



## TR News July-August 2008 Transportation Education and Training Solutions

### DETAILS

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# 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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An innovative pilot program for a graduate certificate in multimodal transportation is nearing implementation, guided by the founding directors of the Regional University Transportation Centers, with funding from the Federal Highway Administration and advice from industry, associations, and others. The goal is to educate transportation leaders and to recruit and retain professionals to fill workforce needs.

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**CORRECTION:** A footnote in the article, Promoting Public Health Through Transportation Planning: Utah Region Adopts and Applies Guidelines, by Shaunna K. Burbidge (*TR News*, May–June 2008, pp. 16–18), stated that “a high-speed rail line began operation in April 2008.” As pointed out by Matthew Melzer, National Association of Railroad Passengers and editor of *Intercity Passenger Rail* newsletter, it was “the first phase of the FrontRunner commuter rail line, a service of Utah Transit Authority,” that began operation, not a high-speed rail line.

## COMING NEXT ISSUE

A behind-the-scenes account of the collaboration and cooperation contributing to the success of the Marquette Interchange Project in Milwaukee, Wisconsin; practical lessons and workable models from the finalists in the first TRB Communications Competition; the impact of the U.S. Supreme Court ruling on state eminent domain laws and transportation policies; TRB's newly published study on policies and practices to prevent further introductions of aquatic invasive species into the Great Lakes; uninterrupted power supplies for traffic signals—and more—fill out the contents of the September–October *TR News*.

A mural on the northern abutment of I-43 at Fond du Lac Avenue, Milwaukee—a context-sensitive element of the Marquette Interchange Project—depicts the rescue of runaway slave Joshua Glover from jail in 1854.

PHOTO: JAMES KOSTER



## INTRODUCTION

**BUILDING THE  
21ST CENTURY  
WORKFORCE***Creating a National Strategy*

GREGORY BENZ AND CHANDRA BHAT

*The authors are cochairs of the TRB Transportation Education and Training Committee. Benz is Senior Vice President and Global Director of Capability Development, Parsons Brinckerhoff, Inc., Baltimore, Maryland; and Bhat is Adnan Abo-Ayyash Centennial Professor in Transportation Engineering, University of Texas, Austin.*

**T**he transportation industry is facing a workforce crisis. The ongoing and emerging transportation system needs people with skills in management, administration, policy, planning, engineering, construction, operations, and maintenance. Addressing this issue is a priority for the Transportation Research Board (TRB).

In January, the TRB Transportation Education and Training Committee, in association with the Management and Productivity Committee, the Maintenance and Operations Personnel Committee, and the Policy and Organization Group, sponsored an Annual Meeting workshop, Building the 21st Century Workforce: Creating a National Strategy.<sup>1</sup> The developers of the workshop strove to involve the many other sectors of the transportation industry that also have made workforce development a focus—governments at many lev-

els, industry and professional associations, the academic community, labor unions, and consultants.

This workshop and its breakout sessions built on a 2007 TRB workshop on the same topic and served as a starting point to establish a community for building a transportation workforce. The community expects to consider policies and programs related to the upcoming reauthorization of transportation funding and to the plans of the new administration.

The workshop opened with a briefing on key points from the 2007 program, followed by an overview of the U.S. Department of Transportation's National Plan for Workforce Development.<sup>2</sup> The plenary session concluded with a presentation on the

<sup>2</sup> Summaries of the draft strategies in the national plan are posted on the Federal Highway Administration website, <http://knowledge.fhwa.dot.gov/cops/hcx.nsf/home?OpenForm&Group=Working%20Together%20for%20Highway%20Workforce%20Development&tab=WIP>.

<sup>1</sup> Session 754, 8:30 a.m.–noon, Thursday, January 17, 2008.

For two years, TRB Annual Meeting sessions on Building the 21st Century Workforce have attracted large and participatory audiences on the final day of the meeting; (right) the 2007 session, with Thomas R. Warne speaking on the Changing DOT Workforce: Challenges and Solutions.





evolving missions of transportation developers and providers, addressing ways to examine the emerging and future mission of an organization and to develop and implement a workforce strategy to meet that mission. Four breakout sessions followed the plenary session, each with a specific topic:

◆ **Developing and Implementing a Workforce Strategy for an Organization**

The missions of public agencies are evolving. Some have grown in geographic scope and are extending beyond established jurisdictions. Many are shifting from providing services and implementing projects to overseeing policy, finance, and contracts, either

through third-party arrangements or alternative delivery methods.

Many organizations are focusing more on the management and operation of services and facilities or assets and less on the development of new facilities. Technological changes may provide new and improved services but may require a more sophisticated base of skills. As a result, traditional providers of project development, construction, contracting, and operational support services are adjusting their missions and business plans, and many new players are entering the industry. How can an organization examine its mission and develop and implement a workforce strategy to fulfill that mission?

## TransTech Academy Builds on Success

**T**ransTech Academy was established in 1991 as the first transportation studies high school program in the Washington, D.C., metropolitan area. TransTech Academy's mission is to provide students with experiences that inculcate the values of education, constructive employment, and careers in various modes and sectors of the transportation industry. The program links education to the real world, enabling students to adapt successfully to complexity and change in the workplace.

