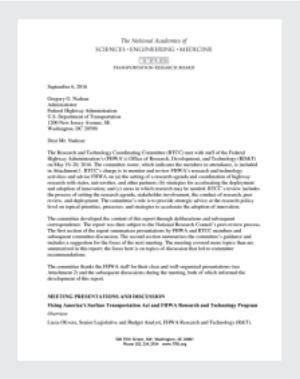

Research and Technology Coordinating Committee Report: September 6, 2016

DETAILS

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Research and Technology Coordinating Committee; Studies and Special Programs Division; Transportation Research Board; National Academies of Sciences, Engineering, and Medicine

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TRB
TRANSPORTATION RESEARCH BOARD

September 6, 2016

Gregory G. Nadeau
Administrator
Federal Highway Administration
U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Mr. Nadeau:

The Research and Technology Coordinating Committee (RTCC) met with staff of the Federal Highway Administration's (FHWA's) Office of Research, Development, and Technology (RD&T) on May 19–20, 2016. The committee roster, which indicates the members in attendance, is included in Attachment 1. RTCC's charge is to monitor and review FHWA's research and technology activities and advise FHWA on (*a*) the setting of a research agenda and coordination of highway research with states, universities, and other partners; (*b*) strategies for accelerating the deployment and adoption of innovation; and (*c*) areas in which research may be needed. RTCC's review includes the process of setting the research agenda, stakeholder involvement, the conduct of research, peer review, and deployment. The committee's role is to provide strategic advice at the research policy level on topical priorities, processes, and strategies to accelerate the adoption of innovation.

The committee developed the content of this report through deliberations and subsequent correspondence. The report was then subject to the National Research Council's peer-review process. The first section of the report summarizes presentations by FHWA and RTCC members and subsequent committee discussion. The second section summarizes the committee's guidance and includes a suggestion for the focus of the next meeting. The meeting covered more topics than are summarized in this report; the focus here is on topics of discussion that led to committee recommendations.

The committee thanks the FHWA staff for their clear and well-organized presentations (see Attachment 2) and the subsequent discussions during the meeting, both of which informed the development of this report.

MEETING PRESENTATIONS AND DISCUSSION

Fixing America's Surface Transportation Act and FHWA Research and Technology Program

Overview

Lucia Olivera, Senior Legislative and Budget Analyst, FHWA Research and Technology (R&T),

began the meeting with an overview of FHWA's R&T program. Five major programs are authorized in the Fixing America's Surface Transportation (FAST) Act and preceding legislation, two of which are managed by FHWA's R&T staff at the Turner-Fairbank Highway Research Center: the Highway Research and Development (HRD) Program and the Technology, Innovation, and Deployment (TID) Program. HRD focuses on eight areas: infrastructure, safety, operations, planning and environment, policy, innovative programs, delivery, and exploratory advanced research. TID develops tools and methods for accelerating adoption of proven innovative practices and technologies as standard practice, such as through the Every Day Counts (EDC) initiative. The other three authorized programs are the Intelligent Transportation Systems Program and the University Transportation Centers (UTC) Program, which are managed through the Office of Secretary, Research, and the Training and Education Program, which is managed by a separate FHWA office.

The FAST Act was enacted on December 4, 2015. It authorized $305 billion in capital funding for surface transportation between Fiscal Year (FY) 2016 and FY 2020. The HRD Program was authorized $125 million each FY ($625 million total), and the TID Program was authorized $67.5 million each FY ($337.5 million total).

As described by Olivera, the FAST Act maintained an overall funding level for R&T similar to that authorized in the Moving Ahead for Progress in the 21st Century Act (MAP-21), but it added two new deployment programs. The net effect is to reduce funding available for FHWA's discretionary R&D by 25 percent. As illustrated in Figure 1, overall funding for RD&T has declined significantly since the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) of 2005. This decline is only partially attributable to the completion of the second Strategic Highway Research Program (SHRP 2).

