Letter Report on Review of the U.S. DOT Strategic Plan for Research, Development, and Technology 2013-2018

DETAILS

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Committee for Review of the U.S. Department of Transportation (DOT) Strategic Plan for Research, Development, and Technology

TRB TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

April 30, 2013

The Honorable Ray LaHood
Secretary
U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary LaHood:

Section 508 of the 2012 surface transportation authorization statute, Moving Ahead for Progress in the 21st Century (MAP-21), calls for the U.S. Department of Transportation (U.S. DOT) to develop a 5-year strategic plan for federal transportation research, development, and technology (RD&T). The law requires the plan to describe the primary purposes, topics, expected outcomes, and anticipated funding of RD&T. It also calls for the plan to integrate the RD&T programs of all U.S. DOT modal administrations, to reflect input from a wide range of stakeholders, and to consider research conducted outside the U.S. DOT to avoid duplication of efforts. Finally, the law calls for the National Research Council (NRC) to review the plan.

On February 19 and 20, 2013, NRC, under the auspices of the Transportation Research Board (TRB), convened the Committee on the Review of the U.S. DOT Strategic Plan for Research, Development, and Technology, a 13-member committee of experts in transportation engineering, economics, system operations and administration, and research management. Senior officials from the Research and Innovative Technology Administration (RITA) provided a draft of the plan, entitled the *RD&T Strategic Plan for 2013–2018*, and briefed the committee on its development. Research managers from the department's modal administrations participated in these briefings and provided additional information about strategic plans within each administration. The committee then met in closed session to establish its findings and begin preparing this review, which was completed through correspondence. The roster of committee members and a list of presentations made by the individuals who briefed the committee are included as attachments to this letter report.

On behalf of NRC and the committee, I wish to thank the many U.S. DOT officials who participated in the briefings; they provided the committee members with valuable insights. Kevin Womack, Associate Administrator, Office of Research, Development and Technology, RITA, asked the committee for its assessment and provided an overview of the strategic planning process. He was extremely forthcoming in his discussions, and the committee appreciated his candor and receptiveness to committee comments. I would also like to thank the department for the opportunity to review a draft of the plan; the committee appreciates the chance to make substantive comments that can positively influence the shape of the final plan and believes that both the U.S. DOT and the committee benefited from reviewing the plan at an early stage. This letter report presents the results of the committee's review and is offered with the intention of aiding current and future strategic planning for RD&T by the U.S. DOT. The committee would like to emphasize that it did not evaluate the topical focus of the modal administration strategic plans or research programs; rather, it focused on reviewing the U.S. DOT strategic plan along with the strategic planning process and performance

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measurement. References to topical coverage of the research plan are made only in the context of testing the plan against some of the important research topics that are currently being investigated or are anticipated on the basis of evolving demographics, technology, culture, economic conditions, and other factors.

SUMMARY

The criticality of transportation to the economy, the environment, personal mobility and opportunity, public health and safety, and other aspects of quality of life requires continuing efforts to ensure that the benefits of mobility are realized and that its negative impacts are minimized. Effective RD&T allows transportation systems to keep evolving and improving to meet the changing needs of their users. As described below, the U.S. DOT faces the challenge of coordinating efforts between its administrations and with other entities to provide a robust and strategic transportation RD&T program in support of the department's strategic goals. Coordination across the modal administrations will not come easily, given the many institutional and financial constraints that the U.S. DOT faces. However, moving toward a strategic, coordinated research effort can improve the contributions of current and future RD&T to the achievement of national goals.

The committee has made both short- and long-term recommendations; the former apply to the current plan and the latter to future strategic plans. Highlights of the committee's recommendations to the U.S. DOT are listed below and are explained in greater detail in the sections that follow.

Short-Term Recommendations

1. The plan should explain the research context of the U.S. DOT, including priorities and levels of resources as well as the roles and authorities of the different modal administrations.
2. Some of the modal administrations have put a great deal of effort into the development of their own strategic RD&T plans, and the U.S. DOT should leverage the strength of these modal plans when developing its overall strategic RD&T plan.
3. The plan's performance measures should be specific to a strategic research plan and should measure mode-specific research objectives and outputs as they relate to the department's strategic objectives.
4. The U.S. DOT should use the plan to describe past successes of and future opportunities for RD&T in order to provide a compelling case for the importance and value of funding transportation RD&T.