Located at Cardozo Senior High School, the program has been coordinated by Shirley McCall since its start. The first year of enrollment included 30 tenth graders who became the first graduating class in 1994. This year, 40 seniors were honored at the TransTech Academy Senior Recognition and Awards Ceremony in June. Norma Ventura, who worked at an internship at TRB, received recognition for graduating third in this year's class.

The U.S. Department of Transportation (U.S. DOT), the Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA) awarded TransTech Academy a grant of \$300,000 in September 2008 to support the school's day-to-day activities and to assist with the opening of a preengineering program.



*Renowned engineering professor David P. Billington of Princeton University meets with TransTech students during the 2004 TRB Annual Meeting, to encourage them to continue in transportation-related studies and careers.*



*The TransTech Academy Exhibit at the 2008 TRB Annual Meeting highlighted student projects, training programs, school-to-career activities, hands-on learning, partners and supporters, and graduates. Program coordinator Shirley McCall is seated second from left.*

The TransTech Academy Industry Partners Consortium, which held its inaugural meeting in February 2008, includes representatives from the U.S. DOT, the Federal Aviation Administration, the National Black Coalition of Aviation Employees, the Organization of Black Airline Pilots, FHWA, FTA, the National Highway Traffic Safety Administration, Washington Metropolitan Area Transit Authority, the Conference of Minority Transportation Officials, the District of Columbia DOT, D.C. Public Schools, the International Brotherhood of Teamsters, the American Public Transportation Association, Howard University, NASA, Bombardier-Aero Club, and TRB.

In 2004, TRB recognized McCall with the Sharon D. Banks Award for sustained leadership accomplishments and innovations that exemplify Banks's ideals of humanity and service by making a difference in the lives of those who use, deliver, or support transportation services.

### ◆ Increasing the Supply: Transportation as a Career Choice and Improving the Retention of Engineering Students

The transportation industry must attract people into the field. Young people, their parents, teachers, and other influencers must be made aware of the opportunities in transportation. Young people also must receive the necessary educational prerequisites in mathematics, technology, and science to enter the industry. Candidates must have access to opportunities and must be recruited and retained—many other, often more visible industries are competing for the same workforce.

The full spectrum of potential audiences should be considered: kindergarten through 12th grade, trade school, college, postgraduate programs, and midcareer employees considering changes. Methods of outreach include career days—for example, to recruit equipment operators, designers, planners, environmental scientists, and the like, separately or together; school projects on transportation problems; tours, videos, and advertisements; educating school counselors; working with magnet schools; professional outreach and mentoring at schools; summer programs; and providing marketing, experiential, engagement, and even financial support to students and prospects.

### ◆ Developing and Improving College and Technical School Programs for Transportation, Including Specialty Areas

What courses and curricula are needed to attract, develop, and direct students interested in the various academic, professional, and technical fields within transportation? What are the foundations of an educational program, and what specialty areas within the industry have current and emerging needs? What strategic and tactical guidance is needed, so that edu-



PHOTO: ATHAPHON KAMRASEET, UIUC

High school students hear a presentation at the CSX Transportation booth during an engineering open house at the University of Illinois at Urbana-Champaign; the annual program, organized by engineering students, attracts up to 20,000 attendees.



PHOTO: UIUC

cational and experiential content and methods can meet near-term and longer-term industry needs?

### ◆ Preparing the Workforce for Evolving Organizational Needs

Emerging organizational needs must be understood, such as transitioning from mechanical tasks to high technology, from technical responsibilities to management and oversight, and from working as operators to working as contract managers. The transportation industry workforce must be able to meet the needs of the 21st century and have enough people with the necessary skills in management, administration, policy, planning, engineering, construction, and operations and maintenance.

Emerging methods of delivering and operating roadways, airports, and other facilities and services require sophisticated financial and management skills. Buses, trains, trucks, and construction equipment are becoming more technologically complex—the operations and maintenance workforce requires not only traditional mechanical skills but also high-tech electronic and computer competencies. Ideas to be considered include developing options for retention; developing options for organization; outsourcing; training; developing an esprit de corps; rehiring retirees; offering part-time employment opportunities; retraining personnel from downsized industries; telecommuting; initiating round-the-clock operations; and developing employees—that is, succession planning.

### Action Plan for 2009

The workshop and breakout sessions generated an agenda for the sponsoring TRB committees:

Undergraduate students in the University of Illinois at Urbana-Champaign Railroad Engineering Program gain practical, hands-on experience doing trackwork at the Monticello Railway Museum, Monticello, Illinois.

Distance learning, webinars, and online course delivery are strategies for reaching already-employed professionals looking to advance in their education or careers or to make mid-career changes; photo shows equipment for web-based courses at the Transportation Training and Education Center, Baton Rouge, Louisiana.



