

ITS Program Advisory Committee 2009 – 2016 Recommendations Implementation Update

The ITS Program Advisory Committee (Committee) has played an essential role in bringing the perspective of private industry and research institution to advise the ITS research program, highlighting critical gaps the US Department of Transportation (Department) must address to realize the benefits of ITS innovations.

Since 2009, the ITS Joint Program Office (JPO) has incorporated recommendations from the Committee into its strategic planning and program activities. The Committee recommendations, original JPO response, and specific actions taken are listed below.

2009 Recommendations

Committee Recommendation #1	
<p>In addition to the JPO’s stated goals of mobility, safety, the environment, and 21st century partnerships, the Committee recommended an additional programmatic goal: “ITS-Enabled Universal Access to the U.S. Transportation System.” The proposed focus area under this goal was to “conduct research on and enable deployment of means by which all citizens can access the full mobility and information benefits of the US transportation system through ITS technologies.” The Committee recommended that, while focusing on the safety goal is appropriate, other important program objectives should be acknowledged and treated explicitly, even if within the framework of the safety objectives.</p>	
JPO Response:	<p>The Department concurs that a clearly-focused ITS research program is critical, and that the ITS research program must remain multidimensional. While safety is clearly a key area for the Department in which ITS can have a significant impact, the ITS can also have an impact in the Department’s goal areas of congestion, environment, and global connectivity. In addition, the Department fully supports multimodal transportation options and services for all citizens through the use of the ITS so that all Americans have a full range of transportation and mobility choices available to them. The JPO expects to have further discussion with the Committee to more fully understand what work areas are intended to support a goal to enable universal access to the transportation system.</p>
JPO Actions:	<p>The JPO is currently addressing accessible transportation through the Accessible Transportation Technologies Research Initiative (ATTRI), which researches ways to improve transportation for all travelers. The JPO is working collaboratively with Federal Transit Administration (FTA) and the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) in the Department of Labor to develop demonstrations or prototypes in four applications areas (Wayfinding & Navigation Systems, Assistive Technologies, Data Integration, and Automation & Robotics) to advance transportation accessibility for people with disabilities.</p> <p>A second program involving transportation access involves the Mobility on Demand (MOD) program, which is looking at ways to view transportation mobility in a new context. Current MOD work involves working with the FTA on Sandbox deployment grants. The JPO and FTA have agreed to fund an \$8 million joint venture using research “sandboxes” to encourage and create new mobility options by demonstrating MOD concepts.</p> <p>Finally, the Smart City Challenge Demonstration includes User-Focused Mobility Services and Choices as a key vision element that consists of strategies, initiatives, and services that increase</p>

	transportation choices and options by supporting and improving mobility across all modes for all travelers, including aging Americans and persons with disabilities.
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Committee Recommendation #2

The Committee also specifically recommended that the ITS program establish quantifiable performance metrics for other programmatic research goals and measure research program performance over time. The Committee cited an example of greenhouse gas emissions where goals could be defined, in coordination with other agencies, such as the Department of Energy (DOE), and addressed with recent findings in ITS technologies, which may yield significant benefits in fuel economy and emissions reductions. In addition, the Committee recommended that Research Innovative Technology Administration (RITA) validate the achievability of the safety goal by:

- Breaking down the goal into the various ITS technologies with the potential for reducing crashes and their contributions to achieving the overall goal;
- Identifying needed Research and Development (R&D);
- Preparing a timeline for development and field deployment with interim goals to reach the goal;
- Pursuing a top-down systems engineering approach to the analysis of the goal;
- Innovating a package of technologies and research techniques available to attack the goal; and
- Developing individual programs to help move this goal toward reality.

JPO Response:	The Department concurs with the need to establish and define quantifiable goals and performance metrics for each dimension of the ITS research program. The JPO intends to prepare a detailed strategic plan for the future of the ITS research program, coordinate this strategic plan with its modal partners and promote leadership through the ITS Strategic Planning Group (SPG) and the ITS Management Council. Additionally, the JPO will work with these groups to develop highly specific, supportable, and quantifiable performance metrics for future goal areas
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JPO Actions:	In 2010, the JPO adopted its Strategic Research Plan 2010-2014 that established programmatic research goals utilizing the strategies recommended by the Committee. This plan was developed in coordination with the ITS SPG and the ITS Management Council. An update was published in 2012, see https://research.usc.edu/files/2011/05/ITS-Strategic-Plan-Update-2012-1.pdf . The latest version of the ITS Strategic Plan 2015-2019 (http://www.its.dot.gov/strategicplan/) serves as guiding document for the JPO. The strategic plan outlines the direction and goals of the Department’s ITS Program and provides a framework around which the ITS Joint Program Office and other Department agencies will conduct research, development, and adoption activities to achieve them.
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Committee Recommendation #3

The Committee recommended that, while pursuing the safety goal, the Department, and the JPO, recognize that a large percentage of crashes are due to driver error, and that driver behavior would need to be addressed as this goal is approached through research. The Committee stressed that a large-scale reduction on highway fatalities would only be truly feasible if research were conducted that addressed the concept of creating a “vehicle that cannot crash.” The Committee described four “domains” to an ITS-enabled 360-degree awareness car:

- Domain 1: within the car (technologies and data sources that help monitor driver behavior);
- Domain 2: line of sight (sensors allowing a vehicle to sense objects and conditions around it);
- Domain 3: static far field (sensors and maps that provide information on the road ahead); and
- Domain 4: dynamic far field (sensors and systems that provide information on changing conditions on the road ahead).

The Committee recommended that these four domains about the car be addressed in a seamless, highly integrated, and complementary fashion in order to accomplish the goal.	
JPO Response:	The Department concurs that driver behavior in response to events inside and outside of the vehicle is a significant contributor to road crashes. While, as the Committee indicated, the JPO is addressing some, but not all, of these four domains, the Department also recognizes that further work needs to be done in order to address the safety goal in an integrated manner. The National Highway Traffic Safety Administration (NHTSA), the Federal Highway Administration (FHWA), and the Federal Motor Carrier Safety Administration (FMCSA) are currently conducting research into driver behavior issues and the Department, through the JPO, expects to more fully engage the NHTSA, the FHWA, and the FMCSA in order to leverage research activities and results to reduce roadway crashes. The JPO, NHTSA, FHWA, and FMCSA are currently developing a work program for such research. It is expected that driver behavior will be a component of that research program
JPO Actions:	The JPO works with NHTSA on support for Human Factors research.

Committee Recommendation #4

The Committee was very clear in its recommendation that the JPO, and the Department, must provide leadership across all safety domains where ITS could have an impact, regardless of whether the source of the technology is private or public. The Committee emphasized that the Department consider all tools that can maximize the chances of success in developing and deploying the ITS technologies that create “cars that can’t crash.”	
JPO Response:	The Department concurs with these recommendations. The Department agrees that it must play a leadership role in working with the private and public sectors in developing and executing a research plan that addresses the full range of activities to fulfill the Department’s commitment to safety.
JPO Actions:	The JPO has identified Realizing CV Implementation and Advancing Automation as its two priority areas of the ITS Program. The prospect of connected automation leverages CV and vehicle automation technology to realize benefits in safety, mobility, and reduction in environmental impact. Beyond current Vehicle to Vehicle (V2V), Vehicle to Infrastructure (V2I), Vehicle to any-device (V2X), CV Policy and other related CV programs, the CV Pilot Deployment program will disburse \$42 million to three sites (Wyoming, New York City, and Tampa, FL) in order to demonstrate real world applications enabled by CV technologies in urban, suburban and rural settings. The Smart City Challenge will provide \$40 million to Columbus OH to demonstrate innovative transportation solutions, serving as a laboratory for new types of transportation services, including automated vehicles. Integrating ITS, CV technologies, automated vehicles, and other advanced technologies – along with new mobility concepts that leverage the sharing economy – within the context of a city provides the opportunity to make moving people and goods safer, more efficient, and more secure. The source of technology for these programs may be public or private as selected by the Pilot Sites/Smart City.

2010 Recommendations

No formal recommendations to the Department in 2009.

2011 Recommendations

No formal recommendations to the Department in 2010.

2012 Recommendations

<i>Committee Recommendation #1</i>	
<p>Develop concepts for, promote, and facilitate open platforms and standards for software developers that can be accommodated in the CV infrastructure architecture, to promote the development and incorporation of “soft safety” applications using consumer electronics devices, developer applications for those devices, and communications interfaces with existing cellular infrastructure or other consumer networks to enable near term and wide deployment. Successful deployment of a CV system depends on widespread adoption by the user community so that the costs of system expansion can be shared with high volume consumer applications. This is essential for promoting consumer buy-in and for motivating the private sector investments that will drive costs down so the necessary market penetration is achieved.</p>	
JPO Response:	<p>The Department concurs with this recommendation and is taking action toward its implementation. Proper layering within design of the CV system is a key enabler for open platforms to support all types of applications. One of the features of the recently completed system description update is the inclusion of the concept of layered communications – the content of the message used to facilitate an application is separated from the medium used to transport the message. Based on feedback from the Committee and other stakeholders, the design of the security credential management system that will initially be used to support the Safety Pilot Model Deployment, a one-year field test of new vehicle safety systems, makes use of a layered approach so that other wireless communication media such as cellular could be used for “soft-safety” applications as appropriate. The Department believes that this recommendation serves as a guiding principle for maximizing the benefits and minimizing the costs associated with CV technology integration.</p>
JPO Actions:	<p>The ITS Standards program is conducting a new generation of research initiatives aimed at bringing ITS to bear on real-life transportation problems by improving transportation safety, relieving congestion, and enhancing productivity. The development of CV system standards is an effort that is informed by:</p> <ul style="list-style-type: none"> • The results of ongoing CV technical and policy research activities, findings from field testing, and other global technological developments • Adaptation of existing standards, where relevant • Harmonization through joint international efforts • CV applications supported by ITS Standards

<i>Committee Recommendation #2</i>	
<p>Promote, encourage, and use open systems that seek to maximize broad-based active developer communities.</p>	
JPO Response:	<p>The Department concurs with this recommendation and is taking action toward its implementation. As noted by the Committee, it is important to engage a broad range of developers to enable a robust industry and creative development. At this point in the research program, the Department has taken care to ensure that all device procurement activities related to the Safety Pilot Model Deployment have been held as full-and-open competitions. We have attracted a number of companies that range from small start-ups to old-line automotive and infrastructure electronics companies. Their devices are being designed so that they could eventually accommodate third-party applications. This is one step toward the broader goal of engaging an active developer community. The Department will continue to be cognizant of this recommendation from the Committee as research progresses.</p>

