TR News March-April 2010: Opening Avenues for Innovations: Coordinating Across Modes, Delivering into the Mainstream

DETAILS

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AUTHORS

TR NEWS

NUMBER 267 MARCH–APRIL 2010

3 A Tour of the Research and Innovative Technology Administration: Implementing Transportation Solutions to Define a New Era
Peter H. Appel
At the fifth anniversary of the Research and Innovative Technology Administration (RITA), Administrator Appel reviews the work and accomplishments of RITA's six components and advances a vision of researchers communicating across modes to share findings and best practices and to develop and implement innovative transportation solutions.

12 Vanguard Technologies on the Move: Delivering Innovations into the Mainstream of Practice
Byron N. Lord
Through the Vanguard Technologies initiative, the Federal Highway Administration is promoting proven, high-payoff innovations that save time, boost safety and quality, and decrease congestion during highway construction: road safety audits, prefabricated bridge elements and systems, precast concrete pavement systems, techniques for making work zones work better, and the safety edge to reduce roadway departure crashes.

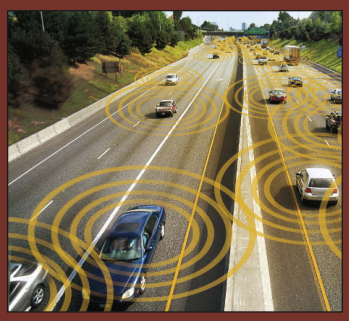
20 Transportation to Enhance America's Best Idea: Addressing Mobility Needs in National Parks
Katherine F. Turnbull
Meeting the transportation needs of visitors to national parks, wildlife refuges, wilderness areas, and other federal lands presents an ongoing challenge. The author reviews the planning, financing, and operation of recent initiatives and projects, as well as research efforts, findings from case studies, and best practices.

24 Rebirth of the Historic Hermit Road
Jonathan Upchurch

27 POINT OF VIEW
The Creative Financing Sidestep
Steve Williams and Dan Murray
The role of the fuel tax in generating future transportation revenue has been downplayed in the national debate, and several of the creative financing alternatives are problematic, the authors maintain, pointing to flaws in congestion pricing, tolling, privatization, and vehicle mileage taxes. They argue that raising the fuel tax is the better option.

31 TRB ANNUAL MEETING HIGHLIGHTS
Investing in Our Transportation Future: Bold Ideas to Meet Big Challenges
A photo essay documents sessions, workshops, special events, poster presentations, awards, exhibits, committee meetings, and networking at TRB's 89th Annual Meeting in Washington, D.C., January 10–14, including a speech by U.S. Secretary of Transportation Ray LaHood and panel discussions with U.S. DOT leaders.

43 Expanding International Transport Research Collaboration: Working Group Presents Findings
G. A. Giannopoulos and O. A. Elrahman
An international working group has examined the issues of collaboration in transportation research between groups in the European Union and the United States. The report explores differences in research management, finance, and governance; investigates ways to effect collaboration; identifies possible models; and makes recommendations.



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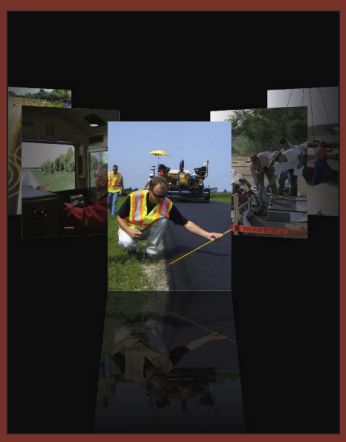

COVER: Touch the image (and turn the page) to review and preview several innovations for transportation that are being developed and integrated into the mainstream of practice.

TR NEWS

features articles on innovative and timely research and development activities in all modes of transportation. Brief news items of interest to the transportation community are also included, along with profiles of transportation professionals, meeting announcements, summaries of new publications, and news of Transportation Research Board activities.

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ALSO IN THIS ISSUE:

50 Calendar

51 Research Pays Off
Jointless Bridge Research Pays Dividends for Vermont
Chad A. Allen

54 Profiles
Public transportation systems consultant Karla Karash and international transportation consultant Cesar Queiroz

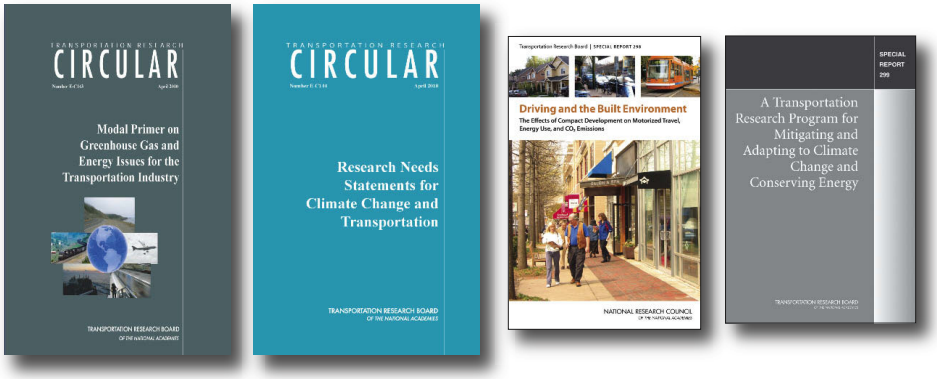
56 News Briefs
Oregon's solar highway, smart phones to reduce congestion, airport Segways, and bus rapid transit in India

58 TRB Highlights

60 Bookshelf

COMING NEXT ISSUE

Energy and climate change are the focus of articles assembled for the May–June *TR News* under the auspices of the TRB Special Task Force on Climate Change and Energy. Articles assess transportation's current and anticipated contributions to emissions of greenhouse gases and fossil energy use, the challenges and opportunities to reduce emissions by freight carriers, the transition to low-carbon nonpetroleum fuels, operational issues for reducing carbon emissions, plus findings and recommendations from recent TRB policy studies, research needs statements, other publications, and more.



A Tour of the Research and Innovative Technology Administration

Implementing Transportation Solutions to Define a New Era

PETER H. APPEL

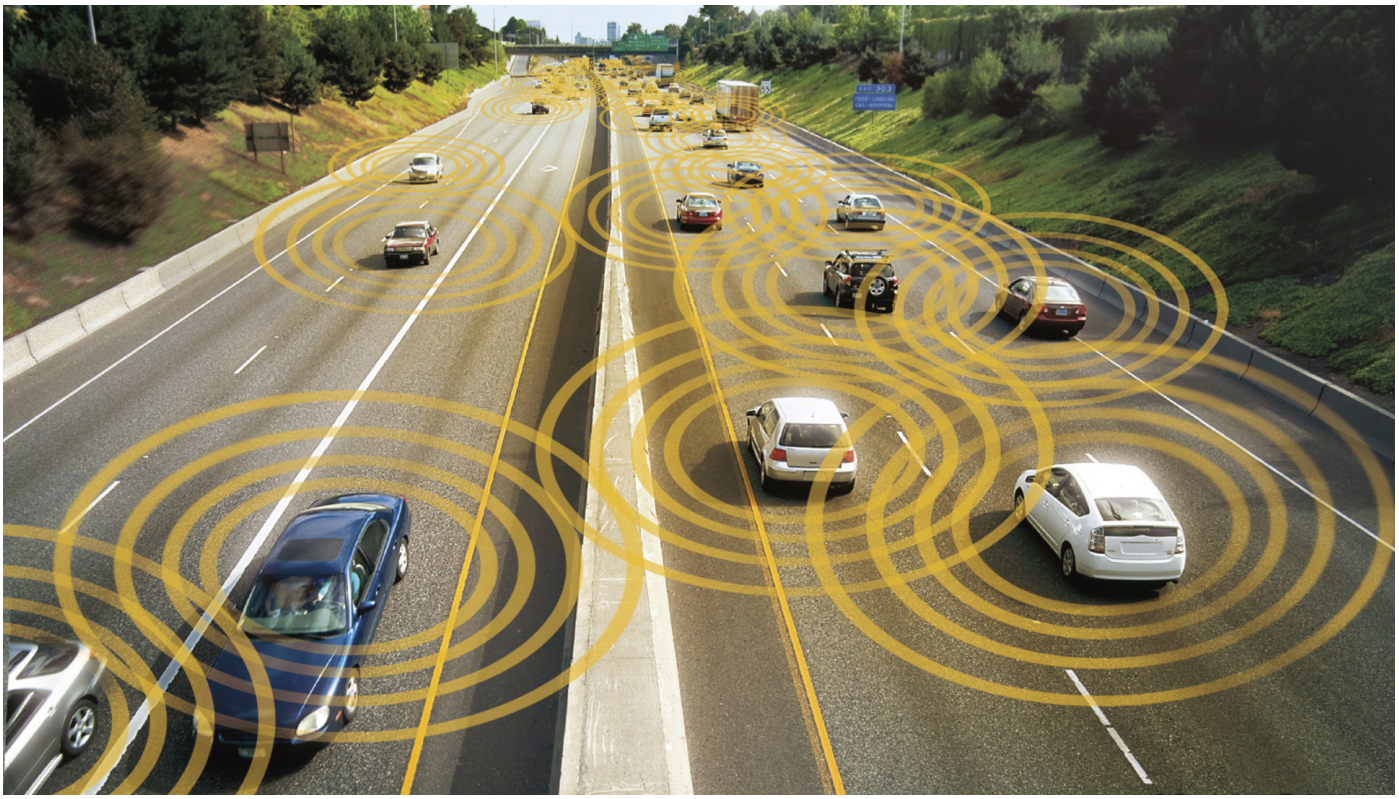


PHOTO © ISTOCKPHOTO/DEITSCHEL

The author is Administrator, Research and Innovative Technology Administration, Washington, D.C., and an ex officio member of the TRB Executive Committee.

Five years ago, Congress passed the Norman Y. Mineta Research and Special Programs Improvement Act, which created the Research and Innovative Technology Administration (RITA) within the U.S. Department of Transportation (DOT). RITA coordinates the Department's multimodal research and education programs, advances the deployment of cross-modal technologies into the transportation system, supplies comprehensive transportation statistics research and analysis, and supports education and training in transportation and transportation-related fields.

RITA is positioned to help researchers communicate across modes to share research and best practices in support of the nation's transportation goals. The Obama Administration is committed to making policy and investment decisions based on sound science and rigorous analysis. Secretary of Transportation Raymond H. LaHood has strongly embraced this philosophy and has championed cross-disciplinary, multimodal research and analysis as the foundation for transportation policy making. RITA is working closely with its partners within the U.S. DOT operating administrations to advance the Secretary's priorities: safety, livable communities, environmental sustainability, state of good repair, and economic competitiveness.

(*Photo above*:) RITA's 5-year ITS Strategic Research Plan focuses on enhancements to the transportation system through technology and connectivity, such as vehicle-to-vehicle systems that allow vehicles to communicate with each other on the road and that have shown the potential to reduce crashes.

Harnessing Resources

RITA is harnessing U.S. DOT resources in a vigilant push for collaborative research and innovative transportation solutions—solutions that will define a new era and transform America's transportation system. The Transportation Research Board (TRB) community is invited to partner in this effort. RITA staff members are involved in a variety of roles at TRB; 53—or 7 percent of the administration's staff—are involved in 93 different TRB activities, including leadership roles on standing committees at the council, group, and section levels; and with the Cooperative Research Programs and the Second Strategic Highway Research Program (see sidebar, below). This level of involvement will continue and will increase.

RITA has made great strides in fulfilling Secretary Mineta's vision. Much more can be accomplished, however, to ensure that RITA effectively addresses the nation's transportation challenges. RITA's mission is crucial in ensuring that U.S. DOT's research investments produce results for the American people.

RITA is structured to bring together important research, technology, and data collection assets within U.S. DOT, including

- The Bureau of Transportation Statistics (BTS);
- The Intelligent Transportation Systems (ITS) Joint Program Office;
- The Office of Positioning, Navigation, and Timing (PNT);

RITA and TRB
A Growing Partnership

From the RITA staff, 53 individuals—7 percent of the employees—are involved as volunteers in TRB, filling 93 roles:

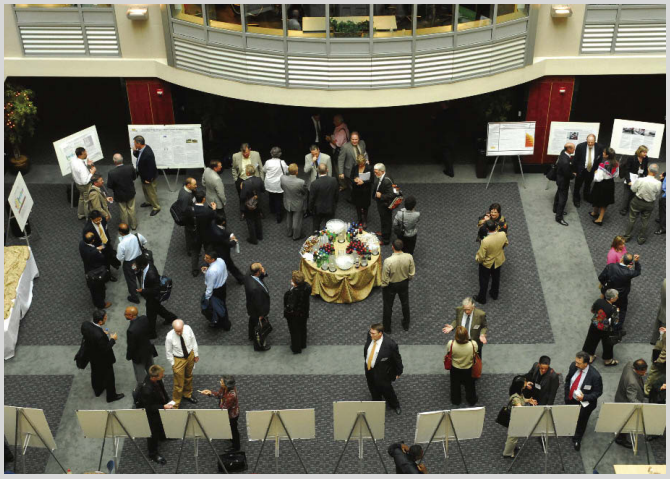
- For the Executive Committee: 1 member;
- For Technical Activities: 1 council chair, 1 council member, 1 group chair, 2 group executive committee members, 4 section executive committee members, 3 committee chairs, 1 committee vice chair, 4 committee secretaries, 37 committee members, and 4 committee young members;
- For Cooperative Research Programs panels: 1 with the Airport Cooperative Research Program; 10 with the National Cooperative Freight Research Program (NCFRP); 11 with the National Cooperative Highway Research Program; and 7 with the Transit Cooperative Research Program; and
- For the Second Strategic Highway Research Program expert task groups: 2 members.

In addition to its sponsorship of NCFRP since 2006, RITA has sponsored the following activities at TRB from 2005 to 2010:

- Commodity Flow Survey Data Users Conference and Peer Exchange (July 2005);
- Freight Demand Modeling: A Conference on Improving Tools for Public-Sector Decision Making (cosponsor; September 2006);
- Meeting Freight Data Challenges Workshop (July 2007);
- Information Assets to Support Transportation Decision Making Peer Exchange with the AASHTO Standing Committee on Planning (April 2007);
- University Transportation Centers (UTC) Spotlight Conference on Radio Frequency Identification (October 2006);
- UTC Spotlight Conference on Research Issues in Freight Transportation: Congestion and System Performance (October 2007);
- UTC Spotlight Conference on the Impact of Changing Demographics on the Transportation System (October 2008); and
- UTC Spotlight Conference on Developing a Research Agenda for Transportation Infrastructure Preservation and Renewal (November 2009).

Planning is under way for the following:

- UTC Spotlight Conference on Transportation Systems for Livable Communities (October 2010);
- Commodity Flow Survey Workshop (November 2010); and
- TRB policy study on Strategies for Improved Passenger and Freight Travel Data (cosponsor).



A 2007 conference on Research Issues in Freight Transportation—Congestion and System Performance featured a poster session in the atrium of the National Academies' Keck Center.

◆ The Office of Research, Development, and Technology (RD&T);
◆ The Transportation Safety Institute (TSI); and
◆ The Volpe National Transportation Systems Center.

These programs provide valuable transportation data, research, education, and training for informed policy and decision making; combined, they allow U.S. DOT and RITA to become more than the sum of their parts.

Bureau of Transportation Statistics

Decision makers need data, information, and analyses to develop relevant and valuable transportation policies and programs for the nation. Data are at the heart of critical decisions that affect the American way of life. Comprehensive transportation data play a crucial role, from tracking the airline industry's efforts to reduce flight delays to analyzing the movement of passengers and freight across the country.

BTS provides key insights into the interconnections of the transportation system with the U.S. economy and livelihood. BTS collaborates with U.S. DOT modal administrations and with other agencies, such as the Census Bureau, to offer products and services essential to the transportation community.

Tools for Decision Makers

BTS also provides lawmakers with a lens into the dynamics of America's transportation networks, revealing how people, goods, and vehicles move through the system, as well as measuring the impact of social, economic, and environmental factors on system performance. Through the Transportation Statistics Annual Report and the National Transportation Atlas Database, BTS supports national efforts to improve the transportation system. BTS airline data—such as reports on flight delays or air traffic trends—supply tools for policy makers, the airline industry, and consumers evaluating the safety and performance of the aviation industry.

The Commodity Flow Survey (CFS) is a crucial tool for evaluating freight movement across the nation's ports, railways, roads, and airways. The volume of goods—including hazardous materials shipments—that flows across U.S. transportation networks is ever increasing; decision makers require robust, high-quality data to evaluate the safety, security, and performance of these flows.

BTS assembles economic indices to measure the trends in the U.S. economy; the Transportation Services Index, for example, synthesizes data on passengers, vehicles, and goods moving across the transportation system. As the nation's commerce grows and transcends borders, comprehensive data about international freight traffic and its movement across borders and through the transportation system become essential. The BTS Transborder and Border Crossing data provide measures of these trade elements.

The North American Transportation Statistics Data Interchange in June 2009 brought together representatives from Mexico, the United States, and Canada to share data.

To reach their full potential, however, BTS data must match up with the emerging needs of decision makers. To improve its data products and services and position them to meet user needs, BTS continuously engages stakeholders and customers through a variety of outreaches. BTS works closely with TRB on several of these efforts, such as the CFS data users workshop scheduled for November 2010, the National Research Council–appointed Committee on Strategies for Improved Passenger and Freight Travel Data, and the North American Transportation Statistics Interchange.

PHOTO: CANADA BORDER SERVICES AGENCY

Freight trucks at the primary inspection line at the United States–Canada border. BTS assembles and analyzes key data about the movement of freight across U.S. borders.

Information Platform

BTS employs a variety of communication methods to connect customers to the most recent transportation statistics. The National Transportation Library, the BTS website, and a Twitter network disseminate statistical information.[1] BTS also sponsors the Advisory Council on Transportation Statistics, which examines the quality, consistency, objectivity, and relevance of the agency's statistics and analyses.

The National Transportation Library serves as a platform for organizing critical transportation information and for ensuring that stakeholders, the public, and other consumers have access to relevant resources. As a national transportation knowledge warehouse, the library maintains extensive digital and print collections—all available through its website—and supports many of the federal government's most complex data and statistical projects.

To ensure that BTS is best aligned with stakeholder needs, however, more proactive outreach to customers is needed. BTS is redoubling its efforts to request and to listen to feedback from its customers to improve products and to develop new ones to meet the needs of the transportation community. These listening sessions and other outreaches will be critical to position BTS to support complex transportation decision making.

Intelligent Transportation Systems Joint Program Office

In 2008, more than 37,000 Americans lost their lives, and another 2.3 million were injured in vehicle crashes on America's highways. Additional fatalities and injuries occurred across the other modes of transportation. Vehicle crashes remain the leading cause of death among persons 4 to 34 years old. Yet efforts to reduce roadway fatalities and injuries face an emerging challenge that Secretary LaHood has vowed to fight—driver distraction.

Advancing Safety Technology

Advances in safety technology—particularly for crash avoidance—show promise in contributing to unprecedented safety on the roads, on the rails, in fleets, in the air, in pipelines, and on the waterways. The ITS program, managed by RITA and with partners across U.S. DOT, in academia, and in the international transportation community, is pioneering research and development into systems that can achieve once-unimaginable safety benefits across all modes of transportation. The ITS program also focuses on the benefits of technology for mobility and for the environment.

[1] See sidebar, page 11, for a list of RITA websites that offer additional information about these and other initiatives described in this article.

PHOTO: MICHAEL CHAPMAN, UCAR

A prototype of IntelliDrive℠, a multimodal initiative to enable vehicles to communicate wirelessly with each other and with transportation infrastructure, was tested in Detroit, Michigan, in 2009. The onboard equipment collects, stores, and transmits weather data—future equipment will be smaller and integrated into the car design, instead of taking up trunk space.

U.S. DOT has a legacy of cooperative research with major automobile companies, producing innovative safety advances. Although improved safety features in vehicles have made it possible for people to survive crashes that once were considered fatal, the ITS program is now advancing vehicle, transportation management, and roadway applications that move beyond mitigating crash severity to preventing crashes.

ITS technologies and applications that capture real-time data about weather and road conditions, traffic patterns, and other elements critical to safe and efficient transportation management will change how operators and users approach travel. State and local transportation agencies will have a new arsenal of cost-effective traffic management tools to ease gridlock and improve the quality of life in their communities.

Strategic Research Plan

Released in January 2010, the 5-year *ITS Strategic Research Plan, 2010–2014* outlines a comprehensive vision that builds on progress made and that positions the program for continued progress. The theme of the plan is Transforming the Nation's Transportation System Through Connectivity. The connectivity that defines the information age will have a similar impact on travel; harnessing this technology will benefit all Americans. Crafted with extensive input from stakeholders across the transportation enterprise, the plan moves beyond research, development, and demonstration to lay the groundwork for the deployment and integration of ITS in the United States.

At the core of this research plan is IntelliDrive℠, a multimodal initiative to enable vehicles to communicate wirelessly with each other and with transportation

infrastructure to alert drivers to—and to help prevent—potential crashes and to provide other safety, mobility, and environmental enhancements. Specifically, vehicle-to-vehicle (V2V) systems that enable vehicles to communicate with each other on the road have shown the potential to prevent up to 82 percent of the most severe vehicle crashes. V2V will create an awareness-driven environment for drivers.

V2V systems can alert drivers safely and reliably to imminent dangers on the road, such as sudden traffic stops ahead or a car in the blind spot during a lane change. The research will determine how to deliver warnings effectively to vehicle operators to enhance safety and to minimize driver distraction.

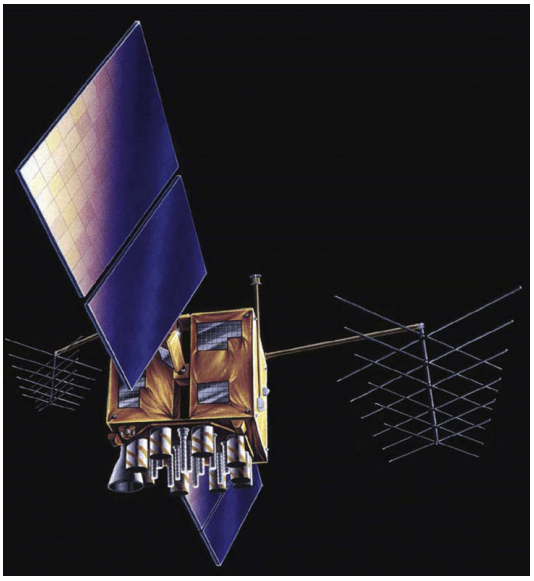
The plan focuses on proven technologies and accommodates developments that may support or improve on current research and development. Dedicated Short-Range Communications (DSRC) was established to underwrite time-critical safety applications like V2V; the plan ensures that DSRC remains the core technology. By answering the remaining questions for the program, the planned research will act as a catalyst for the implementation of IntelliDrive by enabling deployment.

The ITS strategic plan also provides state and municipal agencies with tools and applications to enhance the management and performance of the transportation system and to use their resources most efficiently. The 5-year program supports technology transfer and the development of the knowledge and skills of ITS professionals across the country. The plan envisions a transportation future that will be safer, greener, and more mobile.

Office of Positioning, Navigation, and Timing

All modes of transportation rely on the Global Positioning System (GPS) and its augmentations and on other PNT capabilities to provide safe and reliable operation of transportation systems. Increasingly, the use of the precise time available via GPS is supporting communication systems, finance and banking, freight logistics, and energy and other critical infrastructure systems on which shippers and carriers rely. RITA's Office of PNT ensures that all civil-sector users—not just those in transportation—are represented in technical and policy discussions about GPS and PNT across and outside the federal government.

PNT is crucial for planning and tracking shipments and for mapping routes; it is integral to the future of American transportation. For example, ITS safety applications will require reliable and accurate navigation to support vehicle crash avoidance and other safety features of IntelliDrive. In addition, FAA's Next-Generation Air Transportation System will rely on GPS to support performance-based navigation, as well as aircraft surveillance, to improve safety in all flight phases, reduce airspace and airport congestion and environmental impacts, reduce weather impacts, and expand airspace capacity and improve the management of air traffic flow through Collaborative Air Traffic Management.