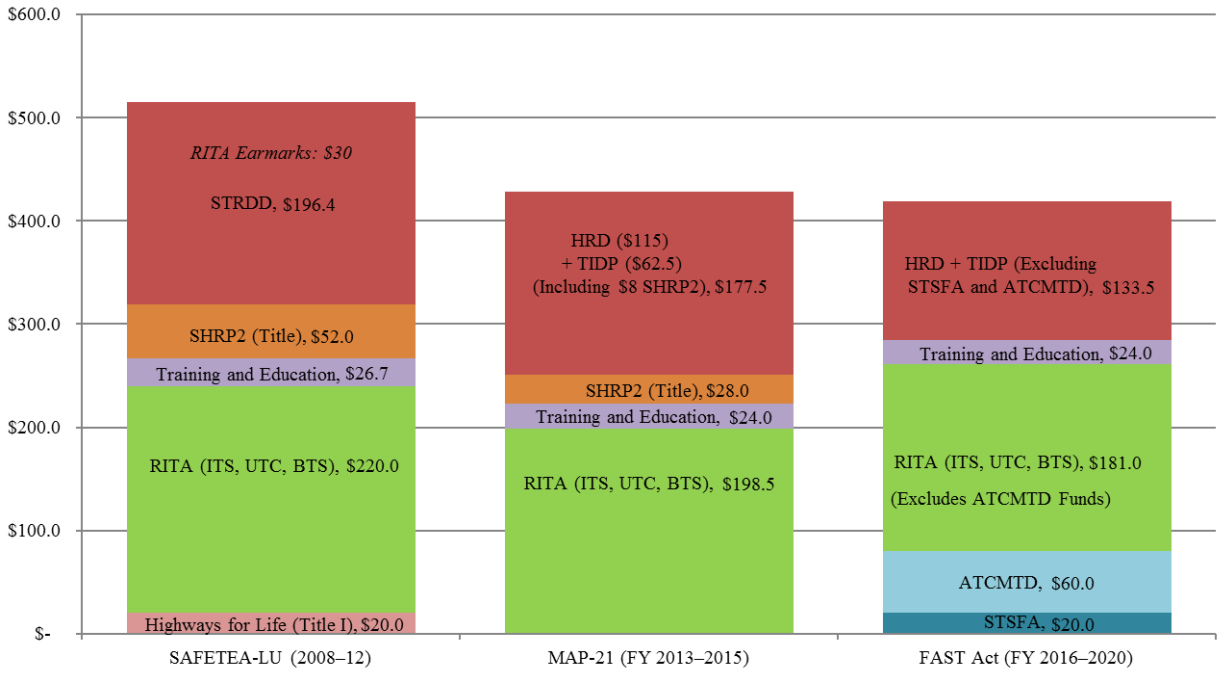


Figure 1 Authorized funding for highway RD&T programs, FY 2008–2020. Dollar amounts are in millions.

Acronyms: ATCMTD—Advanced Transportation and Congestion Management Technologies Deployment Program; BTS—Bureau of Transportation Statistics; FAST Act—Fixing America's Surface Transportation Act; HRD—Highway Research and Development Program; ITS—Intelligent Transportation Systems Program; MAP-21—Moving Ahead for Progress in the 21st Century Act; RITA—Research and Innovative Technology Administration (note that RITA programs in the FAST Act are administered through the Office of the Secretary, Research, after RITA was dissolved in previous legislation); SAFETEA-LU—Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users; SHRP 2—Strategic Highway Research Program 2; STRDD—Surface Transportation Research Development and Demonstration Program; STSFA—Surface Transportation System Funding Alternatives Program; TIDP—Transportation Innovation Deployment Program; UTC—University Transportation Centers Program.

Discussion

In the discussion that followed, RTCC members expressed concerns about the implications of cutting R&D to support deployment activities. Members recognize the value of and need for concerted deployment efforts to encourage states and local governments to adopt proven innovations (discussed in more detail in a subsequent section on deployment). However, the consequences of reducing research funding are worrisome, since research conducted in the near term provides the basis for future innovations. Committee discussion on this theme continued in the presentation concerning FHWA's advanced research program (discussed later).

FHWA R&T Agenda Setting

Overview

Jack D. Jernigan, R&T Team Director, provided an update on the "Top Three" initiative with the state departments of transportation (DOTs), under which staff of FHWA division offices have queried state DOT leadership about the top three challenges that they face. He and Debra Elston, Office Director, Corporate Research Technology and Innovation Management, also discussed a new reporting requirement in the FAST Act for annual modal research plans by U.S. DOT's modal administrations. The plans are designed to help the Secretary identify opportunities for research spanning multiple modes and to avoid duplication of effort within the department.