JPO Actions:	The JPO developed the Open Source Application Development Portal (OSADP) to provide access to and support the collaboration, development, and use of mobility and transportation-related applications that are federally funded or approved. Together, the Department and OSADP facilitate the advancement of research, development, planning, testing, and deployment of CV and traveler-related applications and ITS.
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<i>Committee Recommendation #3</i>	
Respond to the specific need for non-proprietary and/or license-free security, authentication, and Application Programming Interface (API) standards, which include data among vehicles and data transmitted between vehicles and infrastructure, as well as transit schedule-related data.	
JPO Response:	<p>The Department concurs in principle with this recommendation and is taking action toward its implementation. For example, the Department is engaged in policy research products that outline the viable alternatives for security, authentication, and API standards. As part of this work, per the Committee’s recommendation, the use of non-proprietary approaches will be investigated. A second activity is the Safety Pilot Model Deployment, where several security and credential management schemes are being deployed and evaluated for suitability as a model for long-term deployment. Again, the Department understands the Committee’s recommendation for non-proprietary interfaces. The final resolution of this issue may hinge on the party that becomes the final deploying entity.</p> <p>For transit data, the goal is for non-proprietary data, and DOT is currently examining this as part of the Dynamic Mobility Applications program. Applications will be developed using non-proprietary data and open sourcing.</p>
JPO Actions:	<p>The Department is engaged in policy research products that outline the viable alternatives for security, authentication, and API standards. As part of this work, per the Committee’s recommendation, the use of non-proprietary approaches will be investigated. A second activity is the Safety Pilot Model Deployment, where several security and credential management schemes are being deployed and evaluated for suitability as a model for long-term deployment. The final resolution of this issue may hinge on the party that becomes the final deploying entity.</p> <p>For transit data, the goal is for non-proprietary data, and DOT is currently examining this as part of the Dynamic Mobility Applications program. Applications will be developed using non-proprietary data and open sourcing.</p>

<i>Committee Recommendation #4</i>	
Rely as much as possible on communications architectures that promote flexibility and extensibility and can be used across multiple sectors, not just within the transportation sector.	
JPO Response:	<p>The Department concurs with this recommendation and is taking action toward its implementation (see Department’s Response to Recommendation 1). This topic was discussed in the Committee’s meetings; therefore, the Department had previous insight into this recommendation. The thoughts of the Committee, as well as input from others in the ITS community, prompted the Department to update the system architecture for CVs. The recently completed system architecture update emphasized the proper layering of communication to allow the separation of the message payload from the medium that transports it. This allows a variety of communication media to be used as fits the needs of the applications, which promotes flexibility and the broadest possible user base.</p>

JPO Actions:	The JPO developed the CV Reference Implementation Architecture (CVRIA) in 2013 to identify key Interfaces of the CV Environment. The CVRIA (currently at version 2.2) serves as a basis for identifying standards. The architecture identifies the key interfaces of a CV environment that will support further analysis to identify standards. The CVRIA is currently being integrated with the National ITS Architecture. The Systems Engineering Tool for Intelligent Transportation (SET-IT) (Currently version 2.2.35) is available as a no-cost download; it facilitates developing customized CV architectures in accordance with CVRIA.
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Committee Recommendation #5

Using the principle of driver opt-in, consider ways to make vehicle data available to developers who can then innovate applications serving individuals as well as applications generating information from the data across wider populations of drivers and vehicles.

JPO Response:	The Department concurs with this recommendation in part and is taking action toward its implementation. The JPO plans to make data from federally-funded research programs available for research purposes in an open data environment accessible through a Research Data Exchange (RDE) providing supporting mobility, weather, and sustainability data environments to application developers and researchers. We will then use the lessons learned to support recommendations related to a deployed CV environment. However, in a deployed system, availability of the data is likely to be the prerogative of the owner of the data. In many instances, DOT may have limited leverage to compel privately-owned data to be made available to developers. The Department agrees that driver opt-in solutions may offer an opportunity to the broad developer community for greater innovation based on the availability of new data sources. However, the Department may have little direct authority in this space, depending upon the final deployment scenario that is ultimately determined to be viable.
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JPO Actions:	The JPO continues to update the Research Data Exchange (RDE). The RDE was developed as a transportation data sharing system that promotes sharing of both archived and real-time data from multiple sources (including vehicle probes) and multiple modes. This new data sharing capability will better support the needs of ITS researchers and developers while reducing costs and encouraging innovation.
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Committee Recommendation #6

Emphasize utilization of common, high-volume commercial sector components wherever possible to leverage cost curve advantages so that new solutions do not necessitate high-cost, low-volume components. Where customization is required, attempt to utilize open, common hardware standards and customize with software for flexibility and lowered costs. In addressing aggressive “hard safety” goals, the current CV system concept has certain technological limitations, which should be thoroughly analyzed and evaluated. While active V2V, V2I, and V2x programs need to be pursued in a timely manner, the Federal Government should continue to reassess its assumptions and be completely objective about the technology and its limitations. These limitations are noted in the following three recommendations.

JPO Response:	The Department concurs as outlined in the responses below.
JPO Actions:	The JPO continues to support test bed activities and deployments. The JPO also provides free support services for CV innovators via the CV Core Systems Service Desk.

<i>Committee Recommendation #7</i>	
CV performance will be highly dependent on vehicle positioning performance. Ensure that lane-level positioning is feasible in most conditions, across all vehicle types, and at acceptable cost. For V2V communications, relative lane-level positioning is key, while for V2I, absolute lane-level positioning is critical.	
JPO Response:	The Department concurs with this recommendation and is taking action toward its implementation. Further, the Department concurs with the Committee’s assessment that positioning is a critical element for successful V2V and V2I performance. Therefore, technical analysis is under way to ensure that this issue is fully addressed and resolved. Specifically, the Crash Avoidance Metrics Partnership (CAMP) and the Department are jointly conducting extensive research into characterizing the positioning performance of the various GPS devices and positioning services that make use of them. Furthermore, in the Safety Pilot Model Deployment, both V2V and V2I applications will be deployed in the test environment and extensive data will be collected which can be used to accurately assess the performance of the devices in terms of absolute and relative positioning performance. Based on the results of the data collection, performance standards may be employed to ensure that V2V and V2I positioning solutions are consistent and accurate across all manufacturers.
JPO Actions:	The JPO continues to support test bed activities and deployments. The JPO also provides free support services for CV innovators via the CV Core Systems Service Desk.

<i>Committee Recommendation #8</i>	
Near-zero communications latency and packet loss is essential to V2V safety performance. Ensure that this is feasible under extreme communications loads and at acceptable cost.	
JPO Response:	The Department partially concurs. First, near-zero packet loss is very difficult to achieve, and current research has shown that some amount of V2V packet loss is acceptable while still meeting the minimum V2V performance levels. Furthermore, packet loss alone is not an adequate metric. Packet loss requirements must be coupled with requirements on inter-packet gap. We are not prepared, at this point, to quantify these values and the final specification may vary according to the various application types. The results of scalability testing, other performance testing, and the Safety Pilot Model Deployment will provide a basis for future recommendations on required packet performance and latency. However, the intent of the Committee’s recommendation is understood and the Department agrees that reliable performance of the communications systems is essential for safety-of-life applications. The Department will continue to assess this issue in future CV research.
JPO Actions:	The JPO continues to support test bed activities and deployments and provides free support services for CV innovators via the CV Core Systems Service Desk.

<i>Committee Recommendation #9</i>	
Current Dedicated Short Range Communications (DSRC) 5.9 GHz communications have limitations in line-of-sight, range, and signal blockage and corruption. Ensure that this signal will be robust in all realistic intersection environments. The potential gap between Federal Government platform initiatives and private sector deployments - the problem of “if we build it, will they come?” - needs to be monitored and addressed. The success of a CV Safety System will also require active participation at all levels of government; it is important to devise ways to speed State, regional and local adoption of technologies that meet safety goals.	

<p>JPO Response:</p>	<p>The Department concurs with this recommendation and is taking action towards better characterization of performance and increased robustness of the technology. The line-of-sight limitations of DSRC are currently being tested and results have been positive. Those tests have demonstrated strong capability for the signals to take advantage of features in the environment to cause signals to go around vehicles and around blind intersections. This capability has been demonstrated at each of the Safety Pilot Model Deployment driver clinics as well as at demonstrations in Washington, DC and public demonstrations at the ITS World Congress in Orlando, Florida. We continue to conduct performance testing at each of the driver clinic locations around the country and in a variety of environmental conditions; e.g., urban canyons, rural, etc. Roadside equipment is also being redesigned to include multiple radio sets that provide equally capable radio lines-of-sight at intersections. We will also be collecting data as part of the Safety Pilot Model Deployment to ensure that the technology meets necessary performance requirements at both intersection and open road environments.</p> <p>Additionally, another objective of the Safety Pilot Model Deployment is to begin involving State, regional, and local governments in limited model deployments to better understand the issues associated with actual deployment of CV safety technology. Lessons learned from the Safety Pilot Model Deployment will be applied both to the DOT research program as well as to the State and local governments involved with ITS deployment and operation as part of the continuous ITS technology transfer function.</p>
<p>JPO Actions:</p>	<p>The JPO continues to support test bed activities and deployments. The JPO also provides free support services for CV innovators via the CV Core Systems Service Desk.</p>

<p><i>Committee Recommendation #10</i></p>	
<p>Use leverage and incentives to maximize and strategically support a complex nationwide deployment for an extended period of years. While V2V capabilities may be mandated for the auto industry, potential actions affecting other sectors and industries (including the infrastructure sector) also need to be considered.</p>	
<p>JPO Response:</p>	<p>The Department concurs with this recommendation and appreciates the emphasis that the Committee places on this issue. While V2V capabilities are critical for advancing safety, they alone do not encompass the entire vision of CV technology. This vision also includes the capability for vehicles to interact with traffic signals and “back-end” systems to support a multitude of safety, mobility and environmental applications. The ITS policy research being conducted by the JPO is looking at how the broader network needs for CVs could be implemented and supported. Additionally, the Department continues to engage the stakeholder community throughout all of its research activities related to the CV program. Specifically, the Department works with the American Association of State Highway and Transportation Officials (AASHTO) members to understand the perspectives of State and local agencies. The Department expects to have more clarity on how to provide for other sectors and industries as the research illuminates opportunities and tradeoffs.</p>
<p>JPO Actions:</p>	<p>The JPO is supporting the CV Pilots deployment program. On September 14th, 2015, the Department announced the selection of three CV deployment sites in the CV Pilot Deployment Program. The three sites collectively envision a broad spectrum of applications enabled by CV technologies driven by site-specific needs. The three pilot sites include using CV technologies to improve safe and efficient truck movement along I-80 in southern Wyoming, exploiting V2V and intersection communications to improve vehicle flow and pedestrian safety in high-priority</p>

	corridors in New York City, and deploying multiple safety and mobility applications on and in proximity to reversible freeway lanes in Tampa, Florida.
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Committee Recommendation #11

Communications with vehicles and with individuals will require applications at the device level (including in-vehicle) and the services infrastructure to deliver the required services and applications. Whatever part of that infrastructure is defined or implemented by the Federal Government should be delivered to State and local governments to reduce their required investment. This could be done via model deployments that are executed in such a manner that they can truly be replicated by other regions and organizations. In order for such model deployments to become permanent, operational solutions, it is essential to allocate the maintenance and operational expenses of the system after the termination of the model deployment.

