A Vision for Transportation Research and Development

Mortimer Downey, Deputy Secretary of Transportation and Chairman of the National Science and Technology Council's Committee on Transportation Research and Development

I'd like to talk about our interagency vision for transportation research and development (R&D)—our guiding principles—and our priorities and objectives as we are developing them within the cooperative system that Dr. Gibbons outlined.

CHALLENGES TO THE TRANSPORTATION SYSTEM

Let me begin by emphasizing the obvious: as a continental nation, separated by vast oceans from its trading partners, the United States owes much of its present prosperity to the flexibility, low cost, and efficiency of its transportation system. When you take a moment to think about the tasks this system performs daily, it is truly amazing.

But this system must continue to progress. Our transportation system works well only when it is moving forward. We must respond to changing patterns of people's travel wants and needs as well as support new ways of doing business.

The nation's transportation system is being challenged to meet increasingly high standards regarding its impact on the environment and society. Given the strength of these expectations and the substantial role of transportation in the economy, it is easy to understand why.

IMPORTANCE OF FEDERAL ROLE

The federal government has played a major role in supporting innovative transportation technologies. Although industry is an important partner, the federal government owns and is responsible for much of the nation's transportation infrastructure. In addition, we all know that the benefits of investing in transportation systems often can be measured only over a period of several decades. The federal government is best positioned to undertake and support this form of long-term investment.
In such a capital-intensive area, research investment risks can be very high, and the return can be so far off that private-sector support is unlikely. Because the public benefits of long-term research often cannot be fully captured by private investors under these circumstances, federal research partnerships are essential for ensuring innovation. The federal government also has a unique responsibility for protecting the public interest in areas such as environmental quality and safety.

The objectives of both business and government can be achieved through well-designed research programs that optimize and leverage government and private-sector resources. Often, the kinds of long-term research needed to achieve major gains in vehicle efficiency, emissions, and safety are precisely the kinds of research needed by companies to protect their competitive positions in domestic and international markets.

Research leading to improved aircraft, ships, land vehicles, and transportation technologies often is critical for national security. In the past, we have seen military technologies mature into civilian use. But now we see that many defense technology needs can be met at less cost when research is managed in a way that encourages technology that immediately supports both defense and civilian markets. The Department of Defense can no longer afford to support research to sustain firms specializing in defense markets only. Enormous savings can be achieved if defense products can be purchased from commercial businesses.

Addressing these challenges with respect to the federal role in science and technology is the first priority of the National Science and Technology Council (NSTC). The council's Committee on Transportation Research and Development is charged with ensuring that federal investment in transportation research conducted by all agencies is

- Coordinated to ensure efficient use of federal funds aimed at this mission,
- Focused on projects verified by users, industry, and other stakeholders as being the most critical to achieving success, and
- Limited to areas in which it is clear that major public benefits can be achieved only through cost-shared federal research.

The committee's vision is development of a sustainable and seamless intermodal transportation system that effectively ties America together and links it to the world. This system will help citizens and businesses meet their needs by providing efficient, safe, secure, and environmentally friendly transportation of people and goods. Such a system will result from a strengthened partnership between government and the private sector—a partnership that balances effective management and renewal of existing infrastructure and strategic deployment of new technologies and infrastructure by drawing on R&D that supports this balanced approach.

**NSTC Transportation Goals**

The building blocks for achieving this vision follow:

- A sound physical infrastructure;
- A broad array of technological, design, and system management alternatives that facilitates the most effective use of the physical infrastructure; and
- A comprehensive understanding of the system and its operations.

Realizing this vision will require us to develop the following:

- A personal transportation system that meets people's travel needs conveniently, with minimum cost and delay. We want government and industry to work together to achieve some key transportation breakthroughs, and we seek reactions from forum participants to these goals and our research efforts to attain them.
• A prototype of an affordable, attractive automobile capable of up to three times today’s fuel economy performance and of meeting future safety and air pollution standards.
• A technology base that enables development of a new generation of safe subsonic and high-speed civilian aircraft that far surpasses today’s aircraft in affordability, efficiency, and environmental capability.
• A safer, more efficient, and more productive air traffic management system, drawing on satellite-based technology.
• Advanced, integrated transportation information systems that monitor system performance and provide users with maximum flexibility and choice, with minimum congestion and environmental impact.
• Technologies that result in bridges and highway surfaces capable of lasting years without frequent or major maintenance.
• A system of intermodal freight transportation that supports both traditional shipping needs and new requirements of industries that rely on fast, reliable, and flexible deliveries.
• A civilian space launch industry capable of competing successfully in a nonsubsidized international market.
• A federal procurement system based on life-cycle costing and performance specifications that support innovation and meet ambitious safety and environmental goals efficiently, with a minimum of regulation.
• A government structure that supports wise and effective decisions, policies, and legislation based on comprehensive private- and public-sector input; builds on a solid information base regarding the transportation system’s condition, performance, and operations; and effectively evaluates the impact and implications of alternative choices and courses of action.

