, including best practices. This should also include understanding of where shared mobility will and will not work, potential impacts, and opportunities for expansion to other environments (e.g., rural, suburban) and future innovations (e.g., CV and automated vehicles).

Department's Response to Recommendation 14. The Department concurs with this recommendation. The FTA's MOD program, if future funding is available, will include performance-based approaches and identify the appropriate performance metrics for system optimal and person based mobility. In addition, if funding is available, the program may investigate strategic business models and partnering for shared use mobility services. Lastly, MOD is enabled by connectivity and we will continue to incorporate the CV work to this connected traveler approach.

e. **Workforce Development.** The American transportation workforce is at a crossroads, facing a perfect storm of impending challenges. Within the next ten years half of the current workforce will be eligible to retire, which includes many highly experienced and skilled practitioners across the spectrum of transportation specialties, ranging from construction to public transit operations to engineering design and planning to maintenance. At the same time, many current and incoming transportation professionals lack training in important emerging issues and technologies. In particular, communication technologies, information systems, and other advanced technologies are playing a rapidly expanding role in the daily operations of our nation's ITS. Transportation agencies are increasingly looking to these technologies for potential cost-effective solutions to growth, mobility, and safety challenges, so agencies must have skilled personnel who can not only plan and deploy these systems, but also operate and maintain the infrastructure, vehicles, and equipment over the long term. For example, the near-term advent of connected vehicles and automated vehicles suggests that transportation professionals need a strong understanding of how these vehicles function and interact, as well as their potential contribution to and impacts on our transportation systems.

There is an urgent need to evaluate the knowledge, skills, and abilities of the current workforce and to identify the critical training and skill needs for the future workforce; and provide access to Ladders of Opportunity for underserved communities through these skilled professions. Technology knowledge and training must be incorporated into the professional development of both current and future practitioners, at management and planning levels, in operational facilities, and in the field. In addition, effective transportation development is increasingly multi-disciplinary and multi-jurisdictional, so the next generation of practitioners must be prepared to think holistically to work in

urban, suburban, and rural environments and to collaborate with State, national, and even global partners.

Recommendation 15. The ITS JPO should conduct a national and international scanning tour of surface transportation agencies (DOTs, public transit agencies, rail, etc.) to identify critical future investments in workforce development, in particular those that relate to enhancing technology skills of personnel who operate and maintain transportation systems, infrastructure, and vehicles.

Department's Response to Recommendation 15. The Department concurs with this recommendation and, if resources are available, is considering a national and/or international scanning tour of surface transportation agencies in support of a high performing workforce in ITS systems operations. The ITS Professional Capacity Building (PCB) Program recently completed a CV Training and Education Implementation Plan which identifies transportation roles in the CV program, the knowledge, skills and abilities required of transportation professionals, training and education that is already available and recommendations for future courses as the program continues to evolve. The PCB program continues to expand its partnerships with FHWA Office of Operations, FHWA Office of Safety, FHWA Office of Planning, Consortium for ITS Training and Education (CITE), universities and the National Highway Institute (NHI). The Program provides multiple course offerings at ITS America State Chapter meetings reaching hundreds of State and local DOT staff.

Recommendation 16. The ITS JPO should leverage FHWA Regional Workforce Centers of Excellence (WCE). Using the knowledge gained from the scanning tour, identify collaborative initiatives with each of the FHWA Regional WCE. Identify cooperative opportunities to enhance curriculum development, training resources, and apprenticeship programs for current and incoming transportation personnel.

Department's Response to Recommendation 16. The Department concurs with this recommendation. The ITS PCB Program has already been in conversations with the FHWA Regional WCE. The PCB Program has funded a workforce study with ITS America and will use the WCE as a focus group for the study. If funding is available, the PCB Program will also leverage the opportunities provided through the National Operations Center of Excellence (NOCE).

Recommendation 17. The ITS JPO should coordinate and host a National Summit on Transportation Workforce Development (NSTWD) to engage public and private stakeholders and to develop training initiatives based on findings from the scanning tour.

Department's Response to Recommendation 17. The Department concurs with this recommendation. The ITS PCB Program participated in the Council of University Transportation Centers (CUTC) National Workforce Summit held in April 2012. The PCB Program has already been in conversations with FHWA Office of Operations and the NOCE discussing the opportunity to coordinate a NSTWD, if funding is available.