Discussion

RTCC is pleased to see the Top Three initiative taking root. It is a useful way of eliciting identification of key stakeholders' concerns that might be addressed through focused R&T and a constructive way of involving FHWA's division offices in the innovation process. However, the effect of cuts in FHWA's R&T budget on the agency's ability to follow up on states' concerns troubled members. Other options for investing in supplemental R&D, perhaps through FHWA's pooled-fund program or the National Cooperative Highway Research Program (NCHRP), were examined. Members discussed the possibility of referring important issues that the states have identified to the Standing Committee on Research (SCOR) of the American Association of State Highway and Transportation Officials (AASHTO). Since the Top Three initiative elicits challenges rather than specific research topics, SCOR might refer some of the identified challenges to the appropriate AASHTO committee and ask it to develop problem statements for submission to NCHRP. The UTC program might also serve as a source of research funding.

RTCC members volunteered to assist in FHWA's development of annual modal research plans required under the FAST Act by providing input, discussing possible FHWA initiatives, and providing any other support that the agency would find constructive.

Exploratory Advanced Research Program

Overview

David Kuehn, Team Director/Program Manager, Exploratory Advanced Research (EAR) Program, provided the committee with an update on the program. Because the EAR Program is funded through the discretionary portion of the HRD Program, its funding has been reduced proportionately with reductions in R&D caused by the FAST Act. EAR was funded at nearly $12 million annually during SAFETEA-LU. Its funding declined to about $7.5 million per year during MAP-21; under the FAST Act, its funding is down to $6 million annually (Figure 2). The reduced funding will have its most profound consequences in future years. The number of active projects includes those funded in prior years and continuing into the present (Figure 2). As these projects are completed and fewer new projects begin, the number of active projects will be cut by more than half by 2018 under estimated funding levels.

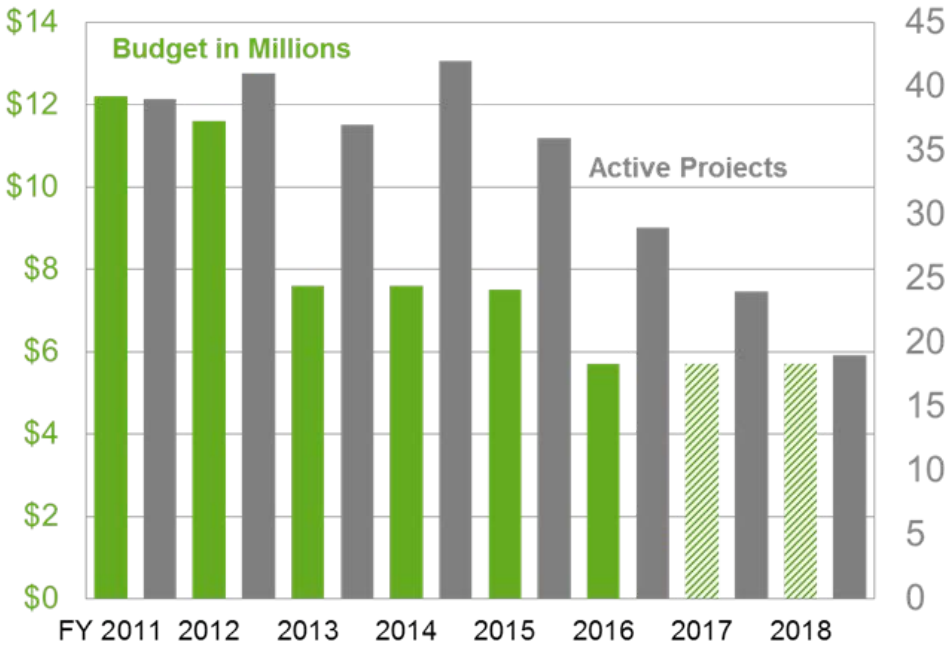


Figure 2 EAR Program funding and active projects, FY 2011–2018. (2017 and 2018 funding is projected.)

Kuehn also described a few illustrative projects, including innovative projects providing wayfinding assistance to the blind and supporting platooning of autonomously operated trucks.

Discussion

RTCC has long supported advanced (that is, longer-term, higher-risk) research. The R&D portfolios of FHWA and NCHRP are dominated by applied, problem-solving research. The EAR Program is the

only highway research activity seeking knowledge and advances through funding of longer-range, higher-risk research. By scanning developments in other fields and in basic research, the program identifies and funds promising areas of research that would otherwise be overlooked. It reaches out to those who tend not to work in highway research and solicits proposals for investigation of novel and promising concepts.