Global Positioning System (GPS) satellites are providing an expanding range of data for transportation systems; the Office of Positioning, Navigation, and Timing (PNT) conducts all-inclusive technical and policy discussions about GPS and PNT applications.

RITA leads the National PNT Architecture effort in cooperation with the Department of Defense, looking to 2025 and beyond to provide more efficient and effective PNT technologies and to overcome capability gaps, such as physically and electromagnetically impeded environments that hamper GPS.

Office of Research, Development, and Technology

RITA's mission involves transforming the ideal of coordinated, multimodal, and synergized transportation research and education into a reality. U.S. DOT's modal administrations traditionally have engaged in research that has led to historic advances.

RITA Adminsitrator Peter Appel and U.S. Transportation Secretary Ray LaHood confer during the U.S. DOT's Distracted Driving Summit in 2009.

The National Cooperative Freight Research Program (NCFRP) Oversight Committee met to discuss upcoming projects in October 2009. NCFRP is a collaborative initiative of RITA and TRB.

Although much of the focus of this research reflects the agencies' missions, opportunities arise to find synergies across the programs.

Secretary LaHood's effort to confront the issue of distracted driving represents an excellent example. Distracted driving affects every mode of transportation—cars, trucks, buses, transit, trains, maritime vessels, and aircraft. When the Secretary convened the Distracted Driving Summit in 2009, RITA worked collaboratively with its modal partners to bring together the best thinking on the topic for each mode. The intent was, for example, to leverage research on aircraft pilot distraction to address emerging issues for drivers of other vehicles, or to leverage research by the National Highway Traffic Safety Administration to address issues confronting the railroad industry.

RITA is positioned not only to facilitate, support, and institutionalize the coordination of research between agencies or between a modal administration and a stakeholder, but also to facilitate communication and awareness that can identify synergies across research and among people to implement a technology.

Information Exchange

RITA seeks specific areas of common ground within scientific disciplines or research clusters—such as human factors—and identifies common pursuits, research issues, and technology products that can be leveraged across modes and research projects. Initiatives that expand across modal boundaries support U.S. DOT priorities and foster technological advances in the interconnected transportation system. Secretary LaHood has created an environment that facilitates communication among researchers in the department and across the transportation community through such forums as the Distracted Driving Summit, the U.S. DOT Safety Council, and the ITS Management Council.

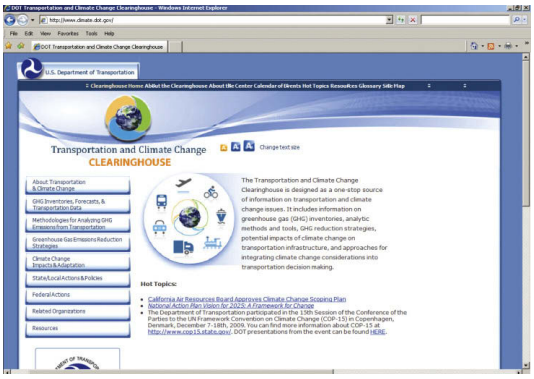
RITA's Office of RD&T embraces this commitment to maintaining dialogues between stakeholders. The RD&T Planning Team comprises research leaders from each agency and outlines avenues for coordination and collaboration; the RD&T Planning Council, composed of the modal administrators, sets RD&T policy and priorities.

The RD&T office coordinates an information exchange to optimize the U.S. DOT's more than $1 billion annual investment in transportation research, recognizing that the benefits of research do not accrue unless the results are implemented. The office also works to advance transportation technology by providing cross-modal research, analysis, and operational support; managing multimodal research programs; and advising U.S. DOT leadership on cross-modal research.

Sampler of Initiatives

Initiatives include the following:

- Sponsored by RITA and managed by TRB, the National Cooperative Freight Research Program carries out applied research on freight issues.
- The virtual Climate Change Center, an online, interactive knowledge base on transportation and climate change, includes information on greenhouse gas emissions, the potential impacts of climate change on the infrastructure, approaches for integrating climate change considerations into transportation decision making, and ideas for adaptation and mitigation.
- The Remote Sensing and Spatial Information Technologies Program leverages existing and emerging remote sensing and spatial information technologies and technology applications—such as satellite-based GPS and topographic technologies—



The Climate Change Center (www.climate.dot.gov) is an interactive online knowledge base on transportation and climate change.

to address multimodal issues through a university-based grant program.

◆ General and multimodal research is under way on alternative fuels, and technical support is being provided for RITA's leadership in hydrogen and alternative fuels research and development. RITA represents U.S. DOT on the Interagency Working Group on Hydrogen and Fuel Cells, which is facilitating the safe transport, delivery, and storage of alternative fuels.

Education and Training

Within the Office of RD&T, the University Transportation Centers (UTC) program funds transportation research at 136 colleges and universities and provides the education and training needed to advance the nation's transportation system. The research and education programs address critical national transportation challenges while developing the next generation of transportation professionals.

The UTCs focus on transportation issues aligned with U.S. DOT priorities and maintain vital partnerships with regional, state, and local transportation and transit agencies, to help find solutions to challenges affecting their communities. The projects are peer-reviewed, and the results are shared with the transportation community through the Transportation Research Information Services—housed on the TRB website[2]—and through other forums that encourage collaboration. UTC colleges and universities trained 32,000 practicing transportation professionals in 2009.

[2] http://tris.trb.org/.

RITA sponsors general and multimodal research on hydrogen and alternative fuels.

The development of the U.S. transportation workforce is a priority for U.S. DOT, RITA, and the UTC program. In an initiative led by RITA Deputy Administrator Robert Bertini, the UTC program is partnering with internal and external stakeholders on a transportation workforce development program to ensure that the workforce of the future can address changing technologies, emerging environmental challenges, safety issues, and other evolving trends in the transportation enterprise.

The RD&T office recently began the development

PEOPLE IN TRANSPORTATION

Peter H. Appel, RITA Administrator

Confirmed by the U.S. Senate as Administrator of the Research and Innovative Technology Administration (RITA) in April 2009, Peter H. Appel has worked with Secretary Raymond H. LaHood to advance key U.S. Department of Transportation (DOT) initiatives by leveraging effective research and cross-modal coordination. These initiatives include the Distracted Driving Summit, which convened key transportation researchers, advocates, decision makers, and other leaders to address a growing safety issue; the bolstering of the U.S. DOT Intelligent Transportation Systems Program to improve safety, efficiency, and environmental sustainability across all modes of surface transportation; and the establishment of the U.S. DOT Safety Council, convening all 10 modal administrators.

Appel

Before joining RITA, Appel worked with A. T. Kearney, Inc., a global management consulting firm, heading up business improvement initiatives for clients in the private and public sectors, with a focus on transportation and infrastructure. Appel has more than 20 years of experience in transportation and has supported organizations in the railroad, trucking, airline, and ocean shipping industries in growth strategy, supply chain improvement, postmerger integration, public–private partnerships, and other business and policy assignments.

He previously served as the Special Assistant to the Administrator of the Federal Aviation Administration and as Assistant Director for Pricing and Yield Management at Amtrak. Appel earned a bachelor's degree in economics and computer science with highest honors from Brandeis University and a master of science degree in transportation from Massachusetts Institute of Technology.

PHOTO: UNIVERSITY RELATIONS, UNIVERSITY OF ALABAMA

Jay Lindly, professor, and student researcher Zachery White investigate pupil seating patterns on school buses, under a 3-year pilot project at the University Transportation Center for Alabama, Tuscaloosa, to assess the efficacy of lap and shoulder seat belts.

of a strategic plan and has reached out across modes and to stakeholders to invite participation, input, and involvement.

Transportation Safety Institute

Located in Oklahoma City, TSI conducts worldwide safety, security, and environmental training for the public and private sectors across transportation disciplines, with transit, aviation, pipeline, motor carrier, highway safety, hazardous material, and risk management training sessions. The program supports the protection of life, property, and the environment across all modes. TSI differs from most federal organizations in that it receives no direct appropriation from Congress. Its entire funding comes through a fee-for-service structure—all costs are covered by sponsored project work.

Drawing on U.S. DOT and other sources, TSI has assembled a cadre of instructors with robust, multi-disciplinary expertise. The more than 700 innovative courses and seminars presented at the state-of-the-art facilities prepare safety professionals to handle emergencies and other critical incidents through a hands-on, real-world training experience. For example, aircraft crash investigation classes use staged debris fields, and another class presents a simulated scenario of a city bus hijacked by terrorists.

TSI has trained more than 750,000 transportation safety professionals since its inception in 1971; in 2009, class enrollments totaled more than 35,000. Each year, TSI trains more than 1,000 Department of Defense personnel, as well as 8,000 highway, enforcement, and motor carrier personnel in the safe transport and handling of hazardous materials.

TSI also trains officials from safety entities, such as the National Transportation Safety Board, in the skills needed to conduct investigations of aviation, transit, and rail crashes. TSI offers a variety of selected accident samples, including aircraft wreckage and parts, as well as a large, open-bay laboratory building for accident investigation exercises involving large wreckage, accident scene layout, and other hands-on activities for specialized training.

More than 85 percent of TSI courses are held offsite, and web-based training and other cost-effective approaches are offered, including a new Internet certification course for motor carrier safety. RITA will continue to work with transportation stakeholders to identify emerging workforce development needs for TSI to address and to incorporate innovative educational techniques and training technology into the courses.

The Transportation Safety Institute, Oklahoma City, maintains a plane crash "boneyard" that serves as a hands-on laboratory in training.

John A. Volpe National Transportation Systems Center

RITA's John A. Volpe National Transportation Systems Center in Cambridge, Massachusetts, partners with stakeholders across government and the private sector to engage in research into emerging transportation issues and to develop solutions that meet the challenges of a rapidly changing world. Celebrating its 40th anniversary this year, the Volpe Center is organized into eight cross-modal Centers of Innovation, each focused on key issues. Each Center of Innovation is modeled for cross-modal collaboration and has the capabilities and expertise to support the priorities established by President Obama and Secretary LaHood.

Like TSI, the Volpe Center is funded through a fee-for-service structure—all costs are covered by sponsored project work. Volpe has more than 500 employees—including many leading experts in fields across transportation research and systems—with 75 sponsors for 400 projects. Strategic priorities include

high-speed rail, distracted driving, and next-generation air traffic control systems.

Volpe has established itself as a Center of Excellence in the transportation community; it recently received the Regional Laboratory Award, recognizing its national and regional technology transfer activities; and the Innovations in American Government Award for the development of the Maritime Safety and Security Information System (MSSIS). Created in partnership with the U.S. Navy, MSSIS is a web-based platform that provides a near real-time view of maritime vessel activity worldwide, enhancing surveillance and management and eliminating costly shipboard inspections and flyover surveillance.

The system has proved critical in strengthening global sea safety—reducing piracy, human trafficking, and contraband smuggling. Called a "wiki on the waves," the program fosters an unparalleled level of cooperation among participating nations, which have partnered to enforce environmental and safety regulations, to prevent oil spills, and to reduce port congestion and collisions.

The Volpe Center is collaborating with U.S. DOT leadership on two priorities—environmental sustainability and livable communities. The Volpe Center is supporting U.S. DOT efforts to provide affordable housing and transit and to improve interagency collaboration on these issues, building on work with metropolitan planning organizations on quality-of-life issues, including transportation, jobs, and education. The work supports U.S. DOT efforts to ensure that livability and environmental sustainability are integral to transportation decision making.

Volpe's newly appointed Director, Robert C. Johns, has more than 20 years of experience leading transportation research organizations and has played a leadership role within TRB, currently as chair of the TRB Technical Activities Council—he is well prepared to build on the Center's successes. Johns is committed to a new emphasis on workforce development at Volpe and will continue to strengthen ties to TRB and to the UTC communities by exploring partnership opportunities.

A laboratory simulator is used to conduct research on locomotive cab technology integration at the Volpe Center.

Moving Forward

These six components of RITA—some that have existed for decades, others that have emerged in the past few years—are positioned to work in coordination with each other and with stakeholders across U.S. DOT and the transportation community to address emerging challenges. The nation's transportation challenges are increasingly difficult, and in an era of constrained resources and rapidly changing technology, RITA looks forward to collaborating with the TRB community to make the best and most integrated use of research, data, and education to confront these challenges.

Volpe Center Director Robert C. Johns conducts a meeting of the TRB Technical Activities Council, which he chairs.

Selected RITA Websites

- Bureau of Transportation Statistics, www.bts.gov
- Bureau of Transportation Statistics on Twitter, twitter.com/TransportStats
- Climate Change Center, www.climate.dot.gov
- Intelligent Transportation Systems, www.its.dot.gov
- *ITS Strategic Research Plan, 2010–2014,* www.its.dot.gov/strat_plan/strategic_plan2010_2014/
- John A. Volpe National Transportation Systems Center, www.volpe.dot.gov
- National Positioning, Navigation, and Timing Architecture, http://pnt.rita.dot.gov/major_initiatives/national_pnt_architecture.html
- National Transportation Library, www.ntl.bts.gov
- Research, Development and Technology Office, www.rita.dot.gov/ordt
- Research and Innovative Technology Administration, www.rita.dot.gov/
- Transportation Safety Institute, www.tsi.dot.gov
- University Transportation Centers, www.utc.dot.gov

Vanguard Technologies on the Move

Delivering Innovations into the Mainstream of Practice

BYRON N. LORD

The author is Team Leader, Highways for LIFE, Federal Highway Administration, Washington, D.C.

Many proven innovations can save time, boost safety and quality, and decrease congestion during highway construction projects. Through its Vanguard Technologies initiative, the Federal Highway Administration (FHWA) is encouraging transportation agencies to consider these innovations when planning and building projects.

Vanguard technologies are a key component of Highways for LIFE—which stands for Long-lasting, Innovative, and Fast construction of Efficient and safe highway infrastructure—FHWA's program to accelerate the adoption of innovations in the highway community. Created by the U.S. Congress under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, Highways for LIFE aims to improve the American driving experience.

The program is promoting five high-payoff innovations through the Vanguard Technologies effort: road safety audits, prefabricated bridge elements and systems, precast concrete pavement systems, techniques for making work zones work better, and the safety edge to prevent roadway departure crashes. Moving these innovations rapidly to full implementation requires a focused approach.

Highways for LIFE offers incentives to highway agencies to adopt innovations and customer-focused performance goals in building better highways and bridges. The program also helps private industry move promising prototypes from late-stage development into the marketplace. The approach employs communication tools, training, technical assistance, and highway community stakeholder involvement.

PHOTO: UTAH DOT

Prefabricated bridge sections at Utah's "bridge farm" on I-80 await use on a project.

PHOTO: FHWA

An aging bridge in Old Town, Maine, was replaced with three precast spans, saving months from the schedule required for cast-in-place concrete construction.

Rapid Deployment

In the past, an innovation could take years to gain national acceptance, even with tens of millions of dollars dedicated to its deployment. For example, FHWA's effort to implement Superpave® technology—which tailors the mix recipes for hot-mix asphalt to an area's climate and pavement-loading characteristics—took 12 years for all 50 states.

Barriers to innovation in the highway community include procurement practices—such as the low-bid process, restrictions on proprietary products, and a reliance on standards and specifications instead of performance goals. Moreover, agencies that face public scrutiny and accountability have a low tolerance for risk-taking. Although innovations can improve performance and save money over the long term, the initial implementation costs may be higher because of the learning curve and the risks involved.

The Vanguard Technologies initiative eliminates these barriers through dedicated teams, proven marketing approaches, and designated funding for quick and broad deployment. A team of technical and marketing experts identifies the critical needs and obstacles for each innovation, develops a marketing plan, and creates implementation tactics and communication tools. The teams make presentations to potential users at technical meetings, workshops, peer exchanges, and demonstration projects. The teams partner with organizations throughout the highway community to champion the technologies.

A marketing plan details specific, measurable strategies and tactics to help the deployment team achieve its goals. Marketing is a standard practice in private industry but has not been adopted universally in the public sector—few highway agencies have marketing expertise on staff. To help agencies become more marketing-savvy, Highways for LIFE developed a *Guide to Creating an Effective Marketing Plan*, a step-by-step manual for agencies and organizations deploying innovation and other highway-related initiatives.[1] The publication includes sample marketing plans and guidance for forming innovation deployment teams.

In addition, FHWA teamed with the National Highway Institute to create a course, Leap Not Creep: Accelerating Innovation Implementation.[2] The course provides transportation professionals with the tools to put innovations to work quickly and to make implementation part of the agency's standard procedures. The course addresses successful implementation, the implementation plan, and strategies for overcoming barriers to adoption.

Road Safety Audits

An example of the success of the Vanguard Technologies approach is the road safety audit, a tool to improve the safety of roadway design, construction, and operation and to reduce highway deaths and injuries. In a road safety audit, an independent, multidisciplinary team examines the safety performance of an existing or planned roadway or intersection to identify safety issues. The audit can help produce designs that may reduce the number and severity of

[1] For a free Technology Transfer Toolkit DVD that contains the *Guide to Creating an Effective Marketing Plan* and other information, contact the Highways for LIFE office at 202-366-0131.

[2] FHWA-NHI-134073, www.nhi.fhwa.dot.gov.

PHOTO: FHWA

A road safety audit team of experts from various disciplines studies safety issues at a busy suburban intersection in Northern Virginia.

crashes, promote awareness of safety design practices, and cut costs by eliminating potential safety problems.

Road safety audits have proved more effective than the usual safety review processes of highway agencies, by engaging people from diverse disciplines—and with no involvement in the project's design or implementation—to look at the safety issues only. In this way, the safety review can be more objective and comprehensive.

The road safety audit first assembles a team to study the project or area. The audit teams typically have three to five members, representing a variety of disciplines, including the fields of highway safety, traffic engineering, planning, operations, geometric design, construction, maintenance, human factors, and enforcement.

The audit team reviews project information and performs field studies, often following checklists to make sure all safety issues are addressed. The team looks at everything from traffic signal operation and the installation of roadway barriers to the location of bus stops so that pedestrians can cross the street safely. The team analyzes the findings and prepares a report suggesting safety improvements. The final step is to incorporate the findings as appropriate into the project or roadway and to track the results.

The marketing plan developed by the FHWA road safety audit deployment team aims to have all state Strategic Highway Safety Plans document road safety audits this year. The plan promotes a workshop on how to conduct audits[3] and has targeted 34 states to undergo audit training. The team also developed a peer exchange program to provide technical assistance on conducting audits.[4]

Workshops have been held in 38 states. Three states have full-time road safety audit coordinators. Several states—including Arizona, Delaware, Iowa, Nevada, New Jersey, South Carolina, Tennessee, and Virginia—have made the audits a standard procedure. FHWA policy guidance now endorses road safety audits as a proven safety countermeasure.

Follow-up research shows that after safety audits are conducted and team recommendations are implemented, crashes and injuries decrease. The South Carolina Department of Transportation (DOT), for example, conducts road safety audits on projects during the development stage and on roads in use. A safety audit of South Carolina Highway 14 yielded nine suggestions to improve safety; all were implemented. As a result, fatalities on the road in 2004 dropped 60 percent from the 2003 total, avoiding more than $3.6 million in potential economic losses.

Prefabricated Bridge Elements and Systems

Many states are trying prefabricated bridge elements and systems, a Vanguard Technology that is a main ingredient in accelerated bridge construction (ABC). Prefabricated bridge elements are manufactured away from or next to the work zone and moved to the construction site for installation. Among the benefits are decreased disruption of traffic, improved work zone safety, greater durability, and lower construction costs.

The deployment team has set a goal for all states to make prefabricated bridge elements and systems a standard practice this year. Product demonstration showcases combine workshops and construction site

[3] FHWA-NHI-380069, www.nhi.fhwa.dot.gov.
[4] E-mail safetyP2P@dot.gov or call 866-P2P-FHWA.

PHOTO: OREGON DOT

In an Oregon project, an old bridge superstructure was moved sideways onto temporary piers after being lifted by hydraulic jacks.

PHOTO: OREGON DOT

The old steel truss bridge (*right*) rests on temporary piers. The new bridge (*left*) was built next to the structure on temporary supports.

visits to show highway professionals how the technology works. Enabling potential users to witness new construction techniques firsthand is an effective way to advance the implementation of innovations—the opportunity provides a better understanding of the uses and benefits and builds confidence in the innovation.

More than a dozen states have used prefabricated bridge elements and systems on projects, and others are considering the technology. Seven states—Florida, Iowa, Louisiana, New York, Oregon, Texas, and Utah—have adopted ABC as a standard practice. Highways for LIFE has provided incentives to several state highway agencies to use ABC and prefabricated bridge elements and systems on projects. One project replaced a bridge over Interstate 215 in Salt Lake City, Utah, in a weekend (see sidebar, page 17).

In another Highways for LIFE project, Maine DOT used prefabrication and full road closures to accelerate construction and reduce the effects on drivers in replacing two bridges on Highway 116 in Old Town and Route 4 in Addison. The precast, prestressed concrete substructure and superstructure elements, built off-site in a controlled environment, also enhanced the durability of the bridges. With the shortened schedule, the work was completed during the summer, avoiding long detours for school buses.

Innovative construction techniques also reduced reconstruction time for two single-span rural bridges on Maryland 28 in Frederick County and on Maryland 450 in Anne Arundel County. With prefabricated concrete superstructures and full road closures, the Maryland State Highway Administration shortened the project completion from more than 1 year to 60 days, so that the bridges reopened to traffic before the start of the school year.

Oregon DOT replaced five bridges on Oregon 38 between Drain and Elkton, using prefabricated bridge elements made with high-performance concrete. The agency built the new bridges on temporary supports next to the existing structures and slid them into place overnight on a rail system. The technique eliminated the need for a 50-mile detour, minimizing disruptions to the traveling public and freight carriers.

On a Virginia DOT project, a prefabricated superstructure was used to replace a bridge on US-15/29 in a congested area of Prince William County near Washington, D.C. The prefabricated elements were constructed off-site and assembled on-site over three weekends. As a result, workers were able to finish the project in six days of full closure; conventional construction would have required 100 days. All traffic lanes remained open during peak traffic periods, without construction of a temporary lane.

PHOTO: FHWA

Ribboncutting for Virginia DOT's US-15/29 project; prefabrication and accelerated construction techniques enabled workers to complete the bridge project over three weekends instead of the 100 days needed for traditional construction methods.

Precast Concrete Pavement Systems

Precast concrete pavement systems, another Vanguard Technology, are revolutionizing highway renewal and repair. Cast off-site and installed when traffic volume is low, precast concrete pavement panels reduce traffic congestion and increase durability.

In high-traffic areas, the construction process for precast systems is safer and more efficient than that for traditional cast-in-place construction, because the roadwork can be completed during off-peak periods in as little as 5 hours, reducing the need for road closures. The panels offer improved durability and can be fabricated under environmentally controlled conditions. In addition, because the panels can be made thinner than cast-in-place sections, they are ideal for installation under overpasses with limited height clearances.

PHOTO: FHWA

Precast concrete pavement systems speed work and cut congestion during renewal and repair projects in high-traffic areas.

PHOTO: DYNATEST CONSULTING INC.

A California DOT test project showed that a precast concrete pavement system could have a service life of approximately 30 years.

In the construction of precast concrete pavement systems, adjacent panels are assembled sequentially and tied together on site through either posttensioning or cast-in-load transfer systems. Nonproprietary and proprietary systems are available. The nonproprietary system is the result of FHWA research to strengthen concrete panels by prestressing, a decades-old technique used in cast-in-place concrete construction.

Parallel to FHWA's efforts, several private companies have worked independently to refine jointed precast concrete pavement technologies; products include the Fort Miller Super-Slab® system, the Uretek Stitch-in-Time® system, and the Kwik Slab® system. Each system has unique design features for installation and for transferring load across panels.

The deployment team's goal is for a dozen states to adopt the use of precast concrete pavement systems as a standard approach by 2013. Demonstration showcases are available, along with web conferences and videoconferences on the technology.[5] Technical information also is being disseminated through DVDs and the Highways for LIFE website.[6] To date, nine states—California, Delaware, Florida, Missouri, New Jersey, New York, Pennsylvania, Texas, and Virginia—have used or are planning to use precast concrete pavement systems.