Long-Term Recommendations

1. RITA should develop longer-range RD&T strategic plans for the department, and the U.S. DOT might consider partnering with university transportation centers (UTCs) to develop long-term research plans that take advantage of resources outside the department.
2. The U.S. DOT should partner with universities for cross-modal research as well as both basic and advanced research, none of which are department strengths.
3. The department should stay attuned to investment in transportation-related RD&T by other federal agencies, national organizations, and international research organizations, both to draw on and to contribute to these efforts.
4. A substantial share of transportation-related research is conducted by federal agencies such as the National Aeronautics and Space Administration, the National Science Foundation, and the

U.S. Departments of Energy and Defense. The U.S. DOT should develop substantive interactions with other federal agencies and White House offices, and its plan should describe these efforts.

5. The U.S. DOT strategic research plan should be informed by and coordinated with numerous private sector stakeholders, including those entities involved in vehicle and facility development and services for automobiles, trucks, airlines, pipelines, the maritime sector, and rail. Future research agendas should be built around the major issues the U.S. DOT faces now and is likely to face in the future. The agendas should be driven by a deep and systematic strategic planning process.

CRITICAL RD&T ISSUES AND OPPORTUNITIES

Both the U.S. economy and the world economy depend on an efficient, safe, and reliable transportation system to move people and goods. Transportation systems serve both rural and populated areas and link regions and the world, creating the potential for long-term economic growth and prosperity and contributing globally to the quality of life. In the United States, the population is increasing at the same time that it is becoming older and more diverse; these demographic changes mean that the transportation system must be able to respond to changing demand and conditions over the coming decades. A strong transportation RD&T program is needed to support sustained economic growth and help meet the needs of a growing and changing population as well as achieve the U.S. DOT's stated goals of safety, state of good repair, economic competitiveness, livable communities, and environmental sustainability.

Changes in technology are occurring rapidly as technological innovations move quickly from the prototype stage to being an integral part of society. These changes will undoubtedly affect the transportation systems of the future. These effects will include vehicle and infrastructure interaction along with real-time information for transit, air, and rail systems. In addition, technology is likely to transform the transportation system as computers begin to exert an increasing amount of control over vehicles and infrastructure. The department needs a forward-looking RD&T strategic plan to understand future directions and prepare for both expected and unexpected challenges. This environment of change, coupled with the pervasive role of transportation in society and the complexity of the interrelationships between government, industry, and the public, creates a challenging environment for developing a strategic research plan.

For example, the rise in communications technologies has the potential to shape future transportation demand in ways that cannot yet be fully anticipated. With cell phones, video conferencing, online shopping, and the many other innovations that have become commonplace over the past decade, communications technology has the potential to substitute for many transportation choices while increasing the demand for others. Online shopping may be reducing individual trips to stores, but it is increasing freight on highways and community streets. Similarly, video phone calls may result in fewer in-person business meetings but lead to more personal trips as individuals choose to stay closely connected with far-flung friends and family. The U.S. DOT's strategic plan needs to anticipate and plan to investigate the changes that evolving information and communications technologies will have on future patterns of travel demand to help states, local governments and agencies, and private carriers provide a high-functioning transportation system able to meet this demand.

Along with communication changes, advances in vehicle automation are likely to bring about regulatory and safety challenges for the U.S. DOT. The aviation system has been dealing with the complexities of human systems integration for some time as functions have become automated. Similar and even more complex challenges will emerge with the growth of automation in personal vehicles operated by drivers, most of whom have less training and skill than commercial pilots. The research on and pilot testing of autonomous vehicles by Google and the U.S. DOT's connected vehicle initiative provide broad hints of what might be possible. Even without autonomous operations, every type of vehicle has safety and convenience features that rely increasingly on automated electronic control systems. Although these systems promise improved safety, they also raise questions about liability, privacy, and security that can be addressed through research. The department may well be faced with many regulatory and safety concerns related to these electronic control systems and will need to be able to provide evidence-based answers to support good decision making.[1]

Safety for passengers, vehicles, and infrastructure will perpetually be a critical issue for society. According to the current and former Secretaries of Transportation, safety is the department's major cross-cutting priority and will continue to be a major focus of each modal administration. Indeed, certain modal administrations, including the Federal Railroad Administration and the Federal Motor Carrier Safety Administration, are almost exclusively tasked with a safety regulatory role. Secretary LaHood has emphasized safety throughout his term and Congress has recently responded to a Departmental request to task the Federal Transit Administration with a stronger safety mission.

