Developing the Framework

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This breakout session was charged with discussing and identifying the key elements of a planning process that determines strategic choices with respect to the direction of federal transportation research and development (R&D). Participants interpreted this charge as meaning that they should suggest a framework that will help the National Science and Technology Council's (NSTC) Interagency Coordinating Committee on Transportation R&D develop the next iteration of the transportation R&D agenda. Thomas Larson's paper, "Framework for Developing the Future Transportation Research Agenda," which was presented in the plenary session, reviewed the principles and concepts that should underpin any R&D strategic planning process and thus provided important resource material for the discussion.

At the outset, Thomas Deen, session cochair, posed three questions for the group to consider:

1. How do we define the federal role in transportation research?
2. Is there a need for a federal transportation R&D agenda?
3. Is there a need for a comprehensive, national transportation R&D agenda?

Participants agreed that the nature of a strategic planning process, and even the need for such a process, depends on the answers to these fundamental questions.

In the ensuing discussion, participants did not reach the point of recommending a specific process for revising the federal R&D agenda, but they did consider the context and need for federal transportation research and the characteristics of an effective strategic planning process. Key findings of the session are summarized below.

Need for a Federal Transportation R&D Agenda

1. There is a need for a federal R&D agenda. Given the level of the federal government's investment in transportation-related research and the fact that the work is scattered among

many agencies and overseen by a number of congressional committees, an overall agenda could be a useful tool to (*a*) budget examiners, legislators, and other decision makers; (*b*) help private industry understand the direction of the federal government's interest; (*c*) and help industry determine how to fit its practices with those of the government.

2. The transportation system and transportation R&D activities must be designed to support and achieve critical national goals such as economic growth (job creation and competitiveness in world markets), defense and national security, environmental quality, and energy sufficiency. The pursuit of continuous improvement in transportation system performance through innovation is an appropriate and necessary step toward achieving these national goals.

3. Federal transportation R&D must be seen and understood as part of a much broader context:

- As part of an innovation process that includes a number of steps: basic research, invention, product development, market test/acceptance, and deployment.
- As part of a de facto national transportation R&D program in which responsibility is shared among hundreds, if not thousands, of public and private organizations.

4. To be effective, federal transportation R&D must reflect the institutional structures that exist within transportation, the capabilities of the public and private organizations involved, and the resulting constraints on innovation.

5. Transportation R&D should incorporate basic principles, some of which are articulated in Larson's paper:

- Make unambiguous connections to principles of our society ("provide every individual safe access to work, health care, recreation and other basics for living.").
- Respond to citizen/customer views and needs; draw on their expertise.
- Favor the private sector whenever possible; take advantage of marketplace "pull" for new technology.
- Recognize need for government agencies to be responsible stewards of public domain (e.g., airways, airwaves, highways, and waterways).
- Make transportation user fees reflect costs.
- Ensure that negative social externalities are reflected in user fees.
- Include basic research as part of the R&D agenda.

Initial Findings

1. The taxonomy outlined in the draft Strategic Implementation Plan (i.e., system assessment, physical infrastructure, information infrastructure, human factors, and vehicles) fits the way R&D is authorized, budgeted, and appropriated. The potential problem with this taxonomy is that it may place undue emphasis on monetary inputs to R&D instead of placing emphasis on desired outcomes.

- Use of a "clean slate" classical approach to strategic assessments might lead to alternative taxonomies for classifying and organizing R&D activities; for example, an outcome-based structure consisting of systems, standards and regulations, policy, education, and technology transfer. This outcome-based taxonomy is similar to the one adopted by the Transportation Research Board's Research and Technology Coordinating Committee, which recently completed, under sponsorship of the Federal Highway Administration, an overview of highway research in the United States (TRB Special Report 244, *Highway Research: Current Programs and Future Directions*). The committee's taxonomy consisted of the following categories of R&D activities: research aimed at incremental improvements, research aimed at breakthrough improvements, long-term systems issues, policy proposals and reg-

ulatory compliance, intermodal transportation, technology transfer/field application, education and training, technical support, and testing.

- The R&D agenda should avoid being too prescriptive because this would stifle creativity.
- The R&D agenda should be designed with an eye toward leveraging resources from nontransportation federal R&D.
- The R&D agenda and its implementation plans should encourage better coordination among federal agencies with common interests; for example, between the Environmental Protection Agency and the Department of Transportation.
- The R&D agenda should promote measuring system performance (e.g., how the transportation system contributes to meeting national goals) and developing methodologies for assessing investments in transportation and ranking alternative proposals.
- The time frame for the R&D agenda should be clearly presented and should delineate activities and resources using an output-oriented taxonomy, such as the one described previously, so that, for example, resources for incremental research, breakthrough research, policy, technology transfer, and training can be distinguished. The time frame should identify how R&D work will be accomplished (e.g., by contract, in government labs, or in partnership with other organizations). In addition, the time frame should identify major changes in institutional arrangements necessary for applying promising research results.

2. The strategic planning process for federal R&D should include clear linkages from the vision statement to goals, objectives, policies, and finally, the federal role. The appropriate federal role in R&D may vary depending on the context, and a continuum of possibilities exists, ranging from catalyst, to standard setter, to promoter. In some cases and in some stages of the R&D process, a federal agency may act independently, but in others various partnership arrangements are needed with the private sector and state and local government agencies.

- The vision statement in the draft Strategic Implementation Plan should be modified to add "and appropriate stewardship of resources that remain in the public domain."
- The connection between specific goals for transportation and the vision statement should be strengthened, and the distinction between goal and objectives should be sharpened.
- Federal policies should be described clearly to ensure alignment with the vision statement. "Alignment" should include institutional, financial, operational, and human resource policies.
- Outreach to nonfederal public and private transportation agencies is critical and essential for informed decision making about the federal transportation R&D agenda. A variety of outreach strategies are possible. For instance, NSTC can follow this forum with activities targeted to specific segments of the transportation community. After a round or two of interaction at this level, and once NSTC can point to specific changes that have resulted from this interaction, another national forum might be appropriate. Any future national forum should include representation from as broad a group of transportation constituencies as possible, and more advance information should be provided to participants. National forums are not effective mechanisms for soliciting input at the project level, but they are appropriate mechanisms for looking at the roles various transportation constituencies can play in transportation R&D.

3. In structuring the strategic planning process, the inputs to the process must be inventoried, and the outputs (results) must be defined. The inputs include principles (such as those noted previously), a review of the external (nonfederal) environment for transportation and innovation, an understanding about the strengths and weaknesses of various transportation-related organizations, and knowledge of the threats and opportunities facing transportation systems. The outputs of the process include R&D themes, topics, and pro-

jects; role selection (designation); priorities/trade-offs among topics and projects; commitments; and funding.

- R&D activities should take into account the fact that the future is uncertain. Researchers should anticipate changes in transportation problems and the possibility that the "enabling environment" for transportation policy may change over time. What is politically infeasible today may be feasible in the future.
- As the administration and Congress reconcile their differences concerning federal transportation programs, there should be feedback to the R&D agenda-setting process.
- Stakeholders (operators and users) are not likely to reach a consensus about priorities and trade-offs. This means that, at some point, the federal R&D agenda must be shaped by the judgments of public officials.

4. There is a need for a comprehensive, national transportation R&D agenda. This agenda should be dynamic and should clearly represent the expectation that the federal role is to help identify areas of focus and contribute to development of funded research from which the private sector can "jump off."