Highways for LIFE grants are assisting several states to try out the technology. On a pavement rehabilitation project on Interstate 15 near Ontario, California, a portion of the concrete pavement will be replaced with a concrete panel system precast off-site and installed during off-peak traffic periods. This technique will enable California DOT to speed construction, enhance traveler and construction worker safety, reduce the impact on motorists during construction, and produce a longer-lasting, lower-cost roadway. The highway agency anticipates that the precast slabs will have a 30- to 40-year service life; in comparison, fast-setting concrete would have lasted approximately 10 years.

Virginia DOT accelerated construction and enhanced durability by replacing distressed pavement slabs with precast concrete pavement panels on an access ramp for Interstate 66 in Fairfax County. Conventional repair with cast-in-place concrete would have required at least 100 days, with traffic congestion from lane closures, but the precast slab approach required the closing of only one lane at a time during 35 nights of work, so that all lanes were available for rush-hour traffic on the heavily traveled route near Washington, D.C.

Making Work Zones Work Better

To make work zones work better, Vanguard Technologies are helping highway agencies gain a better understanding of the potential impacts of work zones, improve work zone management programs, and apply a suite of product and system innovations to decrease the negative effects of work zones on construction workers and motorists.

The work zone effort also is helping agencies comply with the regulations and the goals of FHWA's Work Zone Safety and Mobility Rule. The rule applies to all

(continued on page 18)

[5] Download the precast concrete pavement systems web conference at www.nhi.fhwa.dot.gov/about/innovationseries.aspx.
[6] www.fhwa.dot.gov/hfl.

Installing a Bridge Superstructure on a Weekend

In June 2006, Utah DOT staff observed a Florida project in which a prebuilt bridge was moved into place overnight with innovative equipment, saving motorists months of traffic disruption. The staff members were impressed and recommended that Utah DOT try the technique.

With the help of a demonstration project grant from FHWA's Highways for LIFE program, the agency adopted the accelerated bridge construction (ABC) techniques—including prefabricated bridge elements and systems—to build a new superstructure alongside the 4500 South Bridge over Interstate 215 in Salt Lake City while traffic continued to flow.

Under a carefully coordinated plan, Utah DOT removed the old superstructure and shifted the new superstructure into place in one weekend in October 2007. The rapid move was accomplished with a self-propelled modular transporter (SPMT), a computer-controlled vehicle that transfers heavy loads with precision. Equipped with 256 articulating wheels and operated remotely by a single operator using a joystick control, the SPMT made two trips to remove the four-span superstructure on Saturday. The next day, the SPMT moved the new 172-foot-long single-span superstructure to its final destination. I-215 reopened to traffic at 1 a.m. on Monday.

After using ABC techniques on this and other projects, Utah DOT decided to make ABC standard practice for all bridge projects by 2010, the first U.S. highway agency to take this step. Utah's experience exemplifies the changes that Highways for LIFE is working to effect—to bring high-payoff, readily available innovations into the mainstream of practice at highway agencies across the country.

Faster Construction

"For many of our urban projects, the critical path goes through the structures," notes James McMinimee, Utah DOT Director of Project Development. "If we can shorten the time it takes to build the structures, we can dramatically cut the time it takes to complete an entire urban project."

Innovation on the I-215 bridge project significantly sped up construction and reduced the impact on motorists. With conventional techniques, the 2007 project would have taken six to nine months, and construction-related impacts on travelers would have lasted at least 120 days. The ABC techniques reduced the traffic impact to one weekend on I-215 and to 10 days on State Route 266, which includes the bridge.

Quantifying the value of using innovation is a key aspect of Highways for LIFE projects. The net savings on the Utah bridge project were approximately $3.2 million. Traditional construction methods would have cost approximately $800,000 less than the accelerated construction techniques, but the ABC techniques reduced the impact of construction congestion, saving approximately $4 million in user costs. Moreover, the agency has noted that the initial costs for ABC are declining as contractors become more efficient and comfortable with the innovative techniques.

The project also garnered approval from Utah DOT customers. A postconstruction survey found that 92 percent of area residents and businesses were satisfied or very satisfied with the project performance by Utah DOT and its contractor, and 94 percent were satisfied or very satisfied with the project results.

Paying It Forward

On the weekend of the bridge move, Utah DOT and FHWA held a project showcase that drew 150 transportation professionals from around the country. They joined local residents and national media at the construction site to watch the SPMT remove the old bridge superstructure and shift the new one into place.

The transportation professionals also attended presentations on the design, construction, and innovative aspects of the project. Representatives from 14 highway agencies brought back to their states knowledge of the ABC and SPMT techniques, along with observations of the project.

"The workshop made it possible for many of the surrounding states and many Utah DOT employees to see the project firsthand," said Rukhsana Lindsey, Utah DOT Director of Bridge Operations and Research. "The interest and confidence created by this successful project and workshop helped Utah DOT construct 12 more ABC projects in 2008."

Since then, Utah DOT has pursued efforts to make ABC mainstream by conducting workshops with contractors and designers on ABC practices, working on standard drawings and specifications for ABC elements, and planning additional projects with ABC techniques.

To learn more about Utah DOT's ABC standards, visit www.dot.state.ut.us/main/f?p=100:pg:0::::T,V:1991.

Crews used an SPMT to move the 4500 South Bridge superstructure from the construction site to its final location over Interstate 215.

state and local governments that receive federal-aid highway funding and is intended to reduce crashes and congestion in and around work zones.

More than 100 innovative techniques and products are available to address safety and mobility challenges in work zones, ranging from sophisticated electronic equipment that notifies drivers of real-time road conditions to innovations in construction processes that speed up project completion. Approaches include full road closure during rehabilitation or maintenance to reduce construction time and eliminate the exposure of motorists to work zones and of workers to traffic.

More than a compilation of techniques, the effort presents a philosophy focused on decreasing the impact of work zones on motorists, nearby residents, local businesses, and workers by reducing the number of work zones, managing the time that travelers and workers are exposed to work zones, and enhancing the safety and mobility of travelers and workers in the work zones.

The deployment team's goal is to increase the number of states that use innovative strategies for work zone management, including analysis tools for assessing a work zone's impacts. Through a peer exchange program, agencies can obtain expert assistance on innovative work zone strategies and technologies, as well as advice on implementing the Work Zone Safety and Mobility Rule.[7] In addition, focused technical assistance workshops and project assessment assistance have enabled many states to use new technologies to enhance traffic flow and improve work zone safety for motorists and workers.

Manuals, guidance documents, and other resources—for example, for work zone traffic analysis—are in development. *Work Zone Modeling and Simulation: A Guide for Decision Makers* reviews the application and use of a range of analytical tools for work zone planning and management.[8]

In 2008, under a Highways for LIFE project to rehabilitate part of M-115 in Clare County, Michigan DOT tested temporary traffic-actuated signals and soon after adopted the work zone innovation as a standard practice. The rural route project replaced the superstructures of two small bridges, which required narrowing the road to one lane. To minimize motorist delay, the contractor used portable signal systems that detect the number of waiting vehicles and adjust the lights for efficient traffic control. The signal systems helped the contractor keep the vehicle queue lengths under half a mile and the travel time delays at less than 10 minutes throughout the project. Michigan DOT identified 11 projects to use the innovative signal system in 2009.

An Edge on Safety

The safety edge is the latest Vanguard Technology, designed to protect motorists from roadway departure crashes, 53 percent of which are fatal. Adoption of the safety edge, an asphalt paving technique, is gaining momentum across the country. FHWA recommends that states apply the safety edge on rural two-lane roads with unpaved or narrow shoulders, where roadway departure crashes are most prevalent.

When a tire goes off a paved surface, the driver can have difficulty reentering the roadway if the pavement edge is nearly vertical—especially if the height difference is 2 in. or more. When the driver tries to steer back on to the road, the nearly vertical edge can cause what is known as tire scrubbing, a condition that may cause oversteering. The driver can lose control of the vehicle and crash into oncoming traffic, roll over, or hit a fixed object.

Created with a simple paver attachment, the safety edge assures that the interface between the roadway pavement and the graded shoulder will be at an optimal angle to minimize the vertical drop-off and provide a safer roadway edge. The recommended angle of the taper is 30 to 35 degrees from horizontal.

The safety edge does not require an extra procedure, only a slight change in the paving equipment, and has little impact on project costs. In addition, the safety edge improves the consolidation of the pavement near the edge, enhancing pavement durability and potentially prolonging pavement life.

Approximately 15 state highway agencies have applied the safety edge, including Alabama, Georgia, Indiana, Iowa, Missouri, North Carolina, and Utah. FHWA's safety edge team is developing a marketing

[7] E-mail workzoneP2P@dot.gov or call 866-P2P-FHWA.
[8] http://ops.fhwa.dot.gov/wz/traffic_analysis/tatv8_wz/index.htm; Publication FHWA-HOP-08-029.

PHOTO: FHWA

After several years of materials settling, erosion, and tire wear, an aggregate shoulder originally flush with the pavement has left the vertical edge exposed. A car or motorcycle tire that has driven over this edge could have difficulty returning to the pavement safely.

PHOTO: FHWA

An extruded wedge will increase the pavement life. When the project is complete, the safety edge will be covered with an aggregate shoulder. After several years, when the edge becomes exposed, a vehicle tire going over it will have no trouble safely returning to the pavement.

plan to encourage more states to try the technique and to adopt it as standard practice for resurfacing and paving projects.

Lessons Learned

The Vanguard Technologies effort has generated several lessons for innovation deployment:

◆ **Although hundreds of millions of dollars are spent on highway research, only a fraction is dedicated to deploying innovations and making them standard practice.** Sometimes efforts to expand innovation stop at the research level under the assumption that the innovations will be adopted automatically. Adequate resources—qualified people and funding in addition to the funding for research—also should be dedicated to technology deployment. Successful deployment does not end with the introduction of the technology but requires focused follow-through until mainstream implementation is achieved.

◆ **Training is needed in marketing to accelerate technology deployment.** The use of proven marketing approaches is a key to accelerating technology deployment, but few transportation agencies have marketing professionals on their staffs. Just as effective marketing can persuade potential customers to try new consumer products, it can encourage highway professionals to try better ways to build roads and bridges. Marketing plans with specific goals and timelines can speed the implementation of innovation.

◆ **Peer group support and testimonials are valuable tools in advancing innovation implementation.** Highway professionals trust what their peers tell them. They can learn much from colleagues' experiences in using new technologies and can benefit from technical advice on how to implement innovation in their own agencies.

◆ **With its institutional knowledge and extensive network of contacts in the highway community, FHWA can play a national leadership role in technology advancement and deployment.** In many cases, highway community stakeholders become involved in initiatives such as Vanguard Technologies because FHWA is leading the effort and brokering the participation of other transportation agencies and industry.

◆ **Involving highway community stakeholders early in the innovation implementation process is important at both the national and local levels.** Stakeholder input and support are essential in making implementation a success. Early involvement helps overcome resistance to new techniques and practices, enabling stakeholders to offer insights and to gear up for using the innovations effectively.

Through the focused deployment approach of Vanguard Technologies, Highways for LIFE has developed a way to encourage faster, more widespread adoption of proven highway innovations that are available but infrequently used. The lessons learned will benefit highway community efforts to tap the full potential of innovations in improving the way that highways and bridges are built.

For more information on Vanguard Technologies, visit the Highways for LIFE website, www.fhwa.dot.gov/hfl.

Transportation to Enhance America's Best Idea

Addressing Mobility Needs in National Parks

KATHERINE F. TURNBULL

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Most visitors would agree with film director Ken Burns that the national parks are "America's best idea"—or at least one of America's best ideas. Meeting the transportation needs of visitors to national parks, wildlife refuges, wilderness areas, and other federal lands represents an ongoing challenge.

The National Park Service (NPS), other federal land management agencies, the U.S. Department of Transportation (DOT), local communities, state DOTs, transit agencies, foundations, businesses, and other groups continue to explore, implement, and operate innovative approaches to address traffic and parking congestion in parks and other federal lands, and to meet the mobility needs of visitors and residents. Efforts at the federal and local levels in the past two decades have established new transit services and additional bicycle and pedestrian trails; applied advanced technologies for managing transportation within the parks; improved roadways and parking facilities; and introduced other enhancements.

PHOTO: NATIONAL PARK SERVICE

Bear Lake is one of the most visited sites at Rocky Mountain National Park.

At the federal level, recent surface transportation acts, presidential directives, and interagency agreements have initiated programs, partnerships, and funding for transportation in national parks, other federal lands, and gateway communities. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users included the Alternative Transportation in Parks and Public Lands (ATPPL) program, also known as the Transit in the Parks program. ATTPL provides funds for planning and capital projects in or near federally owned or managed parks, refuges, or recreational areas open to the general public.

Transit systems established in national parks in the 1990s continue to flourish. New services are being added at other parks, wilderness areas, and wildlife refuges. Planning studies are under way for yet other areas.

Three Million Riders

The Island Explorer transit system in Acadia National Park in Maine surpassed 3 million riders in July 2009. Initiated in 1999 and operated free of charge, the Island Explorer represents one of the most well-received and well-used transit systems serving park visitors and area residents.

In the first year of the service, eight propane buses operated on six routes, linking hotels and businesses with destinations in the park. In response to popular demand, the system added a seventh route in 2000, and introduced an eighth route, serving the Schoodic Peninsula, in 2004. The Bicycle Express was initiated in 2005, running a 12-passenger van

PHOTO: NATIONAL PARK SERVICE/RAY RADIGAN

Bicyclists at Maine's Acadia National Park can take advantage of the Bicycle Express, which has a bicycle trailer and runs from Bar Harbor Village Green to Eagle Lake.

with a bicycle trailer between Bar Harbor Village Green and Eagle Lake.

Over the years, the Island Explorer has extended its summer-only service into the fall for leaf-viewing tourists. On most routes, the service operates from early morning into the evening, providing travel options for hikers and bikers, sightseers, diners, shoppers, and workers. Real-time information on the status of buses is posted at key stops and on the Internet.

The Island Explorer carried approximately 368,000 passengers in 2009, well above the 142,000 riders in 1999. The system averaged 4,240 passengers per day during the summer of 2009, with a high of 6,640 riders in one day. In addition, the bicycle express transports more than 12,000 bicycles during the summer.

The Island Explorer has tracked rider perspectives through on-board surveys, conducted from 2000 through 2008. The results show strong support and high levels of satisfaction among riders. The majority of respondents indicate that the Island Explorer improves the quality of their visit to the Acadia region; local residents also give the service high marks.

The free bus service represents the coordinated efforts of Acadia National Park, Maine DOT, the Mount Desert Island League of Towns, Friends of Acadia, Downeast Transportation, local businesses, the Federal Highway Administration (FHWA), and the Federal Transit Administration. L. L. Bean became the single corporate sponsor of the Island Explorer in 2002 and reaffirmed its commitment in 2005. The company's contributions have reached $2 million.

PHOTO: FRIENDS OF ACADIA

Island Explorer picks up passengers in front of the Visitor Center at Acadia National Park.

The Friends of Acadia, a nonprofit charitable organization, has played an instrumental role, funding a free service on an initial campground shuttle bus route, which proved successful and led to the development of the Island Explorer. The group also coordinated the contribution from L. L. Bean. In 2004, the Friends of Acadia bought a three-year option to purchase 369 acres at Crippens Creek in Trenton for the Acadia Gateway Center. The park and federal and state agencies cannot undertake these types of activities.

Acadia National Park and its partners in the Island Explorer continue to consider service improvements and opportunities to enhance the operation of the system. The Acadia Gateway Center represents a major future improvement—it will house the Acadia National Park transportation information center and will function as an intermodal hub. Maine DOT has taken the lead on this project, working with the City of Trenton, the park, Friends of Acadia, and Downeast Transportation.

Going-to-the-Sun Road Rehabilitation

Going-to-the-Sun Road traverses Glacier National Park in northwestern Montana, crossing the Continental Divide. Since 1932, traveling the road by automobile or by the restored historic red buses has been a highlight for visitors. Planning for the rehabilitation of the 52-mile historic alpine road began in the 1990s.

The planning process involved representatives from Glacier National Park, Montana DOT, and FHWA. A citizens advisory committee actively ensured that the perspectives of local communities, businesses, tribal governments, and other groups would be considered. Planners identified a goal of reducing the summer vehicle traffic on Going-to-the Sun Road by 10 to 12 percent during the 8- to 10-year rehabilitation. A shuttle bus system was recommended to help reduce traffic during the reconstruction.

A free voluntary shuttle bus system started up in 2007. Operating a bus service on a narrow historic alpine roadway undergoing rehabilitation presented many challenges. Solutions included operating two sizes of buses and establishing separate routes to serve the east side and the west side of Sun Road.

PHOTO: KEN THOMAS

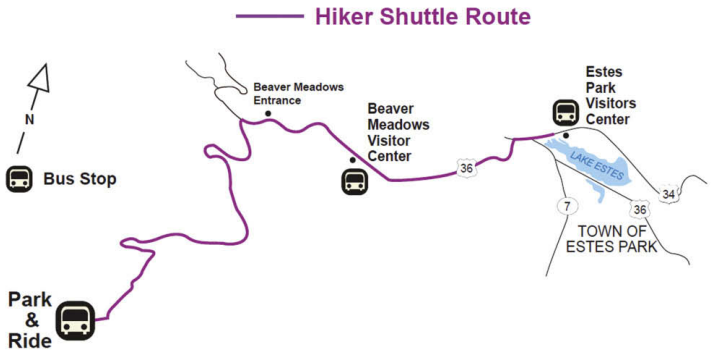
A short tunnel on Going-to-the-Sun Road near Logan Pass. Since 2007, shuttle buses have assisted in reducing traffic during the rehabilitation of the 52-mile road.

A fleet of buses, each with a capacity of 23 passengers, operates on the east side of Sun Road, from the St. Mary Visitor Center to Logan Pass. Four routes serve the west side of the park, with smaller, 12-passenger Sprinter buses operating on the routes to Logan Pass. The Apgar Transit Center, the focal point for the shuttle bus system on the west side of the park, is designed to be environment-friendly and offers parking, a covered waiting area, interactive kiosks, restrooms, and drinking water.

Approximately 132,100 passengers rode the shuttle buses in 2007, the first summer of operation. Ridership levels declined slightly to 105,640 the following summer, but in 2009 increased to 156,726. Reactions from riders and visitors have been positive. The shuttle has reduced traffic volumes on Going-to-the-Sun Road.

The shuttle system involves a unique cooperative interagency agreement among Glacier National Park, Montana DOT, and Flathead County, which covers the purchase and shared use of the 22 12-passenger and eight 23-passenger buses. The buses ply the Sun Road Shuttle routes in the summer and serve Flathead County's Eagle Transit and other general public transit service providers in the state during the remainder of the year.

In the mid-1990s, increasing congestion of roadways around Rocky Mountain National Park and Estes Park in Colorado prompted expansion of park shuttle services. The Bear Lake shuttle bus route was established in 2001, with the Moraine Park route and Hiker Shuttle route (pictured) added later.



Gateway to the Rockies

Rocky Mountain National Park and the gateway community of Estes Park draw visitors from the Denver metropolitan area, as well as from the United States and around the world. In the mid-1990s, the limited parking at many trailheads and the increasing traffic congestion on the park roadways prompted consideration of transit alternatives. A limited shuttle bus service had operated since 1978, and the park master plan and the transportation plan addressed expansion of the system. Traffic congestion and limited parking in Estes Park also emerged as problems during peak visitor times.

The Bear Lake shuttle bus route was implemented in 2001, and the Moraine Park route and the Hiker Shuttle route were added later. In coordination with the park bus service, the Town of Estes Park initiated a Shopper Shuttle in 2006, with routes serving the downtown area.

The Bear Lake shuttle operates between the park-and-ride facility and Bear Lake, one of the most visited parts of the park. When the parking lot at Bear Lake is full, visitors are directed to the park-and-ride, where they can take the shuttle to Bear Lake. The Moraine Park Shuttle runs between the park-and-ride and Fern Lake, and the Hiker Shuttle connects the Estes Park Visitors Center and the park-and-ride.

For the first 3 years of operation, the park shared its fleet of vehicles with the town. In 2009, the park expanded service hours, and the town leased three vehicles to operate the service—two new cutaway buses with seating capacities of 14 and one new cutaway bus accommodating 25. In 2009, three routes operated, linking major destinations in the town.

Response to the shuttle bus system in the park and in town has been positive. Total ridership for the three park routes was approximately 337,540 in 2008 and 361,250 in 2009. Ridership increases on the Hiker Shuttle indicate that more visitors may be leaving their cars outside the park. Ridership on the Shopper Shuttle routes in 2008 was approximately 32,900. A slight decline in riders occurred in 2009, apparently because of the restructuring of some routes. Nonetheless, feedback from visitors about both shuttles has been positive.

Enhancements, Launches, and Studies

Shuttle buses and other transit services continue to operate in Zion, Yosemite, Golden Gate, and Grand Canyon National Parks, as well as at the Colonial National Historical Park, the Lewis and Clark National Historical Park, and other sites. Projects are being implemented at additional parks and fed-

The website of Bryce National Park in Utah offers a virtual tour of the park's shuttle system (www.nps.gov/brca/photosmultimedia/etours.htm).

eral lands, and planning studies are under way at yet more. Enhancements to the Bryce Canyon National Park shuttle bus system, implementation of a new shuttle bus service at the Marsh-Billings-Rockefeller National Historical Park, and a planning study under way at the J. N. "Ding" Darling Wildlife Refuge provide examples of these activities.

Bryce Canyon National Park

A free shuttle bus system has operated during the summer months at Bryce Canyon National Park in Utah since 2001. The system serves major points of interest along the 18-mile roadway through the park. In 2008, a new shuttle staging area opened, accommodating shuttle operations and staff; the park-entrance and reservation personnel; and waiting areas, restrooms, and parking.

The new facility represents a partnership among Bryce Canyon City, Best Western Ruby's Inn, Lewis Brothers Stages, and Bryce Canyon National Park. The city and Best Western Ruby's Inn provided the land for the project and funded the construction.

To introduce visitors to the shuttle system before their trip, the Bryce National Park website offers a shuttle e-tour, a virtual tour of the system from the shuttle staging area to stops at the park's major natural features. Visitors also can obtain information by radio about the shuttle system via the Travelers Information Station, 1610 AM, as they approach the park.

Marsh-Billings-Rockefeller National Historical Park

The Marsh-Billings-Rockefeller National Historical Park in Woodstock, Vermont, is one of the more recent additions to the National Park System. Established in 1992 and opened to the public in 1998, the Marsh-Billings-Rockefeller National Historical Park focuses on conservation history and on the evolving nature of land stewardship in the United States.

Traffic congestion and the lack of parking during the peak summer and fall visitor seasons have been problems for the Village of Woodstock. To explore the role that public transit service could play to address these concerns and to enhance mobility for residents and visitors, the park, the Two Rivers–Ottauquechee Regional Commission, and the Town and Village of Woodstock conducted a planning study with funding from the ATPPL program.

As a result of the study, a 2-year pilot project is starting up this summer, with an implementation grant from the National Park Service. Advance Transit in Wilder, Vermont, will operate the pilot bus service under contract to the village, using electric buses leased from the Greater New Haven Transit District in Connecticut.

J. N. "Ding" Darling National Wildlife Refuge

An ATPPL-funded alternative transportation study for the J. N. "Ding" Darling National Wildlife Refuge in Sanibel, Florida, is examining alternative transportation techniques and scenarios for the refuge and for the Sanibel–Captiva Islands. The goal is to balance human activities with the commitment to preserve and protect natural areas. The refuge, the U.S. Fish and Wildlife Service, the City of Sanibel, and Lee County–Lee County Transit are partnering on the project.

The J. N. "Ding" Darling National Wildlife Refuge on Sanibel Island is one of the most visited refuges in the country, featuring approximately 6,000 acres of mangrove forest, submerged seagrass beds, cordgrass marshes, and West Indian hardwood hammocks. Traffic congestion is an issue, primarily along the 4-mile, one-way Wildlife Drive, the main destination for visitors.