PHOTO: LOUISIANA TRANSPORTATION RESEARCH CENTER

◆ **Website**—Develop and host a website at the University of Texas to serve as a repository for students and professionals looking for information on transportation workforce issues, needs, and development programs. The website, [www.trb-education.org](http://www.trb-education.org), will offer extensive information and links to a variety of programs and scholarships for students and to training programs and career growth plans for professionals. The site will compile strategies for enhancing the transportation workforce, such as fostering the development of skills to match workforce needs.

◆ **Booth**—Set up an interactive booth at the TRB Annual Meeting, January 11–15, 2009, in Washington, D.C., to attract attention to workforce issues and challenges. The display could include a demonstration of the website, as well as animations and simulation tools.

◆ **Activities at the 2009 TRB Annual Meeting:**

- Poster session on How to Get People Interested in Transportation—Posters by professionals in different fields, including education and workforce development, would formulate ideas and showcase programs that encourage people to consider transportation as a career.

- Session on What Do Prospective and Current Employees Want from Employers? The session would focus on what young people and mid-career employees look for in a job—that is, what might attract them to transportation. How must transportation organizations change to meet these expectations? For example, many organizations have increased salaries or have changed licensing and other job requirements to attract and retain employees. Younger employees appear to value flexibility in work schedules and the opportunity to make a contribution through their work.
- Session on Adaptive Transportation Organizations and Employees—Case studies would present organizations that have learned to be flexible and programs that have helped employees adapt to new requirements and new jobs.

## Ongoing Activities

The sponsoring committees are continuing the outreach and coordination activities that have developed in response to the issues identified in the workshop on Building the 21st Century Work Force: Creating a National Strategy. The goal is to establish a transportation industry community that will consider policies and programs for the upcoming reauthorization legislation and for the new administration—and to keep workforce development in focus.

## Acknowledgment

Assembled in this issue of *TR News* are articles that describe a variety of promising initiatives and problem-solving approaches to stimulate transportation workforce recruitment, development, and retention. Joedy Cambridge, TRB Senior Program Officer, was instrumental—and, as always, expert and indefatigable—in developing the contents of this special issue.

## Young Professionals Unite

A new organization, Young Professionals in Transportation (YPT), is providing career guidance, fellowship, and networking opportunities:

- ◆ **Guidance**—with a series of seminars from leaders and teams in the field of transportation;
- ◆ **Fellowship**—through an ongoing forum for mutual support and interaction among young transportation professionals, especially those starting out in their careers; and
- ◆ **Networking**—via opportunities and seminars to help young professionals advance their careers and share innovative ideas.

The organization does not define young by age restrictions—anyone is welcome to participate in the activities. For more information and to sign onto an e-mail list, visit the website at <http://ypt.transportation.org>. The group can also be found online in Facebook via the keyword “ypt.” Send questions or comments to [ypt@transportation.org](mailto:ypt@transportation.org).



# THE LOUISIANA MODEL FOR TRANSPORTATION WORKFORCE DEVELOPMENT

## *Integrating Technical Assistance, Structured Training, Continuing Education, and Technology Transfer*

HAROLD R. (SKIP) PAUL

*The author is Director, Louisiana Transportation Research Center, Louisiana Department of Transportation and Development, Baton Rouge, and a past chair of the TRB Technical Activities Council.*

**T**he Louisiana Transportation Research Center (LTRC) is more than its name implies. The center's research section explores the thresholds of technology, and the technology transfer and training section applies the findings in practical ways.

Created by the Louisiana legislature in 1986, LTRC has gained national recognition through its efforts to improve transportation systems in the state. The center conducts short- and long-term research and provides technical assistance, training, continuing education, technology transfer, and problem-solving services to the Louisiana Department of Transportation and Development (DOTD) and to the transportation community at large.

By merging the resources of its two parent institutions—Louisiana State University (LSU) and Louisiana DOTD—the center has assembled a versatile core of facilities and expertise for application to rapidly evolving transportation challenges. Supported by state and local government, universities, and private industry, LTRC identifies, develops, and implements new technology to improve the state's transportation system.

Auditorium at the Transportation Training and Education Center seats 100 and includes many high-tech amenities.



With guidance from the Transportation Curriculum Council (TCC)—an advisory committee with representatives from Louisiana DOTD and industry—LTRC seeks innovative solutions to the state's transportation problems. TCC serves as the governing body in the search for the most effective ways to educate and train all sectors of the transportation community—public, private, and local government. Meeting twice a year, TCC evaluates training programs, implements curricula, and provides direction for LTRC training efforts. Following are highlights of the center's training programs.

### Structured Training

In 2001, DOTD issued its first comprehensive policy addressing workforce development and defining the expectations of supervisors and employees.<sup>1</sup> The policy asserts that training is key to developing qualified personnel and is crucial to the effective management of the transportation system.

The DOTD-structured training program, therefore, consists of a department-sanctioned, progressive training curriculum that requires the completion of specific work-related training at each level of an employee's career path. For DOTD, training is necessary and integral to career advancement. The department supports and promotes an environment of continual learning, so that employees can pursue professional development to the fullest extent and can contribute to the goals of the department.