The declining funding for the EAR Program, and the subsequent drop in projects, is disconcerting in light of policymakers' inability to adequately fund the federal-aid highway system. Innovative R&D to significantly improve infrastructure condition and performance is all the more important when reinvestment in the system falls below what is required. Cuts in funding to the EAR Program will require scaling back and not investing in as many areas. Fewer new ideas will be explored, and not all of the most promising work under way will be extended. These retrenchments will result in (*a*) fewer interactions with other research agencies funding basic research and (*b*) less ability to interest researchers in other fields in the application of novel approaches to transportation problems. Members discussed ways that FHWA could quantify the impact of these lost opportunities. For example, FHWA might use simple measures of the consequences, such as less frequent interaction with researchers in other agencies and less research in other promising disciplines to illustrate the consequences of declining funding.

The members found the example of the wayfinding technologies to support the blind helpful in illustrating the diversity of FHWA's R&T program through its focus on disadvantaged travelers. Research into vehicle platooning, though valuable and important, may be one area where the EAR Program could reallocate its funding. Private funding for autonomous and semiautonomous vehicle technologies is growing rapidly. A strong public-sector role remains in researching semiautonomous driving, however, primarily in order to address the problem of drivers being easily distracted from their responsibility to monitor their vehicles continuously while they are in semiautonomous mode. Work zone safety might be another promising area for exploration by the EAR Program, particularly use of vehicle-to-infrastructure technologies to communicate with autonomous and semiautonomous vehicles.

Deployment Activities

Overview

As Debra Elston explained to the committee, FHWA has made deployment of proven innovations a high priority for many years. Even before the FAST Act added two new programs (described below), FHWA was actively promoting adoption of innovations through the EDC initiative, by supporting State Transportation Innovation Councils, and by continuing funding for deployment of innovations developed through SHRP 2.

Two new deployment programs are funded in the FAST Act. The Surface Transportation System Funding Alternatives Program will fund demonstrations of alternative revenue-generating programs of individual states or groups of states. Grants will be available in the amount of $15 million in FY 2016 and $20 million in subsequent years. The new Advanced Transportation and Congestion Management Technologies Deployment Program will provide up to $60 million annually to states, local agencies, larger metropolitan planning organizations (MPOs), and research consortia. FHWA expects to award five to 10 grants annually, with an initial focus on "smart cities" (see below), pedestrians, ridesharing, and multimodal corridors.

Elston also described the 2016 Smart City Challenge, which provided $40 million in federal funds to a single city to show what is possible when communities find matching funds from private companies and use information and communication technologies to connect multimodal transportation assets into an interactive network.

Discussion

The transfer and adoption of new technologies are essential components of the R&T continuum, and FHWA has been building a strong program in this area for some time. The committee is pleased by FHWA's efforts to foster a stronger culture of innovation within FHWA itself and the agencies that it serves.

The committee shares a strong interest in developing new mechanisms to fund transportation and relieve congestion through information technologies. However, RTCC members expressed concern about whether the new grant funding programs authorized by Congress will concentrate funding at a large enough scale to create lasting impacts. The committee encouraged FHWA to consider how these demonstrations might be evaluated, with a view toward documenting them, learning from them, and sharing the results.

RTCC members noted that many of the competitors for the 2016 Smart Cities grant are strong and thriving communities able to develop creative plans and obtain private investment. We encourage FHWA to consider how to assist struggling and disadvantaged cities with less ability to develop creative plans and fewer private-sector matching options, but which might have greater need.

Support for SHRP 2 implementation as a specific program area has ended. The committee was pleased to learn that other FHWA deployment and technical assistance activities are mainstreaming the best SHRP 2 innovations into their regular technical assistance and deployment programs.

R&T Performance Evaluation Update

Overview

John Moulden, National Partnership Program Manager, R&T Management, provided an overview of FHWA's effort to evaluate the effectiveness of the R&T program through case studies of projects in each of the R&T program's subject areas. The results of two of six completed retrospective case studies were presented by Volpe Center researchers Lydia Rainville and Margaret Petrella, who reported, respectively, on FHWA's deployment of roundabouts and on the National Household Travel Survey (NHTS). The Volpe team's research found that FHWA was instrumental in fostering the adoption of roundabouts throughout the United States, that the NHTS is heavily relied on by researchers in transportation and other fields, and that NHTS staff have been responsive in sharing data with the research community.

