

U.S. Surface Transportation and Technology Development: The Critical Role  
for the Research Community

Statement of

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## INTRODUCTION

Good morning, Madam Chairwoman and members of the Committee. My name is Michael D. Meyer. I am a Senior Advisor to Parsons Brinckerhoff, Inc., one of the nation's leading transportation consulting firms, and currently serve as chairman of the Transportation Research Board's Research and Technology Coordinating Committee (RTCC). The Transportation Research Board (TRB) of the National Academies is one of the five divisions of the National Research Council (NRC), which, in turn, is the operating arm of the National Academy of Sciences, National Academy of Engineering, and the Institute of Medicine. This complex of organizations is collectively referred to as the National Academies. The institution operates under the charter given to the National Academy of Sciences by Congress in 1863 to advise the government on matters of science and technology.

The TRB's mission is to promote innovation and progress in transportation through research. It is best known for its role in promoting innovation and information exchange by maintaining approximately 200 standing technical committees in all modes of transportation and hosting an Annual Meeting that attracts more than 12,000 participants from the United States and around the world. TRB also conducts policy studies for Congress and the executive branch, and administers research programs for others that are stakeholder-directed and primarily award research funding based on competition and merit review by peers.

TRB's Research and Technology Coordinating Committee provides guidance on highway research and technology programs and activities and makes broad-based research priority recommendations, with an emphasis on the Federal Highway Administration's (FHWA's) annual research program plans and budgets. The committee's scope also includes technology transfer and the implementation of research; ways and means of increasing state, local, and private-sector participation in highway research and innovation; and economic, social, energy, and environmental issues as they influence highway research policy and programs.

I should also note that as a state Department of Transportation (DOT) official in the 1980s, I was responsible for a state DOT's research program, and for 15 years I was Director of one of the largest university transportation centers in the country. My background thus provides a broad perspective on the role of research in our Nation's research efforts and their link to future technology development.

The testimony I will give today is focused on two reports prepared by the work of experts, appointed by the NRC, and serving without compensation to examine the role of the federal government in transportation research. I will also offer my own observations, based on years of a range of experience, on aspects of the nation's research program that are important as we move ahead.

*Special Report 313, Framing Surface Transportation Research for the Nation's Future* [TRB, 2014]

This report examined transportation research efforts in other countries and from domestic non-transportation organizations, and how lessons learned from such efforts might be used to improve surface transportation research in the U.S. The report observes that other nations not only place greater emphasis on transportation research as a means of achieving economic, societal, and environmental goals; they also have effective frameworks for prioritizing, funding, assembling, and coordinating research activities. In contrast, the U.S. surface transportation research enterprise was characterized by a diversity of participants, activities, and funding sources; and it is highly decentralized, with most research programs initiated from the bottom up. As a result, much of the research aims at specific problems identified by sponsors and is relatively short term and applied in nature. The report further noted that, "the U.S. system too frequently lacks clear linkages between research and national goals, and it tends to focus on solving narrowly defined problems at the expense of basic and advanced research that could form the basis for exploring broader crosscutting issues and developing innovative solutions to long-term challenges."

The committee found, not surprisingly, that the research and technology deployment initiatives in other countries differ from the U.S. primarily because of different government structures. However, the assessment found characteristics of research programs that should be common to successful efforts, no matter the governance structure. For example, other countries' research programs were more cohesive in terms of linkage to national transportation and other societal goals; in general, they provided more support for basic research (in Japan, for example, basic research is regarded as an integral part of the overall innovation process and is not artificially separated from other research activities in the funding process); they placed great emphasis on research partnerships among governmental agencies and with private sector firms; and they emphasized the importance of monitoring on-going research to assess research

outcomes in various forms, such as new understanding of basic phenomena, new transportation policies, and new or improved commercial technologies.