Several innovative approaches are being taken to engage the public and key stakeholders in the study, which was initiated in 2008—for example, a study website, newsletters, workshops, and online, mail-

Several public workshops—along with a website, newsletters, and surveys—aim to engage the public and key stakeholders in the alternative transportation study at the J. N. "Ding" Darling National Wildlife Refuge on Sanibel Island, Florida.

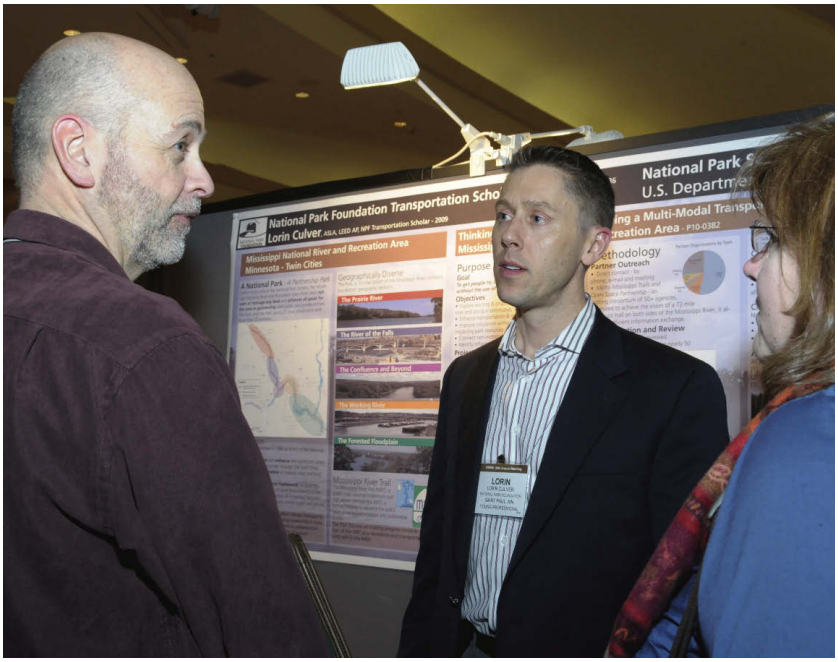


PHOTO: CABLE RISDON, TRB

Lorin Culver (*center*), National Park Foundation, discusses his paper on a multimodal alternative transportation plan for the Mississippi National River and Recreation Area at the 2010 TRB Annual Meeting's National Park Transportation Scholars poster session.

back, and seasonal surveys. Stakeholder interviews were conducted with representatives from 26 organizations. As of August 2009, three public workshops had been held on the project, to promote interaction and to obtain feedback on various topics. The study is developing geographic and mode themes for consideration and for more detailed analysis.

Focusing on Research

TRB's Transportation Needs for National Parks and Public Lands Committee provides a focal point for the discussion of issues, opportunities, and research on transportation to and within parks, wildlife refuges, recreation areas, and other federal lands. Established as a task force in 1998 and approved as a standing committee in 2006, the committee is engaging new and diverse stakeholders in TRB activities, sponsoring TRB annual meeting sessions, holding midyear meetings, developing research problem statements, and facilitating outreach to other committees and groups.

In addition to representatives from transportation agencies, academia, and consulting firms, committee members come from the National Park

Rebirth of the Historic Hermit Road

JONATHAN UPCHURCH

As noted in Katherine Turnbull's article, the national parks—"America's Best Idea"—are continually striving to improve visitor experience. The visitor experience is influenced in many ways by transportation—the ability to access points of interest within the parks with a minimum of traffic and parking congestion.

Among the efforts mentioned by Turnbull are transit services, additional bicycle and pedestrian trails, and improvements in roadways. A major project at Grand Canyon National Park in 2008 involved all three. But the project presented a special challenge, because it involved an historic roadway.

The Hermit Road in Grand Canyon National Park was originally constructed as a wagon road in 1912 by the Santa Fe Railroad and improved in 1935 by the Bureau of Public Roads and the National Park Service. An 8-mile-long scenic roadway along the South Rim of the Grand Canyon, the Hermit Road offers several overlooks and parking areas with breathtaking views of one of the seven natural wonders of the world.

In 1935, the park's annual visitor count was 206,000; by the early 1970s, the park was receiving nearly 2 million visitors, and the Hermit Road experienced significant parking and traffic congestion during peak season. In 1974, the road was closed to private vehicles during the summer, and a shuttle bus service was initiated. Today the park receives 4.5 million visitors per year, and shuttle buses operate on the Hermit Road for 9 months, with a total ridership that exceeds 2.3 million boardings annually—one of the most heavily used alternative transportation systems in the national parks.

Pullout 1, circa 1935 (left) *and in November 2008, postconstruction* (right).

The original design of the roadway reflects many principles of context-sensitive design, with historic features such as stone masonry walls at overlooks and pullouts, weepholes in masonry walls, and stone culvert head-

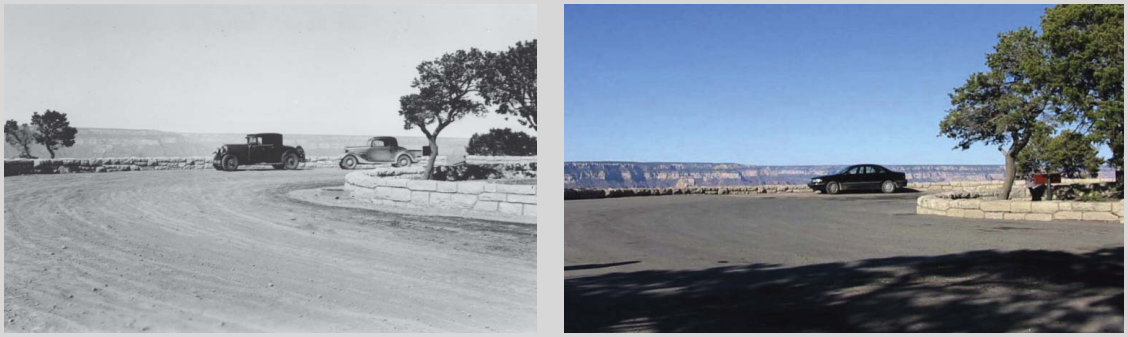
Service, the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture Forest Service, the Smithsonian Institution, the National Parks Conservation Association, and the Rails-to-Trails Conservancy. The individuals from these agencies and organizations bring new perspectives to TRB and enhance the committee's focus on critical transportation issues within parks and federal lands.

◆ **Annual Meeting Sessions**. The committee has sponsored diverse sessions on transportation needs in federal lands and gateway communities, ecotourism, context-sensitive design, environmental impacts of transportation alternatives, and nonmotorized transportation. Showcasing the work of the National Park Transportation Scholars in a poster session has become a highlight of the Annual Meeting. The Transportation Scholars Program represents a partnership among the National Park Foundation, the National Park Service, and the Eno Transportation Foundation, with funding support from the Ford Motor Company.

◆ **Midyear Meetings**. The committee's midyear meetings provide opportunities for detailed discussions on critical issues, interactions with other committees, first-hand briefings on current projects, and tours of transportation projects in national parks. The committee has participated in TRB joint summer meetings, cohosted summer meetings with other committees, and has met separately to focus on strategic planning. Meeting tours have included Boston National Historical Park, Mount Rainer National Park, Rocky Mountain National Park, Glacier National Park, Harpers Ferry National Historical Park, and Cape Cod National Seashore.

◆ **Research Problem Statements**. The committee has developed several research problem statements, submitted to the Cooperative Research Programs and other potential sources for funding. The National Cooperative Highway Research Program (NCHRP) selected and sponsored a project completed in 2003 and published as NCHRP Synthesis 329, *Including Tourism and Recreation Travel with Transportation Planning and Project Delivery* (*1*). NCHRP Project 08-36, Task 83, Innovative Transportation Planning Partnerships to Enhance National Parks and Gateway Communities, was completed in 2009; the contractor's final report is available online (*2*).

walls. After seven decades, however, the Hermit Road was showing its age.



Hopi Point Overlook, circa 1935 (left) *and in March 2008* (right).

The National Park Service faced the challenge of retaining a high level of historic integrity while rehabilitating and improving the road. The pavement surface was in poor repair; some of the road and overlook historic features were endangered. The narrow, 18- to 20-foot-wide road presented safety concerns, especially when serving transit buses that are 8-1/2 feet wide.

Improvements constructed in 2008 included widening the roadway to 24 feet and resurfacing; enhancement of existing overlooks, parking areas, and trails; construction of formal shuttle bus stops; and the addition of a paved pedestrian and bicycle trail on a separate alignment (*1*). The pedestrian and bicycle trail was built on a portion of the original 1912 wagon road that was abandoned when the 1935 roadway was constructed.

These improvements were accomplished with minimal impacts on historic and natural resources. As shown in the accompanying photographs, the Hermit Road has changed little in the past 75 years, including the 2008 reconstruction.

The successful restoration will allow the Hermit Road to continue to serve park visitors for decades, as it has since the early 1900s. Careful planning and design have contributed to the historic preservation of a road that is an important part of the visitor experience at Grand Canyon National Park.

Reference

1. Upchurch, J. Preserving a Historic National Park Roadway: The Hermit Road. In *Transportation Research Record: Journal of the Transportation Research Board, No. 2123*, Transportation Research Board of the National Academies, Washington, D.C., 2009, pp. 163–171.

The author is a transportation engineering consultant and lives in Grand Canyon National Park. From 2004 to 2008 he served as a National Park Transportation Scholar. He is an emeritus member of the TRB Traffic Control Devices Committee.

IMAGE: JAY DUNCAN, AECOM

The Gateway Center in Acadia National Park is being built through a partnership of Maine Department of Transportation, Downeast Transportation, Friends of Acadia, and L.L. Bean. A recent NCHRP project cites state, local, and private partnerships as best practices for transportation improvements at national parks.

◆ **Outreach**. The committee fosters interaction with diverse TRB committees, organizations, and groups. Committee members have helped organize sessions at biannual conferences of the Transportation Planning for Small and Medium-Sized Communities Committee and have presented papers at meetings of the George Wright Society, a nonprofit association for the protection, preservation, and management of cultural and natural parks and reserves through research and education.

Best Practices

The recent NCHRP project explores innovative partnerships among national parks, gateway communities, and other groups to introduce transit services and other transportation improvements. The project examines 10 case studies that include a variety of federal lands, sizes, geographic coverage, institutional arrangements, and approaches. The case study findings, the common themes, and areas for further research are presented in the project report, a PowerPoint presentation, and an executive summary (2).

The following summarizes some of the common best practices that emerged from the case studies:

◆ Match the issues, opportunities, geography, proximity of gateway communities, and characteristics of each area with appropriate transit services, intelligent transportation systems technologies, and other techniques. Build on relationships and develop new partnerships.

◆ Recognize and respect the missions of the different agencies and organizations involved, including federal land agencies, local communities, state DOTs, transit agencies, foundations, and businesses.

◆ Maximize staff, financial resources, and expertise among the various groups, and leverage a range of federal, state, local, and private-sector funding.

◆ Communicate with and listen to partners, the public, and other stakeholders.

◆ Start small and build on the success of initial routes and services; make changes and modify service in response to changes in visitor demands and other conditions.

◆ Engage the private sector, from large and small corporations to local businesses, as well as other private-sector groups, in supporting park and community transit services and other transportation projects.

◆ Make use of foundations, which can undertake and facilitate many activities that parks, federal lands, and government agencies cannot.

◆ Document successes, as well as elements that did not work well, to obtain feedback and ongoing support from policy makers, funding agencies, and the public.

Avenues for Research

Additional research is needed to assess the impacts of the new transit systems and other transportation improvements in national parks and federal lands. Two topics of vital interest, for example, are the air quality and environmental benefits and detailed assessments of the economic impacts on gateway communities.

A comprehensive program of on-board ridership surveys would benefit the parks, local communities, federal agencies, and researchers. Methods of funding to support ongoing operations should be explored. Sharing best practices through workshops and webinars would benefit all groups.

Additional areas of research identified by the TRB committee include exploring the transportation needs of national parks in the statewide and metropolitan planning processes, linking recreational travel demand with transportation demand modeling, and identifying performance measures for federal land transit services. Other research topics focus on long-term transportation needs and on developing innovative approaches to meet visitor demand.

Web Resources

Acadia National Park, www.nps.gov/acad/index.htm

Bryce Canyon National Park, www.nps.gov/brca/photosmultimedia/etours.htm

Glacier National Park, www.nps.gov/glac/

Island Explorer, www.exploreacadia.com/index.htm

J. N. "Ding" Darling National Wildlife Refuge, www.fws.gov/dingdarling/

J. N. "Ding" Darling Transportation Study, www.DingDarlingTransportation.com

Lee County Transit, www.rideleetran.com/

Maine Department of Transportation, Acadia Gateway Center, www.acadiagatewaycenter.com/

Marsh-Billings-Rockefeller National Historical Park, www.nps.gov/mabi/index.htm

Town and Village of Woodstock, www.valley.net/~woodstock/

Two Rivers–Ottauquechee Regional Commission, www.trorc.org/

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1. NCHRP Synthesis 329, *Including Tourism and Recreation Travel with Transportation Planning and Project Delivery*. Transportation Research Board of the National Academies, Washington, D.C., 2004. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_329.pdf.
2. *Innovative Transportation Planning Partnerships to Enhance National Parks and Gateway Communities*. National Highway Cooperative Research Program, Project 8-36, Task 83. Prepared by the Texas Transportation Institute and Cambridge Systematics, Inc., 2009. http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP08-36(83)_FR.pdf.

POINT OF VIEW

The Creative Financing Sidestep

STEVE WILLIAMS AND DAN MURRAY

Williams is Chairman and CEO of Maverick USA, Inc., Little Rock, Arkansas, and a past member of the TRB Executive Committee. Murray is Vice President of Research, American Transportation Research Institute, Arlington, Virginia.

The critical importance of the surface transportation system to the high standard of living in the United States is undisputed. A concurrent message is that the 55-year old Interstate Highway System—the distribution linchpin of the world's largest economy—is in a serious state of disrepair. In the midst of one of its most severe economic recessions, the United States must now grapple with a nearly impossible conundrum. With the reauthorization of highway funding imminent, politics and special agendas must quickly yield in the national debate to objective data collection, research, and analysis. This will ensure that decisions are strategic and in the best interest of U.S. citizens for years to come.

As the largest user of the country's roads, bridges, and intermodal connectors, the trucking industry observes firsthand the nation's failure to invest in transportation infrastructure. Government and industry research findings are unequivocal. The near-term impacts of underinvestment are increased traffic congestion and its consequences: pollution, safety degradation, longer transit times, and increased logistics costs. In the long term, the nation can expect higher inflation, lower productivity, and a continued decline in its ability to compete in the global economy. As a result, more manufacturing jobs will move overseas.

Holistic transportation planning should start now to prevent the secondary and tertiary impacts of job and production losses, including declines in income levels, consumer spending, real estate values, and capital spending. Transportation stakeholders, such as the American Transportation Research Institute

PHOTO: DERRICK COETZEE

The health of the nation's transportation infrastructure is vital to its security, economy, and environment.

(ATRI) and the U.S. Chamber of Commerce, have estimated 6-year transportation funding shortfalls ranging from $500 billion to $1 trillion; the prognosis for full funding is poor.

Infrastructure at Risk

The transportation infrastructure is at great risk. Empirical, reproducible analyses indicate that the various creative financing solutions promulgated by both government and private investment houses could exacerbate problems, not resolve them.

The need to reduce traffic congestion, increase system capacity and productivity, and improve roadway safety is seldom debated—all are objectives of national interest. The problem is that the national discourse focuses on—and stops at—raising user revenue regardless of the long-term implications. The literature shows that most of the so-called creative financing tools raise transportation costs without a requisite increase in infrastructure investment. The net effect is that the system will continue to decline while the cost of using the system continues to increase. Cost increases that do not provide requisite value-added benefits are inflationary.

Nevertheless, that does not impede the advocates of creative financing, who are quick to surrender the transparency and accountability of elected government to the esoteric interests of private-sector beneficiaries, who in most cases do not share the goals of the driving public. A few specific instruments have gained popularity, principally because of the lack of political will to support a rational U.S. transportation strategy predicated on increases in traditional funding sources—namely, taxes. Several of the creative alternatives are particularly problematic.

Problematic Alternatives

Congestion Pricing

Congestion pricing has several goals: to raise revenue from captive users, to move users to transit modes, to move vehicles onto different roads, or to shift users' daily schedules. From a freight perspective, the first goal is inflationary; the second is not applicable; the third creates major safety and infrastructure issues for neighborhoods and roadways not designed for heavier traffic levels; and the fourth requires a complete shift in the nation's 9-to-5 economy. In this regard, congestion pricing addresses none of the country's transportation objectives; because the same total of net trips continues at some point on the system, the infrastructure still declines, and lives are lost—although elsewhere—for lack of appropriate safety measures.

Tolling

Tolling continues to be one of the most inefficient revenue tools available. In a review of publicly accessible financial reports, ATRI was unable to find a single toll system in the United States that expended less than 20 percent of its collected revenues on administrative costs. In some cases, toll system administration consumed nearly 50 cents of every dollar

PHOTO: DANIEL SCHWEN

A truck passes through the Pennsylvania Turnpike toll plaza, Somerset.

collected. Other toll systems required massive non-toll revenue subsidies. The true cost of tolling is difficult to decipher, because few toll systems calculate and report standardized administrative costs, according to the Reason Foundation. Nevertheless, the literature raises concerns:

- Many of the tolling inefficiencies identified in research continue in some form with electronic tolling (Peters and Kramer, 2003; Mulshine, 2002; Chin et al., 2004).
- Budget estimates for new toll projects are often inaccurate in documenting start-up and management costs. In 2004, the budget overruns of the New Jersey E-ZPass electronic tolling program exceeded 37 percent—a deficit of $469 million.
- An electronic tolling system that expends $33 million to collect $16 million in E-ZPass tolling violations, with a 68 percent false-positive error rate, cannot claim to be efficient (Malinconico, 2002).

To promote tolling as a way to finance infrastructure capacity is disingenuous. In contrast, 97 percent to 99 percent of fuel tax revenue returns to transportation; tolls do not provide comparable long-term net benefits to the system. Instead, tolls shift vehicles and costs to less capitalized jurisdictions. More disconcerting is the dearth of information and guidance on the safety impacts of toll diversion in either the literature or on the U.S. Department of Transportation's now-defunct website (www.fightgridlocknow.gov). The website, however, previously offered confusing logic on toll-related congestion benefits:

> However, when pricing is introduced on previously congested highways, some traffic may actually be reduced on parallel arterials because certain travelers who were previously deterred by freeway congestion may shift back to the priced highways once congestion is eliminated and throughput has increased....

But where did the original traffic go?

Privatization

The same issues that arise with tolls continue with privatization, but on a larger, more costly scale. The dramatic toll increases built into the leases of the Illinois Tollway near Chicago and the Indiana Toll Road exceed inflation by two to three times annually. This is to be expected when a private-sector profit margin is added to an already soaring highway construction price index. Yet the federal guidance for public–private partnerships lacks discrete strategies for maintaining infrastructure or safety—the nation's two most pressing objectives. Because the leases affect specific roadways, any throughput improvements on the leased corridors may be offset by increased congestion elsewhere.

PHOTO: AAA FOUNDATION FOR TRAFFIC SAFETY

The trucking industry is the largest user of the country's roads, bridges, and intermodal connectors.

Finally, the tenuous nature of leveraging private capital to purchase public assets can be seen in the many withdrawals of concession proposals and in the recent bankruptcies of major investment houses. In 2009, Macquarie Atlas Roads revealed that its portfolio's newly spun-off toll road assets, valued at $1.28 billion, were encumbered with more than $8.6 billion in debt.

Mileage Fees

The latest revenue tool under consideration is the vehicle mileage tax. Any technological system that requires Geographic Positioning Systems to differentiate traffic lanes, distinguish public roads from private driveways, communicate wirelessly with the gas pump, and transfer electronic revenue payments from the driver's checking account to a variety of government agencies would cost tens to hundreds of billions of dollars to install nationwide, before the first penny went to infrastructure investment. Nonetheless, the mileage tax advocates have not yet addressed these "extraneous" components of transportation efficiency.

A Better Option

A better option is to raise the fuel tax. The role of the fuel tax in generating future transportation revenue has been downplayed, despite the following:

- A key benefit is that the fuel tax conveys social equity—those who choose to drive large or ineffi-

PHOTO: JIM GRONEWEG

The American Trucking Associations support increases in fuel taxes to generate revenue for transportation improvement projects.

cient vehicles pay more in fuel taxes. In tolling systems, large, inefficient cars pay the same toll as small, efficient cars.

◆ Whether measured in gallons, kilowatts, or therms, all forms of energy easily can be commoditized and monetized, making the potential migration to alternative fuels a viable opportunity for taxes.

◆ The apparent obsolescence of the fuel tax derives from data that reflect a federal fuel tax that has not increased since 1993, and from a slowing growth in fuel consumption, primarily the result of the economic recession. Neither of these situations is likely to be permanent.

Additionally, in relation to commercial transportation, the traditional tax methodology has the flexibility to respond to alternative fuels and to improvements in vehicle efficiency, as well as to the potential changes in truck sizes and weights—necessary if the nation is to meet the challenges of moving more freight in a more congested environment, while enhancing highway safety. Federal and state fuel taxes, heavy vehicle use taxes, and federal excise taxes all create flexibility vis-à-vis incentives and penalties for various transportation solutions.

Refocusing the Discourse

A recalcitrant populace and tax-averse politicians are primarily responsible for the current funding shortfall. Frustration has pushed transportation agencies toward less desirable fundraising strategies and to multigenerational agreements that eliminate future flexibility. But sidestepping critical public debate on public taxation is not justifiable. To rechristen a tax as a user fee—or to move legislative debate or referenda to a five-person tolling authority simply to avoid public participation processes—is again disingenuous.

For these and other reasons, the national discourse has shifted focus from fuel tax increases to creative financing alternatives. Nonetheless, many local and national organizations—including the American Trucking Associations—support increases in fuel taxes. The first challenge is to develop agreement and collaboration among stakeholders on how and where to invest future revenues.

This requires expanding the research to resolve politically sensitive incongruities. For example, what is the cost and benefit of enforcing a user-pays measure on the millions of vehicles now exempt from the fuel tax—owned by charities, government, transit companies, emergency services, and driver education fleets? How much is known about transportation's indirect social and economic benefits, which are reaped by businesses and special populations alike?

A Rational Strategy

Research and guidance on infrastructure capacity improvements are lacking. Not-in-my-backyard pressure appears to take precedence over the need for technical assessments on where new infrastructure can be built, or where lane capacity can be improved, or where to construct double-deck roads. Shortly after the I-35 bridge collapse in 2007, the Minnesota Department of Transportation used white paint to increase lane capacity on I-94 by 25 percent. Could similar innovations offer additional benefits?

Research shows that system users typically are aware of the costs and benefits of the various creative financing strategies—and find them dubious. The nation's inability to raise new revenue may result less from the technicalities of revenue generation tools and more from the lack of a logical relationship between dramatic price increases and meaningful transportation benefits.

By linking the public's trust—and money—to a rationalized transportation strategy, America's leaders can regain the political will and the confidence that they are doing the right thing for the country. Resisting easy, short-term, creative financing proposals; identifying and implementing infrastructure-oriented solutions; and seamlessly transferring system management responsibilities to future generations of transportation users and decision makers are today's imperatives.

POINT OF VIEW presents opinions of contributing authors on transportation issues. The views expressed are not necessarily those of TRB or TR News. *Readers are encouraged to comment in a letter to the editor on the issues and opinions presented.*

Investing in Our Transportation Future

Bold Ideas to Meet Big Challenges

The challenges faced by transportation researchers, practitioners, and administrators—transportation's role in the economy, zero-fatality goals for highways, targets for climate change reduction efforts, preservation of infrastructure, and more—and the bold ideas to meet these challenges were highlighted at the Transportation Research Board's 89th Annual Meeting, January 10–14, 2010, in Washington, D.C. More than 10,000 transportation professionals from 65 countries came together for approximately 3,000 presentations at more than 600 workshops and sessions, plus 350 committee meetings, special events, awards presentations, and more. Approximately 65 sessions and workshops addressed the meeting's theme, "Bold Ideas to Meet Big Challenges."

