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# RESEARCH AND TECHNOLOGY UNDER TEA-21

## *Overview of Impacts on U.S. DOT*

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MORTIMER L. DOWNEY

As the 20th century draws to a close, it is appropriate to reflect on the great advances achieved in transportation during the past 100 years: the birth and growth of worldwide automobile and air transportation, and the modernization of ship and rail technology. Just as the success of these industries depended on technological innovation, so the face of tomorrow's transportation industry will be improved by the research and technology initiatives of today.

The Transportation Equity Act for the 21st Century, successor to the Intermodal Surface Transportation Efficiency Act of 1991, continues efforts at the federal level to create a safer, more efficient, more environmentally friendly, and more technologically advanced U.S. transportation system. TEA-21 provides approximately \$3.3 billion through 2003 for the continuation of successful initiatives in research and development, technology deployment, and training, as well as for many new efforts. The legislation also includes strong support for transit and safety programs and for transportation statistics.

Overall, the U.S. Department of Transportation will place heightened emphasis on partnerships with other government agencies, as well as private entities. These partnerships will include continuation of the Department's relationship with the Transportation Research Board, which, among many cooperative ventures, has long provided us with valuable studies, input on our strategic plans and programs, and opportunities to reach out to the transportation research community through TRB's annual meetings and working groups. Such partnerships are an appropriate direction. Just as effective policies cannot be formulated in a vacuum, viable technologies cannot be developed without the participation and support of the various stakeholders and consumers involved.

### **National Goals**

Strategic planning guides every aspect of U.S. DOT's work, including R&D. After all, it is the application of technologies resulting from R&D that will help meet the nation's transportation challenges. TEA-21 goes beyond ISTEA in acknowledging the fundamental importance of strategic planning to ensure that national goals are achieved. Under the new authorization, U.S. DOT will undertake more planning than ever before. And, as with our research activities, these planning efforts will include our partners across the transportation system and involve all levels of government.

The U.S. DOT Strategic Plan sets forth the agency's prioritization of goals and activities. Within that plan is the U.S. DOT Research and Technology Management Strategy, an outline of the Department's efforts in partnership initiatives, enabling research, and education and training. Annual Performance Plans further detail the performance objectives, strategies, and resources for accomplishing both national and agency goals.

U.S. DOT's strategic planning contributed to the development of a national transportation vision. In 1997 the federal government undertook an inter-agency initiative to identify national goals and give an overarching structure to the many science and technology efforts conducted or supported by the various federal agencies involved in transportation. The result of this coordination was the National Science and Technology Council's Transportation Science and Technology (S&T) Strategy. This strategy provided a vision of transportation enterprise in the future, identified areas for enabling research, and set national goals and measures. Five goals were established: safety, mobility, economic growth and trade, protection of the human and natural environment, and national security. In the future,

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the strategy will be updated to include other S&T initiatives beyond the federal arena. Inclusion of the goals and projects of states, localities, and the private sector will result in a comprehensive framework for the nation's R&D and S&T priorities.

The R&D and technology initiatives authorized by TEA-21 complement the overall federal strategic plan for transportation technology, as well as the Department's new R&D plan. The structure of these plans is best represented by a pyramid, with national goals at the top, realized through the deployment of technologies resulting from public-private partnerships, benefiting from enabling research, and all supported by a foundation of education and training.

### **Partnership Initiatives and Enabling Research**

The partnerships identified in the National Science and Technology Council's S&T Strategy will serve as mechanisms for achieving the vision of a superior transportation future. TEA-21 provides funding for U.S. DOT activities to support each of the strategy's goals. These programs will result in the near-term application of technologies and information tools that should benefit the general public and further American industrial competitiveness. For example, under TEA-21 U.S. DOT will:

- ◆ Improve passenger and operator safety through the development of night and bad-weather vision technologies, adaptive cruise control, advanced lane keeping, collision avoidance, and other in-vehicle technologies.
- ◆ Reduce traffic congestion and improve traveler information through the use of incident management systems and technologies to sense traffic anomalies and apply advanced weather forecasting.
- ◆ Expedite emergency response by relaying crash location and severity data to emergency dispatch centers.
- ◆ Reduce emissions, improve energy efficiency, and protect the natural environment through the development of alternative-fueled medium and heavy vehicles, through support for communities, and through emphasis on sustainability in land use and planning.
- ◆ Enhance economic competitiveness through the application of technologies for improved border crossing and corridor travel.