With respect to non-transportation research programs, the committee highlighted the fundamental differences between mission-oriented and scientific agencies. By definition, mission-oriented agencies focus on applied research relevant to their mission, with specific targets and an emphasis on implementation. This is certainly a characteristic of much of the research conducted in transportation. The most effective research agenda-setting was inclusive, engaging stakeholders in the establishment of priorities and identification of projects. When rigorous peer review was used to select projects, the research community was more tolerant of the process and the quality of the results appeared to improve. A well-designed stakeholder-engagement process helped identify and overcome barriers to the implementation of research outputs.

Based on their analysis, the committee made the following recommendations:

1. Establish a new framework for U.S. surface transportation research guided by key national stakeholders in transportation.
2. Hold a national summit on transportation research to launch efforts to explore ways of implementing a new national surface transportation research framework, discuss means of funding the framework initiative, and consider opportunities to leverage existing research.
3. The White House Office of Science and Technology Policy (OSTP) should convene a task force to explore potential synergies and other gains from greater coordination and cohesion among federal agencies engaged in research relevant to surface transportation.
4. The Secretary of Transportation should consider ways to strengthen the coordination of transportation research within the U.S. DOT and across other federal agencies, including the creation of a “chief scientist” position within the DOT.
5. The U.S. DOT should engage more fully with the research community, with a view to leveraging investments in technical and policy areas by other federal departments, as well as by states, industry, and academia.
6. A broad and robust program of basic and advanced research that encompasses the many disciplines relevant to surface transportation should be established.
7. The U.S. DOT should continue its activities that promote knowledge transfer and disseminate research results.
8. The U.S. DOT should establish a relationship with Office of Science and Technology Policy to elevate the visibility of transportation research and its importance on the national science and technology agenda.

9. The many and diverse organizations that make up the surface transportation research community should, both individually and in cooperation with each other, take a proactive approach to sharing the successes of transportation research with a wide range of audiences, including elected officials, other high-level decision makers, and the general public.

The report concludes, “as the U.S. DOT takes steps to build its research capacity and culture, a variety of public, private, academic, and nonprofit organizations should be cooperatively engaged in starting to create that new framework.”

*Special Report 317, The Essential Federal Role in Highway Research and Innovation* [TRB, 2015]

This report examined the Federal Highway Administration’s (FHWA) role in fostering national deployment of innovations based on its own research and development and that of other highway research programs. As noted, research, development and technology (RD&T) have fueled innovation across the nation’s road network since the early 1950s, when the nation’s highway organizations joined forces to develop advances in pavement design. Today, a wide variety of research activities are conducted under the auspices of programs responding to the needs of the numerous jurisdictions responsible for the highway system. Among funding agencies, only FHWA has the resources and ability to conduct long-term research dedicated to highways that explores fundamental relationships.

The report observes that FHWA has invested in exploratory advanced research (in part due to the recommendations of the RTCC). The Exploratory Advanced Research (EAR) program, funded at \$11 million annually by Congress during SAFETEA-LU and continued at about \$8 million during MAP-21, focuses on research that has a very high potential in return on investment, but is high risk in terms of the possibility of not producing immediately useful results. [FHWA, 2015] The focus areas are: 1) connected highway and vehicle system concepts, 2) breakthrough concepts in material science, 3) human behavior and travel choices, 4) technology for assessing performance, and 5) new technology and advanced policies for energy and resource conservation. RTCC members support this type of research; it is considered fundamental to laying the foundation for a future transportation system based on technology.

The report concludes that FHWA’s RD&T role in the future will be critical in two other particularly important ways. FHWA is the lead federal agency in developing and deploying safety applications to provide safety messages between infrastructure and vehicles. The safety

alerts to motorists will depend on FHWA leadership in applying national standards to the variety of traffic signaling systems in use around the country. Second, FHWA is poised to work with states and local governments in deploying the innovations developed through the second Strategic Highway Research Program (SHRP 2), a congressionally authorized 9-year, \$223 million federal–state investment. SHRP 2 has developed dozens of innovations to renew aging infrastructure more quickly and cost-effectively, improve the reliability of travel time, provide capacity consistent with environmental protection, and improve safety. The benefits of this significant investment will be delayed or lost if FHWA’s central role in fostering deployment is not continued.