Discussion

RTCC has long encouraged and supported FHWA's efforts to evaluate its research program and is pleased to see the results bearing fruit. The committee recognizes the challenges associated with evaluating R&T deployment efforts and believes that the evaluation teams have been appropriately circumspect in drawing inferences from imperfect data. The evaluation of FHWA research and deployment efforts on roundabouts, carried out in partnership with state DOTs and NCHRP, was designed principally to assess whether FHWA's efforts resulted in greater use of roundabouts by state

and local governments. Nevertheless, it is but a short leap from assessing FHWA's influence over the number of roundabouts to the societal benefit of the increase in their use. The Volpe team's estimate of $9 billion in social benefit because of reduced crashes from roundabouts compared with conventional stop-controlled intersections illustrates how credible estimates of the benefits of program efforts can be derived through careful evaluation.

Estimation of FHWA's influence on the increased use of roundabouts is difficult because of the passage of more than 20 years since the effort began. Qualitative and quantitative information about other influences on roundabout adoption has been lost with the passage of time. However, FHWA has also been a leader in the promotion of diverging diamond interchanges, which have both operational and safety benefits over conventional interchanges. The committee suggests that FHWA take advantage of the relatively recent and short period over which it has been promoting this type of intersection by collecting information now that can be useful for subsequent evaluation.

Other agencies that have complex R&D and deployment programs are beginning to use more mixed methods research approaches – applying both quantitative and qualitative methods – to assess the efficacy and impact of the R&D and deployment programs. In the past, evaluations focused either on process improvements (ways of conducting programs more effectively or efficiently) or on impact (typically measured in economic terms). In contrast, evaluators today are using more mixed approaches and developing measures for different audiences. Past retrospective impact evaluations did not address how programs could be made better. Now, as evaluators carry out surveys or interview experts to assess impact, they are also asking how programs could be made more effective. The committee encourages FHWA to use a mixed method approach in carrying out future case studies. Assessment of whether FHWA's deployment programs affect public attitudes would be useful in this context. For example, testing of new revenue-raising methods deployed in the Surface Transportation System Funding Alternatives Program may itself influence public opinion about the acceptability of these methods.

Communication

Overview

Debra Elston described the ways in which FHWA shares the results of its research and deployment. Among them are press releases, magazine articles, summaries of research findings, and, increasingly, use of other media. Elston showed five short videos developed to communicate the results and impact of R&T research:

- Telling the R&T Story,
- Paving the Way to Connected Automation—Cooperative Adaptive Cruise Control,
- Real-Time Tracking System,
- Exploratory Advanced Research Project: Advanced Traffic Signal Control Algorithms, and
- Intelligent Situation Awareness and Navigation Aid.

Discussion

RTCC urges FHWA to continue its efforts to explain highway research programs and their benefits to policy makers and their staffs. The committee is pleased with FHWA's expanding use of video technology and encourages FHWA to expand its efforts in social media. Today's policy makers may not all be active users of new media, but their staffs are. In addition, FHWA should consider developing short-duration, high-impact messages that draw public interest and that may lead to a

wider appreciation of the valuable work done by FHWA's R&T team. In time, the results of the ongoing program evaluation, discussed in the previous section, should provide estimates of program benefits that can be shared widely.

Future Transportation

The final presentations on the first day were by a pair of RTCC members. Chris Puchalsky reported on a future visioning effort carried out by the Delaware Valley Regional Planning Commission, and Mike Meyer summarized visioning efforts carried out in Atlanta, Baltimore, and other metropolitan areas. These efforts are attempts to assess how changing demographics, housing and location preferences, technology, and other forces might influence the demand for and shape of transportation. Rather than attempting to predict the future, these exercises are trying to understand how the world might be different in the future and what the implications are for actions taken in the present. Because transportation infrastructure not only lasts for decades but also influences development patterns for centuries, a long-term view in trying to anticipate how people and places might be different in future decades and in evaluating the effects of today's investments (or lack of investments) is important.