Recent statistics indicate that after a period in which the safety records of every transportation mode were improving, highway deaths increased in 2012. Neither the causes of the sharp decrease in highway deaths and injuries before 2012 nor those of the subsequent spike in fatalities are well understood. The RD&T plan needs to include research across transportation modes to improve safety and lessen environmental impact. The role of the modal administrations as safety regulators demands that the department stay ahead of the risks, benefits, and costs of evolving systems and rapidly changing technologies. The department's difficulty in coping with new automotive technologies, as in the unintended acceleration case, or with aviation technologies, as in the case of the Boeing 787 batteries, shows the need for increased research to deepen staff skills and technical insights. The growing challenge of drivers using smart phones and texting while driving also requires further research, as the use of devices continues despite well-publicized warnings and legal prohibitions. The issues listed above merely illustrate some of the major challenges that RD&T can help transportation providers address. Additional examples in areas such as materials, finance, human factors, climate change, and modal competition could be given. A good strategic plan will identify such issues and the research needed to prepare for them.

CONTEXT OF THE STRATEGIC PLAN AND LETTER REPORT

Creating and managing a unified RD&T plan for all modal administrations of the U.S. DOT is a significant challenge that is limited by a set of well-recognized institutional constraints. For example, the missions, stakeholders, authorizing and appropriating committees, and constituencies of each

[1] *Special Report 308: The Safety Promise and Challenge of Automotive Electronics: Insights from Unintended Acceleration* (Transportation Research Board of the National Academies, Washington, D.C., 2012).

administration are mode specific, and this specificity represents the way U.S. transportation policy has been implemented for decades. As a result, most of the research programs funded within the department are mode specific and have little flexibility to pursue multi- and cross-modal opportunities. The RD&T maturity levels of the modal administrations also vary widely, especially with regard to strategic planning.

The varied roles of the U.S. DOT's modal administrations also have a strong influence on the research portfolios of both the individual administrations and the agency as a whole. The administrations for railroads, pipelines, motor carriers, and automobiles serve largely as safety regulators. However, the research programs of the administrations devoted to highways, transit, and aviation focus on providing resources and expertise on system connectivity, operations, and maintenance. These research programs support the work of the Federal Aviation Administration's air traffic control service and of state, county, and local departments of transportation, transit agencies, and airports responsible for transportation infrastructure. This disparate set of missions, coupled with mode-specific funding mechanisms, makes the creation of a unified RD&T plan a significant challenge. The resulting lack of a rational, coherent approach to the U.S. transportation system is a serious handicap that is worsening with time, and the importance of this handicap cannot be understated.

In addition, the department's long-term strategic planning has been constrained in recent years by a continued series of short-term funding authorizations. The previous aviation authorization legislation was subject to dozens of short-term extensions. Authorization of the highway and transit programs was delayed and extended multiple times over a 2-year period. MAP-21 is only a 2-year bill that expires in 18 months. An environment of continued uncertainty regarding both short- and long-term funding is not one in which long-term strategic planning and supportive research activities can thrive.

Despite these and other challenges facing the department, strategic planning for transportation RD&T is vitally important. Without a well-articulated plan, there is less assurance that the department's well-intentioned efforts will serve the goals it is striving to achieve.

CURRENT DRAFT OF THE STRATEGIC PLAN

The February 2013 draft of the strategic plan is divided into five chapters that correspond to each of the department's five strategic goals: safety, state of good repair, economic competitiveness, livable communities, and environmental sustainability. Each chapter begins by listing relevant strategic system outcomes. This introduction is followed by sections that describe research for each of the modes and a section on cross-cutting research. At the end of each chapter is a list of proposed performance measures that relate back to the strategic outcomes.