JPO Response:	The Department partially concurs. At this time, the infrastructure requirements to support a CV environment are not clear nor is it clear who will be the most logical party to provide infrastructure should it be needed. Multiple final system implementation models for CV infrastructure exist, and various public, private, and hybrid approaches are being explored through the current policy research. Should the best approach involve State and locally deployed infrastructure, then field testing and model deployments would certainly be a viable approach to familiarizing State and local agencies with the technology and facilitating local deployment. However, part of the consideration must include full deployment and the associated operations and maintenance costs. The level of effort is not yet clear and would require serious discussion with any party that provides the final system. The Department is aware that the JPO research program funding is not intended, nor adequate for funding long term operations and maintenance costs of deployed systems.
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JPO Actions:	The JPO is supporting the CV Pilots deployment program. On September 14th, 2015, the Department announced the selection of three CV deployment sites in the CV Pilot Deployment Program. The three sites collectively envision a broad spectrum of applications enabled by CV technologies driven by site-specific needs. The three pilot sites include using CV technologies to improve safe and efficient truck movement along I-80 in southern Wyoming, exploiting V2V and intersection communications to improve vehicle flow and pedestrian safety in high-priority corridors in New York City, and deploying multiple safety and mobility applications on and in proximity to reversible freeway lanes in Tampa, Florida.
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Committee Recommendation #12

Decide on where open standards are required and ensure that they are put in place so that system solutions work in all locations and the operation of vehicles and experience of individuals is the same wherever they travel.

JPO Response:	The Department concurs with what we believe to be the underlying intent of this recommendation. The Department agrees that an appropriate suite of V2X applications should be made available to permit seamless nationwide interoperability. Standards are an essential part of ensuring consistent operation between vehicles. However, the Department does not advocate “open standards” in the sense of the sometimes-used definition where anyone may add to or alter content of a standard. Rather, the Department advocates open standards development processes that allow full participation of all interested stakeholders in the development of standards that are then made available on equal and reasonable terms to everyone. For the most part, we support standards development being led by appropriately qualified standards development organizations (SDO) via their own processes using open working groups and a rigorous but appropriately
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	tailored systems engineering process. In our experience, this has produced the best results for ITS standards, although the Department supports alternative development processes when advantageous to do so. Further, when beneficial and feasible, we of course will continue to seek to harmonize standards internationally. Currently, it is not the Department's intent to specify how warning systems will be displayed inside a vehicle. The Department supports the vehicle manufacturers' opportunity to differentiate their system solutions to meet all necessary performance requirements – including those related to driver distraction.
JPO Actions:	<p>The development of CV system standards is an effort that is informed by:</p> <ul style="list-style-type: none"> • The results of ongoing CV technical and policy research activities, findings from field testing, and other global technological developments; • Adaptation of existing standards, where relevant; • Harmonization through joint international efforts; and • CV applications supported by ITS Standards. <p>The JPO was involved in developing the following list of ITS standards used to deploy CVs:</p> <ul style="list-style-type: none"> • IEEE 802.11 - 2012 Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification; • IEEE 1609.2-2016 Standard for Wireless Access in Vehicular Environments - Security Services for Applications and Management Messages; • IEEE 1609.3-2016 Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services; • IEEE 1609.4-2016 Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operation; • IEEE 1609.12-2016 Standard for Wireless Access in Vehicular Environments (WAVE) - Identifier Allocations; • SAE J2735 Dedicated Short Range Communications (DSRC) Message Set Dictionary; and • SAE J2945/1 On-board Minimum Performance Requirements for V2V Safety Communications

<i>Committee Recommendation #13</i>	
Monitor private sector developments in vehicle communications and safety technologies to ensure that planned government systems will be compatible.	
JPO Response:	The Department concurs with this recommendation and is taking action toward its implementation. In 2008, the Department, through the JPO, established a technology scanning program to monitor private sector technology developments related to communications and other topics with potential implications for the CV environment. Recent technology scan studies have included: Electric Vehicle and the Smart Grid; Vehicle Based Active Ranging Sensors – RADAR, LIDAR and Ultrasonic Sensors; Location Aware Technologies and Vehicle Applications – High Resolution Navigation, Computer Vision and Active Ranging Sensors; Stream Computing and Real-Time Transportation Applications; Global innovations in computing with a focus on design of secure systems and risk management. Based on the Committee's recommendation and the great value the Department and its partners and stakeholders have found in these assessments, the JPO plans to continue the technology scanning effort to ensure ITS technologies are compatible and interoperable with other commercial technologies.
JPO Actions:	The JPO participates in discussions, conferences and other forums with the private sector in order to stay aware of non-Department ITS developments.

Committee Recommendation #14	
Ensure that the unique needs of full electric and hybrid electric vehicles are included in the Federal Government developments. Support and incentivizing of this rapidly emerging segment, which enjoys a large investment in technology, could assist rapid deployment of CV technology.	
JPO Response:	The Department concurs with this recommendation and is initiating action toward its implementation. Based on the Committee’s recommendation, the Department, through the JPO, has allocated funds in the fiscal year 2012 budget to explore the potential to leverage electric vehicle research and development into the CV research. This funding will enable the Department to better understand the unique needs of full electric and hybrid electric vehicles. The CV research team has had initial discussions with Department of Energy colleagues. The JPO plans to continue this dialogue as we execute the exploratory research into electric vehicle technology.
JPO Actions:	The JPO continues ongoing dialogue with the DOE regarding electric vehicles.

Committee Recommendation #15	
Ensure that vehicle drivers have control over their data and that adequate privacy safeguards are in place to prevent data breaches and to maximize participants’ ability to exercise control over their information.	
JPO Response:	The Department concurs that privacy and data protection policies are essential components of any CV system, and are actively addressing privacy and security safeguards through the CV research. The Federal Fair Information Practices Principles (FIPPs) established under National Institute of Standards and Technology (NIST) SP 800-53 Draft, Appendix J (http://csrc.nist.gov/publications/drafts/800-53-rev4/sp800-53-rev4-ipd.pdf) will provide the framework for analysis of privacy protection in any test or end-state system involving the Federal Government. However, the Department concurs in part with the statement that vehicle drivers must have control over their data. Should the Department conclude that some safety applications be made mandatory, the data needed to support those applications would be mandatory and not optional. On the other hand, future opt-in services would allow vehicle drivers to choose data to be shared as required by the services that they seek.
JPO Actions:	The JPO realizes that security is a key element in enabling CV systems. The Security Credential Management System (SCMS) is critical to achieving safe and trusted V2V messaging with appropriate privacy protections. The JPO is also involved in other ongoing Cyber Security work.

Committee Recommendation #16	
Encourage facilitation of multimodal transport by investigating ways to publish transport schedule and price data so that it is searchable in real-time.	
JPO Response:	The Department concurs with this recommendation in part and is taking action toward its implementation in a research environment. The Department plans to make <i>research</i> data available for research purposes in an open data environment accessible through a RDE providing supporting mobility, weather, and sustainability data environments to application developers and researchers. Mobility applications and data supporting multimodal transit, freeway, and arterial transportation are being explored that can provide transit schedule and pricing data both static and in real-time. From the perspective of the transit community, the Department concurs with the intent of the recommendation. The JPO is working with the FTA and the transit community to address some of these issues. However, with respect to transit data, specific data challenges exist. Since transit agencies own their data, the data they make available may vary from one agency to another. The

	<p>Department has limited authority to require data sharing. Nonetheless, the Department has supported the concept of open data sharing through standards. The JPO, in partnership with FTA, has made available standards (TCIP) and Google has established a common feed standard so that when transit agencies want to coordinate services they can share information in a common way. The Department will continue to encourage and facilitate real-time multimodal data sharing for all high-value transportation data sets to leverage greater uses and benefit to the traveling public.</p>
JPO Actions:	<p>The JPO's The Enable Advanced Traveler Information System (EnableATIS) research program (2010-2015) explored a future operational environment that will support and enable an advanced, transformational traveler information services enabled by a much more robust pool of real-time data through CVs, public and private systems, and user-generated content. Today the majority of transport data is published in real-time by third parties and is readily available in real time via Internet or Smartphone applications.</p>

<i>Committee Recommendation #17</i>	
<p>The JPO should make, and periodically reinforce, a clear public statement that globally harmonized ITS standards are critical to the efficient and rapid deployment of ITS technologies. Similar statements from the Administrator of the Department's RITA, the Secretary of Transportation, and the Secretary of Commerce would add important emphasis. The statement should also make clear that the quality of standards and the degree to which they are harmonized is more important than arbitrary dates imposed for completing them. While JPO has in the past made such statements as part of its outreach programs, clear single-purpose statements, and reinforcement from higher levels within Department, would be of substantial value.</p> <p>In order to play a visible, leading role, the JPO should provide adequate funding to appropriate organizations to involve more U.S. experts, develop harmonized standards and apply pressure where appropriate. The appropriate office/department within the U.S. Government should be identified to assume leadership of this important issue. It is also critical that this issue be given adequate senior level political support within Department, the Department of Commerce, and the White House. The other regions are invested at the political level and the U.S. Government should be as well.</p>	
JPO Response:	<p>The Department concurs that high level reinforcement for internationally harmonized standards by key U.S. political leadership is valuable and desirable. The Department has continued to publicly reinforce our commitment to internationally harmonized high-quality standards and has cooperated with the Department of Commerce via the NIST to disseminate our messages. Recently, the Secretary of Transportation spoke at the ITS World Congress in Orlando and reiterated his support of the V2V research and met with the international consortium of automobile manufacturers involved in the research. Going forward, the JPO will seek additional opportunities to elevate outreach efforts and advocacy for harmonization of international standards by senior political leadership including the Secretarial level. Regarding the recommendation that the appropriate office within the Federal government be identified to assume leadership of this issue, the Department uses the JPO to coordinate ITS standards engagement across several agencies within the Department. Specifically, standards continue to be discussed and coordinated among RITA, NHTSA, FHWA, FMCSA, FTA, and the Office of the Secretary (OST) to ensure high-level visibility and appropriate stakeholder involvement from all modes. With the JPO serving in a leadership and coordination role with other Department modal administrations, the Department can also connect and cooperate with other governmental and industry stakeholders. The JPO regularly reports to the Secretary on the progress of international</p>

	standards harmonization, as RITA is responsible for the implementation of the Secretary's Performance Plan item regarding international standards harmonization.
JPO Actions:	The JPO works with International Standards and Harmonization with Europe, Japan, Australia, Canada, Mexico and others. The Department has established a Joint Declaration of Intent on Research Cooperation in Cooperative Systems with the European Union (EU). The purpose of the agreement is to encourage international cooperation on information and communication technology research, as applied to transportation. U.S. Department and the European Commission (EC) Information Society and Media Directorate have pledged to work together to identify the research areas that would benefit from a harmonized approach and which should be addressed by coordinated or joint research. The JPO also worked with the EU and Japan on the Trilateral Probe Data project.