Structured training programs ensure workforce proficiency and knowledge, prepare workers for the challenges of a highly technical work environment, and guide employees systematically into career advancement. Depending on an individual's position, structured training can involve professional development, continuing education, technical skills training, and on-the-job training.

<sup>1</sup> Policy and Procedure Memorandum No. 59: Workforce Development.





(Left:) A Louisiana DOTD training session on operation of an automated profiler to evaluate pavement smoothness. The DOTD emphasizes structured, progressive training and continual learning at all career levels.



(Right:) Maintenance training courses promote safe and efficient operation of equipment.

LTRC oversees three main areas in the structured training program: construction and materials, maintenance, and management development.

**Construction and Materials**

The construction and materials training program provides comprehensive, up-to-date training and evaluation for professional engineers, engineering technicians, and transportation industry contractors and materials producers. LTRC monitors changes in departmental specifications, test procedures, quality assurance operations, new technology, and federal regulations affecting the program. Training professionals then develop, revise, or acquire training materials accordingly.

LTRC has been involved in a nationwide effort to develop a standard quality control–quality assurance training program for state highway departments. The construction and materials training program manages the inspector–technician certification program for DOTD and the Louisiana transportation industry by coordinating the testing, authorization, and certification of inspectors and technicians statewide in each area of construction activity.

**Maintenance**

The maintenance training unit develops job-specific courses on the functions, processes, and safe handling of each piece of equipment operated by maintenance field personnel. Maintenance training courses promote safe practices and the attitudes needed for optimal job performance.

LTRC training specialists redesign older courses to incorporate updates in state and federal regulations, as well as in department policy, procedures, and specifications. The maintenance training unit also offers testing services for the International Municipal Signal Association to certify DOTD and Louisiana city or parish employees.

**Management Development**

The management development training unit oversees several supervisory and career development training programs for management-level employees from all areas of the agency. The unit organizes DOTD’s participation in the Governor’s Office of Comprehensive Public Training Programs for supervisory and nonsupervisory employees.

The program also plays a key role in the state’s participation in the National Partnership for Highway Quality, the only national program that brings public highway agencies and private industry together to advance highway quality, safety, and service. The DOTD Chief Engineer and the FHWA Division Administrator cochair the Louisiana Partnership for Highway Quality. LTRC coordinates Louisiana’s training and education subcommittee of the partnership through TCC.



A management training session at LTRC.

In managing these programs, LTRC regularly solicits input to determine what training is needed, and the DOTD administration periodically reviews all programs to ensure that all sections and divisions are served equitably. LTRC facilitated the first formal review of the workforce development policy in 2006, convening meetings around the state to gather feedback from administrators at all levels. The findings were presented to the DOTD Secretary, executive committee, and district administrative officials before revisions were implemented in early 2007.

## State-of-the-Art Learning Environment

In August 2004, construction crews broke ground on the Transportation Training and Education Center (TTEC), a progressive partnering effort between the public sector and private industry. Adjacent to LTRC's main facility on the LSU campus, TTEC provides a stimulating learning environment to assist and enable workforce development. The 14,000-square-foot center offers a variety of learning spaces: a 100-seat auditorium, a computer laboratory, a library, an executive conference room, and two classrooms that can be configured for lectures or group learning. A state-of-the-art audiovisual system provides mixed media delivery in each classroom, the auditorium, and the conference room. The facility is equipped to send and receive web-based transmissions for distance learning, e-learning, and teleconferencing.

The center began hosting classes in January 2006 and has expanded with computer workshops, computer-aided design and drafting courses, geographic information system workshops, American Traffic Safety Services Association classes, and more. TTEC has enabled LTRC to reduce its contracts for external training space by half.

## Center Goals

TTEC seeks to accomplish the following goals:

- ◆ Create and provide pedagogically sound training;
- ◆ Transition classes to distance learning, as appropriate;
- ◆ Incorporate instructional design concepts to update and modernize courses;
- ◆ Provide content-rich classes to district, municipal, and industry participants through onsite instruction, videoconferencing, live web-based seminars, and stored web-based content;
- ◆ Maximize the use of instructional resources such as National Highway Institute (NHI) courses, computer-based training, structured training pro-



grams, contract training, individual conferences and seminars, major conferences, and miniconferences; and

- ◆ Build a digital transportation library with national and regional connections for technology exchange and research enhancement.

NHI courses are among the most popular offerings. TTEC has increased the number of NHI courses offered by 50 percent and has signed a memorandum of understanding to serve as a regional NHI center—one of only two in the country.

The TTEC librarian assists a researcher in finding a journal paper. A digital transportation library is in the works.

A training session in the TTEC computer laboratory; the facility is equipped for distance learning, teleconferencing, and e-learning.





A Local Road Safety Program class performs a site audit.

The Louisiana Local Technical Assistance Program conducts a workshop for local agency road maintenance managers and personnel as part of the Roads Scholar program.

### Local Community Outreach

The Louisiana Local Technical Assistance Program (LTAP) is one of 58 providing services to local transportation communities in each state, Puerto Rico, and the Native American tribal areas. Each center operates independently to develop and implement programs that meet the needs of local transportation agencies; all foster a safe, efficient, and environmentally sound surface transportation system by improving the skills and knowledge of the transportation workforce. LTAP has four national focus areas: infrastructure maintenance, safety, workforce development, and value delivery.