The report concludes:

- FHWA is better positioned than are individual states to take a longer view in research and development. This allows the agency to conduct advanced research to harvest breakthroughs in basic research for application in transportation; conduct long-term pavement and bridge experiments to collect necessary data to improve infrastructure performance; and carry out complex, long-term R&D with the automobile industry and infrastructure owners in the connected vehicle initiative, which will help avoid vast numbers of crashes in the future.
- FHWA, with its national perspective, can lead states in the development and transfer of tools and processes that improve safety and system capacity at less cost.
- With its economies of scale and offices in each state, FHWA is uniquely positioned to identify and support the implementation of innovations by states and local agencies. The opportunities for carrying out this role are particularly promising in V2I development and standardization and in deployment of the products from SHRP 2 research. Only FHWA has the national perspective, leadership, resources, and ability to invest for the long term to carry out these responsibilities to the benefit of the nation as a whole.

Madam Chairwoman, these two reports speak toward the need for federal leadership in promoting, fostering, leading and, in some cases, managing research programs that lay the groundwork for technology applications that could fundamentally change the way we use transportation in the future.

I would like to add some personal observations to the conclusions of these two TRB reports. These observations are thus not the product of TRB committees, nor have they been vetted by the peer review process of the National Academies....they are my own thoughts.

I congratulate the Subcommittee on Research and Technology in choosing the subject of this hearing---“Surface Transportation: Technology Driving the Future.” I have been in the field of transportation long enough and in a variety of positions to appreciate the impact that technology has had on the way we use the transportation system and how agencies responsible for managing these systems can improve system performance. Who would have guessed 15 years ago that a large number of our citizens would be getting their information on travel options or on the condition of the transportation system from our phones? Who could have foreseen the massive generation of data on trip-making and network usage that comes from advanced sensors and network monitoring technologies? In transportation planning, geographic information systems along with global positioning systems have revolutionized planning analysis approaches.

Looking to the future, what role will “smart” materials play in the provision of future infrastructure? How will vehicle-to-vehicle and vehicle-to-infrastructure technologies influence travel behavior and network performance? What impact will technology applications have in making our vehicles more energy efficient, more sustainable and safer? These are but a few questions we face today in trying to anticipate the impacts of future technologies. These questions become even more important when one realizes that our metropolitan areas and states produce federally-required transportation plans that look 20 to 25 years in the future in order to lay out the capital investments that are needed to satisfy expected demands.

A fundamental characteristic of the nation’s transportation research effort, and one that has contributed greatly to the success we have enjoyed so far as a nation in our transportation system, has been the recognition that no one has a “lock” on creativity or transformational ideas. America’s industry and service companies have led the way in many of the technology developments that we are now starting to see on the road. In many ways, what happens in the laboratories of the nation’s automobile manufacturers or in the research think tanks of companies like Google will probably have more impact on travelers than any other source of innovation. An analogy from the freight sector illustrates this point. The introduction of the 20-foot container in maritime commerce in the 1960s revolutionized the industry, and certainly had a

tremendous impact on the nation's public ports and highway system. Very few in public sector transportation agencies even knew this transformational innovation was occurring. But the impact of the container on road and port capacity, design, operations and associated environmental impacts was long-term, resulting in many research efforts to better understand the implications of this change on transportation system performance.

In other areas, the rich diversity of our nation's universities results in research initiatives that span a range of subjects that will benefit the nation. Many have contributed, and continue to contribute, to advancements in vehicle and network technologies. Others are making major contributions to fuel cell technology or other alternative fuels. Still others are examining the social and economic impacts of changing transportation behavior as well as the consequence to national transportation policy.

And as noted earlier, federal agencies are fostering their own support for transportation technology, and importantly paving the way for these technologies to be understood and used by state, regional and local governmental agencies. In addition, the federal agencies adopt a national perspective on transportation research, focusing on those issues and technology applications that will be of national import.