The meeting presented an opportunity for transportation professionals from across the globe to exchange ideas and share research across all modes and disciplines. At a Welcome Session for Annual Meeting newcomers, committee chairs made informal presentations on their areas. After the session, approximately 370 people expressed an interest in becoming involved in the committee process.

Visual aids and recordings of video and audio from 45 sessions were posted online as e-sessions at www.TRB.org, and 1,900 papers were included in the 2010 Annual Meeting Compendium of Papers DVD.

The 2010 Thomas B. Deen Distinguished Lecture was delivered by Martin Wachs of the RAND Corporation. U.S. Secretary of Transportation Ray LaHood was the featured speaker at the Chairman's Luncheon, which included major award presentations.

Details and highlights appear on the following pages.

1 U.S. Transportation Secretary Ray LaHood (*center*) answers media questions after speaking at the Chairman's Luncheon; in reviewing his priorities, the Secretary emphasized the need to prevent distracted driving.

2 The Transportation Network Modeling Committee was one of more than 350 committees and task forces that met at the TRB 89th Annual Meeting, many attracting full rooms of observers.

Annual Meeting photographs by Cable Risdon Photography

TRB 2010 ANNUAL MEETING HIGHLIGHTS

INTERSECTIONS

1 New attendees hear a briefing by committee leaders in the Social, Economic, and Cultural Issues Section at the Welcome Session, which introduces newcomers to TRB's many committees, activities, and networking opportunities.

2 Between sessions, Jalil Kianfar, University of Missouri (*left*), consults the Annual Meeting interactive program with Omidreza Shoghli and Mohammadsaied Dehghanisanij (*right*) of Virginia Tech.

3 The TRB Technical Activities Council met to review the current status of initiatives and to plan for the coming year and the 2011 meeting—TRB's 90th.

3 TRB Technical Activities Council: (*front row, left to right*) Cynthia J. Burbank, Parsons Brinckerhoff, Inc.; Jeannie G. Beckett, Beckett Group; Robert C. Johns, Volpe National Transportation Systems, Chair; Katherine F. Turnbull, Texas Transportation Institute; Mary Lou Ralls, Ralls Newman, LLC; (*back row, left to right*) Mark R. Norman, TRB; Daniel S. Turner, University of Alabama; Edward V. A. Kussy, Nossaman, LLP; Peter F. Swan, Pennsylvania State University; Peter B. Mandle, Jacobs Consultancy, Inc.

4 At a session that showcased the SHRP 2 Collaborative Decision-Making Framework web tool, Matt Day, ICF International (*left*); Craig Cooper, Pikes Peak Area Council of Governments; and Margie Sheriff, Federal Highway Administration (*right*) experiment with the program on the computers provided.

5 At poster sessions, attendees reviewed research displays and directly interacted with authors of papers.

6 Tanju Sofu, Argonne Transportation Research and Analysis Computing Center, explains his organization's work to Scott Ornitz, Florida Department of Transportation (DOT), in the exhibit hall.

7 At an informal meeting of international leaders, Magda Kopczynska of the European Commission discusses collaboration in transportation research between Europe and the United States.

TRB 2010 ANNUAL MEETING HIGHLIGHTS

1 U.S. DOT leaders included (*from far left*) David Grizzle, Federal Aviation Administration; David Strickland, National Highway Traffic Safety Administration (NHTSA); Anne S. Ferro, Federal Motor Carrier Safety Administration; Joseph Szabo, Federal Railroad Administration (FRA); Robert Rivkin, U.S. DOT Chief Counsel; Polly Trottenberg, Office of the Secretary of Transportation; Roy W. Kienitz, Under Secretary for Policy; Victor Mendez, FHWA; Peter H. Appel, Research and Innovative Technology Administration; David T. Matsuda, U.S. Maritime Administration; Craig Middlebrook, Saint Lawrence Seaway Development Corporation; and Peter M. Rogoff, Federal Transit Administration.

SPOTLIGHT SESSIONS

1 Members of the new U.S. Department of Transportation (DOT) leadership team communicated visions, plans, and priorities for federal transportation programs and policies at a special Annual Meeting session.

2 FRA Administrator Joseph Szabo outlined key goals for rail programs at the Meet the U.S. DOT Leadership session.

3 David Strickland, newly sworn-in as head of NHTSA, briefed the audience on the future of highway safety.

4 Rodolfo Sabonge of the Panama Canal Authority presents information on expansion of the Panama Canal and its potential impact on U.S. ports.

5 Earl Easton, U.S. Nuclear Regulatory Commission, addresses the state of nuclear power generation and its implications for transportation in the United States.

6 Rakesh Shalia, FedEx, presents the integrated carrier perspective at one of four sessions on What Lessons Has the Freight Transportation Sector Learned from the Global Economic Crisis?

7 Rongfang (Rachel) Liu, New Jersey Institute of Technology, speaks at Bold Ideas and Big Challenges: Transportation Infrastructure in China.

8 Lee Schipper, University of California, Berkeley, moderates How to Achieve a Global Low-Carbon Transport System by 2050.

9 Catherine Ross, Georgia Institute of Technology (*far right*), discusses megaregions with panelists (*left to right*) Mark Pisano, University of Southern California; Jos Arts, Rijkswaterstaat; and William Lyons, Volpe Center.

TRB 2010 ANNUAL MEETING HIGHLIGHTS

SESSIONS AND WORKSHOPS

1 Larry Sutherland, Parsons Brinckerhoff, examines crash modification factors at the Highway Safety Manual Introductory Training session, one of the Human Factors Workshops held Saturday, January 9.

2 Leslie Ann McCarthy, Villanova University, moderates Flexible Pavement Design Sensitivity Analysis with Mechanistic–Empirical Pavement Design Guide.

3 Bernard Igbafen Izevbekhai, Minnesota DOT, details MnROAD research in a two-part session on Highway Noise and Pavement Parameters.

4 Rebecca Sanders, University of California, Berkeley, guides a workshop on Improving University Pedestrian and Bicycle Transportation Education.

5 Kristine Williams (*standing*), University of South Florida, and Jimmy Isonhood, Mississippi DOT, explore Legal Considerations in Corridor Projects and Access Control.

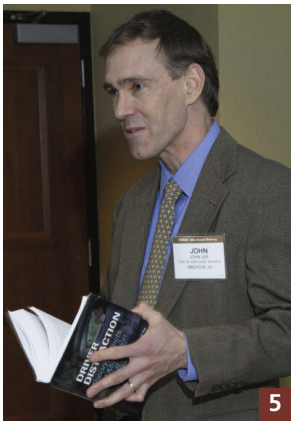
6 Thomas Hicks, Maryland DOT, addresses Human Factors Road Design Guidelines: Use by Highway Designers and Traffic Engineers.

7 Ed Moreland, American Motorcyclist Association, speaks at the second part of the Motorcycle and Roadway–Roadside Panel.

8 Don Shanis, Delaware Valley Regional Planning Commission (*right*), presents the Philadelphia-area perspective at Innovative Funding and Financing Mechanisms: Implications for Long-Range Planning.

9 Communicating with John and Jane Public competition finalists and presenters (*left to right*): Public Involvement in Transportation committee members Jennifer L. Weeks, PB, and Judy Meyer, Public Information Associates; Carol Doering, Sound Transit, winner; Lisa Horanyi, RideShare/Thomas Jefferson Planning District Commission; Brandi Steffen, CH2M Hill; Tony Mendoza, Metro Portland; Michael Culp, FHWA; and Planning and Environment Group Chair Katherine F. Turnbull, Texas Transportation Institute.

TRB 2010 ANNUAL MEETING HIGHLIGHTS



9 Margarida C. Coelho, University of Aveiro, Portugal, discusses a poster on vehicle energy use and safety systems with Gopal Duleep, ICF Consulting.

10 Guntur Sugiyarto, Asian Development Bank (*right*), listens as Orlando Strambi, University of São Paulo, describes his findings on the effects of a bus rapid transit system on emissions.

SESSIONS AND WORKSHOPS
(continued)

1 Speakers at Performance Specifications for Geosynthetics in Highway Projects (*left to right*): Barry Christopher, Christopher Consultants; Mark Morvant, Louisiana Department of Transportation and Development; Daniel Enrique Alzamora, FHWA; Silas Nichols, FHWA; and Khalid A. Farrag, Gas Technology Institute.

2 Daniel McGehee, University of Iowa, presides over discussion at Analysis Planning for SHRP 2 Naturalistic Driving Study.

3 Maria Vegega, NHTSA, guides a session on International Perspectives on Impaired Driving.

4 Paul Leiby, Oak Ridge National Laboratory, addresses the energy security implications of biofuels at Trade-Offs and Complementarities Between Energy Security, Carbon Mitigation, and Sustainability.

5 John D. Lee, coeditor of *Driver Distraction: Theory, Effects, and Mitigation*, discusses his book at a meet-the-author session.

6 Rini Sherony, Toyota Technical Center, asks a question at Distracted Driving: Findings from Human Factors and Crash Investigation Research.

7 Stephanie Binder, NHTSA, responds to audience questions at the Distracted Driving session.

8 Jennifer Hopp, University of Maryland, participates in a question-and- answer session at Medicine Versus Public Health: Divergent Approaches to the Regulation of Driver Competency.

TRB 2010 ANNUAL MEETING HIGHLIGHTS

SESSIONS AND WORKSHOPS
(continued)

1 Brian L. Smith, FHWA, moderates Erosion Issues in Transportation.

2 Richard Christenson, University of Connecticut, explains his project on smart damping technologies, developed under the NCHRP Innovations Deserving Exploratory Analysis program.

3 Hamid Ghasemi, FHWA, presents information on the Status of FHWA's Long-Term Bridge Performance Program.

4 Cindy Menches, University of Texas at Austin, addresses contracting strategies at Management of Maintenance Contracts, Quality Assurance, and ITS Devices.

5 Xiaodun Sun, University of Louisiana, presides over Traffic Safety and Traffic Management in Developing Countries.

6 Mathieu Dunant, Règie Autonome des Transports Parisiens, describes safety measures on the Paris Metro at Urban Rail Safety: A Global Perspective.

7 Aviation Risk and Recovery Assessments examined topics such as airport disaster preparedness and airport rescue and fire fighting regulations.

8 Lucas Franck, The Seeing Eye, Inc., guides the dialogue on Roundabouts and Pedestrians with Disabilities: Continuing the Discussion.

9 Gordon Mott, Association of American Railroads, speaks about positive train control safety and economics at Positive Train Control: Meeting the Mandate.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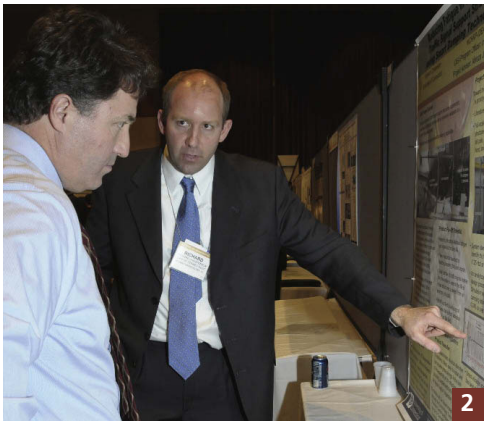
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7 Panelists for Aviation Risk and Recovery Assessments (*left to right*): Robert E. David, RED & Associates, Inc.; Arnab Majumdar, Imperial College London; James Fielding Smith, American Public University System; and Gloria Bender, TransSolutions.


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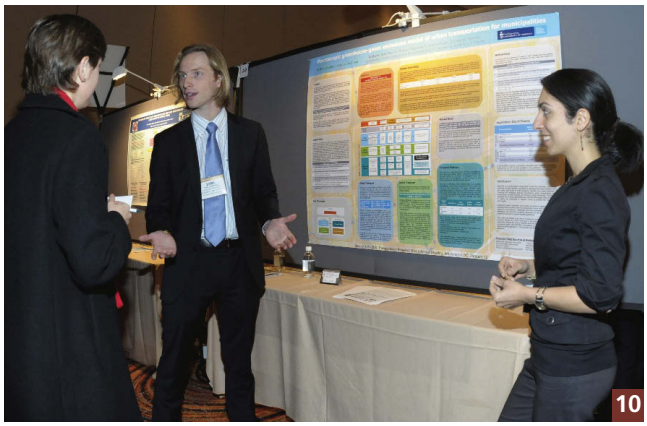
10 Sybil Derrible and Sheyda Saneinejad (*right*), University of Toronto, discuss their paper on a macroscopic greenhouse gas emissions model at a poster session on Current Issues in Transportation and the Environment.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TRB 2010 ANNUAL MEETING HIGHLIGHTS

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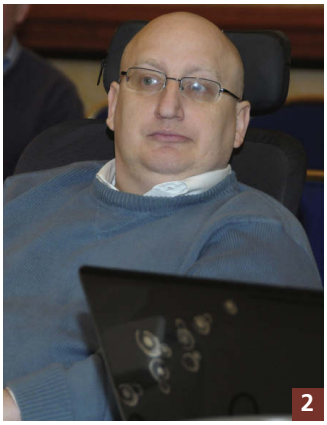
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11 Roundabouts Task Force Chair Eugene Russell, Kansas State University (*right*), presents Leif Ourston, Ourston Roundabout Engineering, with a recognition.

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COMMITTEE MEETINGS

1 Janette Sadik-Khan, New York City DOT, chairs a meeting of the Transportation Issues in Major U.S. Cities Committee.

2 Scott Windley, U.S. Access Board, meets with the Highway Safety Manual Task Force.

3 Properties of Concrete Committee chair Tara Cavalline, University of North Carolina at Charlotte, reviews agenda items.

4 Asha Weinstein Agrawal, San Jose State University, participates in a discussion with the Transportation Education and Training Committee.

5 Consultant James E. Bryden conducts the inaugural meeting of the Positive Protection in Work Zones Joint Subcommittee.

6 Mark L. Reno, Quincy Engineering, Inc., leads the Structures Collaboration Subcommittee.

7 Data and Information Systems Section Chair Johanna P. Zmud, NuStats, LLC (*left*), receives a poster of appreciation from Reginald R. Souleyrette, Iowa State University.

8 Highway Safety Workforce Development Task Force Chair Susan Herbel, Cambridge Systematics, Inc., chats with members.

9 Barbara Martin offers insights at a meeting of the Maintenance and Operations Personnel Committee.

10 Soil Mechanics Section Chair Njoroge W. Wainaina, North Carolina DOT (*right*), and Foundation of Bridges and Other Structures Committee Chair Mark Morvant (*left*) present Brent Robinson with the section's best paper award.

TRB 2010 ANNUAL MEETING HIGHLIGHTS

EXHIBITS

1 The well-trafficked Exhibit Hall featured displays from more than 150 organizations and businesses.

2 Exhibits allowed attendees to discuss transportation-related products and services with vendors.

OUTSTANDING PAPER AWARDS

3 The Pyke Johnson Award recognizes outstanding papers in the field of transportation systems planning and administration.

3 A team of researchers from University of California, Irvine, received the Pyke Johnson Award for their paper, "Environmental Impacts of a Major Freight Corridor: A Study of I-710 in California." With TAC Chair Robert C. Johns (*left to right*): R. Jayakrishnan, Soyoung (Iris) You, Stephen Ritchie, Jean-Daniel Saphores, and Gunwoo Lee.

4 D. Grant Mickle Award winners for best paper on operation and maintenance of transportation facilities were Richard W. Jenney, Jr., Iteris, Inc. (*left*); Eddie Curtis, FHWA; and Larry Head, University of Arizona.

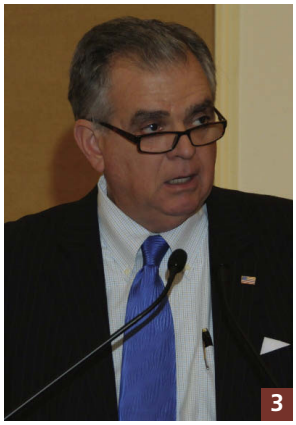
5 Ida van Schalkwyk (*left*), Karen Dixon, and Bob Layton of Oregon State University won the K. B. Woods Award for their paper, "Balancing Urban Driveway Design Demands Based on Stopping Sight Distance."

6 The authors of the Patricia F. Waller Award-winning paper, "Safety Effectiveness of HAWK Pedestrian Treatment," are Kay Fitzpatrick (*left*) and Eun Sug Park, Texas Transportation Institute.

7 Adam Millard-Ball, Stanford University, received the Fred Burggraf Award, which honors papers by young researchers, for "Cap-and-Trade: Five Implications for Transportation Planners."

8 Terry McNinch (*left*) and Timothy Colling, Michigan Technological University, received the Charley V. Wootan Award for an outstanding paper in policy and organization.

TRB 2010 ANNUAL MEETING HIGHLIGHTS



CHAIRMAN'S LUNCHEON

1 Adib Kanafani, 2009 Executive Committee chair, speaks at the Chairman's Luncheon.

2 U.S. Transportation Secretary Ray LaHood (*left*), chats with Institute of Medicine President Harvey Fineberg, representing the National Research Council.

3 In his address, LaHood discussed the American Recovery and Reinvestment Act and key U.S. DOT initiatives.

AWARDS

4 Suzanne Schneider, TRB Associate Executive Director (*left*) presents the Sharon D. Banks Award for Innovative Leadership in Transportation to Michael S. Townes, president and CEO, Hampton Roads Transit.

5 Kumares C. Sinha, Olson Distinguished Professor of Civil Engineering, Purdue University, received the Roy W. Crum Distinguished Service Award.

6 David L. Huft, Research Program Manager and Intelligent Transportation Systems Coordinator, South Dakota DOT (*left*), receives the W. N. Carey, Jr., Distinguished Service Award from Michael R. Morris, 2010 Executive Committee chair.

7 TAC chair Robert C. Johns (*left*); Thomas B. Deen, former TRB Executive Director; and 2009 Executive Committee chair Adib Kanafani (*right*); present Martin Wachs, RAND Corporation (*second from left*), with the Deen Distinguished Lectureship plaque.

8 Wachs delivers the Thomas B. Deen Distinguished Lecture on "Transportation Policy, Poverty, and Sustainability: History and Future."

Committees Salute Long-Term Leaders

TRB awarded emeritus membership to 3 individuals at the 2010 Annual Meeting, honoring significant, long-term contributions and outstanding service on technical activities committees. The honorees and their committees are

John M. Burns, Jr.
(deceased November 2009)
Committee on Maintenance Equipment

Nathan A. Gartner
Committee on Traffic Flow Theory and Characteristics

Barbara A. Petrarca
Committee on Landscape and Environmental Design

Scott Bradley, Minnesota DOT (*left*); Stephen Maher, TRB; and Elizabeth Hilton, FHWA (*right*) present an Emeritus Membership certificate to landscape architect Barbara A. Petrarca (*second from right*).

Executive Committee Gains New Leaders

Michael R. Morris, Director of Transportation, North Central Texas Council of Governments (NCTCOG), is the 2010 Chair of the TRB Executive Committee. He succeeds Adib Kanafani, Cahill Professor of Civil Engineering, University of California, Berkeley. Neil J. Pedersen, Administrator, Maryland State Highway Administration (SHA), is the 2010 Vice Chair.

2010 Executive Committee Chair Michael R. Morris presents a plaque honoring 2009 Chair Adib K. Kanafani for his leadership.

Transportation director since 1990 for the North Central Texas Council of Governments—the metropolitan planning organization for the Dallas–Fort Worth area—Morris has guided implementation of the Regional Transportation Plan, the Transportation Improvement Program, and air quality–related transportation control measures in the State Implementation Plan. Previously, he held responsibilities as transportation planner, senior transportation planner, and assistant director of transportation at NCTCOG.

In 1994, Morris received the Transportation Engineer of the Year Award from the Institute of Transportation Engineers; he was presented with the Texas Department of Transportation Road Hand Award in 1995. At TRB, he is a member of the Executive Committee's Subcommittee on Planning and Policy Review. He earned a master's degree in civil engineering from the State University of New York at Buffalo in 1979 and is a registered professional engineer in the state of Texas.

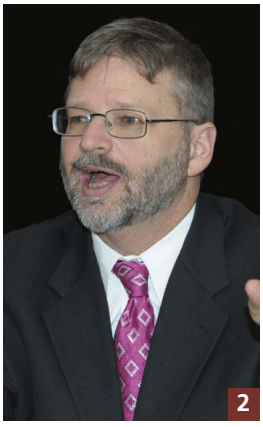
Before becoming Maryland SHA Administrator in 2003, Pedersen was Director of the Office of Planning and Preliminary Engineering and Deputy Administrator and Chief Engineer for Planning and Engineering. Projects under his watch have included the Woodrow Wilson Bridge Project in metropolitan Washington,

(continued on page 42)

U.S. DOT LEADERSHIP PANEL

At a meeting of the Executive Committee, a panel of new U.S. DOT administrators gathered to brief TRB leaders on federal transportation policies and programs. Panelists included

1. John D. Porcari, Deputy Secretary of Transportation;
2. Roy W. Kienitz, Under Secretary of Transportation;
3. Polly Trottenberg, Assistant Secretary for Transportation Policy;
4. Peter H. Appel, Administrator, Research and Innovative Technology Administration;
5. Peter M. Rogoff, Administrator, Federal Transit Administration;
6. Gregory G. Nadeau, Deputy Administrator, Federal Highway Administration (FHWA);
7. David Grizzle, Chief Counsel, Federal Aviation Administration; and
8. David T. Matsuda, Deputy Administrator, U.S. Maritime Administration.



TRB 2010 ANNUAL MEETING HIGHLIGHTS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EXECUTIVE COMMITTEE

1 2009 Chair Adib Kanafani guides the Executive Committee through an ambitious agenda.

2 Michael Morris engages in a dialogue with the U.S. DOT panelists.

3 TRB Executive Director Bob Skinner presents a review of the past year and a preview of the next.

The Executive Committee gained several new members in 2010. These included

4 Beverly A. Scott, Metropolitan Atlanta Rapid Transit Authority;

5 Douglas W. Stotlar, Con-Way, Inc.;

6 Daniel Sperling, University of California, Davis; and

7 David Seltzer, Mercator Advisors LLC.

8 Sandra Rosenbloom, University of Arizona, Tucson, is the Executive Committee's International Secretary.

9 Neil J. Pedersen, Maryland State Highway Administration, is the 2010 Executive Committee Vice Chair.

10 Past Chair Debra L. Miller, Kansas DOT, reports on the Subcommittee on Planning and Policy Review.

Also participating in Executive Committee meeting business were

11 Anne S. Ferro, Federal Motor Carrier Safety Administration;

12 Therese W. McMillan, Federal Transit Administration;

13 Randell H. Iwasaki, California Department of Transportation; and

14 Rear Admiral Kevin Cook, U.S. Coast Guard.

(continued from page 40)

D.C., and the planning and building of the Intercounty Connector, which links I-270 with I-95 north of the Capital Beltway.

Pedersen, who has a TRB service record of more than 30 years, chairs the Second Strategic Highway Research Program Technical Coordinating Committee for Capacity Research. He chaired the Technical Activities Council from 2005 to 2008 and has served on many TRB committees and panels. He is active in the American Association of State Highway and Transportation Officials (AASHTO) and chairs the Executive Board of the I-95 Corridor Coalition, a group of transportation agencies from 16 states, the District of Columbia, and two Canadian provinces. A Massachusetts native, Pedersen has two undergraduate degrees from Bucknell University and a master's degree in civil engineering from Northwestern University. He received the Thomas H. MacDonald Award from AASHTO in 2007 and the George S. Bartlett Award from TRB, AASHTO, and the American Road and Transportation Builders' Association in 2006.