Louisiana LTAP provides an array of services geared to the local agencies and to personnel charged with managing and maintaining local roads and transportation systems. Training classes and work-

shops have been the program's primary services, with classes at eight locations under the Roads Scholar program. Special-topic classes and onsite, on-demand workshops also are offered. More than 3,000 participants have attended approximately 18,000 hours of technical and safety training each year. LTAP also provides technical assistance, publishes a quarterly newsletter, and maintains a library of publications and videos.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users provided LTAP with opportunities to bring road safety assistance to the local community. Working with DOTD's Office of Highway Safety, LTAP coordinated implementation of the Louisiana Local Road Safety Program (LRSP). In 2006, its first year, LRSP offered basic road safety training classes, technical assistance, statewide informational meetings, and funding through DOTD for local road safety improvement projects.

Local agencies identified low-cost improvement projects and submitted applications through LTAP. Applications were received for 54 projects; 41 were eligible for funding, including installation of improved signage and pavement markings, traffic studies, line-of-sight improvements, warning signs, crash data collection and management systems, sidewalk construction, and new guardrail installation. LRSP continues to provide training and technical assistance free of charge.

### Training Events

Every two years, DOTD's Louisiana Transportation Engineering Conference convenes representatives from all sectors of the transportation community nationwide to learn about the latest technologies and to share best practices. Held in Baton Rouge, the conference is a premier opportunity for technology transfer by LTRC, which plans, coordinates, and manages the event. The most recent conference, in February 2007, attracted nearly 1,600 attendees and featured 72 technical sessions, how-to clinics, and many alternative sessions covering management and workplace issues. Conference attendees earn 16 professional development hours, including the biennially required hour in professional ethics. The next conference is scheduled for February 2009.<sup>2</sup>

Building on the popularity and success of the Transportation Engineering Conference, LTRC identified a need for more frequent, focused conferences at smaller venues throughout the state. In 2004, the center initiated a forum to demonstrate new  
(continued on page 12)



<sup>2</sup> [www.ltrc.lsu.edu/tec\\_07](http://www.ltrc.lsu.edu/tec_07).



## Freight Academy Targets Transportation Professionals

KAREN RYAN TOBIA

The I-95 Corridor Coalition, through its Intermodal Program Track Committee, is sponsoring a Freight Academy to train public-sector transportation professionals whose work in planning, operations, or management has an impact on decisions, investments, and interactions related to the movement of goods. Designed as an immersion program, the first Freight Academy will be held October 26 through October 31, 2008, at the Center for Advanced Infrastructure and Transportation, Rutgers University, New Brunswick, New Jersey. Instructors will represent both the public and private sectors, and the curriculum will be structured so that the Freight Academy can be held in any state of the I-95 Corridor Coalition region.

The Intermodal Program Track Committee proposed the project after considering such trends as the large increases in freight movements and the dynamic changes in the goods movement industry, as well as the need to understand freight as an integral part of the transportation system and the need to integrate freight facilities and operations with community goals. These trends and needs, combined with the expected retirements of many experienced members of transportation agencies in the next 5 to 10 years, prompted the proposal to develop the Freight Academy.

The week-long program will allow approximately 30 participants to learn from industry experts, understand issues involving goods movement, and visit port, rail, aviation, trucking and distribution center sites to see firsthand what is involved in multimodal freight movements. Participants then will apply what they have learned by working on capstone projects addressing real-world transportation issues suggested by I-95 Corridor Coalition members.



PHOTO: NEW ENGLAND MOTOR FREIGHT

Freight Academy participants will examine training vehicles like this, used by New England Motor Freight.



PHOTO: A. STRAUSS-WIEBER, INC.

Maher Terminals in Elizabeth, New Jersey, the largest container terminal operator in the Port of New York and New Jersey, offers Freight Academy participants firsthand case studies.



PHOTO: DISTRIBUTIONS SOLUTIONS, INC.

A field trip will include warehouse facilities and equipment, like these operated by Distribution Solutions, Inc., Secaucus, New Jersey.

The Freight Academy is open to participants from throughout the United States. The cost of the program is approximately \$3,500 per person and includes lodging and meals. The Coalition is offering a limited number of scholarships to applicants from member organizations.

The I-95 Corridor Coalition is an alliance of transportation agencies, toll authorities, and related organizations from Maine to Florida, with affiliated members in Canada. The Coalition encompasses all modes of travel and focuses on the efficient transfer of people

and goods between modes in and throughout member states. It also provides a forum for decision makers and policy makers to address transportation management and operations issues of common interest and to work together to improve transportation system performance. Recent Coalition projects have involved regional passenger and freight movement analysis, long-distance trip planning on public transportation modes, port access, and international border-crossing security.

For additional information about the Freight Academy, visit [www.freightacademy.org](http://www.freightacademy.org).