As described above, RTCC is aware of and supports FHWA's outreach effort to its division offices and their state partners in helping to define research needs and directions. The committee believes that FHWA could do more to identify the challenges that the future will bring and begin research to find ways to address them. Research can have long-term benefits that are difficult to anticipate, but imagining ways in which public expectations and preferences might change can influence choices about the topics and nature of research undertaken today. The committee encourages FHWA's leadership and research managers to consider its research portfolio closely in the light of documents such as Secretary Foxx's *Beyond Traffic* report and to make use of the visioning exercises being undertaken in many metropolitan areas.

RECOMMENDATIONS AND NEXT STEPS

This section of RTCC's report provides a brief summary of the committee's recommendations.

FHWA R&T Budget Under the FAST Act

Research

RTCC understands the value and importance of deployment but is concerned that diversion of R&D funds to deployment is akin to farmers eating their seed corn in difficult times. The practice works in the near term, but the long-term consequences are concerning, especially for the EAR Program. The committee encourages FHWA to try to document the consequences—lost opportunities—of reductions in its R&D program.

The committee considers FHWA's Top Three challenges facing state DOTs to be an important initiative, both for soliciting input from major stakeholders and for involving division offices more directly in the innovation process. In view of the shortfalls in FHWA's R&D budget, the committee recommends that FHWA partner with AASHTO and NCHRP to address the concerns raised by the states. The committee also recommends that FHWA encourage UTCs to partner with state DOTs to address state-identified issues.

We hope that constraints on the R&D budget do not curtail FHWA's ongoing efforts to partner with and learn from highway research agencies in other nations. During a period of resource constraints, leveraging the work of others and avoiding unnecessary duplication are all the more important.

Deployment

In assisting MPOs and local governments in the use of new technologies and approaches, the committee recommends that FHWA consider equity and social issues and define eligibility criteria allowing agencies in areas below the national average in resources an opportunity to receive assistance. In addition, we recommend that FHWA develop guidance for evaluating the two new demonstration programs mandated in the FAST Act, which might be done by requiring recipients to set aside grant funds for this purpose.

R&D Program Evaluation

FHWA is making commendable progress in program evaluation through the conduct of case studies of past research and deployment activities. The committee recommends that this process become an integral part of such activities. We recommend that FHWA, in conducting additional case studies, use mixed methods to measure both program effectiveness and, to the extent possible, the impacts that projects have had. Success stories from case study results will be helpful in communicating the benefits of investment in highway R&T. In light of budget shortfalls and the need to communicate the importance and effectiveness of the R&T program, the committee encourages FHWA to complete the first round of case studies as soon as possible.

Communication

The committee is pleased to see FHWA using video and web-based technologies to spread the word about the important work it is doing. We recommend further reliance on social media to reach policy makers as well as wider audiences and encourage FHWA to focus its messages on the importance and impact of its projects and not simply on the fascinating technologies themselves. Communication of success stories through the use of targeted messages—including short statements of importance and impact—for different audiences is also important.

Looking Forward

Particularly in the context of rapid changes in technology, transportation options, and apparent shifts in location preferences (and associated travel demand), the committee believes that sufficient resources should be devoted to longer-term, higher-risk research to explore how demand for infrastructure might change and what the implications might be. Expansion of the horizons of FHWA's R&T managers through exposure to innovative, forward-looking visioning efforts such as those discussed at the meeting would be healthy.

In addition, in preparation for the next authorization, FHWA should begin defining "grand challenges" in highway transportation that could justify sustaining or increasing investment in highway RD&T. Grand challenges include increasing resilience in response to the increasing frequency of severe storms; safely incorporating advanced autonomous and semi-autonomous vehicles in the traffic stream; adequately maintaining the vast federal-aid highway system in an era of constrained resources; and providing capacity for passengers and freight in response to an expanding population and economy. It may be time for the kind of preparatory work that built the case for the

two past strategic highway research programs. Building on the MPO visioning exercises or developing one might be a way to begin such an effort.

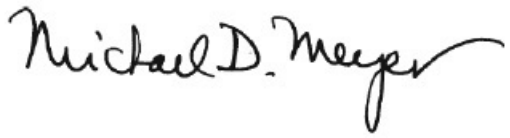
Next Steps

In addition to hearing responses to the suggestions and recommendations made in this letter, the committee would like to continue to be informed about and to provide input on FHWA RD&T's adjustments to the FAST Act and the ongoing results of RD&T program evaluation. With regard to the modal research plans required by the FAST Act, the committee offers to assist in any way it can, including adjusting the schedule of its meetings to provide timely advice. In view of the increased emphasis on deployment, we would also like to learn more at the next meeting about the programs themselves and how FHWA is organizing itself to carry them out.