U.S. Transportation Secretary Ray LaHood confers with 2010 Executive Committee Chair Michael R. Morris after LaHood's address at the Chairman's Luncheon.

Newly appointed to the Executive Committee are Beverly A. Scott, General Manager, Metropolitan Atlanta Rapid Transit Authority; David Seltzer, Cofounder, Mercator Advisors; Daniel Sperling, Interim Director, Energy Efficiency Center, and Professor, University of California, Davis; and Douglas W. Stotlar, President and CEO, Con-way Inc. Reappointed members of the Executive Committee are J. Barry Barker, Executive Director, Transit Authority of River City; Tracy L. Rosser, Vice President, Corporate Traffic Department, Wal-Mart Stores, Inc.; and C. Michael Walton, Ernest H. Cockrell Centennial Chair of Engineering, University of Texas at Austin.

EXECUTIVE COMMITTEE

(*continued*)

1 Susan Martinovich, Nevada DOT, offers insights at the Executive Committee meeting.

2 Michael Meyer, Georgia Institute of Technology, reports on an Executive Committee–sponsored study that examined directions for research on climate change and energy.

3 Edward (Ned) Helme, Center for Clean Air Policy, reports on the Copenhagen Climate Change Conference.

4 Joris Al, Rijkswaterstaat, briefs the Executive Committee on the progress of Kilometerprijs, a nationwide congestion pricing system in the Netherlands.

5 Robert C. Johns, Volpe Center, describes Technical Activities Council plans for 2010.

6 James Jensen, the National Academies' Director of Congressional and Government Affairs, updates the Executive Committee on science- and technology-related initiatives in Congress.

7 TRB Technical Activities Director Mark Norman presents statistics indicating another successful Annual Meeting.

Expanding International Transport Research Collaboration

Working Group Presents Findings

G. A. GIANNOPOULOS AND O. A. ELRAHMAN

Giannopoulos is Head, Hellenic Institute of Transport, Thessaloniki, Greece, and Past President, European Conference of Transport Research Institutes (ECTRI). Elrahman is Head, Research Coordination and Technology Transfer, Transportation Research and Development, New York State Department of Transportation, Albany.

This article is based on the main findings and recommendations of the TRB-ECTRI Working Group on European Union (EU)–U.S. Transport Research Collaboration. The authors were cochair and corapporteur, respectively, of the working group.

In January 2006, the European Conference of Transport Research Institutes (ECTRI) and the Transportation Research Board (TRB) signed a memorandum of understanding to foster international collaboration in transport research. Complementing the memorandum of understanding was an action plan—to be renewed every 2 years—that called for the formation of a joint working group on transport research collaboration between the European Union (EU) and the United States.

The working group examined the issues of transport research collaboration on both sides of the Atlantic, considered and discussed issues of research management and governance, and investigated ways and procedures to effect closer collaboration. Formed under Article 10 of the action plan, the working group came to be known as Working Group 10 (see box, page 49).

Global Marketplace

Transport innovation in global markets and modern economies affects the dynamics of international collaboration in transport research. Knowledge is the most important resource in modern economies; innovation is the result of well-funded research that makes use of appropriate research infrastructures.

Transport connects markets, enabling the purchase, production, accumulation, and distribution of raw materials or finished products. International transport research collaboration can develop and operate safer and more efficient transport systems to serve the needs of national and international markets.

Markets also have contributed to the development of transport, often with government involvement. The innovations range from automated signals to composite materials. In addition, the accelerated

Jean-Pierre Médevielle, French National Institute for Transport and Safety Research (*left*), Georgios Giannopoulos, then-president of ECTRI, and TRB Executive Director Bob Skinner display the Memorandum of Understanding between TRB and ECTRI, signed at the 2006 TRB Annual Meeting.

PHOTO: GERALD L. NINO

A U.S. Customs and Border Patrol agriculture specialist uses digital imagery to examine a shipment; innovations and new technologies affect all transactions in the global marketplace.

development and deployment of innovations and technologies on a global scale have streamlined solutions to many of the most significant problems in surface transport.

The global market plays a twofold role in transport research and innovation. First, transport research and innovation are influenced by industry policies and the socioeconomic goals of consumers, customers, and voters. The industry participates in research and innovation through structured, organizational mechanisms. Second, transport research and innovation influences the supply of transport products and services and may help to shape demand. The government's role is apparent in both the demand and the supply sides of the market.

Effective partnerships between government and the private sector can nurture innovations, so that benefits flow directly to the innovators and are distributed across the public domain. Optimizing public–private involvement in transport research and innovation and making the research results available to the marketplace in an entrepreneurial way—to motivate and drive innovations—is a strong reason to support international transport research collaboration and exchange.

Identifying Barriers

A truly international or even global undertaking in transport research faces significant hurdles. First, the political support for research is changeable, and access to capital and to scientific and technical talent varies worldwide. Second, the globalization of transport research and development could threaten domestic research and product development networks, limiting government and commercial support. Third, research cooperation on an international scale usually is limited to problems or questions that no single nation has sufficient resources to investigate. Transport research issues are international in this sense but are often divisible and can be approached on smaller scales.

The following represent additional barriers to effective international research collaboration:

- The high costs of information and data;
- The complexity of the transactions, with several organizations and parties involved;
- Differences in regulations governing intellectual property;
- Cultural differences;
- The capacity of large countries to proceed alone, without partners;
- Institutional inertia and differences in institutional cultures; and
- Labor issues.

Overcoming the Barriers

According to the Working Group 10 report, these barriers can be overcome by adding several key ingredients for successful international research collaboration:

- A strategic convergence of individual and collective interests among partners focused on the scientific or technical issue in question;
- Clearly defined goals and principles for collaboration;
- Clear ground rules for interaction among partners, such as a formal agreement, memorandum of understanding, or other guidance;

Michael D. Meyer, Georgia Tech (*left*), TRB Executive Director Bob Skinner, and Josef Mikulik, CDV, Czech Republic, and former Vice Chair of ECTRI, participate in the International Research Roundtable at the 2007 TRB Annual Meeting.

- The inclusion and involvement of stakeholders;
- The participation of champions, or advocates, who are critical in ensuring the successful launch of the partnership and the elimination of barriers;
- An inclusive, participatory decision-making process that establishes all partners as owners of the process, with a stake in the success of the partnership;
- An agreement about the initial sources of funds and about how the partnership will sustain itself;
- A clear pattern for the distribution of benefits among the partners;
- An organizational structure or procedures for the management and operation of the partnership;
- A clearly defined way to evaluate results;
- A seamless communication link, functioning vertically and horizontally, to coordinate the research partners; and
- Transnational research networks to build connections, create communities of practice, and facilitate the strategic convergence of individual and collective interests.

Structures and Drivers

The institutional structures for collaboration can be classified as follows:

1. Ad hoc and informal collaborations between individuals;
2. Partnerships taking advantage of special relationships or arrangements between the cooperating research organizations;
3. Formal partnerships between umbrella organizations representing many members;
4. Newly formed lead organizations for joint research and funding from public or private sources; and
5. International mechanisms that encourage research cooperation in particular topics and policy areas.

Despite several successful examples, collaborative research and technological innovation on an international scale require enabling frameworks. The frameworks should not always rely on governments or the public sector but must include private funding and market-approved processes.

Finding the drivers to make the frameworks operationally viable is important. Several expected drivers for international research collaboration, however, have proved to be myths—that is, despite expectations, they did not produce an increase in international collaborative projects. These myths include the Internet, national interests, geographical proximity, and historical relations.

John F. Munro, Federal Highway Administration, speaks at a session on International Research Collaboration at the 2009 TRB Annual Meeting.

Models for International Collaboration

The report identifies six models of international collaboration in transport research and technological development:

1. *Organized, centralized, and institutionally driven collaborative research and technological development.* Government entities direct the collaboration by identifying the objectives, strategic goals, and agenda. The governments provide the means for accomplishing the agenda. The Joint Transport Research Center of the Organisation for Economic Co-operation and Development and the International Transport Forum is an example of this model.
2. *Foreign investments by national programs.* By hiring foreign researchers, national transport research and technological development programs can optimize resources through less costly rates and can expand the pool of talent.

(continued on page 48)

Participants in the International Technology Scanning Program visit the Stoke Pathfinder Project in Stoke-on-Trent, England.

Engaging the International Research Community

To serve the international transportation research community, TRB facilitates transportation research efforts abroad and assists in disseminating the research results worldwide. At the TRB Executive Committee level, Sandra Rosenbloom, University of Arizona, serves as the international secretary. The International Activities committee, chaired by Jorge A. Prozzi, University of Texas at Austin, sponsored or cosponsored more than a dozen sessions, committee meetings, and events at the 2010 TRB Annual Meeting, including an International Participants' Reception, a session on Global Road Safety, and a session on Key Findings from a Scan to India.

Jorge Prozzi, University of Texas at Austin, speaks at the 2008 TRB Annual Meeting.

Data Analysis Working Group

Through its international forums, the TRB Data Analysis Working Group (DAWG) facilitates a discussion of pavement performance data analysis methods. DAWG has offered two forums in 2010: a recent meeting took place January 9 in Washington, D.C., immediately before the TRB Annual Meeting; the second is scheduled for August 4 in São Paulo, Brazil, as part of the 2nd International Conference on Transport Infrastructures. Presentations at these forums address the technical interests of professionals from around the globe who are engaged in pavement research, design, maintenance, and rehabilitation; in collecting, processing, and analyzing pavement data; and in developing insights into the behavior of pavements.

Strategic Highway Research

The Second Strategic Highway Research Program (SHRP 2) has developed strong connections with the international transportation research community through partnerships with international organizations for joint research programs and through information and personnel exchange agreements:

- In April 2008, SHRP 2 signed a memorandum of understanding (MOU) with the Korean Institute of Construction and Technology Evaluation and Planning to exchange information on initiatives of mutual interest.
- In October 2008, SHRP 2 signed an MOU with the Swedish Governmental Agency for Innovation (VINNOVA) and the Swedish Road Administration (Vagverket) to encourage interaction and the exchange of information and personnel—particularly in road safety and naturalistic driving research.
- In January 2010, SHRP 2 signed an MOU with the Finnish Road Administration to field-test SHRP 2 research results on the nondestructive testing of tunnel linings.
- In 2008, SHRP 2 and the Federation of European Highway Research Laboratories held joint symposia on nondestructive testing in Slovenia and in Washington, D.C. Two more symposia on long-life bridges are planned for 2010 and 2011 in Brussels, Belgium, and Washington, D.C., respectively.
- In October 2009, an international workshop in Vancouver, Canada, convened through a SHRP 2 partnership with the Joint Organisation for Economic Co-operation and Development (OECD)–International Transport Forum Transport Research Committee to study the reliability of surface transport networks.
- In 2010 and 2011, Canada will undertake a naturalistic driving study in conjunction with the SHRP 2 research effort.
- Canada and the Netherlands have loaned visiting professionals to the SHRP 2 team in Washington, D.C.
- SHRP 2 is a member of the European PROLOGUE naturalistic driving study advisory board.

Chang-se Kim, President, Korea Institute of Construction and Transportation Technology Evaluation and Planning (KICTEP), visited Washington, D.C. in April 2008 to sign a memorandum of understanding between KICTEP and TRB's Second Strategic Highway Research Program.

Database Exchanges

Since the 1970s, TRB's Transportation Research Information Services (TRIS) Database[1] and International Transport Research Documentation (ITRD) Database[2] have cooperated by exchanging records. Produced in conjunction with the OECD Joint Transport Research Centre and managed at Transport

[1] http://tris.trb.org.
[2] www.itrd.org.

Research Library, Limited, in the United Kingdom, ITRD is a cooperative worldwide database of information on transportation, comprising records of published research contributed institutions from 25 countries. Record inputs are made in one of four languages—English, French, German, or Spanish—and a four-language thesaurus is used to index the publications for the database.

TRB participates in the ITRD Operations Committee and works with ITRD members on improving access to transportation research worldwide. The TRIS database, which now contains almost 750,000 records, is one of the largest contributors to ITRD. TRIS supplies records of U.S.-published transportation research made available to member countries and to the public through commercial vendors, and ITRD supplies TRIS with English-language records. These records and the TRIS Database are now available to TRB sponsors on TRISWorld,[3] as well through commercial vendors.

*Visiting professional Ralph Hessian (*left*) and SHRP 2 consultant Andrew Horosko (*center*) bring Canadian perspectives to TRB projects. Hans van Saan (*right*) is a visiting professional from the Netherlands.*

Technology Scans

The International Technology Scanning Program, conducted by the Federal Highway Administration (FHWA) in cooperation with the American Association of State Highway and Transportation Officials and the National Cooperative Highway Research Program, has four scanning tours planned in 2010:

- Outdoor Advertising Control: Best Practices, Policy, and Implementation, March 11–28, in Sweden, the United Kingdom, the Netherlands, and Australia.
- Understanding the Policy and Program Structure of National and International Freight Corridor Programs, April 16–May 2, in Belgium, the Netherlands, Germany, Poland, and Hungary.
- Flexible Geometric Design Practices to Improve the Performance of Freeway Facilities, June, locations to be determined.
- Successful Infrastructure Countermeasures to Mitigate Motorcycle Fatalities, September, locations to be determined.

[3] http://trisworld.trb.org.

PHOTO: FEDERAL HIGHWAY ADMINISTRATION

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Team members in the International Technology Scanning Program test a driving simulator at the Monash University Accident Research Centre, Australia, in 2008. The findings of this study were released in the report, "Improving Safety and Mobility for Older Road Users in Australia and Japan."

ECTRI Working Group 4 considers "soft research" infrastructures, which include libraries, databases, and computer-linked networks; access to these is a critical issue for international collaborative research.

(continued from page 45)

3. *Spontaneous, dynamic, researcher-to-researcher collaboration.* Researchers from several countries come together to share ideas and exchange best practices.

4. *Distributed collaboration among several government entities using a common management structure.* Needs are identified at the individual investigator level, and strategic directions are identified at the management level.

5. *Information exchanges on technologies and best practices involving one or more host countries and an information-seeking technical delegation.* Technology scanning programs provide a forum for the exchange, adaptation, and adoption of advanced information.

6. *International information exchange programs.* International technology exchange programs established at the state and national levels can create formal and informal exchanges of information. Twinning is a method of exchange that establishes relationships between agencies and organizations that have similar responsibilities.

The vision of effective international collaboration involves many countries and many stakeholders; a focus on regional issues and challenges; efficient coordination between advanced and less advanced regions; a diversified research infrastructure and multiple structures of governance; and a single labor market for researchers.

Research Governance and Financing

Finding common ground and compatibility in research governance and financing at the international level can foster efforts and breakthroughs by overcoming current barriers. Possible efforts include the following:

- Facilitating the issuance and evaluation of international research bids;
- Finding ways to combine international sources of finance to fund specific, common research programs;
- Developing shared rules for the allocation and commitment of research funds;
- Finding common procedures for administering and monitoring international research projects;
- Setting commonly acceptable procedures for evaluating research results; and
- Establishing common rules for intellectual property rights and the implementation of research results.

To achieve a collaborative environment, each of these issues must be addressed through a concerted effort.

Privately funded collaboration must present clear market advantages to all parties—that is, beneficial opportunities must be available to all; in some instances, opportunities may arise as a result of services provided during the research. Parties should consider joint ventures, partnerships, and marketing agreements.

Road to Successful Collaboration

In its report, Working Group 10 recommends several drivers for international collaboration:

- *Creating enabling policies.* Successful collaboration requires national policies to alleviate concerns about intellectual property rights, to create standards and common frameworks for the conduct of research, and to take into consideration the market's role in fostering innovations. Policies also can establish incentives to stimulate funding for cooperation. An executive-level approach can dismantle barriers to cooperation that involve prohibitive costs and conflicting approaches to intellectual property rights. Enabling policies must allow for the mobility of scientists across borders.
- *Mobilizing human capital.* The recruitment, training, and involvement of new scientists and the strengthening of the collaborative capacity of working scientists are key endeavors. Training and education should target governance and management, as well as global issues, such as climate change and sustainability. Communication across cultures is a key technique, because collaboration involves mutual understanding and the establishment of positive interactions. Cultural competency and sensitivity can lead to successful cross-cultural collaboration.

◆ *Building collaboration mechanisms and joint programs.* Decisions at the leadership level will result in clearly defined goals, processes that reduce barriers and enhance synergy, and fair partnerships that rely on credible champions and institutions. Eventually this will lead to joint programming, with shared calls for proposals and shared work programs. Successful case studies can serve as guiding examples. At the same time, professional networks can bring researchers in contact with each other across national borders. Strengthening the capacity of these networks and creating mechanisms to cultivate new and productive collaboration are recommended.

◆ *Systematically addressing the barriers.* Working systematically to develop and foster policies and mechanisms for cooperation will overcome the major barriers to international transport research collaboration.

◆ *Improving data management and sharing.* Improved data management and sharing is essential for successful international collaboration. Developing the infrastructure for data management and sharing is imperative. Free access to soft research infrastructures—for example, libraries and databases—is a critical issue to address. Creating shared standards for technical documentation would facilitate collaboration, as would the establishment of common practices.

Laying the Groundwork

Preparations for joint programming and funding would entail the following:

◆ Intergovernmental decisions to facilitate international calls for research and the evaluation of the responses;

◆ Ways to merge international sources of finance to fund specific research programs;

◆ Common rules for the allocation and commitment of research funding;

◆ Common administration and monitoring procedures for international research projects;

◆ Commonly acceptable procedures for the evaluation of research results; and

◆ Common rules for intellectual property rights and the implementation of research findings.

Education and Training

Three initiatives are recommended in the critical areas of education and training:

◆ Exchanges at the doctorate and postdoctorate levels to train and educate the new generation of scientists in internationally oriented transport research;

◆ The development of research administrators or research managers who are trained in strategic and operational research governance, preferably at an internationally funded and supervised training academy; and

◆ The development of a professional certification for international research work.

Substantial Benefits

Government administrations that are interested must work closely and consistently toward these goals to build a productive environment for research cooperation. The result will be substantial benefits for all countries involved, as well as the furtherance of international and global cooperation and development.

The globalization of transport research can produce a more closely intertwined cooperation among transport communities and can help in taking full advantage of all the other economic and developmental benefits of globalization in all sectors of the economy.

The full report is posted online at http://onlinepubs.trb.org/onlinepubs/general/EU-USResearch.pdf and at http://www.ectri.org/.

TRB-ECTRI Working Group 10 on EU-U.S. Transport Research Collaboration

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* Main authors of the final report.

CALENDAR

May

19–20 Toward Better Freight Transportation Data: A Research Road Map
Irvine, California

19–21 4th International Conference on Transportation Finance: Forging a Sustainable Future—Now
New Orleans, Louisiana

30–June 2 Safety and Mobility of Vulnerable Road Users: Pedestrians, Motorcyclists, and Bicyclists*
Jerusalem, Israel
Richard Pain

June

2–4 National Road Pricing Conference*
Houston, Texas

2–4 TRANSED 2010: 12th International Conference on Mobility and Transport for Elderly and Disabled People*
Hong Kong, China

2–5 4th International Symposium on Highway Geometric Design*
Valencia, Spain

3–5 GeoShanghai 2010 International Conference*
Shanghai, China

6–10 Environment and Energy Research Conference*
Raleigh, North Carolina

8–10 Joint Conference of Harbor Safety Committees and Area Maritime Security Committees*
Jersey City, New Jersey

8, 10 FEHRL–SHRP 2 Joint Symposium on Long-Lived Bridges
Brussels, Belgium

21–24 North American Travel Monitoring Exposition and Conference (NATMEC): Improving Traffic Data Collection, Analysis, and Use
Seattle, Washington
Thomas Palmerlee

29–July 1 Transforming the Marine Transportation System: A Vision for Research and Development*
Irvine, California
Joedy Cambridge

July

11–14 TRB Joint Summer Meeting
Minneapolis, Minnesota

11–14 49th Annual Workshop on Transportation Law
Newport, Rhode Island

11–15 5th International Conference on Bridge Maintenance, Safety, and Management*
Philadelphia, Pennsylvania

August

23 Asset Management in a World of Dirt*
Oklahoma City, Oklahoma
G. P. Jayaprakash

September

4 Pavement Performance Data Analysis Forum
São Paulo, Brazil
A. Robert Raab

15–17 International Conference on Sustainable Concrete Pavement Technologies: Practice, Challenges, and Directions*
Sacramento, California

22–24 10th National Conference on Transportation Planning for Small and Medium-Sized Communities: Tools of the Trade
Williamsburg, Virginia

22–24 Symposium on Mineral Aggregates in Transportation
Charleston, South Carolina

October

10–13 9th National Conference on Access Management*
Natchez, Mississippi

11–13 European Transport Conference*
Glasgow, Scotland

18–19 Transportation Systems for Livable Communities Conference
Washington, D.C.

24–27 19th National Rural Public and Intercity Bus Transportation Conference
Burlington, Vermont

24–29 Pavement Evaluation 2010*
Roanoke, Virginia

Additional information on TRB meetings, including calls for abstracts, meeting registration, and hotel reservations, is available at www.TRB.org/calendar. To reach the TRB staff contacts, telephone 202-334-2934, fax 202-334-2003, or e-mail lkarson@nas.edu. Meetings listed without a TRB staff contact have direct links from the TRB calendar web page.

*TRB is cosponsor of the meeting.

RESEARCH PAYS OFF

Jointless Bridge Research Pays Dividends for Vermont

CHAD A. ALLEN

The author is a Geotechnical Engineer for the Vermont Agency of Transportation, Montpelier.

Jointless bridges—often referred to as integral abutment bridges—have a superstructure that is cast integrally with the substructure, eliminating costly expansion joints and bearings. The Vermont Agency of Transportation (VTrans) had used jointless bridge designs since the late 1970s, but in 1999, the agency formed an Integral Abutment Committee (IAC) to codify a measured, analytical, and multidisciplinary approach to jointless bridge design and construction. The committee included representatives from the Hydraulics, Structures, Soils and Foundations, Contract Administration, and Construction sections of VTrans, as well as from the Federal Highway Administration.

Problem

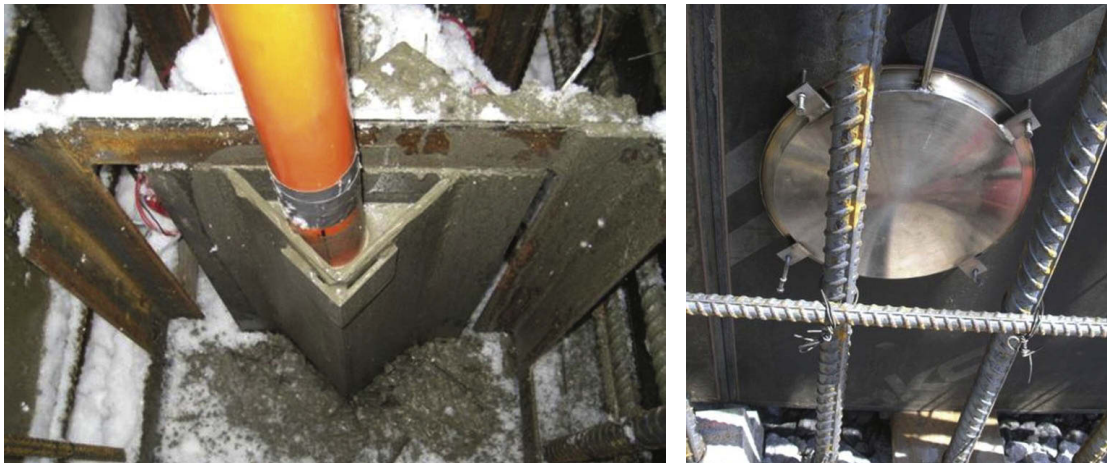
VTrans has constructed several jointless bridges in the past 10 years, finding the structures more advantageous than conventional abutment bridges. The advantages of jointless bridges often include one or more of the following:

The curved-girder, two-span continuous structure in Stockbridge has a total length of 69 meters.

The 37-meter-long East Montpelier Bridge is part of ongoing research to establish design guidelines for integral abutment bridges.