The committee commends the general readability of the current draft and the department's attempt to overcome modal constraints by organizing the document according to well-defined departmental goals instead of modes. The inclusion of performance measures is useful, although the particular measures included generally describe transportation system performance instead of the impact of RD&T. Some required details were also missing from the plan; these included information about the share of departmental resources allocated to research in each goal area, examples of important

contributions of previous and current RD&T efforts, and information about how performers of the research are chosen.

Previous Guidance

The current review of the U.S. DOT's RD&T strategic plan is the second required by authorization legislation for surface transportation. In 2005, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) required the department to develop a strategic plan and charged the NRC with an independent review. The NRC's 2006 review recognized the short time the department was provided in which to prepare a plan and described what a strategic plan "could and should do" given the constraints described above.[2] The current committee's assessment of the 2013 draft is given in the sections that follow; the headings used are taken from the 2006 report, a copy of which is attached.

Articulate the Role and Value of U.S. DOT's RD&T

The draft plan does not make a sufficiently strong case for the role and value of the RD&T undertaken by the U.S. DOT, whether for the department as a whole or at the administration level. Although there is a section entitled "The Role of Federal Transportation RD&T," the overview it gives of the valuable role that the department's research plays is very general. The draft plan does point out that, "[b]ecause the Federal Government owns and operates only limited portions of the Nation's transportation system, RD&T investment represents one of the most effective ways in which the Federal Government can contribute to the improvement of our transportation system" (p. 8). The plan then describes some of the responsibilities facing the U.S. DOT in the most general of terms, with no mention of any measure of the value of the department's research programs or how they support departmental priorities. A plan that explained how research supports the department's congressionally mandated regulatory role and its workforce development role, as well has how research helps ensure cost-effective investment of federal resources, would make a much stronger case about the value of departmental research.

Highlight and Promote Ways to Overcome Constraints to Strategic RD&T Investment

The draft plan does not highlight the reduction in constraints that has occurred since the passage of SAFETEA-LU in 2005. Most notable are the lack of research earmarks in MAP-21 and the reduction in the number of narrowly designated research topics that Congress expects the department to address. As a result, the Federal Highway Administration and the Federal Transit Administration are now facing the welcome but difficult challenge of identifying and prioritizing their research funding. The lack of earmarks has been particularly notable in the UTC program, as it has allowed RITA to award all funding for the program competitively, thereby enhancing the potential for more effective returns on the research investment, even with additional costs to manage the new program. Many of the administrative and institutional hurdles to strategic planning remain, and the strategic plan could identify and promote ways for the administrations to collaborate and overcome these constraints.

[2] Committee on the Review of the U.S. DOT Strategic Plan for Research and Development Letter Report: August 2006 (Transportation Research Board of the National Academies, Washington, D.C., 2006), http://www.trb.org/Main/Public/Blurbs/157676.aspx.

Describe the RD&T Program in Various Dimensions to Inform Decisions

As pointed out in the NRC's 2006 letter report, a strategic plan can inform decisions about priority topics that research should address and about the nature of the research that is needed to address these topics.[3] As illustrated above in the section on critical RD&T issues and opportunities, transportation is facing many large-scale, overarching issues that a good strategic plan ought to address. The draft RD&T plan identifies the priority areas that will serve the department's strategic goals, but it would benefit from providing advice to policy makers about the kinds of research needed to achieve the goals. Almost all of the department's RD&T is highly applied research designed to make incremental improvements in addressing current problems. The dominance of applied research has long proven beneficial and is appropriate given the regulatory roles of most of the modal administrations. Some research topics, however, require the development of new knowledge and understanding derived from basic or advanced research.[4] For example, solving problems of human systems integration with increased vehicle automation would seem to benefit from longer-term basic research as well as near-term applied research.

The current draft of the strategic plan states that "DOT operating administrations will use the DOT RD&T Strategic Plan internally to refine their RD&T strategic plans" (p. 5). The content of the presentations to the committee during its February 2013 meeting suggests that exactly the opposite has occurred within the department in the past. Individual operating administrations have created their own strategic plans that are based on the administration's scope and priorities. Some of these individual strategic plans, including those of the Federal Railroad Administration and the Pipeline and Hazardous Materials Safety Administration, appear to be strong and well conceived, but they do not appear to be informed by a department-wide RD&T strategic planning process. The renewed emphasis on strategic planning required by MAP-21 may help provide more departmental direction to these modal plans.