<i>Committee Recommendation #18</i>	
	<p>The JPO should seek to play a more visible leading role in encouraging the development of globally harmonized standards by adequately funding organizations dedicated to and programs designed to result in harmonized ITS standards, and applying strong political pressure to standards organizations and other stakeholders where appropriate. Sufficient funding needs to be made available to effectively deploy U.S. interests in harmonized standards. In the case of federally-funded organizations, the JPO should fully exercise contractual/grant authority to encourage harmonization. The JPO should make a commitment to ensure adequate funding in future years, reinforcing its commitment to harmonization. The JPO should ensure sufficient U.S. government staff are involved and encourage vehicle manufacturer participation in appropriate international standardization forums.</p> <p>In order to further support the need for harmonization, the JPO should fund a detailed analysis that demonstrates the implications of non-harmonized standards and the obstacles to achieve harmonized standards. The outcome of such an analysis would be useful for all members of the standardization community worldwide. However, it is noted that if such analysis is not done quickly, its value will be diminished by the pace of standardization activities in many regions. The Committee recognizes that it will be challenging to find a means to credibly conduct such a study recognizing the competitive nature of industry and likely challenges in obtaining sufficient data of a type that is not normally publicly available.</p>
JPO Response:	<p>There are several points in this recommendation with varying levels of Departmental concurrence. The Department agrees that robust involvement from industry experts and SDOs is needed to support standards harmonization. Having heard the Committee's discussion on this topic over the last year, the Department has strengthened existing programs to provide appropriate funding for expert, industry, and SDO participation in activities to support harmonization. In recent months, these capabilities have been further strengthened by award of a cooperative agreement task to the Vehicle Infrastructure Integration Consortium (VIIC) for automobile industry support on harmonization efforts. Further, contracts have been awarded to SAE International, AASHTO, and the Institute of Transportation Engineers (ITE) for future standards development work. These contracts specifically require international harmonization support. In all of these activities, the Department exercises intensive management oversight of the agreements with the SDOs to ensure the development of standards in a timely manner that will facilitate the deployment of ITS technologies. The Department exercises highly effective management without resorting to any forms of political pressure.</p> <p>The Committee recommends strong Federal funding support. To that end, the Department has allocated additional funding from the ITS budget to support international standards harmonization efforts. The Department believes that with the new contracts in place and increased funding allotments for development of globally harmonized standards, industry support will further</p>

	<p>increase. Current budgetary plans propose to continue this strong support, which appropriately reflects the high priority of this program. In the future, we plan to fund additional efforts via SDO contracts and other means to execute further specific work items in support of the harmonization program. Additionally, in October 2011, based on collaborative work between the Department and the EC sent letters to the two leading European standards development organizations encouraging their commitment to participating in international standards harmonization activities. The Department is in the process of finalizing a letter to the International Organization for Standardization (ISO) reiterating our support of harmonization.</p> <p>The Department concurs that Federal staff participation is essential. The JPO has attempted to be as comprehensive as possible within staffing constraints and increasing international travel restrictions. The Department acknowledges that staff participation has not been as strong as desirable due to these constraints. Nonetheless, we believe Federal staff involvement continues to increase in effectiveness as relationships are established and strengthened. In order to provide additional staff support, as recommended by the Committee, the Department intends to establish a multimodal Federal support team to ensure appropriate Federal leadership, especially as new work items are identified.</p> <p>The Department agrees in principle that a timely and detailed analysis of the impact on non-harmonized standards would be both valuable and worthwhile. The Department also agrees with the Committee's view that it will be challenging to obtain credible information to support such an analysis. The Department will assess the degree of difficulty involved in this undertaking and make a final determination regarding the feasibility of accomplishing this recommendation in the first quarter of 2012.</p>
<p>JPO Actions:</p>	<p>The Department has strengthened existing programs to provide appropriate funding for expert, industry, and SDO participation in activities to support harmonization. In recent months, these capabilities have been further strengthened by award of a cooperative agreement task to the VIIC for automobile industry support on harmonization efforts. Further, contracts have been awarded to SAE International, AASHTO, and the ITE for future standards development work. These contracts specifically require international harmonization support. In all of these activities, the Department exercises intensive management oversight of the agreements with the SDOs to ensure the development of standards in a timely manner that will facilitate the deployment of ITS technologies. The Department exercises highly effective management without resorting to any forms of political pressure.</p> <p>In addition, the Department has allocated additional funding from the ITS budget to support international standards harmonization efforts. The Department believes that with the new contracts in place and increased funding allotments for development of globally harmonized standards, industry support will further increase. Current budgetary plans propose to continue this strong support, which appropriately reflects the high priority of this program. In the future, we plan to fund additional efforts via SDO contracts and other means to execute further specific work items in support of the harmonization program. Additionally, in October 2011, based on collaborative work between the Department and the EC sent letters to the two leading European standards development organizations encouraging their commitment to participating in international standards harmonization activities. The Department is in the process of finalizing a letter to the ISO reiterating our support of harmonization.</p> <p>The Department concurs that Federal staff participation is essential. The JPO has attempted to be as comprehensive as possible within staffing constraints and increasing international travel restrictions. The Department acknowledges that staff participation has not been as strong as</p>

	<p>desirable due to these constraints. Nonetheless, we believe Federal staff involvement continues to increase in effectiveness as relationships are established and strengthened. In order to provide additional staff support, as recommended by the Committee, the Department intends to establish a multimodal Federal support team to ensure appropriate Federal leadership, especially as new work items are identified.</p>
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<i>Committee Recommendation #19</i>	
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<p>The JPO should fund an analysis of the costs and benefits of harmonized and non-harmonized ITS standards. At present, the EU and Japanese participants to their respective regional Harmonization Working Groups (WG) with the U.S. are populated by a mix of government and industry personnel. This allows them to address harmonization issues at all levels. In contrast, official U.S. WG members are all U.S. government employees in order to assure compliance with legal requirements. Representatives from both the EU and Japan have stated that they would strongly prefer a mix of government and industry personnel and that without this mix the discussions are often inhibited in face-to-face meetings. Recent JPO action to open WG meetings to additional participants is an appropriate course of action. In addition, until recently, meetings of the WG were both infrequent and short. The expansion of participation and increase in length to 1.5 days of the most recent WG meeting in Vienna in June 2011 is a welcome change. On this present course, the Harmonization Plan (HAP) will be completed well after the harmonization timeline has expired. The pace of Plan development, and, therefore, the frequency and duration of development meetings must be accelerated.</p>	
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JPO Response:	<p>The Department concurs that understanding the underlying costs and benefits of harmonized and non-harmonized ITS standards would be valuable information. The current costs of V2X technology implementation are only a forecast with substantial uncertainty. Further, vehicle manufacturers' incorporation of V2X technologies will be accomplished primarily through the purchase of products from suppliers. In this highly competitive industry, credible information on these costs is not easily available. That said, the JPO will investigate whether such a study may be feasible in the near future.</p> <p>Regarding the recommendations on frequency and participation in standards harmonization WG meetings, the Department generally concurs with the likely long-term benefits of the recommended actions. As a result of the Committee's discussion, the JPO has already broadened U.S. participation in WG meetings substantially by including U.S. representatives from SAE, ISO, and the VIIC. The JPO will continue to explore methods to ensure robust involvement from U.S.-based stakeholders. The JPO also reached agreement with the EU to increase both the frequency and duration of WG meetings. We intend to maintain this frequency and level of participation going forward. It should be noted, however, that the ability to (1) schedule and conduct meetings and (2) execute HAP work items more quickly are dependent upon our international partners' willingness and ability to act along with the Department and U.S. industry partners. The Department believes that Federal Government staff and non-government involvement is essential in the strategic establishment of harmonization work groups and chartering their activities. The Department plans to continue to enhance stakeholder participation in the development and execution of both a comprehensive standardization plan for CV technologies and in the related harmonization plans that can now be initiated after completion of the Core System Architecture in late 2011. The Department intends to continue to provide travel support funding for voluntary industry experts participating in standards harmonization efforts. Further, the Department plans to continue engaging with industry experts via more traditional means, including SDOs, technical support contracts and cooperative agreements. This</p>
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	commitment to support U.S.-based experts will be substantial and will enable consistent and committed participation by the U.S. in harmonization efforts
JPO Actions:	The JPO has broadened U.S. participation in WG meetings substantially by including U.S. representatives from SAE, ISO, and the VIIC. The JPO will continue to explore methods to ensure robust involvement from U.S.-based stakeholders. The JPO also reached agreement with the EU to increase both the frequency and duration of WG meetings. We intend to maintain this frequency and level of participation going forward. The Department plans to continue to enhance stakeholder participation in the development and execution of both a comprehensive standardization plan for CV technologies and in the related harmonization plans that can now be initiated after completion of the Core System Architecture in late 2011. The Department intends to continue to provide travel support funding for voluntary industry experts participating in standards harmonization efforts. Further, the Department plans to continue engaging with industry experts via more traditional means, including SDOs, technical support contracts and cooperative agreements. This commitment to support U.S.-based experts will be substantial and will enable consistent and committed participation by the U.S. in harmonization efforts

<i>Committee Recommendation #20</i>	
	The JPO should ensure that the U.S. – EU Harmonization Task Force and any future U.S. – Japan Harmonization Task Force (and any other existing regional collaborations working on harmonized standards) are properly supported by both the U.S. Government and industry personnel who are actively engaged in standards work. Further, these groups should meet face-to-face more frequently and for longer periods than had been the case until recently in order to create a workable Harmonization Plan early enough that it supports the aggressive timeline proposed for the creation of harmonized standards. Further still, the U.S. should work to collapse the various regional Harmonization Task Forces into one global Harmonization Task Force. Presently, a variety of international and regional standards organizations are developing ITS standards that will impact the ability to efficiently and effectively implement V2X. Absent strong leadership and commitment, these standards will be developed regionally and will result in inefficiencies and costly duplication of efforts, delaying deployment of V2X. The U.S. Government should play a key role in supporting the identification and prioritization of key standards and support harmonization of those standards. The U.S. Government should continue to work with Europe and Japan as well as seek to engage with other major and emerging markets in this effort. While support for key “core” V2X standards is critical to the success of the V2X program, support for the broader range of ITS standards is also critical considering the breadth of V2X and the need to send a clear message to standards organizations that they need to work together to develop a full range of harmonized ITS standards.
JPO Response:	The Department concurs with this recommendation and is acting in accordance with the collective desires of the countries involved. The U.S. and EU have included Japanese participation in our cooperative work to the extent desired by the Japanese, and we have jointly and clearly stated our willingness to expand cooperation into tri- or multilateral agreements, as well as our willingness to welcome other interested partners. For example, Department is currently acting upon an expression of interest received from the South Korean government. The JPO continues to seek expanded leadership roles in international harmonization of ITS standards and continues to support U.S. governmental, standards community and industry participation, including meeting participation to the extent feasible. As indicated in the response to recommendation 19, the Department is looking into mechanisms to enhance industry expert participation as technical areas are identified for harmonization. In our communications with the EU and Japan in particular, all parties struggle to balance the demands for individual research activities and the resources needed

	for international travel. We share a commitment to multilateral work and we share the challenges that work at a global scale entails.
JPO Actions:	The U.S. and EU have included Japanese participation in our cooperative work to the extent desired by the Japanese, and we have jointly and clearly stated our willingness to expand cooperation into tri- or multilateral agreements, as well as our willingness to welcome other interested partners. For example, Department is currently acting upon an expression of interest received from the South Korean government. The JPO continues to seek expanded leadership roles in international harmonization of ITS standards and continues to support U.S. governmental, standards community and industry participation, including meeting participation to the extent feasible. In our communications with the EU and Japan in particular, all parties struggle to balance the demands for individual research activities and the resources needed for international travel. We share a commitment to multilateral work and we share the challenges that work at a global scale entails.