TEA-21 also authorizes funding for enabling research. The following are illustrative of the intermodal and multimodal research efforts to be conducted under the TEA-21 authorization:

- ◆ *Human performance and behavior*
  - Advanced instructional technology will reduce human error, the largest source of crashes in all modes of transportation.
  - Fatigue detection and alertness enhancement research will enable vehicles to adapt to their operators and passengers, improving human performance and safety.
- ◆ *Advanced materials*
  - New materials and designs will improve the safety of vehicles while reducing their weight and increasing their energy efficiency.
  - Durable pavement materials will not only lower the cost of highway maintenance, but also reduce congestion and delays caused by repair work.
- ◆ *Sensing and measurement*
  - Advanced microsensors and computers will enable vehicles to monitor human and vehicle performance continuously, preventing crashes and enhancing security.
- ◆ *Modeling, design, and construction*
  - Vehicle and infrastructure design models will enable the design and construction of transportation systems that optimize human performance and safety.

### **Education and Training**

TEA-21 supports U.S. DOT in carrying out its goal of fostering education and training to prepare the transportation workforce of the 21st century. Transportation technologies are advancing to the point that many careers, from the research scientist to the auto mechanic, from the transit services operator to the airplane pilot, will require greater high-technology skills and a strong math and science foundation. U.S. DOT is addressing this need through programs at the University Transportation Centers, the National Highway Institute, and the National Transit Institute. Moreover, as part of our effort to prepare the next generation of transportation workers, the Department will continue to reach out to students in grades K-12 and in community colleges and trade schools through the Garrett A. Morgan Technology and Transportation Futures Program.

### **Agency Perspectives Represented in This Issue**

The following articles represent the perspectives on TEA-21 of the federal agencies responsible for the various aspects of surface transportation authorized under the new legislation: the Research and Special Programs Administration, the Federal Tran-

sit Administration, the Federal Highway Administration, the National Highway Traffic Safety Administration, the Intelligent Transportation Systems Joint Program Office, and the Bureau of Transportation Statistics.

◆ RSPA has many roles, from coordinating education and training initiatives, to fostering enabling research and collaborative processes, to guiding the Department's efforts in strategic planning for R&D. As noted earlier, TEA-21 places a strong emphasis on planning.

◆ FTA will increase its R&D efforts under TEA-21, investigating cutting-edge transit alternatives such as advances in alternative-fueled buses, light rail, and ITS. Transit is an integral part of many cross-modal initiatives, including ITS programs. FTA has been an active participant in U.S. DOT's efforts to conduct listening sessions and other outreach activities with stakeholders across the United States—activities that have been pursued in support of all elements of TEA-21.

◆ FHWA's R&D efforts are evolving to reflect stronger ties to states and local governments, as well as to other stakeholders. TEA-21 and ongoing improvements in agency organization are changing the business of highway research—who conducts it, what is investigated, and how the research is funded.

◆ NHTSA R&D is an integral element of U.S. DOT's efforts to promote public health and safety by striving to eliminate transportation-related deaths, injuries, and property damage. NHTSA provides data needed to set safety standards, and conducts research under the Intelligent Vehicle Initiative to develop and integrate systems utilizing crash avoidance technologies and other safety systems. These efforts are especially important in light of such challenges as the increased number of light trucks and sport utility vehicles on the nation's roadways, escalating road rage, and human factors issues related to the complexity of today's vehicles.

◆ The ITS Joint Program Office has had a successful history in the Department since its inception under ISTEA. The program is more than a collection of various technologies; a unifying philosophy guides the development and implementation of technologies in such areas as traffic management, traveler information, emergency response, smart vehicles, weather information, and border crossing. The National Intelligent Transportation Infrastructure program and the Intelligent Vehicle Initiative are priorities in the National Science and Technology Council's S&T Strategy. A key feature of these programs is a systems approach, applied in partnership with private

## TEA-21 Research Funding Guaranteed Levels

Fiscal Years 1998–2003 (in millions)