Identify Gaps in Cross-Modal Policy and Systems Research

Because the department's research is primarily mode specific, little opportunity exists for policy or systems research affecting all modes. Under SAFETEA-LU, for example, the department had scarcely any resources for examining national policy issues at a multi- or cross-modal level. Better insight into how the various modes, both collectively and individually, serve national goals would be helpful to national policy makers, as would information on the areas in which modal policy changes might improve safety, economic competitiveness, or the environment. Collaboration between the U.S. DOT and other research organizations that perform related policy and systems research may have increased since the 2006 strategic plan, but the current draft plan does not provide substantive details. Identification of gaps in research, by topic and type, would inform policy makers about important areas that are being neglected for want of resources.

Promote Efficient and Effective Research Processes

The current plan provides little information about the development of research processes that would improve the performance of the department's many research programs. Instead, it focuses primarily on the department's stated priorities under the five strategic goals listed above. Little information is

[3] Committee on the Review of the U.S. DOT Strategic Plan for Research and Development Letter Report: August 2006, http://www.trb.org/Main/Public/Blurbs/157676.aspx.

[4] Research and Technology Coordinating Committee Letter Report: December 2005 (Transportation Research Board of the National Academies, Washington, D.C, 2005). http://onlinepubs.trb.org/onlinepubs/reports/rtcc_december_2005.pdf

provided about stakeholder input into either the research programs of the various modal administrations or the department's strategic plan. A short and limited appendix describes plans to request comments on the strategic plan through a notice in the *Federal Register*, which seems to be a bureaucratic and ineffective approach to obtaining substantive input. The plan does not develop or explain methods for ensuring relevance, quality, and performance or for creating performance-based metrics to measure research outputs. The plan also does not include financial information that is required by MAP-21 and that can provide a sense of priorities among goals and modalities. The committee would have appreciated an outcome-based assessment of the 2006 strategic plan that described how well the U.S. DOT had performed against its many goals. Such an after-the-fact analysis is a necessary part of any efficient and effective process for developing a strategic plan.

To understand the value of its many and varied research programs, the U.S. DOT needs to rely on evidence-based decision making, peer reviews to ensure the production of objective research, and evaluations of program results. Research developed to support a particular advocacy position is becoming increasingly common in transportation as well as other areas; thus, federal processes to ensure objectivity are becoming increasingly important. Research program evaluation is a relatively new but growing area that other federal departments have begun implementing to provide policy makers with quantitative rather than qualitative measures of the returns on investment in research and development.[5] The U.S. DOT has some internal resources in research program analysis and evaluation; for example, the department employs at least one individual who has won awards for his expertise in these areas. The modal administrations within the department apparently evaluate their programs with varying levels of rigor; those administrations with strong evaluation programs and skilled employees are well positioned to provide guidance for all the departmental administrations, and this capability is an asset the strategic plan could promote.

Potential alternatives to the five-year research strategy that the Department currently pursues are roadmaps or gate systems. A roadmap system would be event-based instead of calendar-based; this type of system may be more meaningful as it is based on actual research efforts instead of fluctuating budgetary levels and an artificial timeline created by legislation. Alternatively, a gate system allows progress from one technological stage to another based on relevant factors. For example, these factors may include technical readiness levels and the Critical Decision process as currently used at the Departments of Energy and Defense and the National Nuclear Security Administration.

Finally, the opportunities to implement the contents of this strategic plan are greater than was the case with previous plans because of the increased discretion in funding given to the modal administrations, as described above. To ensure that the department invests these discretionary resources in the most effective manner, the plan would need to address how departmental research programs solicit stakeholder input, implement merit review of competitively solicited research proposals, provide peer review of completed research, and monitor and evaluate research programs.

RECOMMENDATIONS

The committee is providing both short- and long-term recommendations. The short-term recommendations can be implemented in the final version of the draft RD&T plan and do not require

[5] NRC, *Measuring the Impacts of Federal Investments in Research: A Workshop Summary* (National Academies Press, Washington, D.C., 2011).

significant changes in departmental strategy. The long-term recommendations should be considered over next few years and addressed in future updates of the research strategic plan.