<i>Committee Recommendation #21</i>	
	The JPO should work together with industry and others to develop a list of key V2X standards that should be prioritized for harmonization. Included in the V2X standards list should be a harmonized method to qualify any V2X system's performance and interoperability. Some work in this area has been done regionally, but the regional data has not been aggregated and synchronized to create a global list. This final prioritized list should then be shared with governments in Europe and Japan and a consolidated multilateral prioritized list negotiated. The progress of these standards can then be tracked through the various standards organizations and pressure applied to ensure that they are being developed in a harmonized fashion. Since V2X will encompass a broad range of standards, the JPO should work together with industry and others to promote expanded standardization of ITS standards so that a clear message is sent to standards organizations about the critical importance of harmonization. Consideration should be taken for patents that are embedded in the developed standards (for example, the IEEE 1609.2 standard and Certicom) and the associated licensing waivers and agreements.
JPO Response:	The Department concurs with this recommendation and is acting accordingly. The Department developed an initial list of candidate standards for harmonization and provided that list to the EU representatives through the WG. The Department is awaiting EU input on this list. Further, now that the U.S. V2X Core System Architecture has been completed, the JPO will proceed with developing a reference implementation design of a candidate deployment architecture in order to derive a comprehensive list of candidate interfaces for standardization; this interface list will then be analyzed for harmonization potential with respect to EU and other V2X architectures. The JPO continues to cooperate with stakeholders to promote expanded harmonization of ITS standards. The Department is in the process of developing a letter to ISO to encourage the development of harmonized standards. Our recent contracts with SAE, AASHTO, and ITE include language requiring the SDOs to work on standards harmonization where applicable. Additionally, the Department has initiated a Legal Policy sub-team to research and assess the issue of embedded patents associated with V2X technologies and recommend appropriate steps regarding any needed licensing actions.
JPO Actions:	The Department developed an initial list of candidate standards for harmonization and provided that list to the EU representatives through the WG. The Department is awaiting EU input on this list. Further, now that the U.S. V2X Core System Architecture has been completed, the JPO will proceed with developing a reference implementation design of a candidate deployment architecture in order to derive a comprehensive list of candidate interfaces for standardization; this

	<p>interface list will then be analyzed for harmonization potential with respect to EU and other V2X architectures. The JPO continues to cooperate with stakeholders to promote expanded harmonization of ITS standards. The Department is in the process of developing a letter to ISO to encourage the development of harmonized standards. Our recent contracts with SAE, AASHTO, and ITE include language requiring the SDOs to work on standards harmonization where applicable. Additionally, the Department has initiated a Legal Policy sub-team to research and assess the issue of embedded patents associated with V2X technologies and recommend appropriate steps regarding any needed licensing actions.</p>
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<i>Committee Recommendation #22</i>	
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<p>In addition to making progress toward national deployment objectives, the JPO should provide an effective program and incentives to support system development, investment, and deployment by others such as State and local entities and private sector technology developers. The JPO should identify and quantify its investment in major program elements that are designed to support deployment such as prototype development, technical feasibility, demonstration pilots, evaluations, standards development, facilitation forums, etc. The JPO should measure how the ITS investment in each of the major program elements has resulted in deployment by others; e.g., deployment tracking.</p>	
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JPO Response:	<p>The Department partially concurs with this recommendation. Over the last two decades, ITS activities within the Department have grown and matured so that today the Department’s ITS involvement encompasses several modal administrations, as well as the research program managed by the JPO. The complete picture of ITS within Department must be viewed from a Departmental level, of which the JPO is only one part. For example, FMCSA manages the Commercial Vehicle Information Systems and Networks (CVISN) program, FHWA has an active ITS program in support of transportation planning and operations, FTA supports ITS activities specific to transit properties, and NHTSA supports the Next Generation 911 office. The efforts of these modal administrations are more specifically focused on deployment within their individual mission areas. The JPO works closely with these modal administrations and, in some cases, provides additional research funding support to supplement funding they have access to within their modal budgets. When combined, these Department-wide activities form a complete picture of ITS, from research and testing through the final deployment stages.</p> <p>More specifically to the JPO, per current legislation, the purpose of the JPO program is to “research, develop and operationally test” ITS, as well as to provide “technical assistance” in application of ITS. Consequently, the JPO program focuses on research and makes use of model deployments, field operational tests, and technical demonstrations. There are many examples of the use of field deployments over the history of the program, the most recent of which include field tests of the Integrated Corridor Management (ICM) program, Mobility Services for all Americans (MSAA), CVISN, the Congestion Initiative, and the Rural Safety Initiative. Field tests and technical demonstrations such as these and others provide an opportunity for evaluation under real-world conditions and give opportunity for stakeholder (both public sector and private sector) involvement. The most recent example is the Safety Pilot Model Deployment, which will be a real-world test of CV V2V and V2I technology.</p> <p>With that background, the Department is not clear what the Committee intends by the recommendation to provide “incentives.” For example, the Department does not have authority to change match requirements for ITS deployment projects; however, ITS projects are eligible for Federal-aid funds. Secondly, the choice of which projects to fund is the prerogative of State and</p>
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	<p>local planning agencies. Further, we believe that the Committee did not intend that ITS research dollars be used to fund ITS deployment, as the amount of ITS research funds is insufficient to make an impact on nationwide ITS deployment. On the other hand, ITS research funds are actively used to seed technology development and new industries that support technology applications in transportation.</p> <p>Finally, the Department is pleased to note the ever-growing pace of ITS deployment. The most recent ITS deployment tracking survey, completed in 2010, indicates multimodal growth in ITS deployment (survey results at http://www.itsdeployment.its.dot.gov). Estimates from our most recent ITS deployment tracking indicates that the largest 75 metropolitan areas cumulatively invest \$500 million per year on ITS. The current level of ITS investment among the largest metropolitan areas is estimated to be \$18 billion. ITS deployment, however, is not equal across all segments of the transportation industry. Toll agencies have reached near saturation in ITS toll technology. Large transit properties have made strong use of traveler information for transit schedules. Nonetheless, the Department is in full agreement that ITS deployment benefits from continued emphasis to ensure growth and expansion. The Department, through modal administrations and the JPO, will continue to promote and facilitate deployment in coordination with State and local agencies responsible for deployment planning, operations, and maintenance.</p>
JPO Actions:	<p>Nearly 2,100 surveys were distributed to state and local transportation agencies in 2013 and the survey results are posted on the ITS JPO public website.</p>

Committee Recommendation #23

The JPO should facilitate and accelerate institutional transformation among the Department modal administrations and through Federal interactions with State/local governments and the private sector. The JPO should communicate transferable lessons across geographic areas where it is of fundamental value (or necessary) to achieve progress towards deploying transportation technologies.

JPO Response:	<p>The Department concurs in part with this recommendation. The JPO uses a number of tools to communicate transferable lessons to potential ITS adopters across geographic areas. The ITS Knowledge Resource databases, available online, free to the public, provide a unique collection of reports, studies, technical documents, and instructional guides for planning, procuring, and deploying ITS. Four databases are available that are focused on ITS costs, benefits, lessons learned, and deployment statistics. Additionally, specific technology transfer components are embedded within the major research initiatives, such as ICM, MSAA, and the Congestion Initiative. The ITS Professional Capacity Building (PCB) Program contributes to the transfer of ITS technology through in-person and online training courses, web seminars, peer exchanges, and workshops primarily directed at the State and local transportation agencies. The variety of content and formats allow ITS professionals to meet their learning needs in the most customized and accessible way. The JPO continues to work closely with the Department modal administrations and actively seek areas to effectively partner in knowledge and technology transfer efforts. For example, the ITS PCB Program has partnered with FHWA and FTA to conduct training courses as well as the delivery of technical webinars and other knowledge transfer activities. However, as mentioned above, the JPO is only one part of the ITS presence within the Department. The Department views ITS as an inherently multimodal activity, and as such, technology transfer must be, and is, included in the mission areas of all modal administrations actively involved with ITS, in addition to the JPO. The Department acknowledges the Committee’s recommendations pertaining to institutional transformation of Department modal administrations. The Department believes that much institutional transformation has occurred. This is exemplified by expanded</p>
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	<p>FHWA involvement in transportation operations and active NHTSA management of critical V2V program elements, as well as the relocation of the JPO into RITA. All of these progressive changes speak to the cooperative efforts between the JPO and modal leadership that reflect the strong commitment across Department to foster deployment of ITS technologies. However, consistent with the Committee’s recommendation, the Department will continue to explore new ways to leverage lessons learned across geographic regions and across modal administrations to advance ITS adoption.</p>
JPO Actions:	<p>The ITS Knowledge Resource databases, available online, free to the public, provide a unique collection of reports, studies, technical documents, and instructional guides for planning, procuring, and deploying ITS. Four databases are available that are focused on ITS costs, benefits, lessons learned, and deployment statistics. Additionally, specific technology transfer components are embedded within the major research initiatives, such as ICM, MSAA, and the Congestion Initiative. The ITS PCB Program contributes to the transfer of ITS technology through in-person and online training courses, web seminars, peer exchanges, and workshops primarily directed at the State and local transportation agencies. The variety of content and formats allow ITS professionals to meet their learning needs in the most customized and accessible way. The JPO continues to work closely with the Department modal administrations and actively seek areas to effectively partner in knowledge and technology transfer efforts. The Department views ITS as an inherently multimodal activity, and as such, technology transfer must be, and is, included in the mission areas of all modal administrations actively involved with ITS, in addition to the JPO. Consistent with the Committee’s recommendation, the Department continues to explore new ways to leverage lessons learned across geographic regions and across modal administrations to advance ITS adoption.</p>

<i>Committee Recommendation #24</i>	
<p>The JPO should develop and execute strategies to support investments in modal technologies that are adaptable to other modes. The JPO should evaluate these strategies to determine the degree to which technology investments that are made primarily for a single transportation mode will be beneficial to other modes.</p>	
JPO Response:	<p>The Department concurs with this recommendation and has made a significant effort to ensure that the ITS research program reflects a multimodal perspective. The ITS Program is structured to be multimodal, and involves nearly all of the surface transportation administrations within the Department. By bringing the modes together to coordinate research, the Department, through the JPO, fosters the sharing of knowledge about technologies that can be applied across modes in two ways:</p> <p>One way is through applying technology developed for a specific mode; e.g., automated vehicle location on transit vehicles, to deployment in other modes.</p> <p>A second approach is to support activities that promote multimodal solutions. Examples include ICM and Adaptive Transportation Demand Management (ADTM) that foster the use of modal technologies to solve multimodal issues for the entire transportation system. Through ICM, the Department provides guidance to assist agencies in managing the transportation network as a system. Agencies learn how to manage their regional and cross-jurisdictional corridors as an integrated asset in order to improve travel time reliability and predictability, help manage congestion and empower travelers through better information and more choices. ADTM builds on this work using technologies and innovative operational approaches for improving traffic flows and transportation efficiency within the existing infrastructure.</p>