Time does not allow me to discuss other major participants in the national research effort...state and local agencies, foundations, industry groups, private non-profit organizations, international agencies, and the like. All of this is to say that a national transportation research program cannot really be led or managed by one agency such as the U.S. DOT. However, as noted in *Special Report 313*, the U.S. DOT and its modal agencies have a critical role to play in establishing a research framework that focuses on research of national significance. All of the other participants in research discussed above focus their efforts on topics of specific interest to their organization or group. Industry focuses on research and technology development that will make their products more appealing and cost effective. State DOTs tend to focus on research that will help them in the short run improve their operations. Foundations and special interest groups focus their research on particular topics that have been chosen by their boards (e.g., transportation and public health, system resiliency, and mobility for targeted populations). No one except the U.S. DOT has the interest or motivation to provide national leadership on a relevant and effective research program aimed at national goals.

Note that I used the term “leadership” in describing the U.S. DOT’s role. This does not necessarily mean that the U.S. DOT has to do the research itself. The U.S. DOT has a long and successful relationship with the Transportation Research Board, for example, that results in important research products and findings. It also uses universities, national laboratories and consultants to examine other issues of importance to national transportation policy. In some cases, however, such as in the FHWA’s Turner-Fairbank Highway Research Center, the federal role in providing national direction and oversight (e.g., in highway sign standards and driver recognition) requires in-house research capability. The Research Center is an excellent example of the research partnerships among federal and state agencies, universities, and private industry that will characterize successful federal transportation research leadership in the future.

My key observations with respect to a national surface transportation research program are:

1. The U.S. DOT has a critical role in establishing a research framework that guides its own agencies’ research activities as well as those who are in its area of responsibility (e.g., the University Transportation Centers program).
2. The framework should recognize that many other government and private industry participants are conducting research for their own purposes that could have significant impact on future transportation performance.
3. The DOT’s research portfolio should include a mix of basic and applied research, similar to what is done by the FHWA. The research portfolio should focus on issues of national significance and “fill in the gaps” on impacts and public policy implications of technology development that are not being addressed by others.
4. To the extent possible, look into the future and anticipate the technologies and societal trends that will have important consequences on transportation system performance. These are the topics to focus on.
5. Provide seed money for the “little guy.” Transformational ideas and concepts often do not fit into the norm of today’s common understandings. Look at the proliferation of apps that are constantly changing how we obtain and use information. Big research organizations do not have a lock on innovation. Similar to FHWA’s Exploratory

Advanced Research Program, the research portfolio should provide opportunities for high-risk, high payoff research.

6. Base research program development on peer review. The peer review process is designed to develop a research portfolio that has the best chance to “make a difference.” The Transportation Research Board and National Science Foundation are excellent examples of how successful peer review works. Especially for applied research where the results are directly relevant to those who fund the projects, TRB’s Cooperative Research Programs are an excellent model.

Madam Chairwoman and members of the Committee, thank you for this opportunity to present my ideas. As the Committee has noted, technology is “driving” our transportation future. I would suggest that research and development are “driving” technology development, and it is thus in the national interest to support, foster and encourage the creativity that lays at the foundation of our technology future.

## **References**

Federal Highway Administration (FHWA). 2015. “Federal Highway Administration Research and Technology, Exploratory Advanced Research Program,” Website. Accessed June 7, 2015 from, <http://www.fhwa.dot.gov/advancedresearch/>

Transportation Research Board. 2014. *Framing Surface Transportation Research for the Nation’s Future*, Special Report 313, Committee on National Research Frameworks: Application to Transportation. Transportation Research Board, Washington D.C. Accessed June 1, 2015 from, <http://www.trb.org/Main/Blurbs/169932.aspx>

Transportation Research Board. 2015. *The Essential Federal Role in Highway Research and Innovation*, Special Report 317, Research and Technology Coordinating Committee. Transportation Research Board, Washington D.C. Accessed June 1, 2015 from, <http://www.trb.org/Main/Blurbs/172447.aspx>