Short-Term Recommendations

The following four recommendations can and should be implemented in the final draft of the strategic plan to be published later this year:

1. Explain the research context in terms of variations in available resources and in modal roles, authorities, and priorities.
2. Leverage the strength of the modal RD&T plans.
3. Get the performance measures right.
4. Create a more compelling strategic plan that will be useful for policy makers.

These recommendations, which are discussed in the following sections, may require rewriting of portions of the report, but all of them take into account knowledge and information that the department already has available.

Explain the Research Context

The strategic plan should provide more information about the resources available for carrying out the plan, whether those resources are outlined by modal administration, by strategic goal, or by some other means. Strategic plans that are otherwise excellent but that lack information about funding sources also lack strength and significance. Section 508 of MAP-21 specifically requires a description of "the anticipated annual funding levels for the period covered by the strategic plan." The committee acknowledges that because future funding sources are uncertain and modal administrations are not allowed to indicate resource allocation outside of the normal budgeting process, this requirement presents a challenge. The U.S. DOT should, however, provide information about allocation of past and current RD&T funding toward the goals outlined in the plan. Providing funding levels allows both the U.S. DOT and other readers of the plan to understand where the department's overall priorities lie.

The strategic plan also needs to better explain the context of the research goals it outlines. Stakeholders, particularly Congress, need to be reminded about the differences between the modal administrations in terms of mission, funding, and priorities. Greater clarity about the strategic goals and the ability of each administration to work toward attainment of those goals would be helpful, as some of the department's five primary goals (such as safety) seem to be more important to the current administration than do others.

Leverage the Strength of the Modal RD&T Plans

Some of the modal administrations have done a great deal of work in developing their own strategic research plans. The quality of these plans varies, and the U.S. DOT would be well served to build on the strongest of the plans. Some administrations are already doing thoughtful strategic planning that suits their needs and resources and that reflects serious stakeholder involvement and customer interfaces. The overall plan should take the modal efforts into account and make clear that a great deal of effort has gone into the planning process.

Get the Performance Measures Right

The performance measures need to be appropriate for a strategic research plan rather than for a general departmental strategic plan. The measures should be specific to research objectives and outputs rather than to system performance and should also be specific to modes as well as to the overall system. Breaking the measures down by modal administration also creates accountability for the administrations. Clearly defined research objectives produce verifiable results and help policy makers and research managers avoid focusing on unproductive effort.[6] Although all of the performance measures should be considered carefully, the committee particularly recommends strengthening the measures associated with livability. As currently written, the goal is aimed almost entirely at transit and affords little opportunity for any other modal research to affect livability. Getting the performance measures right is an important first step toward research program evaluation, which the plan should also address. The strategic plan should be responsive to both the administrations' goals and the goals outlined in MAP-21 and should have performance metrics that reflect the full range of administration and congressional priorities and account for estimates of economic benefit.

Create a More Compelling Strategic Plan

Although the RD&T strategic plan is required by congressional mandate, the U.S. DOT should use the plan as an opportunity to describe its past research successes and future prospects to Congress and the public. The U.S. DOT has had many successes in RD&T that have led to significant transportation improvements for the public and its own administrations. Too often, however, the department has not made these successes clear to its many stakeholders. Success stories should be displayed prominently throughout the document, highlighting the value that a strong RD&T plan brings to both the U.S. DOT and the nation. Incorporation of graphics and sidebars would improve the readability of the strategic plan and provide a compelling case for the importance and value of funding transportation RD&T. The strategic plan should also describe the processes being used to ensure relevance, quality, and leadership and should identify gaps in research by topic area and type.

Long-Term Recommendations

In the long term, the U.S. DOT has the opportunity to rethink its strategic plan and address more of the structural issues that the department's RD&T plan faces. The long-term recommendations are as follows:

1. Develop a longer-range strategic plan within the U.S. DOT.
2. Partner with universities and transportation infrastructure owners to promote research and workforce development.
3. Stay attuned to national and worldwide transportation research.
4. Increase involvement with other federal departments and entities.
5. Determine important areas of future research.

These recommendations are discussed in the following sections.