Program	Contract Authority
<b>Title 1</b>	
Total	\$25
Advanced Travel Forecasting Procedures Program <sup>a</sup>	\$25
<b>Title 2</b>	
Total	\$392
Highway Safety Research and Development	\$360
State Highway Safety Data Grants	\$32
<b>Title 3</b>	
Total	\$317
Transit Research	\$281
University Transportation Research	\$36
<b>Title 5</b>	
Total	\$2,571
Surface Transportation Research <sup>a</sup>	\$592
Technology Deployment Program <sup>a</sup>	\$250
Training and Education <sup>a</sup>	\$102
Bureau of Transportation Statistics	\$186
Intelligent Transportation Systems Standards, Research <sup>a</sup>	\$603
ITS Deployment <sup>a</sup>	\$679
University Transportation Research <sup>a</sup>	\$159
<b>Grand Total</b>	<b>\$3,305</b>

<sup>a</sup> Subject to the obligation limitation, which results in reduction of spending authority.

industry and academia, which has led to the development of a national architecture and national standards that should make it possible to maximize the benefits of emerging technologies.

◆ The expansion of mission and funding for BTS under the new legislation reflects the valuable services this agency has provided to the transportation community. Through the establishment of the National Transportation Library and other programs, BTS will continue to serve the information needs of business, industry, academia, and government under TEA-21.

## Conclusion

To a large extent, TEA-21 enables U.S. DOT to advance efforts begun under ISTEA and continue working toward the vision of the National Science and Technology Council's S&T Strategy. Research and technology will continue to be a priority. The Department will further develop its strategic thinking, making adjustments to Annual Performance Plans and budgets in accordance with advances in technology and the transportation

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## Research and Technology

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needs of the nation. The United States should be leading the development of a world-class transportation R&D capability. This can be accomplished by sharing information across transportation S&T networks; by leveraging resources and forming public-private partnerships; and by supporting the important foundations of long-term research and investment in education and training in math, science, and technology.

Transportation is undergoing a technology revolution: the transportation system of the 21st century will adapt to people. Technology is key to accomplishing the ultimate goal of a safe, accessible transportation system that enhances the natural and human environment, supports the nation's domestic economy and international trade, and protects our national security. TEA-21 will help us achieve this goal.

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## Meeting the Challenges of Highway Safety

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to provide information on driver improvement and testing, fraudulent ID detection, and graduated licensing.<sup>b</sup> NHTSA regional offices also will be able to expand technical assistance to states in program evaluation and data analysis. Additional funding provided by TEA-21 will be used to improve the documents accepted by federal agencies for identification purposes.

<sup>b</sup> Graduated licensing is a three-tiered licensing system comprising a learning permit, a restricted license period, and then graduation to a full nonrestricted license.

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NOTE: *The following individuals contributed to the preparation of this article: Joseph Kianthra, Rolf Eppinger, William Hollowell, Duane Perrin, Keith Brewer, August Burgett, and Patricia Breslin, Office of Research and Development, and James Fell, Office of Traffic Safety Programs, National Highway Traffic Safety Administration, U.S. Department of Transportation.*

## Innovation in Transit

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Transit benefits are a provision of the Internal Revenue Code that permits an employer to pay for an employee's cost of commuting to work by transit or eligible vanpool. This provision is designed to improve air quality, reduce traffic congestion, and conserve energy by encouraging employees to commute in other than single-occupancy vehicles.

Prior to TEA-21, the Internal Revenue Code allowed employers to provide only transit or vanpool benefits in addition to and not in lieu of compensation. Under TEA-21, effective January 1, 1998, transit and vanpool fringe benefits can be provided in addition to compensation, in lieu of compensation, or a combination of both, up to the maximum limit.

## Conclusion

In conclusion, accomplishing the goals of FTA's research and technology programs will depend on the agency's ability to form partnerships with public- and private-sector organizations willing to join in leading the transit innovation process. Many activities will require commitments of staff and funds from sponsoring partners, as well as from FTA and other federal agencies. Clearly, the federal government has a vital interest in funding transit research and innovative technologies. Transit increases basic mobility for millions of Americans, provides congestion relief, and promotes livable communities. TEA-21 affirms that transit is a critical element of the nation's transportation system.

*Readers are encouraged to visit the FTA Web site at <http://www.fta.dot.gov/library> for additional information on transit and TEA-21.*