- **Reduced environmental impacts**—abutments farther from the stream banks minimize the effects on stream water and a longer superstructure allows more room below for wildlife passages;
- **Lower construction costs**—placing the abutments farther away from the stream often eliminates the need for cofferdam construction;
- **A more rapid construction schedule**—fewer piles need to be driven; and
- **Elimination of costly future maintenance repairs**, which can affect users—perhaps the primary benefit. Without the need for expansion joints and bearings, costly, complicated, and time-sensitive maintenance activities are eliminated.

Nonetheless, VTrans engineers often have struggled with how best to approach the design of jointless bridges, because no quantitative data are available, and the American Association of State Highway and Transportation Officials offers no specific guidelines for integral abutment design. Without fully developed design guidelines and construction plans and specifications, the benefits of jointless bridges may not be fully realized.



Two instrumentation features of the Stockbridge structure: (*left*) top view of inclinometer casing and (*right*) earth pressure cell.

Solution

A literature search, conducted when the IAC was being formed, found that designs of jointless bridges often were selected simply "because they work." A drawback to this approach is that the structure may not represent the most economical or efficient design; moreover, the safety factors may be undetermined.

With input from the IAC, VTrans initiated a research project, Performance Monitoring of Jointless Bridges, to gain a thorough understanding of how jointless bridges respond to thermal movements and to dead and live loads in a northern climate. The primary research objectives were to provide VTrans engineers with the knowledge and quantitative data to design and construct cost-effective, efficient, safe, reliable, and low-maintenance structures.

The research project comprises three phases. Phases I and II, completed by Wiss, Janney, Elstner Associates in 2002, included a formal literature search and the development of an instrumentation plan. The total cost of Phases I and II was $64,267.

VTrans applied the information and knowledge gained from the research to develop design guidelines, contract plans, and specifications. The agency has used these documents to build several integral abutment bridges since 2002. The design guidelines and construction specifications have been revised to reflect qualitative assessments of construction experiences and field performance.

The 2010 VTrans *Structures Manual* will include guidelines and procedures for integral abutment design developed from the Phase I research. With the application of the Phase I research findings, integral abutment bridges have become the preferred structures at VTrans.

Application

The University of Massachusetts–Amherst is conducting the Phase III research. The research scope includes modifications to the Phase II instrumentation plans, installation and monitoring of instrumentation, data analysis and reduction, and preparation of a final report. Phase III should be completed in February 2013, with an estimated cost of $558,341. The new research findings will serve as the foundation for future revisions of the design

TABLE 1 Estimated Construction Savings for Phase III Integral Abutment Bridges

	East Montpelier	Stockbridge	Middlesex
Total project cost, as bid	$2,369,907	$4,155,879	$2,254,458
Savings by category:			
Cofferdam construction	$100,000	$150,000	——— [a]
Substructure concrete and reinforcing	$250,000	$308,000	$140,000
Steel piling	$ 25,000	$310,000	——— [b]
Granular backfill	$ 22,000	$ 33,000	$ 35,000
Excavation	——— [c]	$ 20,000	$ 40,000
Total savings	$397,000	$821,000	$215,000
Savings from project bid	16.8%	19.8%	9.5%

[a] Conventional abutment did not require a cofferdam.
[b] Conventional abutment would have utilized a spread footing foundation.
[c] Excavation savings are included in the cofferdam construction savings, noted above.

guidelines for integral abutment bridges.

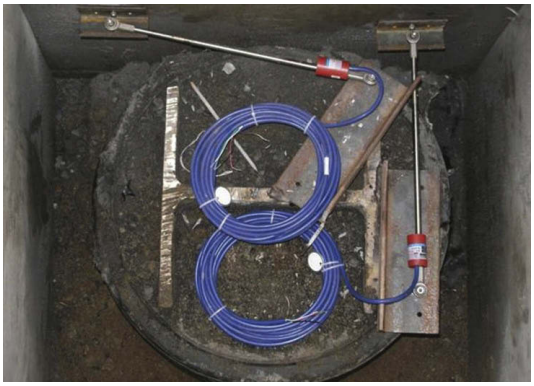
The Phase III research involves three bridges: a straight bridge with a 43-meter span in Middlesex; a 37-meter-long bridge with a 15° skew in East Montpelier; and a curved-girder, two-span continuous structure with 11.25° of curvature and a total length of 69 meters in Stockbridge. Instrumentation includes pile and girder strain gages, earth pressure cells, displacement transducers, inclinometers, tiltmeters, and thermisters.

Benefits

The primary benefit expected from this research is the development of design standards from a comprehensive analysis of performance data, producing designs that can maximize efficiency, as well as identify and mitigate known risks. Ancillary benefits include refining construction details and specifications to avoid unnecessary claims related to these structures.

Tangible economic benefits include reductions in maintenance and construction costs. The construction cost savings result from eliminating cofferdams and from using less concrete and reinforcing steel in the substructure and superstructure. The integral abutments have a typical height that is less than that of a conventional abutment, reducing the quantity of excavation and backfill materials. In addition, integral abutments require fewer piles for support than do conventional abutments.

Indirect benefits include savings from a more rapid construction schedule, which decreases user costs; fewer environmental impacts—for example, less sediment pollution of streams; and better access under the bridge for wildlife passage, because the structures are longer. Preserving the environment is a key task in the agency's mission; however, the cost savings from the reduction in environmental impacts are not easily quantified.



Crack meters in reference pile enclosures measure the longitudinal and lateral displacements on East Montpelier Bridge.

Strain gauges (*left*) close up and (*right*) installed on H-piles for Middlesex Bridge.

VTrans engineers therefore calculated the project cost savings by comparing the estimated costs for constructing conventional abutments on the three Phase III bridges with the costs for the integral abutments. The differences between the estimated costs and the actual construction costs in five categories are reported in Table 1 (page 52). The data do not include the reduced construction and maintenance costs from the elimination of expensive bearings and joints; therefore, the direct project-related savings reflect only a portion of the cost savings.

The construction savings shown in Table 1 total more than $1.4 million—more than twice the cost of the entire Performance Monitoring of Jointless Bridges research project. The savings are directly attributable to the application of the Phase I research findings.

When Phase III is completed in 2013, the final research report from the University of Massachusetts will document the results of the field monitoring program. The report will be used to validate current VTrans jointless bridge design practices, using 3-D finite element models developed for each bridge, and will recommend changes to VTrans construction plans and specifications.

For more information, contact Chad A. Allen, Quality Engineer, Vermont Agency of Transportation, Materials and Research Section, 1 National Life Drive, Montpelier, VT 05633; 802-828-6924; chad.allen@state.vt.us.

EDITOR'S NOTE: Appreciation is expressed to Stephen Maher and G. P. Jayaprakash, Transportation Research Board, for their efforts in developing this article.

Suggestions for "Research Pays Off" topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, Keck 488, 500 Fifth Street, NW, Washington, DC 20001 (202-334-2952; gjayaprakash@nas.edu).

Karla Karash

TranSystems

As an undergraduate studying civil engineering at the Massachusetts Institute of Technology (MIT), Karla Karash developed an interest in transportation planning, cultivated by teachers such as Joseph Sussman and Alan Altshuler. When she received a master's degree in 1970, however, the United States was in the midst of a recession; Karash went to work as a computer programmer for the Massachusetts Bay Transportation Authority (MBTA) instead.

"Fortunately, this was the time of the Boston Transportation Planning Review—a major restudy of highway and transit plans in the Boston region," notes Karash. Loaned to the restudy consultant team by MBTA, Karash spent long hours at a commercial computer center, submitting jobs on punch cards to execute the four-step travel demand forecasting process. She also advocated for better transportation for an emerging group of senior citizens and persons with disabilities. In 1973, she joined Engineering Computer International, which later became Multisystems, and still later, TranSystems; she got her start in public transportation by designing a bus system for the city of Pittsfield, Massachusetts.

"Making the connections between modes work is one key to a great public transportation system."

Karash then became project manager for Transporting the Handicapped and Elderly of Massachusetts (THEM), a private, nonprofit group in Massachusetts that sponsored services for senior citizens and persons with disabilities. With federal grants from the Administration on Aging, THEM planned and funded many transit and paratransit services through collaborations with regional planning agencies. Later, services were taken over by the newly formed Regional Transit Authorities.

In 1974, Karash joined the Massachusetts Executive Office of Transportation and Construction—now the Massachusetts Department of Transportation—under Altshuler, who was the commonwealth's Secretary of Transportation from 1971 to 1975. After 1975, Karash continued to serve Secretary Fred Salvucci and Undersecretary Daniel Brand as an assistant secretary, in what she describes as "the job of a lifetime." She oversaw the formation and policy development of most of the Massachusetts Regional Transit Authorities and the launch of The Ride—the MBTA's paratransit service—and of the state vanpool program.

Brand encouraged participation in TRB activities, recalls Karash: "He told us that we could attend other conferences, but our first priority had to be TRB meetings. Part of the excitement of my early career was getting involved in TRB activities, soaking up information from paper presentations and committee meetings, and meeting many of the giants in the field."

While completing her doctorate in civil engineering at MIT, Karash worked for or took courses from transportation research leaders such as Michael Meyer, Nigel Wilson, Moshe Benekiva, and Steve Lerman. In her dissertation, presented in 1983, she combined transportation and market research to study the impacts of transportation programs on Boston's retail area. She later served as a visiting lecturer on market research at the MIT Sloan School of Business.

In 1983 Karash joined MBTA as deputy director of operations, assisting with the opening of the Red Line rail extension to Alewife, considerable expansion of The Ride, an expansion of personnel training to enhance transit security, an increase in commuter boat service, and the implementation of computerized scheduling service.

Karash rejoined MultiSystems (now TranSystems) in 1995, and is now a principal and senior vice president. Her recent work includes the development of a strategic transit master plan for the Nashville, Tennessee, metropolitan region; a plan for transit service improvements in Hartford, Connecticut; and a plan for improvements to Hartford's historic Union Station. "I am glad for the opportunity to work for a full-service transportation firm like TranSystems, as it gives me access to experts in other modes of transportation. Making the connections between modes work is one key to a great public transportation system," Karash notes.

After serving several times as a Transit Cooperative Research Program (TCRP) project panelist and as a principal investigator, Karash observes that TCRP has worked wonders for the industry: "Now we have access to tools that help us understand customer satisfaction, how transit and land-use decisions affect each other, how to make transit safer, what increases ridership, and more. I use these tools constantly in advising clients."

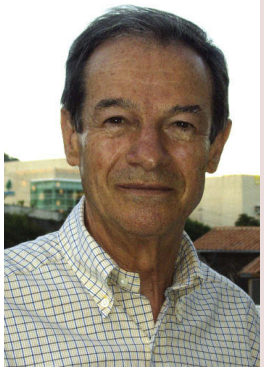
At TRB, Karash has chaired the Public Transportation Group and the Transit Marketing and Fare Policy Committee; from 2007 to 2010, she was a member of the Technical Activities Council. Her published papers include "Exploring Market Support for New Products and Services for Transit and Walking: New Market Research Approach" with Matthew A. Coogan and Thomas Adler, 2007; "An Application of the Lens Model in Measuring Retail Attractiveness and the Effects of Alternative Public and Private Policies on a Retail Area," 1985; and "MBTA Red Line Extension Operating Plan" with Alan H. Castaline and William G. Stead, 1985.

Cesar Queiroz

Consultant

In 2006, after two decades as the highways adviser and in other senior positions with the World Bank, Cesar Queiroz began working as an international consultant on roads and transportation infrastructure, an assignment that has taken him to more than 15 countries. His areas of expertise include highway public–private partnerships, road management and development, public expenditure optimization, pavement design and evaluation, port reform and rehabilitation, performance-based contracts, governance improvement, and quality assurance and evaluation.

A native of Brazil, Queiroz received a bachelor's degree in civil and electrical engineering from the Federal University of Juiz de Fora in 1967 and a master's degree in production engineering from the Federal University of Rio de Janeiro in 1972. As a new college graduate and assistant to the head of the Federal Highway District (Departamento Nacional de Estradas de Rodagem, or DNER) in Resende, Rio de Janeiro, Queiroz supervised the rehabilitation of part of the Rio–São Paulo highway and the design and construction of bridges. He then led the Road Maintenance and Construction District of DNER; he oversaw the conversion of federal road maintenance for 120 km of roads from a force account to a private-sector contract and the design and construction of 50 km of asphalt overlays, 100 km of unpaved roads, and an 8-km bypass in Volta Redonda.



"While a genius like Einstein could do it all alone and have the results of his research disseminated worldwide, mere human beings like most of us can get more impact from their research by associating with other colleagues and institutions."

As senior road research engineer at the Brazilian Transportation Planning Agency (Grupo Executivo de Integração da Política de Transportes, or GEIPOT) in Brasilia, Queiroz directed the road maintenance and performance studies of a $15 million project sponsored by the Brazilian government, the United Nations Development Programme, and the International Bank for Reconstruction and Development. He also guided the development of pavement performance prediction models for road management and implemented the rod and level method for calibrating response-type roughness measuring systems.

Queiroz received a doctorate in civil engineering from the University of Texas at Austin in 1981; that same year, he became deputy director of the Brazilian Road Research Institute in Rio de Janeiro and managed projects such as the World Bank–financed implementation of a nationwide pavement management and monitoring system; a comprehensive study of vehicle and axle loads in Brazil; and, with the University of São Paulo, the development of a linear displacement integrator, which is now used to measure road and airport runway roughness. In 1982, he directed the International Road Roughness Experiment, a joint effort of Brazil, France, the United Kingdom, the World Bank, and the University of Michigan; the results included the development of the international roughness index.

Queiroz came to Washington, D.C., in 1986 to work for the World Bank. As highway engineer, Transport Program team leader, and highways adviser, Queiroz identified and conducted transportation and infrastructure projects in nations including Russia, Serbia and Montenegro, Estonia, and Latvia. After the collapse of the Soviet Union in the early 1990s, Queiroz managed a $1.05 billion portfolio of World Bank loans to the Russian highway sector. He also led several multidisciplinary overseas missions that integrated disciplines such as transportation engineering and economics, the environment, and human resources.

Throughout his career, Queiroz has continued to teach. While in college, he worked as a high school physics teacher; he has served as guest lecturer at many institutions worldwide since then. He is visiting professor at the University of Belgrade and a lecturer in the Minerva Program at George Washington University in Washington, D.C. "While a genius like Einstein could do it all alone and have the results of his research disseminated worldwide, mere human beings like most of us can get more impact from their research by associating with other colleagues and institutions," advises Queiroz, who has published two books and more than 130 papers and articles.

Queiroz's contributions to transportation development and research have been recognized with the Brazilian Ministry of Transportation's Maua Medal in 1984 and a certificate of appreciation from the International Road Federation in 1990. He was elected a member of the Russian Academy of Transport in 1994, and in 2000 received a Performance Award from the World Bank. His TRB activities have included the steering committees for the Eighth and Ninth International Low-Volume Roads Conferences (2001–2003 and 2004–2007), the Pavement Management Systems Committee (2000–2006), and the Flexible Pavement Design Committee (1991–1996). From 1988 to 1995 he was a member of the Strategic Highway Research Program's Long-Term Pavement Performance Advisory Committee.

NEWS BRIEFS

PHOTO: OREGON DOT

Solar panels provide power to light the I-5–I-205 Interchange in Portland, Oregon.

Oregon Powers Up the Solar Highway

The Oregon Department of Transportation (DOT) unveiled the I-5–I-205 Interchange Demonstration Project in December 2008, applying solar power to light a busy Interstate interchange in the Portland metropolitan area. The solar photovoltaic project features 594 solar panels that produce nearly 112,000 kWh per year; the project uses the utility grid as a battery, gathering energy during the day to light the interchange at night. Oregon DOT is working with its partners to expand the solar highway concept, with a goal of lighting the state's entire transportation system with renewable energy.

Allison Hamilton, Solar Highway Program manager in Oregon DOT's Office of Innovative Partnerships and Alternative Funding, introduced the idea after noticing that several European countries were using the sun to reduce their reliance on traditional energy sources. "People sometimes laugh when I mention the Oregon solar highway, because most people believe we live in a rainforest, with little to no sun," Hamilton admits. She notes, however, that Germany has installed more new solar energy systems per capita than any other country—yet Berlin receives less sun than Oregon's cloudiest location.

"Solar energy is, in fact, the most abundant renewable energy resource in Oregon," Hamilton points out. She estimates that solar arrays installed on rights-of-way on less than 1 percent of the state's nearly 19,000 lane miles could supply all of the transportation system's power needs—about 50 million kWh annually.

Oregon has required state agencies to show significant progress toward meeting their electrical needs with 100 percent renewable resources. Oregon DOT pursued a public–private partnership, working with Portland General Electric (PGE) to pioneer a utility solar business model that uses the 50 percent Oregon Business Energy Tax Credit, the 30 percent Federal Investment Tax Credit, accelerated depreciation, and utility incentives to finance solar projects for the public sector. Oregon DOT pays no more for the solar energy than it would otherwise pay for power from the grid.

The Oregon Solar Highway has received a Judge's Award for Environmental Excellence from the Federal Highway Administration and a 2009 Solar Business Achievement Award from the Solar Electric Power Association.

For more information about the Oregon Solar Highway, contact Shelley M. Snow, 503-986-3438, shelley.m.snow@odot.state.or.us, or visit www.oregonsolarhighway.com.

Models Suggest Technological Aid in Emergency Situations

Simulations by the Southwest Research Institute (SRI) show that the behavior of drivers equipped with smart phones can be modified to improve traffic flow and decrease congestion. SRI developed the simulation models based on the San Antonio highway system to study the effectiveness of smart phone technology in mass evacuations of urban areas. Using agent-based modeling techniques that combine elements of game theory, complex systems, emergence, computational sociology, multiagent systems, evolutionary programming, and Monte Carlo methods to produce randomness, the SRI models simulate the actions and interactions of vehicles under extreme conditions.

When a disaster occurs in an urban area, evacuation routes can quickly become clogged with traffic, increasing the risk of injury and death. SRI's models can analyze how the conditions are affected when some vehicles are provided with an evacuation route via smart phone.

For more information, visit www.swri.org.

INTERNATIONAL

Bus System Garners Sustainable Transportation Honor for India

The Institute for Transportation and Development Policy presented the city of Ahmedabad, India, with the 2010 Sustainable Transport Award for the successful implementation of Janmarg, India's first full bus rapid transit (BRT) system. The award honors a city that uses innovations in transportation to increase traveler mobility and safe access for pedestrians and cyclists, while reducing transportation-related air pollution and greenhouse gas emissions. Residents and travelers in Ahmedabad quickly adopted the BRT system—a few months after its opening, Janmarg is now used by 18,000 passengers per day. The system features central median stations located away from junctions, and bus stations with passive solar design that keeps stations naturally and inexpensively cool. The city of Ahmedabad also is incorporating high-quality pedestrian facilities and bicycle lanes and has initiated car-free days.

For more information on the Sustainable Transport Award, visit www.st-award.org.

RUSSIA DEBUTS HIGH-SPEED RAIL—Russian Railways inaugurated its high-speed Sapsan train service between Moscow and St. Petersburg in December 2009. Named for the peregrine falcon—the world's fastest-flying bird—the Sapsan service carried more than 77,000 passengers in its first month of operation, with an average daily passenger count of around 2,500. Produced by Siemens Transportation Systems, the Sapsan is a Velaro RUS series high-speed electric train and can travel at speeds of up to 250 km/h. The 10-carriage trains run three times daily, departing simultaneously from St. Petersburg and Moscow in the morning, afternoon, and evening. First-class tickets are 5,300 rubles ($180) and second-class tickets are 3,300.20 rubles ($112).

SEGWAYS FOR AIRPORT SAFETY—Federal police at Düsseldorf International Airport, Germany's third-largest airport, are conducting a trial of Segway human transporters to monitor criminal activity more efficiently inside airport terminal buildings. The Segways allow officers to move quickly—up to 13 miles per hour—and add about 8 inches to officers' heights, creating a stronger security presence in the airport. The vehicles also are equipped with driver helmets, flashing lights, sirens, and first-aid kits. The test phase ends in June; if it is successful, police officials will deploy Segways at other transportation facilities, such as train stations. The vehicles have received a positive response from police officers—the number of officers who wanted to test the Segways was greater than the number of machines available during the test phase.

TRB Tapped for Study on Unintended Acceleration

Responding to concerns of unexplained acceleration in automobiles, Transportation Secretary Ray LaHood announced in March that the U.S. Department of Transportation will sponsor an industrywide investigation of unintended acceleration and electronic vehicle controls, to be conducted by the National Research Council's Transportation Research Board and Division on Engineering and Physical Sciences.

Experts selected to participate in the 15-month study will review automotive industry and government efforts to identify causes of unintended acceleration, with a focus on electronic control systems. The study also will consider human error, mechanical failure, and possible sources of electronic interference with control systems.

The expert committee will recommend ways for the National Highway Traffic Safety Administration (NHTSA) to use regulations, research, and postmarket investigations of defects to ensure the safety of electronic throttle control and of other electronic systems in motor vehicles.

LaHood also has initiated a separate, shorter study to examine unintended acceleration in Toyota vehicles. Engineers from the National Aeronautics and Space Administration with expertise in computer-controlled electronic systems will conduct the NHTSA-commissioned probe. The study is expected to be completed by the end of this summer.

The cost of the two studies is approximately $3 million, which includes the purchase of cars that have allegedly experienced unintended acceleration. Both inquiries will be peer-reviewed.

For more information contact Maureen O'Leary, National Academies Office of News and Public Information, moleary@nas.edu or 202-334-3875.

COORDINATING AIRPORT RESEARCH—(*Left to right:*) Gina Marie Lindsey, Los Angeles World Airports; Paula Hochstetler, Airport Consultants Council; and Lourdes Maurice, Federal Aviation Administration, discuss Airport Cooperative Research Program (ACRP) projects for the coming year at the ACRP Oversight Committee meeting, January 29 at The National Academies' Keck Center in Washington, D.C. ACRP anticipates a budget of $15 million for fiscal year 2010.

INNOVATION DEMONSTRATION—Rob Ayers, Ayers Electronic Systems, LLC, demonstrates a transit communications interface profiles (TCIP)–based passenger information and vehicle tracking system to the members of the Transit Innovations Deserving Exploratory Analysis (IDEA) panel, February 17 at the Keck Center. The system converts proprietary vehicle tracking data to TCIP, merges the tracking data with a TCIP-based automatic vehicle locator, and uses the data to provide information to passengers via electronic display. The Transit IDEA project is being field-tested at the central bus station of the LYNX transit system in Orlando, Florida. The screen shows up-to-date bus schedules, with space below the timetable display for video advertisements and emergency information.

Annual Meeting Attendee Helps Save Traveler's Life

While attending the TRB 2010 Annual Meeting in Washington, D.C., transportation engineering student Chilan Ta—with companion Michelle Kleisath—rescued a handicapped woman who had fallen onto the tracks at Metro's Union Station. Ta, a graduate student at the University of Washington in Seattle, was in the station January 13 when the woman's motorized wheelchair toppled from the platform onto the tracks. Kleisath climbed down to the tracks and recruited bystanders to help pull the woman and her chair to the platform, and Ta ran to alert the Metro station manager of the accident. The station manager contacted the Metrorail operations center, which cut power to the third rail and stopped the driver of a train bound for Shady Grove from entering the station. Emergency personnel took the woman to a hospital.

Ta coauthored "Building Freight Transportation System Resilience: Actions for State Departments of Transportation," with Professor Anne Goodchild and Barbara A. Ivanov of the Washington State Department of Transportation; the paper was presented at a January 11 session on Freight Transportation Economics, Planning, and Logistics.

IN MEMORIAM

M. Gordon (Reds) Wolman, 1924–2010

M. Gordon (Reds) Wolman at the 2003 TRB Annual Meeting.

M. Gordon (Reds) Wolman, internationally renowned geography expert and former TRB Executive Committee member, died February 24 in Baltimore, Maryland, at the age of 85. His research on the physical characteristics of river channels transformed geomorphology—the study of the evolution of land features—and was instrumental in developing the methods of the discipline and its quantitative framework. Wolman's career at Johns Hopkins University (JHU) spanned five decades and was characterized by hands-on teaching methods and strong support for interdisciplinary studies: in 1970, he combined JHU's Department of Geography with its Department of Sanitary and Water Resources to create the Department of Geography and Environmental Engineering, which he then chaired for 20 years. He preferred to teach out in the field, conducting many lessons outdoors on creek banks.