Develop a Longer-Range Strategic Plan within the U.S. DOT

Recent transportation RD&T strategic plans have looked at a 5-year time frame because of the language and authorization periods in past surface transportation legislation. Some applied research

[6] NRC, *Measuring the Impacts of Federal Investments in Research: A Workshop Summary*.

will yield measurable results within this period, but 5 years is insufficient for advanced or basic research designed to address major anticipated challenges. As the primary research arm of the department, RITA should develop longer-range strategic plans that reflect the time required for the development of new knowledge and its transfer into practice. In addition, the department might consider working with UTCs to develop long-term research plans that take into account human and intellectual capital outside of the U.S. DOT. Finally, the department, and RITA in particular, should consider incorporating a systems engineering activity at the department level to define and assess the RD&T that would best address the challenges.

Partner with Universities and Transportation Infrastructure Owners to Promote Research and Workforce Development

The U.S. DOT provides funds to universities to carry out transportation research. Multiple programs with varying objectives fund the university systems; these programs include Centers of Excellence, which focus on Federal Aviation Administration programs, and UTCs, which focus on multimodal research. Universities are valuable assets for carrying out research but have been historically underutilized by the U.S. DOT. They are a good venue for doing multimodal work that does not fit neatly into the department's existing modal research framework and for carrying out basic and advanced research. This multimodal research should support the broad spectrum of transportation research and be reflective of short and long-term goals for our transportation system. The newly competitive research environment should improve the quality of university research. Universities are also an ideal resource for promoting workforce development, particularly that which results from investments in RD&T. In addition, the U.S. DOT should partner with state DOTs and other public agencies responsible for transportation infrastructure to implement the results of these research efforts. U.S. DOT and UTC collaboration will result in only limited RD&T outcome implementation unless the owners of infrastructure are party to it as stakeholders.

Stay Attuned to National and Worldwide Transportation Research

Transportation-related research in the United States is conducted by many agencies other than the U.S. DOT; indeed, the federal RD&T investment outside the U.S. DOT exceeds that inside the department. U.S. DOT research focuses largely on infrastructure, performance, demand, safety, and, to a lesser extent, strategies and policies for mitigating transportation's adverse impacts on the environment,[7] yet transportation includes vehicles, fuels, emissions, and other forms of environmental impact. The U.S. Department of Defense, for example, has alternative fuels programs, and the largest federal research program on reducing transportation energy consumption is through the U.S. Department of Energy. The U.S. Environmental Protection Agency funds research on controlling motor vehicle emissions and the land use consequences of transportation policies investment.

For the United States to remain a world leader in transportation research, the U.S. DOT needs to stay in close connection with research centers around the world. Because of constrained and uncertain funding, the U.S. DOT may become less involved with international efforts, particularly as travel is curtailed, but international cooperation should remain a focus of the department. The RD&T strategic plan, for example, should highlight how RITA can stay informed about research programs and results

[7] *Special Report 295: The Federal Investment in Highway Research 2006–2009: Strengths and Weaknesses* (Transportation Research Board of the National Academies, Washington, D.C., 2008).

around the world through international scans of technologies and development and coordination with other national RD&T programs.

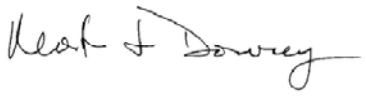
Increase Involvement with Other Federal Departments and Entities
Just as many of the issues confronting the modal administrations cut across many of the administrations, many of the issues the U.S. DOT faces are also being faced by other agencies, research institutions, and regulatory bodies. The department needs to deepen its relationships with other federal agencies, including the U.S. Departments of Energy and Defense and also the U.S. Environmental Protection Agency, to include research. The draft plan contains some generalities about this type of interaction but does not provide many specifics. The department should consider becoming more involved with the Office of Science and Technology Policy and the National Science and Technology Council. If the U.S. DOT develops better connections with these organizations, it may have a better opportunity to provide input and shape the transportation and transportation-related research funding within the department and across the federal government in the future.

Determine Important Areas of Future Research
As part of its strategic planning process, the U.S. DOT should consider and explore areas that will be of concern in future years, such as technological and other issues discussed earlier in this report. A research agenda on policy should also consider competition within and across modes and the potential for influencing modal preferences to serve social, economic, and environmental goals. An emphasis on needed research topics may also help alleviate the losses in funding for research programs, including the National Cooperative Freight Research Program and the Hazardous Materials Cooperative Research Program, which were abolished by MAP-21.