The author is Manager, Technology Planning, in the Port Commerce Department of the Port Authority of New York and New Jersey, and serves as cochair of the I-95 Corridor Coalition's Intermodal Program Track Committee.



New engineers undergo extensive orientation and training in the Engineering Resource Development Program.

technologies, implement and publicize its research, discuss and resolve problems, import best practices, and partner with the transportation community.

LTRC now sponsors one to two seminars each year on a variety of technical topics, including pavement performance, asphalt technology, concrete, and bridge structures. By involving industry partners in planning the conferences, LTRC seeks to attract contractors, consultants, suppliers, and local government staff in addition to DOTD personnel.

### Next Generation of Professionals

The Engineering Resource Development Program (ERDP) introduces new engineers to DOTD employment. In 17 years, 137 participants have completed the training program; of these graduates, 55 are current DOTD employees.

ERDP consists of a 30-week rotation, with an optional extension of two to six weeks. After an orientation at LTRC, the new hires spend one to three weeks in 19 different sections. Individual tracks can

## Rehiring Retirees

### Minnesota's Postretirement Option

On July 1, 2005, the Minnesota Legislature established the postretirement option (PRO) for employees at state agencies. The PRO encourages employees with critical skills to delay full retirement and to remain in state employment on a temporary, part-time basis. The measure provides a way for state agencies to retain the critical skills and organizational knowledge of potential retirees and to gain flexibility in addressing the anticipated skills shortages as increasing numbers of employees become eligible to retire in the next 5 to 10 years.

The law allows employees who have retired since July 1, 2005, to return to state employment for an initial period of up to one year. PRO employment may be renewed, but cannot exceed a total of five years. For the Minnesota Department of Transportation, which has the most PRO employees among state agencies, the measure has expanded alternatives for addressing skills development, knowledge transfer, training, mentoring, transition, skills shortages, and changing demographics.

Following are summary highlights of the legislation, including recent revisions:

- ◆ Each state agency determines whether to offer postretirement employment and whether to agree to it for a particular employee.
- ◆ The employee must have been regularly scheduled to work at least 1,044 hours per year in a position covered by the Minnesota State Retirement System (MSRS) during the pre-

ceding 5 years; qualify for an unreduced annuity; be retired from state service; and have taken steps to commence an annuity.

- ◆ A PRO agreement must be in place for no more than one year and must not exceed 1,044 hours per year. The agreement may be with the same or a different agency, in the same or a different job class.

- ◆ The employee may collect a state retirement annuity, which may not be reduced or enhanced because of earnings in the postretirement position. Neither the agency nor the employee can make retirement contributions on earnings from the PRO position, and the employee earns no additional state retirement service credit.

- ◆ PRO employees may qualify for a contribution to either the state's employee group insurance plan or to the MSRS-administered health care savings plan. Early incentive retirees who already receive an employer contribution do not qualify.

- ◆ The agency may choose to end the PRO arrangement or to renew it, as is or with changes. Each renewal may be for up to one year, but total employment under the program cannot exceed five years.

- ◆ Eligible employees under age 62 must wait 30 days after termination of service before receiving an offer for PRO employment, and must wait 30 days after termination of a PRO position before receiving an offer of a renewal.

For additional information about the program at Minnesota DOT, [www.newsline.dot.state.mn.us/archive/08/jul/2.html](http://www.newsline.dot.state.mn.us/archive/08/jul/2.html).

begin at any time in the year. The rotation gives participants an uncommon perspective of DOTD—experiencing firsthand the variety of the agency's operations and gaining insights that typical orientation sessions cannot supply. The department also benefits from the new ideas and fresh approaches of the participants.

ERDP is the predominant means of entry for new engineers to DOTD employment and has proved particularly beneficial to recent college graduates who need hands-on experience before deciding on a career path. Participants are evaluated not only for academic achievement but also for interest, enthusiasm, preparation, diversity, and other attributes.

After the completion of each section, supervisors and participants fill out evaluations. Supervisors rate the engineers on productivity, communication skills, adaptability, and other characteristics. Participants evaluate the usefulness of the experience, the effectiveness of the training, and their interest in that area.

After the rotation, the ERDP manager considers supervisor feedback, the participant's interests, and position availability before making assignments. Participants have noted that the program helped in determining which assignments to pursue. With more than 40 percent of the graduates still working for the department, ERDP is fulfilling its mission of recruiting and retaining the best engineers for Louisiana DOTD.

LTRC also manages the Cooperative Education Program, which gives full-time undergraduate students a firsthand glimpse into DOTD operations. The program provides practical experience in civil engineering—experience that can enhance the résumés of new college graduates applying for their first jobs. In addition to gaining a field education, students earn a salary and can receive academic credit from their universities. Program participants work 20-hour weeks in different DOTD sections throughout the state.

The assigned DOTD supervisor evaluates the student's work performance, and the students evaluate their program assignments at the end of the work period. To complete the coop program, students must give a 15-minute presentation at LTRC about their job duties and the lessons learned. The number of coop applicants usually exceeds the number of available positions, and the program consistently receives good reviews from supervisors and participants. Past participants have attributed subsequent success in the classroom to real-world situations experienced during coop employment.