JPO Actions:	<p>The ITS Program is structured to be multimodal, and involves nearly all of the surface transportation administrations within the Department. By bringing the modes together to coordinate research, the Department, through the JPO, fosters the sharing of knowledge about technologies that can be applied across modes in two ways:</p> <p>One way is through applying technology developed for a specific mode; e.g., automated vehicle location on transit vehicles, to deployment in other modes. A second approach is to support activities that promote multimodal solutions. Examples include ICM and ADTM that foster the use of modal technologies to solve multimodal issues for the entire transportation system.</p> <p>Through ICM, the Department provides guidance to assist agencies in managing the transportation network as a system.</p>
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<i>Committee Recommendation #25</i>	
<p>The JPO should work toward an ITS program that contributes to a sustainable transportation system that supports economic development, environmental protection, and social equity. The JPO should propose the key metrics for each of these sustainability objectives and the data collection required as technology deployment occurs. Measures should include the degree to which an integrated strategy of ITS investments at the regional/metropolitan planning organization level, as determined by the federally-required metropolitan planning process, results in achievement of a more sustainable transportation system.</p>	
JPO Response:	<p>The Department concurs and is in the very early stages of considering sustainability metrics for ITS research. In order to reduce the learning curve, the Department is seeking to learn from others by developing these metrics in coordination with the EC and Japan as part of the formal agreement to share research results. Once developed, it is our intent for these metrics to be included in future ITS deployment tracking surveys. We note the Committee’s recommendation that these measures be incorporated into the metropolitan planning process. FHWA’s Offices of Operations and Planning lead the Department’s work on incorporating ITS into transportation planning processes. Representatives from these offices are part of current discussions on this subject. Further discussions are planned with these Offices to ensure the Committee’s recommendations are fully considered in the Department’s work going forward.</p>
JPO Actions:	<p>We created and executed the AERIS research program and developed detailed cost benefit analysis and related performance metrics for sustainability. The most significant performance metric was fuel reduction. We created an operational prototype of one application and glide path (eco- approach and departure at signalized intersections). JPO staff co-chaired the US-EU sustainability working group to leverage sustainability research between the US and Europe. We also worked with Japan to share modeling research results related to environmental applications. JPO staff and leadership worked with partners at the local and regional level to access their needs related to planning in the area of sustainability.</p>

<i>Committee Recommendation #26</i>	
<p>The JPO should recommend program-level performance metrics, including metrics for the recommendations of the other two subcommittees, for review by the Committee and implement them as an integral part of an ongoing independent evaluation to measure specific outcomes against expectations.</p>	
JPO Response:	<p>The Department concurs with the intent of this recommendation. The JPO is currently working with the Volpe National Transportation Systems Center and the various programs to investigate project, portfolio-level, and program metrics intended to evaluate the overall performance of the ITS Program. Individual project milestones are important measures of success for internal</p>

	investment decision-making as well as external communication to stakeholders. In addition, the ITS Program is developing processes to enable Program-level evaluation based on a portfolio-level approach. The recommendations made by the Committee are helpful and provide information for consideration in this effort. Reviews of other Federal Government portfolio research programs provided some views on how to approach this effort, but there is no one specific approach that directly applies to ITS. However, best practices obtained from across the Federal Government; specific information from the benefits, costs, and lessons learned databases; and information from the Committee will be used to develop an approach tailored to the unique aspects of the JPO.
JPO Actions:	The ITS Strategic Plan 2015-2019 outlines the direction and goals of the Department's ITS Program and provides a framework around which the ITS Joint Program Office and other Department agencies will conduct research, development, and adoption activities to achieve them. The ITS Strategic Plan's framework is built around two key ITS Program priorities—realizing CV implementation and advancing automation.

2013 Recommendations

No formal recommendations to the Department in 2013.

2014 Recommendations

<i>Committee Recommendation #1</i>	
	The JPO should establish a mechanism to allow entities not directly involved in Federal or automaker developments in the security aspects of DSRC to be able to provide input to the JPO process. This input could be in the form of a briefing request from the JPO or Office of the Assistant Secretary for Research and Technology (OST-R), a solicitation for comments, a public forum for discussion, contractor analysis, public-private partnership, or other means the JPO deems appropriate.
JPO Response:	The JPO has established two mechanisms for other interested parties to participate in the development of the security aspects of CVs that use DSRC and other communication media. First, we are developing a project in Southeast Michigan (Southeast Michigan 2014 project - - http://www.its.dot.gov/testbed/testbed_SEmichigan.htm) where we will be exploring communication security issues. All are welcome to make use of that facility and comment on the practices we are exploring. That project will provide the communication infrastructure for the upcoming ITS World Congress 2014 event demonstrations. Also, we have started the Affiliated Test Beds http://www.its.dot.gov/testbed/testbed_affiliated.htm to allow outside parties to perform collaborative research with us. We have two communication security companies outside of the auto industry that are participating in that activity
JPO Actions:	The JPO CV Test Beds allow affiliates the opportunity to help ensure that all future CV applications are based on common implementations of the communications technology, while harnessing the collective abilities of the membership. Currently the OST-R has entered into 87 Memorandums of Agreement (MOA) with public, private, and academic organizations involved in the Affiliation of Test Beds. The JPO regularly hosts public webinars, concerning DSRC and myriad other CV topics and projects. These webinars are co-hosted by ITS America and feature open question-and-answer and input time as part of each webinar agenda. JPO are available for direct communication with the public via email and telephone, and regularly resolve inquiries and concerns

<i>Committee Recommendation #2</i>	
<p>The JPO should work with industry and policymakers to develop a Privacy Guideline for Vehicle Data and Content, utilizing best practices from other sectors where appropriate. However, there may be a number of fundamental issues that must be addressed first such as data ownership, metadata policies, and self-regulation, among others. We recommend outreach and collaboration with automotive, telecommunication and computation industries, consumer and motorist organizations, and other potential stakeholders and experts to provide input and/or review of the guideline.</p>	
JPO Response:	<p>The Department concurs. Consumer privacy protection in a CV environment is of primary concern to the Department. The JPO has worked with its modal partners to ensure that appropriate privacy protections have been designed into JPO funded V2V and V2I concept designs and architectures. We also have ensured that privacy impact assessments have been performed for all systems procured in connection with research efforts, as required by law. The JPO is committed to working with its modal partners and the Department’s Privacy Office to assess the privacy impacts of any systems developed for implementation through its research. The JPO also intends to continue facilitating the ongoing dialogue between the Department and a wide variety of CV stakeholders around privacy, and working with its modal partners and the Department’s Privacy Office to explore additional Department actions that could help protect consumer privacy, including issuance of potential Guidelines.</p>
JPO Actions:	<p>The RDE is a transportation data sharing system that promotes sharing of both archived and real-time data from multiple sources (including vehicle probes) and multiple modes. This new data sharing capability was developed with privacy protection in mind in accordance with the Departments’ Privacy guidelines. It is the intent that the data sets on the RDE are free of any private or sensitive data. It is also the intent that data on the RDE cannot be combined with other data sources to infer private information.</p>

<i>Committee Recommendation #3</i>	
<p>The JPO should conduct a study to determine the likelihood of false detections given the minimum positioning performance requirements set in place for a possible regulation or New Car Assessment Program (NCAP) certification, and quantify statistical anomaly vs. misbehavior which should be flagged.</p>	
JPO Response:	<p>The Department concurs. Data gathered from the Safety Pilot Model Deployment and follow-on activities will be analyzed to help update minimum performance requirements for devices participating in crash avoidance applications. Understanding the location of a vehicle is one of the most important performance requirements. Analysis of some of the early samples of the data has shown that the devices used are likely to be adequate in this respect. It has also pointed out some unexpected cases where outside factors may be adversely impacting the operation of the devices that was not anticipated.</p>
JPO Actions:	<p>The JPO continues to analyze the Safety Pilot Modal Deployment data.</p>

<i>Committee Recommendation #4</i>	
<p>In the case where a detection of misbehaving devices occurs, the JPO should identify the technical issue and policy actions to be taken to keep the user trust at a level that supports the benefit/cost ratios calculated for deployment.</p>	
JPO Response:	<p>The Department concurs. Efficient revocation and/or quarantining of malfunctioning and misbehaving devices will be an important area of research in the near future.</p>
JPO Actions:	<p>The JPO has a program for misbehavior management research.</p>

<i>Committee Recommendation #5</i>	
FMCSA and NHTSA should pursue Interstate Commercial Vehicle Rulemaking for both V2V Safety Messages and V2X capabilities.	
JPO Response:	The Department concurs. NHTSA will issue a regulatory decision in 2014 for new heavy-duty vehicles similar to the recently announced decision to pursue rulemaking for V2V light vehicles. Any other rulemaking by the Department regarding trucks will need to wait for these decisions to be announced.
JPO Actions:	The JPO continues to support all NHTSA federal rulemakings regarding V2V.

<i>Committee Recommendation #6</i>	
The JPO should ensure that adequate testing of positioning system performance is conducted in all expected conditions and that cases where positioning performance will not be adequate are well understood and their likelihood of occurrence calculated and potential impact on vehicle interactions understood. Furthermore, successful positioning performance must be achievable at acceptable component costs and the performance/cost tradeoffs should be analyzed.	
JPO Response:	The Department concurs. Samples of data gathered from the Safety Pilot Model Deployment and follow-on activities are being prepared for performance requirement studies. Different analysis capabilities are being investigated.
JPO Actions:	The JPO is supporting the CV Pilots deployment program. On September 14th, 2015, the Department announced the selection of three CV deployment sites in the CV Pilot Deployment Program. The three sites collectively envision a broad spectrum of applications enabled by CV technologies driven by site-specific needs. The three pilot sites include using CV technologies to improve safe and efficient truck movement along I-80 in southern Wyoming, exploiting V2V and intersection communications to improve vehicle flow and pedestrian safety in high-priority corridors in New York City, and deploying multiple safety and mobility applications on and in proximity to reversible freeway lanes in Tampa, Florida. The CV Pilots project is currently approaching the end of Phase 1 (Proof of Concept). The three pilot sites are producing foundational documents such as the ConOps and Security Management Operational Concept. Phases 2 and 3 (Deployment and Maintenance) remain on schedule, and the JPO released a notice of funding opportunity in May 2016.

<i>Committee Recommendation #7</i>	
JPO and other organizations within the Department should continue to identify harmonization of ITS standards as a critical priority in their public communications about ITS technologies and continue to include it in their strategic plans. While JPO has in the past made such statements as part of its outreach programs, reinforcement from higher levels within the Department, the Department of Commerce, and the White House would be of substantial value. Other regions are invested at these levels of authority; the U.S. government should be as well.	
JPO Response:	The Department concurs that high level reinforcement of the benefits of internationally harmonized standards by key U.S. policy leaders is valuable and desirable. The Department has continued to publicly reinforce our commitment to internationally harmonized high-quality standards and has cooperated with the Department of Commerce via the NIST to disseminate our messages. The Department will continue to seek appropriate cooperation from the White House, NIST, and other Federal organizations in publicly reaffirming both the value of, and our commitment to international standards harmonization. Standards harmonization will continue to

	remain a key focus area in the next Departmental ITS Strategic Plan which is currently being developed.
JPO Actions:	The JPO standards program continues to work on harmonization of both domestic and international standards. The ITS Standards program has teamed with standards development organizations and public agencies to accelerate the development of open, non-proprietary communications interface standards to support ITS application development and deployment. The JPO recently announced the release of version 7.1 of the National ITS Architecture, which, among other features, includes improved mapping towards Moving Ahead for Progress in the 21st Century (MAP-21) requirements and goals. The national architecture framework is available at http://itsarch.iteris.com/itsarch/index.htm . In July 2016, version 2.2 the JPO-sponsored CVRIA went live and can be accessed at http://www.iteris.com/cvria/ . The JPO works in collaboration with standards organizations such as IEEE, SAE, and others to work towards standards harmonization.