CONCLUDING REMARKS

In closing, the committee is pleased that the U.S. DOT is engaged in strategic RD&T planning and has welcomed the opportunity to comment on the draft strategic plan at a point at which it could influence the final document. The 2006 review occurred late in the report development cycle and had little impact on the previous RD&T strategic plan. The committee has striven to be candid and constructive in its review and trusts that its advice will be received in this spirit. I welcome the opportunity to discuss this review and look forward to progress in this important area.

Sincerely,



Mortimer Downey
Chair
Committee on the Review of the U.S. DOT Strategic Plan
for Research, Development, and Technology

Attachment 1: Committee on the Review of the U.S. DOT Strategic Plan for Research, Development, and Technology
Attachment 2: Meeting Presentations
Attachment 3: 2006 Review of USDOT RD&T Strategic Plan

Attachment 1

Committee on the Review of the U.S. DOT Strategic Plan for Research, Development, and Technology

Mortimer Downey, Senior Advisor, Parsons Brinckerhoff, Washington, D.C., *Chair*
Irwin Feller, Professor Emeritus of Economics, Pennsylvania State University, University Park
Angela Gittens, Director General, Airports Council International, Montreal, Quebec, Canada
John Halikowski, Director, Arizona Department of Transportation, Phoenix, Arizona
Lester Hoel, Professor Emeritus, University of Virginia, Charlottesville
Cliff Johnson, President, Pipeline Research Council International, Falls Church, Virginia
Victor Lebacqz, Founder and Principal, VICC Associates, Aptos, California
Rebecca McDaniel, Technical Director, North Central Superpave Center, Purdue University, West Lafayette, Indiana
Steven Polzin, Director, Mobility Policy Research, Center for Urban Transportation Research, University of South Florida, Tampa
Thomas Sheridan, Professor Emeritus, Massachusetts Institute of Technology, Cambridge
Constance Sorrell, Chief of Systems Operations (retired), Virginia Department of Transportation, Richmond
Gerhard Thelen, Vice President of Operations Planning and Support, Norfolk Southern Corporation, Norfolk, Virginia
Linda Watson, President and Chief Executive Officer, Capital Metropolitan Transit Authority, Austin, Texas

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The names of those who attended the meeting in person are shown in bold. John Halikowski and Lester Hoel participated by conference call, and all committee members assisted in the writing of the report.

Attachment 2

MEETING PRESENTATIONS

FAA AST Research and Development Strategy
Ken Davidian, Director of Research, Office of Commercial Space Transportation, Federal Aviation Administration; and John Wiley, Acting Director, William J. Hughes Technical Center, Federal Aviation Administration, U.S. Department of Transportation

NHTSA Research: Relationship to RD&T Plan
Tim Johnson, Director of Crash Avoidance and Electronic Controls Research, National Highway Traffic Safety Administration, U.S. Department of Transportation

Maritime Administration Research and Development Activities and Demonstration Projects
Carolyn Junemann, Environmental Protection Specialist, Maritime Administration, U.S. Department of Transportation

Pipeline Safety Research, Development, and Technology
Robert Smith, Pipeline Safety R&D Manager; and James Simmons, Acting Chief, Research and Development, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation

Federal Motor Carrier Safety Administration Research and Technology Program Overview
Steven Smith, Director of the Office of Analysis, Research & Technology, Federal Motor Carrier Safety Administration, U.S. Department of Transportation

FTA RD&T Strategic Plan
Jarrett Stoltzfus, Transportation Program Specialist, Office of Research, Demonstration and Innovation, Federal Transit Administration, U.S. Department of Transportation

FHWA RD&T Strategic Plan
Michael Trentacoste, Associate Administrator, Office of Research, Development, and Technology, Federal Highway Administration, U.S. Department of Transportation

Federal Railroad Administration R&D Strategic Planning
John Tunna, Director, Office of Research and Development, Federal Railroad Administration, U.S. Department of Transportation

National Research Council Review of U.S. DOT RD&T Strategic Plan FY 2013–2018
Kevin Womack, Associate Administrator, Office of Research, Development and Technology, Research and Innovative Technology Administration, U.S. Department of Transportation