### Focused Commitment

LTRC is committed to leadership in workforce devel-



opment. The research section focuses on the future of transportation technology, and the technology transfer and training section looks to the present—to the practical application of the technological innovations by the transportation community through implementation, training, and educational activities.

The Cooperative Education Program provides civil engineering undergraduates with practical experience, academic credit, and pay.

### Resource

*Highway Research and Technology: The Need for Greater Investment.* A Report of the National Highway Research and Technology Partnership, April 2002. <http://onlinepubs.trb.org/Onlinepubs/rforum/HwyRandT.pdf>.

## Paving the Way with Scholarships

**T**he National Asphalt Pavement Association Research and Education Foundation (NAPAREF) initiated a scholarship program in 1994 to encourage university-level students of transportation to take elective courses in asphalt technology and management and to assist educational institutions in offering the courses. NAPAREF is a 501(c)(3) nonprofit foundation that conducts and implements research and educational programs in technical and management areas related to hot-mix asphalt (HMA) design and construction.

The scholarship program is open to U.S. students majoring in civil engineering, construction engineering, or construction management who take courses in HMA technology. The numbers of and the dollar amounts of the scholarships distributed each year vary with the contributions from sponsors and with the foundation's investment earnings. Since the program's inception, individual scholarship awards ranged from approximately \$1,000 to \$5,000 per academic year.

The scholarship program is supported by contributions from individual donors, as well as from organizations and corporations in the HMA industry. Graduates pursue careers in the HMA industry and in public works at the municipal, county, state, and national levels.



# THE KENTUCKY ENGINEERING EXPOSURE NETWORK

## State Program KEEN to Inspire and Guide Students

MIRANDA THACKER

*The author is Statewide Coordinator of the Kentucky Transportation Cabinet's Adopt-a-Highway program, Frankfort.*

**“I**f it weren't for the KEEN program I wouldn't be where I am today,” observes T. J. Gilpin, operations engineer in the Elizabethtown District Office of the Kentucky Transportation Cabinet. Gilpin was a middle school student when KEEN—the Kentucky Engineering Exposure Network—brought a group of engineers from the Kentucky Transportation Cabinet to his class to make a presentation on engineering. The Kentucky Transportation Cabinet developed KEEN to introduce bright, young students like Gilpin to the fertile field of engineering.

In the classroom that day, the engineers discussed different facets of their discipline and noted how math and science played a big role in their work. They led the students in activities to connect classroom math and science to real life.

“All children think about what they want to be when they grow up—in most cases, they want to be doctors or lawyers or work in some other profession that brings glory, fame, and money,” Gilpin notes. “Until the KEEN presentation, I hadn't considered engineering as one of those professions. The presentation opened my eyes to engineering by

applying subjects I enjoyed—math and science—to realistic problems.”

In his junior year of high school, Gilpin learned about a civil engineering scholarship offered by the Transportation Cabinet. It would help pay for college and offered a chance to gain engineering experience during the summer. Gilpin now has been working for the Transportation Cabinet for more than seven years. He serves as the KEEN coordinator for the Elizabethtown District Office and as a KEEN board member.

### What Is KEEN?

The KEEN program, the first of its kind, was launched in 1991 at the recommendation of a task force that studied the retention and recruitment of transportation professionals. The program has reached more than 200,000 students throughout the state.

KEEN provides an opportunity for the Transportation Cabinet and local schools to work together and allows engineers to communicate with the students within their own communities, enhancing the public image of the Cabinet and of the engineering

Student members of the Young Black Achievers group engage in a bridge-building activity during a KEEN presentation at the Chestnut Street YMCA in Louisville.



PHOTO: KENTUCKY TRANSPORTATION CABINET

profession. The KEEN program incorporates many of the concepts advanced under the Kentucky Education Reform Act, including the establishment of a Common Core of Learning and the application of basic math and science skills to real-life situations. KEEN is one of the main avenues for informing students about the Civil Engineering Scholarship Program available through the Cabinet.

In addition to benefitting students and teachers, KEEN provides the participating engineers and the coordinators with experience in public speaking. Opportunities include making presentations at public meetings, at project team meetings, and at fiscal court—that is, county government—meetings.

### Who Is the Audience?

KEEN presenters make classroom presentations to all grade levels. The presentations are adapted for the different age groups, and topics range from the work of engineers to computer applications. Most presentations include hands-on activities, and innovative approaches are always being developed. For example, KEEN helps administer a regional bridge building competition in western Kentucky for students in 5th through 12th grades and is working to establish a similar competition in the eastern part of the state.

In the most recent school year, KEEN volunteers made 471 presentations, reaching 13,621 students in 61 counties. KEEN also mounts displays at the Kentucky State Fair, Engineering Day at the University of Kentucky, Governor's Diversity Day, Kentucky State University's Summer Transportation Institute, and at several county fairs. Volunteers participate as judges for the Kentucky-American Science Fair and at other local science fairs. KEEN also works with the Boy Scouts, Cub Scouts, and the Governor's Scholars program.