Committee Recommendation #8

JPO should continue to adequately fund organizations and programs acting to harmonize ITS standards. Sufficient funding should be made available to effectively deploy U.S. experts from the U.S. Government, automobile manufacturers, and relevant organizations to the appropriate forums working on ITS standards. In the case of federally funded organizations, the JPO should fully exercise contractual/grant authority to encourage harmonization.	
JPO Response:	The Department concurs with this recommendation and is acting accordingly within resource and policy constraints. The Department intends to continue to provide limited travel funding support for voluntary industry experts participating in standards harmonization efforts along with executing needed work via more traditional means, including SDOs, technical support contracts and cooperative agreements with industry, to expeditiously meet CV standardization needs. Recently initiated contracts with SDOs explicitly call out harmonization activities and make funding available to execute them. To further support harmonization, we have sought cooperation from JPO funded research programs to support and fund researcher participation in appropriate standards working groups and we have developed appropriate contracting language to facilitate such participation. While we recognize that personal – and in-person – participation in consensus-based standards development efforts remains critical to assuring that U.S. interests are fully represented in effective standards development efforts, resource and travel policy restrictions will likely continue to impact such participation by Federal staff for the foreseeable future.
JPO Actions:	The JPO standards program continues to work on harmonization of both domestic and international standards. The ITS Standards program has teamed with standards development organizations and public agencies to accelerate the development of open, non-proprietary communications interface standards to support ITS application development and deployment.

Committee Recommendation #9

The JPO should assure that the U.S. – EU Standards Harmonization WG and any future U.S.–regional collaborations working on harmonized standards are properly supported by both U.S. government and industry personnel who are actively engaged in standards work. Further, these groups should meet face-to-face on a frequent basis and for periods of sufficient duration to allow thorough discussion and resolution of pertinent issues. Additionally, the U.S. should work to consolidate the various regional groups with interests in standards harmonization into a single global working group.	
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JPO Response:	The Department concurs with this recommendation and is acting accordingly within resource and policy constraints. Both the frequency and duration of U.S. – EU Standards Harmonization WG meetings are subject to agreement by both the U.S. and EU. These meetings are co-led by U.S. Federal staff, and to the extent that domestic or international travel is required, meeting frequency and duration is governed by Departmental and organizational travel policies as well as staff availability. Going forward, we will seek to maintain a frequency of at least semi-annual public meetings adjacent to other events with substantial stakeholder participation, with equitable location distribution between the U.S. and EU and remote participation opportunities. It should be noted that the ability to execute a Harmonization Action Plan (HAP) or other cooperative work items remains dependent upon our international partners’ willingness and ability to act along with the Department and industry partners.
JPO Actions:	The JPO continues to work on international standards and harmonization. The staff interacts and participates with international partners through the trilateral working group and yearly at the ITS World Congress.

<i>Committee Recommendation #10</i>	
The JPO should cooperate with industry and others to develop a list of key CV interfaces and standards required to support broad CVs deployment and identify and aggressively pursue beneficial harmonization and multiregional joint standards development opportunities. The progress of these standards can then be tracked through the various standards organizations and pressure applied to ensure that they are being developed in a harmonized fashion and the development of redundant standards discouraged.	
JPO Response:	The Department concurs with this recommendation and is acting accordingly. A CVRIA is under development with broad domestic and international stakeholder input from industry, academia, and government. The CVRIA will be used to identify candidate interfaces for standardization and to support development of a prioritized CV standardization plan, again with broad stakeholder input. These candidate interfaces will be aligned to the extent practical with those in other global CV architectures to the extent that these are known and documented in order to facilitate standards harmonization. As part of the analysis, interfaces will be evaluated, standards gaps will be identified, and opportunities to adopt or adapt existing standards as well as needs for new standards development identified. When in the public interest, the Department will seek to harmonize needed standards. For example, in cases where both the U.S. and another region such as the EU have identified identical or similar interfaces in their architectures for which no suitable standards currently exists, we will seek to cooperatively adapt or develop a single harmonized standard to cover such an interface. In addition to opening this process to the aforementioned broad stakeholder input, we are also seeking to perform the required gap analysis cooperatively with the EU under our existing cooperation agreement and to open this effort to other regions/nations interested in cooperating.
JPO Actions:	JPO, the European Commission, and the Australian architecture experts have collaborated on the creation of the Harmonized Architecture Reference for Technical Standards (HARTS). This architecture “superset” reflects the cooperative-ITS applications and services of the various geographic regions. With its development, it is now being used with experts to map standards to data flows and interfaces and identify gaps. It is expected that the gap analysis will be complete in later 2017 and will be accompanied by recommendations for harmonization as well as future collaborative standards development.

<i>Committee Recommendation #11</i>	
The JPO should ensure that the intellectual property and patent rights embedded in existing and emerging standards are clearly understood and develop a plan to mitigate the impact of these issues on CV implementation.	
JPO Response:	The Department agrees that intellectual property and patent rights embedded in existing and emerging standards should be clearly understandable. As directed by legislation, we cooperate with SDOs to facilitate development and publication of standards. SDO's intellectual property policies apply to these standards; the Department does not have any specific authority to enforce or dictate what these policies are. The extent to which essential intellectual property might be incorporated in any specific standard is determined by the collective expert judgment of the participants in each standards working group in accordance with the SDO's consensus/voting procedures.
JPO Actions:	Ongoing monitoring of standards IP issues for possible undue impediments to deployment.

<i>Committee Recommendation #12</i>	
The JPO should continue to consider the relationship between CV standards and emerging standards for new technologies, including machine-to-machine communication, necessary to support automated/autonomous vehicle deployment to ensure that CV standards evolve to meet the needs of these developing technologies as well.	
JPO Response:	The Department concurs with this recommendation and is acting accordingly. For example, OST-R has become an Associate Member of the oneM2M global standards development consortium on behalf of the Department, and we continue to monitor and appropriately participate in oneM2M activities to help ensure that U.S. ITS standardization interests are well represented. The analysis of candidate interfaces for standardization following the CVRIA effort will broadly seek out appropriate standards from global sources as candidates for adoption/adaption to meet CV interface needs. Via technical support services contracts and standards working group participation, we seek to remain aware of technological and standardization developments in other industries/fields which might be of benefit to ITS. Further, ITS standards working groups themselves often include experts with broad expertise and do facilitate substantial knowledge transfer to benefit ITS standardization. We recognize the importance of globally harmonized standards, test procedures, and certification processes to facilitate the efficient introduction of automated/autonomous vehicle technologies and we are currently formulating our program plan to address these and other automated/autonomous vehicle research needs.
JPO Actions:	OST-R is an Associate Member of the oneM2M global standards development consortium on behalf of the Department, and we continue to monitor and appropriately participate in oneM2M activities to help ensure that U.S. ITS standardization interests are well represented. The analysis of candidate interfaces for standardization following the CVRIA effort will broadly seek out appropriate standards from global sources as candidates for adoption/adaption to meet CV interface needs. Via technical support services contracts and standards working group participation, we seek to remain aware of technological and standardization developments in other industries/fields which might be of benefit to ITS. Further, ITS standards working groups themselves often include experts with broad expertise and do facilitate substantial knowledge transfer to benefit ITS standardization.

<i>Committee Recommendation #13</i>	
The JPO should continue efforts to pursue global harmonization of 5.9 Gigahertz (GHz) radio spectrum standards to meet the needs of low-latency, secured CV communications. The JPO should closely monitor and participate in spectrum usage testing to ensure that that no changes are made unless thorough data-driven review testing demonstrates that no harmful interference would occur to the existing frequency allocation. The U.S. Department and the Federal Communication Commission (FCC) should collaborate in reaching the right decision on this matter.	
JPO Response:	The Department agrees that global harmonization of the 5.9 GHz radio spectrum would facilitate harmonized standards and common hardware and software to support CV deployments and will continue to call-out these benefits in appropriate forums. We continue to monitor and participate in standards working group activity associated with evaluation of proposed spectrum sharing and development of candidate approaches, and will continue to participate in regulatory processes via appropriate channels.
JPO Actions:	The JPO continues to work on the promotion of DSRC. Currently the JPO is analyzing the FCC issued Public Notice FCC 16-68 that was published with the intent to “Update and Refresh the Record in the ‘Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band’ Proceeding.” The issue of spectrum sharing remains a point of contention and policy decisions by outside agencies (the FCC, for example) may have unanticipated impacts in this area. The JPO is also a leading partner with OST-R in representing the US position on DSRC at the International Telecommunications Union-Radiocommunications (ITU-R) Working Party 5A, which has an agenda item focused on the information and analysis, needed to support allocations of DSRC bands for transportation on a worldwide basis.

<i>Committee Recommendation #14</i>	
The JPO should engage communication professionals to develop an overarching communications strategy, and aggressively launch an effective public communications campaign.	
JPO Response:	The Department concurs and is acting accordingly within the bounds of its legislative mandate, which is limited to communications and outreach to advance research and technology transfer. Ultimately, consumer awareness of the benefits of CV capabilities must be a shared responsibility among the many partners involved in advancing these systems.
JPO Actions:	The JPO continues to study a communications strategy that is within the bounds of the legislative mandate.

<i>Committee Recommendation #15</i>	
NHTSA should create a comprehensive document on safety benefits, particularly as new technologies are being introduced that improve the safety of vehicles. NHTSA cited such a document on CV benefits when voicing support for CVs in May 2012.	
JPO Response:	The Department partially concurs. NHTSA routinely releases safety information regarding new vehicle technology when it has confidence in the results, rather than compiling comprehensive reports regarding multiple technologies. In addition, withholding results to compile a comprehensive list would delay the public release of information. For CVs, as NHTSA has stated, it will evaluate the potential safety benefits of this technology and release that information as soon as it is ready. The Department will continue to be cognizant of current and future technologies and release information on safety benefits when such analyses are appropriate.