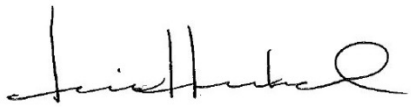
CLOSING REMARKS

The committee appreciates the opportunity to meet with FHWA staff to discuss how the agency is responding to the directives and funding in the FAST Act and to learn about progress being made in the program across multiple fronts. On behalf of RTCC, we thank Michael Trentacoste, Debra Elston, Jack Jernigan, David Kuehn, John Moulden, and Lucia Olivera for their time and noteworthy efforts to assist the committee in understanding the challenges they face and how they are addressing those challenges. We hope that you find this report to be useful as the R&T programs move forward.

Sincerely,



Michael Meyer
Outgoing RTCC Chair



Timothy A. Henkel
Incoming RTCC Chair

Attachment 1: Meeting participants
Attachment 2: Meeting presentations

Attachment 1

PARTICIPANTS

Research and Technology Coordinating Committee

Michael Meyer, President, Modern Transport Solutions, LLC, Atlanta, Georgia, *Chair*
Kevin Chesnik, Applied Research Associates, Madison, Wisconsin
Karen K. Dixon, Texas A&M University Transportation Institute, College Station
Patricia Gillette, Colorado Motor Carriers Association, Denver
Chris T. Hendrickson, Carnegie Mellon University, Pittsburgh, Pennsylvania
Timothy A. Henkel, Minnesota Department of Transportation, Saint Paul
Leslie Jacobson, WSP | Parsons Brinckerhoff, Seattle, Washington
Gregory C. Johnson, Maryland Department of Transportation, Baltimore
Harold Paul, Director, Louisiana Transportation Research Center, Baton Rouge (retired)
Christopher M. Puchalsky, Delaware Valley Regional Planning Commission, Philadelphia, Pennsylvania
Rosalie Ruegg, Technology Impact Assessment Consulting, Inc., Emerald Isle, North Carolina
Stephanie N. Wiggins, Los Angeles County Metropolitan Transportation Authority (Metro), California
James M. Winford, Jr., Prairie Contractors, Inc., Opelousas, Louisiana
Theodore Zoli, HNTB Corporation, New York City

FHWA Staff
Debra Elston
Jack Jernigan
David Kuehn
John Moulden
Lucia Olivera
Michael Trentacoste (by conference call on May 21)

Additional Participants
Margaret Petrella, Economic Analysis Staff, Volpe National Transportation Systems Center
Lydia Rainville, Economic Analysis Staff, Volpe National Transportation Systems Center

TRB Staff

Neil Pedersen
Steve Godwin
Velvet Basemera-Fitzpatrick

The names of those who attended the meeting are shown in bold.

Attachment 2

PRESENTATIONS

The Fast Act and the FHWA R&T Program, *Lucia Olivera, FHWA*

FHWA R&T Agenda Setting, Top Three Initiative and 5-Year Strategic Plan, *Jack D. Jernigan and Debra Elston, FHWA*

EAR Opportunities and Threats, *David Kuehn, FHWA*

Instituting a Culture of Innovation, *Debra Elston, FHWA*

"Telling the R&T Story" (video), *Debra Elston, FHWA*

"Paving the Way to Connected Automation – Cooperative Adaptive Cruise Control" (video), *Debra Elston, FWHA*

"Real-time Tracking System"(video*), Debra Elston, FHWA*

"Exploratory Advanced Research Project: Advanced Traffic Signal Control Algorithms (video), *Debra Elston*

"Intelligent Situation Awareness and Navigation Aid (ISANA)" (video), *Debra Elston, FWHA*

FHWA R&T Evaluation—Status Report for the RTCC, *John Moulden, FHWA*

Roundabouts, *Lydia Rainville, Volpe National Transportation Systems Center*

National Household Travel Survey, *Margaret Petrella, Volpe National Transportation Systems Center*

Future Forces, *Chris Puchalsky, Delaware Valley Regional Planning Commission*

Future of Transportation Planning: Dealing with the Excitement and Frustrations of a Changing World, *Michael Meyer, Modern Transport Solutions, LLC*