GUIDING PRINCIPLES

This vision and its goals were crafted around several guiding principles:

• To establish research priorities in partnership with industry and state and local governments;
  • To ensure sound federal support and effective interagency coordination for the key areas of basic and applied research—including such topics as materials and system analysis—that will enable us to meet our goals;
  • To use independent evaluators for project selection so that merit will be rewarded;
  • To significantly share with industry the costs for all applied research;
  • To give priority to projects capable of achieving business success and meeting such societal goals as environmental protection; and
  • To work within federal budget limits without the expectation of new money.

No matter how well designed our transportation system may be, federal research investment is only one element of a national strategy aimed at ensuring the system’s continued safety and efficiency.

We also must promote a climate that rewards business investment in research, a principal source of innovation in transportation. Although it may not be obvious, this also means reducing the federal deficit—so that federal borrowing does not crowd out private investment—and setting trade policies that ensure the widest possible world markets for reinvented American transportation products.

We also need a regulatory system that achieves environmental and other societal objectives at the lowest possible cost, with the lowest possible business burden. This means regulations that emphasize performance, not prescription, and administrative measures that cut red tape. In our research programs, as well as in our investments, we must remember that our goal is to build bridges, not bureaucracies.
Finally, we have to promote life-long learning to ensure that Americans will be equipped to build, operate, maintain, and use tomorrow's sophisticated transportation systems. We actively support a balanced national program in these areas.

**RESEARCH PRIORITIES**

The NSTC Committee on Transportation R&D, for which I serve as cochairman, identified needs and priorities by considering transportation systems in terms of four broad categories. The first three categories include the visible elements of our transportation system:

- Physical infrastructure, such as roads, railways, ports, and airports;
- Information infrastructure, such as the sensors, computers, and communications facilities that increasingly will provide enhanced traffic control and management; and
- Next-generation transportation vehicles for land, sea, air, and space.

The fourth category captures the overall systems-level considerations of transportation system design, planning, management, and operations—in essence, analysis of how the other three functions interrelate.

Our progress in each of these four areas is limited by many nontechnological factors, but R&D can have a major—and often critical—impact on our success. The provision of transportation services and equipment is largely a private-sector activity; therefore, industry generally will have an important—or even dominant—role in many aspects of R&D. Nevertheless, federal participation can be critical in identifying needs and goals, determining concept feasibility, demonstrating and evaluating performance, and transferring technology to users.

**RESEARCH OBJECTIVES**

The Committee on Transportation R&D has developed a series of objectives for coordinated public and private research for each of the categories mentioned previously.

First, for the physical infrastructure, we want to develop materials, design methods, and other technologies for low-cost, long-lasting highways, bridges, airports, and other structures.

Second, for the information infrastructure, we want to apply the innovations available from the National Information Infrastructure to develop and deploy an intelligent transportation system that will give us safety and efficiency in our transportation system's operation.

Third, for the next generation of transportation vehicles, we have set objectives for each form of transportation.

In aeronautics, we want to maintain our world leadership in aircraft, engines, avionics, and air transportation management systems. We want to ensure reliable and affordable access to space through a stronger American space launch capability that meets the needs of national security and the commercial sectors.

For cars and light trucks, we want to renew America's leadership in automotive technology through the development of a new generation of energy-efficient, low-emissions vehicles. The government-industry Partnership for a New Generation of Vehicles is a landmark step in that direction.

For heavy-duty trucks and buses, we want to invest in improved materials, components, and design concepts to ensure American leadership and to meet our national goals for improved access, energy efficiency, and air quality.

For rail vehicles, we want to position American companies as world technology leaders, seeking export markets by facilitating technological innovation in rail vehicle design and construction.
We want to restore the competitiveness of American shipbuilding, ship repair, ship design, and ship production through a variety of coordinated measures, including the support of new technology.

The fourth, and final, category discussed previously involves transportation system-level considerations—evaluating the system's performance and understanding the human factors involved. Here, we need to collect the information required to make effective decisions about the safe operation of existing transportation systems and decisions about new investments.

As we design transportation systems, we cannot lose sight of the need to integrate how people actually function. Incorporating this understanding into our systems will yield tremendous benefits in safety and efficiency.

CONCLUSION

I've talked about our vision for R&D—our guiding principles—and our priorities and objectives. I ask you to consider these closely. Your viewpoints, knowledge, and experience is going to be extremely helpful as we reach judgments about federal transportation R&D.