JPO Actions:	NHTSA published their "Vehicle-to-Vehicle Communications: Readiness of V2V Technology for Application" report in August 2014. This report presents the preliminary estimation of the safety benefits of the deployment of select V2V technologies, including future projections and variability based on technology penetration. This report will inform NHTSA's upcoming rulemaking concerning V2V technology.
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Committee Recommendation #16

<p>The JPO should create a Glossary of Terms as part of the Strategic Plan. The ITS CVs program would benefit from greater attention to nomenclature. Activities, programs, and technologies should be identified with unique terms that have clear and stable meanings. Every attempt should be made to use terms consistently and to encourage consistent use in the ITS community.</p> <p>We identify two general areas where nomenclature is especially important. The first is in technology. Terms like “V2V”, “automated vehicles,” “autonomous vehicles,” and “driverless cars” should be defined and used consistently. The second area is in deployment. Terms like “adoption,” “implementation,” and “deployment” should also be clearly defined and consistently used. Clarity of terms may make clearer how new technologies will transition into use.</p> <p>Since there is widespread use of these various terms by different sectors such as academia, industry, the press, the public and others, it not likely that the JPO can drive a common lexicon, but at least for the purposes of its own generated documents this glossary can serve to clarify the discussion.</p>	
JPO Response:	The Department concurs. This is planned to be featured as an appendix to the Strategic Plan. Definitions will be drawn from sources like the NHTSA Decision (once available), the Government Accountability Office (GAO) report, the AASHTO Footprint Analysis, the National Cooperative Highway Research Program (NCHRP) Cost-Benefit Analysis, as well as from our research work with industry partners to include the CAMP and the VIIC and through our international cooperation efforts.
JPO Actions:	The ITS Strategic Plan 2015-2019 now contains a listing of acronyms and a glossary of terminology as Appendices B and C, respectively

Committee Recommendation #17

<p>The Department should encourage and incentivize additional DSRC pilot deployments at the state and local level (rural, urban and regional). Such DSRC pilots would educate local officials and local publics about the benefits of DSRC-based systems. Multi-modalism is a desirable feature of such pilots.</p>	
JPO Response:	The Department concurs and is planning to launch a CV pilot program that will focus on a host of transportation applications to include: mobility, road-weather, freight, emergency first responder, environmental, and other transportation management applications. This program is envisioned to be multi-modal in nature, include the use of DSRC technology, and funds a series of projects at various locations around the country. A Request for Information (RFI) was released in late January to gather information from stakeholders regarding this activity. More information will be forthcoming in 2014 once all RFI responses have been analyzed.
JPO Actions:	In September 2015, the Department awarded up to \$42 million dollars for the CV Pilots demonstrations to New York City, Tampa, and Wyoming. In May, the Department named 7 finalists for the \$40 million dollar Smart City Challenge, and in June named Columbus, Ohio as the Smart City Challenge winner.

Committee Recommendation #18

The JPO should continue its efforts to connect Federal and state and local agencies. Given their key role in ITS implementation, state and local officials should have the most effective voice possible in U.S. Department technology programs. Hierarchical federal program structures should be complemented by peer-to-peer program structures (AASHTO and Traffic Management Center (TMC) operators association), and both types of programs should connect.

Federal programs should continue to seek ways to connect with state and local peer-to-peer associations and with non-traditional stakeholders such as National Association of Counties, Conference of Mayors, League of Cities, and Governors Association. Outreach to deployers should focus on ready-to-deploy technologies.

JPO Response:	The Department concurs. The JPO often partners with state and local agencies to field test and demonstrate different ITS solutions. Just recently, the JPO released a procurement to provide Integrated Corridor Management Deployment Planning grants to state and local agencies to support the concept development and analysis of integrated corridor management solutions for different communities. The JPO also partners with the state Department-led pooled fund studies to support the analysis of ITS solutions. Most recently, we provided funding to a ten state partner pooled fund study to look at CV applications that apply to intersections. In the coming year, we are looking to add outreach to new stakeholder groups such as those mentioned above.
JPO Actions:	The JPO partners with state and local agencies to field test and demonstrate different ITS solutions and released a procurement to provide ICM Deployment Planning grants to state and local agencies to support the concept development and analysis of integrated corridor management solutions for different communities. The JPO also partners with the state Department-led pooled fund studies to support the analysis of ITS solutions and provided funding to a ten state partner pooled fund study to look at CV applications that apply to intersections.

Committee Recommendation #19

U.S. Department should further its capacity to identify and to promote local innovations. U.S. Department should provide seed grants and other support for successful innovations, even if they originate outside of the federal program.

JPO Response:	The Department concurs and plans to continue to expand opportunities for private sector and state and local agencies to participate in CV testing and development through expansion of test beds and pilot testing wherein CV innovations can be vetted for efficacy and interoperability.
JPO Actions:	The JPO provides funding and support for the CV Pilots and Smart City Challenge recipients. The JPO additionally provides constant public outreach and technical training in the form of webinars and workshops, and coordinates with industry partners such as VICC and CAMP to develop standards and harmonization.

Committee Recommendation #20

When reporting on the CV program the JPO should use the analytical category “DSRC-necessary Apps”. DSRC-necessary Apps are application-layer programs whose functioning demands the characteristics of the DRSC network (high speed, security, privacy, no subscriber fee, and no opt-in).

JPO Response:	The Department partially concurs. Identifying application categories might be more appropriate since there will be many variations on particular applications. Likely DSRC necessary application categories would include multi-vehicle crash avoidance applications, signalized intersection crash avoidance applications, commercial vehicle inspection or enforcement support applications. All of these categories of applications could operate in (near) stand-alone mode. All include the need to
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	communicate with a (rapidly) moving vehicle. Most other application categories can be accomplished by multiple communication media.
JPO Actions:	With the analysis of the FCC questions to refresh the record on DSRC, the ITS JPO, OST-R, FHWA, and NHTSA are partnering to better describe applications in terms of their communications needs. A key tool in this endeavor is the CVRIA, which identifies communications characteristics of each application.

2015 Recommendations

No formal recommendations to the Department in 2014.

2016 Recommendations

<i>Committee Recommendation #1</i>	
The Department's Chief Information Officer (CIO) should convene a CV forum with State representatives to drive consistent data policies across the States and with the Federal government.	
JPO Response:	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.
JPO Actions:	The JPO is working with the Chief Data Officer on the Open Government National Action Plan and International Open Data Charter.

<i>Committee Recommendation #2</i>	
Based on data content, data source, and data destination, the JPO should analyze the data available from connected and automated vehicles and categorize it in levels of sharing sensitivity.	
JPO Response:	The Department concurs. Data types are identified in the 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 (BSM) 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
JPO Actions:	The JPO has worked to identify and address barriers to sharing connected vehicle data. For example, while individual BSMs contain no unique identifiers, aggregated BSMs may allow for an individual traveler or trip to be identified. Therefore, TMCs collecting such data should treat it as sensitive data requiring sanitization. We are developing methodologies to support such sanitization or provide secure access to restricted data. We plan to conduct analysis on additional high value connected and automated vehicle data sources to identify and address data sharing sensitivities, and support sharing of such data as appropriate via early deployments.

<i>Committee Recommendation #3</i>	
The 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.	
JPO Response:	The Department concurs on this recommendation. An overall policy for data creation and sharing should be developed and leverage examples from other government agencies.
JPO Actions:	The JPO has looked at examples in the weather, health, and finance industries, among others, for data sharing models that support the public interest and drive economic activity. We have started to apply some of these successful practices to our data sharing tools and activities, and plan to conduct more public outreach to get alignment around an overall policy for data creation and sharing.

<i>Committee Recommendation #4</i>	
The 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 JPO should evaluate these solutions and develop a path to resolving the GPS vulnerability issue for connected and automated vehicles.	
JPO Response:	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 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.
JPO Actions:	

<i>Committee Recommendation #5</i>	
The JPO should develop a comprehensive plan for evaluation of benefits and performance of the CV system and, once operational, include the data and analytical procedures required for such evaluation.	
JPO Response:	The Department concurs with this recommendation; we already know the potential benefits of a CV system, which is the basis for the planned NHTSA CV rulemaking. The Department is developing a "Department 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.
JPO Actions:	The JPO CV Pilots program has conducted the Phase 1 - Sites Performance Measurement and Evaluation Support Plan Webinars for the three CV Pilot site locations as well as other early deployers of CV technologies. The three sites are developing evaluation criteria for these pilots.

<i>Committee Recommendation #6</i>	
The 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.	
JPO Response:	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.
JPO Actions:	

<i>Committee Recommendation #7</i>	
The 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.	
JPO Response:	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 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.
JPO Actions:	In September 2015, the Department awarded up to \$42 million dollars for the CV Pilots demonstrations to New York City, Tampa, and Wyoming. In May, the Department named 7 finalists for the \$40 million dollar Smart City Challenge, and in June named Columbus, Ohio as the Smart City Challenge winner.

<i>Committee Recommendation #8</i>	
The JPO should conduct research and stakeholder engagement to assess the role public-private partnerships (P3s) can play in filling the funding gap for ITS.	
JPO Response:	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 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 JPO may be able to build off of these P3 technical assistance efforts, dependent upon budget reprioritization.
JPO Actions:	

<i>Committee Recommendation #9</i>	
The JPO should increase the priority of public transit testing and researching of V2V and V2I CV technologies.	
JPO Response:	The Department concurs with this recommendation, as funds are available. The 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 JPO is identifying follow up research for V2 I and it will include the recommendation in this effort.
JPO Actions:	The JPO continues to work with the FTA in researching and developing Transit V2I Safety applications and work on the Transit Bus Stop Pedestrian Safety Application.

<i>Committee Recommendation #10</i>	
The 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.	
JPO Response:	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.
JPO Actions:	The JPO is working with the FTA on the MOD Program. MOD is in the process of selecting sites for their MOD Sandbox Deployment Program, which is interested in conducting research on new service options in combination with available technologies that allow for greater individual mobility. The outcomes of MOD should produce examples of best practices for public transit agencies to follow.

<i>Committee Recommendation #11</i>	
The JPO should direct research at providing Federal policy guidance regarding governance (Federal, State, and regional levels); best practices; model legislation; and definitions.	
JPO Response:	The Department concurs with this recommendation, if funding is available. The FTA has initiated a 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.
JPO Actions:	

<i>Committee Recommendation #12</i>	
The Department 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 JPO's current research program (e.g., MOD).	

JPO Response:	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 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.
JPO Actions:	The JPO continues to work with the FTA on the MOD program. The JPO and FTA have agreed to fund a \$8 million joint venture using research “sandboxes” to encourage and create new mobility options by demonstrating MOD concepts.

Committee Recommendation #13

The 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.

JPO Response:	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.
JPO Actions:	The JPO continues to support the Mobility Services for All Americans (MSAA) program, which is working with three locations on improving coordination and efficiencies in human service transportation. In FY 2014 and FY2015, Department awarded \$1.3 million in MSAA Deployment Planning Project grants to selected local and regional organizations to plan coordinated mobility services. The JPO currently has ongoing ITS work in accessible transportation through the ATTRI which is research ways to increase transportation for all travelers. The JPO is working collaboratively with FTA and the NIDILRR in the Department of Labor to develop demonstrations or prototypes in four applications areas (Wayfinding & Navigation Systems, Assistive Technologies, Data Integration, and Automation & Robotics) to advance transportation accessibility for people with disabilities.

Committee Recommendation #14

The 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).

JPO Response:	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.
JPO Actions:	The JPO and FTA have agreed to fund a \$8 million joint venture using research “sandboxes” to encourage and create new mobility options by demonstrating MOD concepts.

Committee Recommendation #15

The JPO should conduct a national and international scanning tour of surface transportation agencies (Departments, 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.

JPO Response:	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 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 Department staff.
JPO Actions:	The ITS PCB provides the ITS workforce with flexible, accessible ITS learning through training, technical assistance and educational resources. The program assists transportation professionals in developing their knowledge, skills, and abilities to build technical proficiency while furthering their career paths.

Committee Recommendation #16

The 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.

JPO Response:	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).
JPO Actions:	

<i>Committee Recommendation #17</i>	
The 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.	
JPO Response:	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.
JPO Actions:	