"He was one of a kind—a compassionate eccentric with a wicked sense of humor and the capacity to get to the point without unnecessary circumspection," remembers Geoffrey Hewings of the University of Illinois at Urbana–Champaign, who with Wolman served on the National Research Council (NRC)–appointed Committee on the St. Lawrence Seaway: Options to Eliminate Introduction of Nonindigenous Species into the Great Lakes.

Known as Reds for his red hair, Wolman grew up in Baltimore, the son of pioneering sanitary engineer and JHU professor Abel Wolman. In 1949, after serving in the U.S. Navy in World War II, Wolman graduated from JHU with a degree in geology. He began working for the U.S. Geological Survey in 1951 and received a PhD in geology from Harvard University in 1953. Wolman returned to JHU in 1958 as a professor; he worked alongside his father at JHU until Abel Wolman's death in 1989. In 1964, Wolman published *Fluvial Processes in Geomorphology* with colleagues Luna Leopold and John Miller. The text is a seminal work in the study of geomorphology. In his research, Wolman addressed the central problem of whether river channels are shaped more by smaller, regular flows, or by severe, rare events such as flooding from storms. He determined that the regular flows are the most instrumental in creek bed formation—results that have formed the basis of modern river theory.

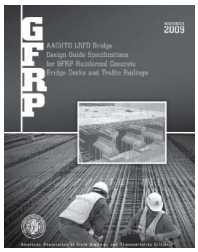
For Wolman, research also provided an impetus to action. He applied his expertise to water stewardship efforts, and in the 1960s, a report he wrote—showing how runoff from construction projects in Maryland clogged streams with sediment—led to state regulations. He was a strong advocate for the Chesapeake Bay watershed, and from 2003 to 2008 headed the Advisory Committee on the Management and Protection of the State's Water Resources, after a drought depleted Maryland's reservoirs.

In 1988, Wolman was elected to the National Academy of Sciences, and in 2002, to the National Academy of Engineering. From 2000 to 2003, he was a member of the TRB Executive Committee and of the Subcommittee for National Research Council Oversight. Wolman was a recipient of the Benjamin Franklin Medal in Earth and Environmental Science in 2006, the Geological Society of America's (GSA) Penrose Medal, and the American Geophysical Union's Horton Medal. He was a past president of GSA and served the U.S. National Member Organization for the International Institute for Applied Systems Analysis.

"He got right to the heart of an issue without offending any who might have different views," recalls Frank Millerd of Wilfrid Laurier University in Waterloo, Ontario. "He was also very humble."

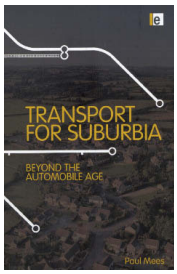
Aside from his geological work, Wolman was a self-described "cow nut" who went to the Maryland State Fair each year to see the livestock. He is survived by his wife, Elaine, and four children.

BOOK SHELF



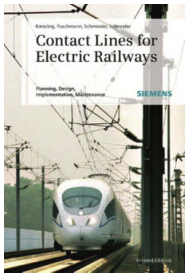
AASHTO LRFD Bridge Design Guide Specifications for GFRP-Reinforced Concrete Bridge Decks and Traffic Railings, First Edition
American Association of State Highway and Transportation Officials (AASHTO), 2009; 68 pp.; AASHTO member, $75; nonmembers, $90; 1-56051-458-9.

Glass fiber–reinforced polymer (GFRP) is an alternative material for producing reinforcing bars for concrete structures. GFRP has advantages over steel reinforcement—it is noncorrosive and nonconductive. Because of other differences between the physical and mechanical behavior of GFRP materials and steel, however, guidance on engineering and building concrete bridge decks and railing reinforced with GFRP bars is needed. AASHTO's guide specifications describe the unique material properties of GFRP composites and outline provisions for the use of GFRP in bridge and railing design and construction.



Transport for Suburbia: Beyond the Automobile Age
Paul Mees. Earthscan, 2010; 225 pp.; $65; 978-1-84407-740-3.

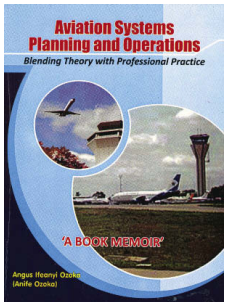
The growing costs of automobile-dominated cities—on the environment, sustainability, and health—offer an argument for moving beyond the automobile age. The author outlines this argument and advances practical recommendations for making such a change, contending that it is possible to implement public transportation in large, nonurban areas. The network transportation model proposed in this volume is based on one that has proved to work in rural Switzerland, Brazil, and the Canadian cities of Toronto and Vancouver. Considerations of politics, network planning, markets, public transportation, pedestrian travel, and cycling are incorporated in this volume.



Contact Lines for Electric Railways: Planning, Design, Implementation, Maintenance
Friedrich Kiessling, Rainer Puschmann, Axel Schmieder, and Egid Schneider. Wiley, 2009; 994 pp.; $145; 978-3-89578-322-7.

Electric traction is an economic and environmentally friendly power supply for electric railways, but its reliability depends largely on contact lines, which must operate in all climates and weather conditions with as little maintenance as possible. Extreme demands arise when overhead contact lines are expected to provide reliable and safe power transmission to electric traction vehicles traveling at speeds above 300 km/h.

In this second edition of *Contact Lines for Electrical Railways*, the authors provide comprehensive descriptions of the configuration, the mechanical and electrical design, and the installation and operation of contact lines for electric railways on local and long-distance transportation systems, including high-speed lines, along with the electromechanical and structural requirements. The book offers practical guidance in systems planning and implementation, appropriate specifications, and technical data such as standards and other regulations, as well as useful information on the design of systems and interfaces to subsystems of electric railway engineering.



Aviation Systems Planning and Operations: Blending Theory with Professional Practice
Angus Ifeanyi Ozoka. Ahmadu Bello University Press Limited, 2009; 431 pp.; 978-125-110-7.

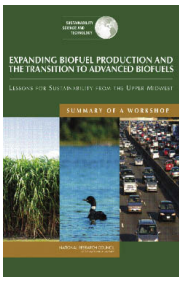
TRB Aviation System Planning Committee member Angus Ifeanyi Ozoka presents a perspective on aviation that focuses on nations in the developing world and specifically on Nigeria. Much of aviation literature and research is based on study and experience in developed countries; this volume offers aviation system planners in Nigeria and developing nations an understanding of the specific conditions and dynamics that affect their areas. The author draws on professional experience and academic knowledge gathered over 30 years in the field. Topics such as historical development, civil aviation regulation and legislation, commercial air transportation trends, deregulation, tourism, the Nigerian experience in aviation system planning, theoretical application, air transportation research, and an analysis of Nigerian aircraft accidents and subsequent investigation are explored.

Expanding Biofuel Production: Sustainability and the Transition to Advanced Biofuels
Compiled by Patricia Koshel and Kathleen McAllister. National Academies Press, 2010; 178 pp.; $41; 978-0-309-14714-9.

As the national discussion about energy prices, energy security, and climate change develops, sustainability takes on a role of increased importance. The effect of biofuel production and use on the economic viability of rural communities and on the environ-

The books in this section are not TRB publications. To order, contact the publisher listed.

ment—water quality and quantity, soils, wildlife habitat and biodiversity, greenhouse gas emissions, air quality, and public health—must be considered. The National Research Council's Roundtable on Science and Technology for Sustainability hosted a 2009 workshop that examined biofuel



technology, policy, and business; economic, environmental, and social dimensions of sustainability in biofuels; and ongoing research. Presented in this book are topics for discussion, such as next-generation fuels and their commercial availability; the future of ethanol and whether other biobased fuels are more sustainable; federal and state-level policy inconsistencies; long-term consequences for water resources, ecosystems services, and local communities; and more.

TRB PUBLICATIONS

Airports and the Newest Generation of General Aviation Aircraft, Volume 1: Forecast
ACRP Report 17, Volume 1
Presented is a forecast of anticipated fleet activity for the newest generation of general aviation (GA) aircraft for the next 5 and 10 years, along with operational activity projections of very light jets used in commercial air taxi services for more than 1,800 U.S. airports. In conjunction with Volume 2 of this report, these fleet and activity forecasts can be used by airport operators to assess practical requirements and innovative ways to accommodate new GA aircraft, and by airport planners to upgrade airports and to create new airport facilities.

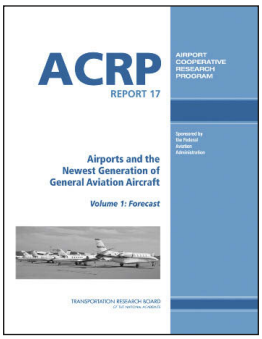
2009; 26 pp.; TRB affiliates, $27; TRB nonaffiliates, $36. Subscriber category: aviation (V).

Airports and the Newest Generation of General Aviation Aircraft, Volume 2: Guidebook
ACRP Report 17, Volume 2
Some forecasts predict that an increasing number of new, smaller GA aircraft soon will take to the skies and suggest that some airports will see more traffic and greater demand for GA infrastructure, facilities, and services. Questions remain, however, about how much traffic will increase from these aircraft; which airports will experience the traffic increases; and what kinds of infrastructure, facilities, and services will be needed. This guidebook can be used in conjunction with Volume 1 of ACRP Report 17, which presents forecasts of fleet activity.

2009; 112 pp.; TRB affiliates, $40.50; TRB nonaffiliates, $54. Subscriber category: aviation (V).

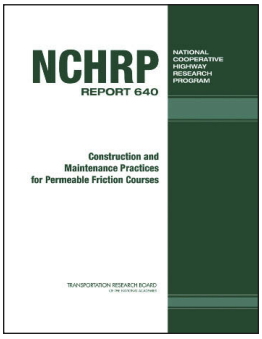
Passenger Air Service Development Techniques
ACRP Report 18
Researchers share findings on the underlying competitive challenges faced by small communities in retaining or enhancing their commercial air service, examine how communities can address these challenges, and describe the basic components and tools of an air service development program. Of interest to airport managers and local government representatives who seek to attract and retain commercial air service in small communities, this guidebook provides information on air service development techniques, tools, and programs such as minimum revenue guarantees, guaranteed ticket purchases, cost subsidies, marketing and advertising, and nonfinancial contributions.

2009; 159 pp.; TRB affiliates, $45; TRB nonaffiliates, $60. Subscriber category: aviation (V).



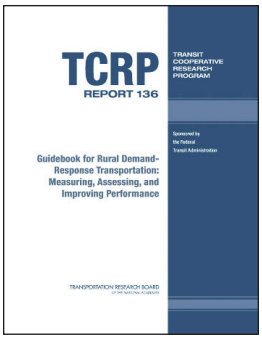
Construction and Maintenance Practices for Permeable Friction Courses
NCHRP Report 640
Researchers present findings on recommended practices for permeable friction course (PFC) design and construction and examine PFC maintenance and rehabilitation. PFCs—which include new-generation open-graded friction courses, asphalt–rubber friction courses, and porous European mixes—are used in the southern and western United States to reduce hydroplaning, splash and spray, and pavement noise; they also improve ride quality and the visibility of pavement markings in wet weather. In colder climates, however, PFCs may require more intensive winter maintenance and may be susceptible to freeze–thaw damage and black ice formation. This report examines research results on practical guidelines for PFC design, construction, and maintenance.

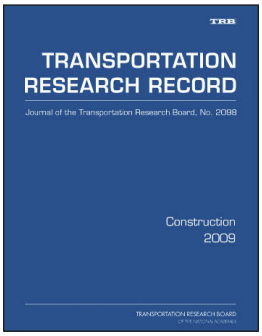
2009; 120 pp.; TRB affiliates, $40.50; TRB nonaffiliates, $54. Subscriber categories: pavement design, management, and performance (IIB); materials and construction (IIIB); and maintenance (IIIC).



Guidance for the Design and Application of Shoulder and Centerline Rumble Strips
NCHRP Report 641
This report explores the design and application of shoulder and centerline rumble strips as a crash reduction measure that can minimize adverse effects for motorcyclists, bicyclists, and residents. Using the results of previous studies and project research, safety effectiveness estimates were developed for shoulder

BOOK SHELF





TRB PUBLICATIONS *(continued)*

rumble strips on rural freeways and rural two-lane roads and for centerline rumble strips on rural and urban two-lane roads.

2009; 171 pp.; TRB affiliates, $48; TRB nonaffiliates, $64. Subscriber category: safety and human performance (IVB).

Guidebook for Rural Demand-Response Transportation: Measuring, Assessing, and Improving Performance
TCRP Report 136
Research findings on the diversity of demand-response transportation (DRT) services are presented in this volume, along with performance data and performance measures, the typology of rural DRT, and examples of performance data from more than 20 representative rural systems. The report also presents key performance data and a limited set of performance measures for DRT, identifies the various influences on DRT performance and the actions that rural DRT systems have taken to improve performance, and documents the quantitative and qualitative effects of those actions.

2009; 90 pp.; TRB affiliates, $38.25; TRB nonaffiliates, $51. Subscriber category: public transit (VI).

Construction 2009
Transportation Research Record 2098
Authors investigate construction management and project delivery, quality assurance, construction of portland cement concrete pavements, the construction of hot-mix asphalt pavements, and the use of stay-in-place forms for concrete bridge deck construction.

2009; 140 pp.; TRB affiliates, $46.50; nonaffiliates, $62. Subscriber category: materials and construction (IIIB).

Freeway Operations; Regional Systems Management and Operations; Managed Lanes 2009
Transportation Research Record 2099
Explored in the papers in this volume are dynamic message signs on toll roads, traffic flow at freeway bottlenecks, an algorithm to determine congestion spillback from incidents, the interdependence of incident durations and secondary incidents, the effect of loop detector error on traffic speed estimates and imputation of ramp flow data, automatic freeway incident detection, traffic management of special events in small communities, data fusion using stationary and mobile data, the impact of tolls on high-occupancy vehicle (HOV) lanes, safety evaluation of truck lane restriction strategies, the safety performance of HOV facilities, and more.

2009; 150 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber category: highway operations, capacity, and traffic control (IVA).

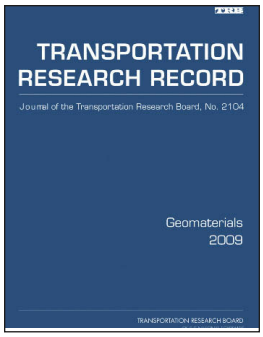
Marine Transportation and Port Operations 2009
Transportation Research Record 2100
This volume includes the 2009 Thomas B. Deen Distinguished Lecture by Geraldine Knatz, which explores the evolution of U.S. seaports and the environmental initiatives that are enabling modernization and expansion. Other papers examine the impact of climate change on U.S. ports, container terminal berth planning, the Lean Enterprise for improving seaport operations, performance indicators for roll-on–roll-off terminals, marine container terminal gate congestion modeling, operational development of U.S. Pacific Coast marine highways, inland waterway transportation performance assessment, U.S. inland waterway system simulation-based network maintenance planning and scheduling, and more.

2009; 102 pp.; TRB affiliates, $42; nonaffiliates, $56. Subscriber category: marine transportation (IX).

Geology and Properties of Earth Materials 2009
Transportation Research Record 2101
Research on topics related to rural low-volume roads—objective distress measures for evaluating unpaved road condition, estimating roughness of unpaved roads, and assessing heavy traffic impacts on gravel roads—is presented in this volume, along with a three-point imaging test for the American Association of State Highway and Transportation Officials (AASHTO) soil classification, the effect of exopolymers on the liquid limit of clays, the evaluation of road substructure drainage systems using structural asset management, the matric suction prediction model in the AASHTO Mechanistic–Empirical Pavement Design Guide, soil suction, subgrade resilient modulus, and double draining-layer flexible pavements.

2009; 117 pp.; TRB affiliates, $42.75; nonaffiliates, $57. Subscriber category: soils, geology, and foundations (IIIA).

The TRR Journal Online website provides electronic access to the full text of more than 10,000 peer-reviewed papers that have been published as part of the Transportation Research Record: Journal of the Transportation Research Board *(TRR Journal) series since 1996. The site includes the latest in search technologies and is updated as new TRR Journal papers become available. To explore the TRR Online service, visit www.TRB.org/TRROnline.*



TRB PUBLICATIONS *(continued)*

Safety Data, Analysis, and Evaluation 2009, Volume 1
Transportation Research Record 2102
A naturalistic driving experiment to determine driving performance, alignment consistency, and road safety; predicting segment-intersection crashes; safety screening of road networks; urban arterial accident prediction models; the effects of road geometry and cross-section variables on traffic accidents; injury severity at freeway diverge areas; hot-spot identification using accident severity and vehicle occupancy; the effects of street patterns on injury risks in crashes; statistical versus simulation models in safety; the use of expert panels in highway safety; and safety performance functions are explored in this volume.

2009; 123 pp.; TRB affiliates, $42.75; nonaffiliates, $57. Subscriber category: highway operations, capacity, and traffic control (IVA).

Safety Data, Analysis, and Evaluation 2009, Volume 2
Transportation Research Record 2103
The 13 papers in this volume examine subjects such as calibration of the Highway Safety Manual's accident prediction model for a secondary road network, accident modification functions, elementary units of exposure, identification of crash hot spots, the effects of pavement marking retroreflectivity on traffic crash frequency, road data aggregation and sectioning for crash analysis, safety evaluation of curve delineation improvements, a comparison of simulated freeway safety performance with observed crashes, traffic operation measures in a safety analysis of signalized intersections, and the varying dispersion parameter as a function of segment length.

2009; 118 pp.; TRB affiliates, $42.75; nonaffiliates, $57. Subscriber category: highway operations, capacity, and traffic control (IVA).

Geomaterials 2009
Transportation Research Record 2104
Authors present research on falling weight deflectometer testing, asphalt mixture skid resistance prediction, a handheld image analysis system, surface wave testing for a rubblized portland cement concrete modulus, testing of recycled pulverized hot-mix asphalt material, differential scanning calorimetry to validate the sensitivity of sulfate-bearing soil to ettringite growth, environmental impacts of soil–cement pavement layers on construction, carbon dioxide emissions from highway subgrade improvements, geogrids and lime treatment to control dry land longitudinal cracking, deformation properties of untreated and enzyme-treated bottom ash waste used in foundations, and more.

2009; 104 pp.; TRB affiliates, $42; nonaffiliates, $56. Subscriber category: soils, geology, and foundations (IIIA).

Information Systems, Geographic Information Systems, and Advanced Computing 2009
Transportation Research Record 2105
Passive transit travel surveys, improving the usability of a complex household travel survey, harmonization of long-distance travel demand figures for European countries, a semidirective interview method to analyze travel behavior changes, cell phone samples in transportation surveys, suppressed travel measurement and estimation using enhanced activity–travel diaries, geolocation data compression for transportation target identification, transport and surveillance aspects of location-based services, spatial interpolation of traffic counts, vehicle detection from satellite images, a distributed algorithm for estimating dynamic origin–destination demand, and a kinematic terrestrial light-detection and ranging scanning system are some of the topics studied in this volume.

2009; 141 pp.; TRB affiliates, $46.50; nonaffiliates, $62. Subscriber category: planning and administration (IA).

Aviation 2009
Transportation Research Record 2106
Research topics in this volume include sketch models for air transport demand estimation, a mixed logit analysis of international airline choice, a conceptual framework for collecting online airline pricing data, a quantification of the relationship between airline load factors and flight cancellation trends, a modeling framework for airline competition in the U.S. domestic network, depeaking strategies to improve the productivity of airport ground operations at midsize hubs, route choice control of automated baggage handling systems, resource allocation in flow-constrained areas, prioritizing aircraft operations at congested airports, design of ground delay programs, and an analysis of training captains' workload.

2009; 152 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber category: aviation (V).

Safety Maintenance and Surface Weather
Transportation Research Record 2107
Researchers explore aspects of work zone traffic control, such as work zone mobility and safety, work zone decision making based on quantitative performance measures, the effect of speed photo–radar enforce-

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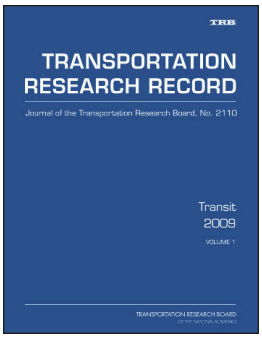

TRB PUBLICATIONS *(continued)*

ment on work zones, QuickZone model improvement and validation, and speed monitoring displays for work zones. Also studied are aspects of pavement markings such as nighttime visibility, performance evaluation using accelerated wear testing, and the performance of thermoplastic inlay pavement markings. Winter services and aspects of surface weather—such as precipitation variation, the impact of rain on driver behavior, and how drivers perceive visibility in blowing snow—are also addressed.

2009; 149 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber category: maintenance (IIIC).

Maintenance and Management of the Infrastructure
Transportation Research Record 2108
The papers in this volume investigate opportunistic behavior in road maintenance markets, performance indicators for the service life of thin hot-mix asphalt overlays, life-cycle cost of pavement surface retexturing with shotblasting, a performance-based uniformity coefficient of chip seal aggregate, chip seal maintenance, the effect of crack sealant material and reservoir geometry of bituminous overlays, wooden bridge preservation treatment, penetrating sealers for reinforced concrete bridge decks, underwater bridge inspection practices, infrared imaging of concrete bridge subsurfaces, rolled erosion control products for roadside maintenance, and other topics.

2009; 126 pp.; TRB affiliates, $46.50; nonaffiliates, $62. Subscriber category: maintenance (IIIC).

Research and Education 2009
Transportation Research Record 2109
Transportation planning education in the United States, transportation simulations for realistic engineering education and training, enhanced civil engineering recruitment and industry coordination, a demonstration of transportation planning and design issues with an interactive display, university–industry partnerships for railroad engineering education, predictive workforce planning for traffic management centers, the New England Transportation Consortium, and ways to overcome roadblocks to innovation are examined.

2009; 73 pp.; TRB affiliates, $39; nonaffiliates, $52. Subscriber category: planning and administration (IA).

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Transit 2009, Volume 1
Transportation Research Record 2110
Explored in this volume are the CityMobil project, the relative merits of express bus and rail transit, the land consumption impacts of a transportation system, transit accessibility to jobs and the employment prospects of welfare recipients, walking distance and transit-oriented development, rail passenger multitasking in an urban corridor, onboard ticket sales, ridership growth caused by extended transit service hours, entry-only automated fare-collection system data, transit passenger information websites, urban travel training for older adults, and other topics.

2009; 170 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber category: public transit (VI).

Transit 2009, Volume 2
Transportation Research Record 2111
Research on transit signal priority, bus-on-shoulders operations, optimal bus stop spacing, bus travel times with passive traffic signal coordination, bus rapid transit in dedicated lanes, and the curbside intercity bus industry is presented in this volume. Also examined are taxi vacancy rates, fares, and subsidies; feeder transit services; cost contingencies in the transit project development process; mass transit performance measurements; visualizations and statistical analysis with historical data; whether transit users employ strategies when waiting for buses; and short-duration unscheduled absences of transit operators.

2009; 194 pp.; TRB affiliates, $52.50; nonaffiliates, $70. Subscriber category: public transit (VI).

Transit 2009, Volume 3
Transportation Research Record 2112
A pedestrian intersection safety index; a network analysis of world subway systems; the benefits of advanced integrated rail service in a developing city; recent Metrorail ridership growth; a transit origin–destination table using the uncertainty maximization concept; regional rail scheduling; a business model for commingled operations of freight and passenger rail services; a passenger environment survey; service-level classification of platforms in urban rail transit; and the impact of transit reliability on user costs are some of the topics investigated in this volume.

2009; 141 pp.; TRB affiliates, $42.75; nonaffiliates, $57. Subscriber category: public transit (VI).

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