### How Does KEEN Work?

An 11-person board oversees KEEN. Nine of the members are elected to rotating, three-year terms, and the other representatives come from the state highway engineer's office and the Cabinet's Office of Public Affairs. The board elects three new members and selects a state coordinator each May, and the newcomers assume their duties in July during a workshop at which presenters and board members share ideas. The workshop program includes a talk by the state highway engineer and an awards luncheon to recognize the most outstanding district, the most outstanding presenter, the most improved district, the district with highest percentage of counties reached, and outstanding leadership and dedication to KEEN.



PHOTO: KENTUCKY TRANSPORTATION CABINET

### Program Start-Up

In April 1990, then-State Highway Engineer O. G. Newman initiated a speakers bureau within the Department of Highways to enhance the image of the department and to encourage students to think about engineering as a career. The speakers bureau asked several Cabinet engineers to form a board consisting of a bureau chairman, a grade school committee chair, a middle school committee chair, a high school committee chair, and the cochair for a college-level committee.

T. J. Gilpin (*front, right*), who benefited from the KEEN program as a middle school student, participates as a coordinator and board member in the annual KEEN conference to plan out and refine the next year's program and activities.



PHOTO: KENTUCKY TRANSPORTATION CABINET

A student adjusts the model bridge girders to accommodate a suspended weight.



PHOTO: KENTUCKY TRANSPORTATION CABINET

Students assemble an arch during Engineering Day activities at the University of Kentucky, February 2008.

◆ The grade school program’s goals were to generate excitement about science and math and to relate interest in these subjects to engineering. The presentation, “Safety Is Engineered into Everything,” is geared toward fifth-grade students and explains how engineers help to make the world a better and safer place. The lecture is filled with hands-on activities and audience participation.

◆ The middle school and junior high school program, “Engineering: Turning Ideas and Technology into Reality,” was designed to reach eighth-grade stu-

dents and to answer the questions: What do engineers do? What types of engineers are there? What does it take to become an engineer? The program shows the contributions of engineering to daily life and includes demonstrations, games, and contests involving the students. Students are encouraged to take courses in math, science, and computers in high school in preparation for an engineering major in college.

◆ The high school presentation aims at second-semester juniors and first-semester seniors and emphasizes opportunities in engineering. Presenters discuss the Cabinet’s scholarship program and the types of classes that engineering students can expect to take in college. The speakers also provide information about the various engineering programs offered at Kentucky colleges and technical schools.

◆ The college-level or technical school presentation encourages engineering students and others who are yet undecided to consider civil engineering as a major. The session also promotes the scholarship program and career opportunities within the Transportation Cabinet. Engineers representing the many disciplines of the Cabinet discuss special research, activities and projects of interest, computer applications, the scholarship program, and the variety of job opportunities for students and graduates. The course structure is flexible and can be adapted to the needs and interests of each particular group of students.

### Program Expansion

The speakers bureau became KEEN in December 1990. During the 1990–1991 school year, representatives of each of the grade school, middle school,

Students at Emma B. Ward Elementary School, Anderson County, test out their aluminum boat designs at a KEEN program.



PHOTO: KENTUCKY TRANSPORTATION CABINET



high school, and college-level committees made presentations at educational institutions, gaining positive responses from students and faculty. In 1991, the Office of Public Relations agreed to assist in developing information pamphlets for teachers and administrators. The office also contributed to the middle school presentation, adding information about the various fields of engineering and recommendations for high school classes for students who are interested in engineering.

With the growth of the program and heightened interest, KEEN expanded into the districts. Engineers throughout the Cabinet were invited to serve as KEEN coordinators. Not all positions were filled at first, until the release of a video, produced by the Institute of Transportation Engineers, which stressed the importance of working with professional organizations to spread the message about engineering careers to students. Soon after, the positions were filled, and local and statewide newspapers received news releases about the KEEN program and the new district coordinators.

KEEN bylaws were adopted in 1994. Since then, armed with aluminum foil, gum drops, marshmallows, toothpicks, and a KEEN mind, the program has made history. (The aluminum foil is for building boats and for testing the strength of the designs, an activity that teaches about buoyancy and surface area. The gum drops and marshmallows are connected with toothpicks to build bridges, which are tested for strength, teaching about shear and compressive stresses.)

## Challenges and Obstacles

Coordinating the KEEN program at the district level can be challenging, notes Jennifer McCleve, a utilities engineer in the Louisville District Office.

“The district office is where the proverbial rubber meets the road,” McCleve comments. “Our goal is simple—to meet kids in our district and to teach them a little about engineering.”

The goal is not as easy as it sounds. McCleve’s district encompasses seven counties, and KEEN presenters try to meet students in each. For each KEEN event, the coordinator must meet the specific needs of the school, the students, and the presenter. Spare time is a luxury—the KEEN program must be managed and run efficiently.

In the district offices, a small network of volunteers with varying degrees of experience as presenters relies on standardized presentations. A presenter goes to the KEEN resources cabinet and picks up a box labeled with the appropriate presentation. Inside the box are the materials, including a PowerPoint show and giveaways for the students.

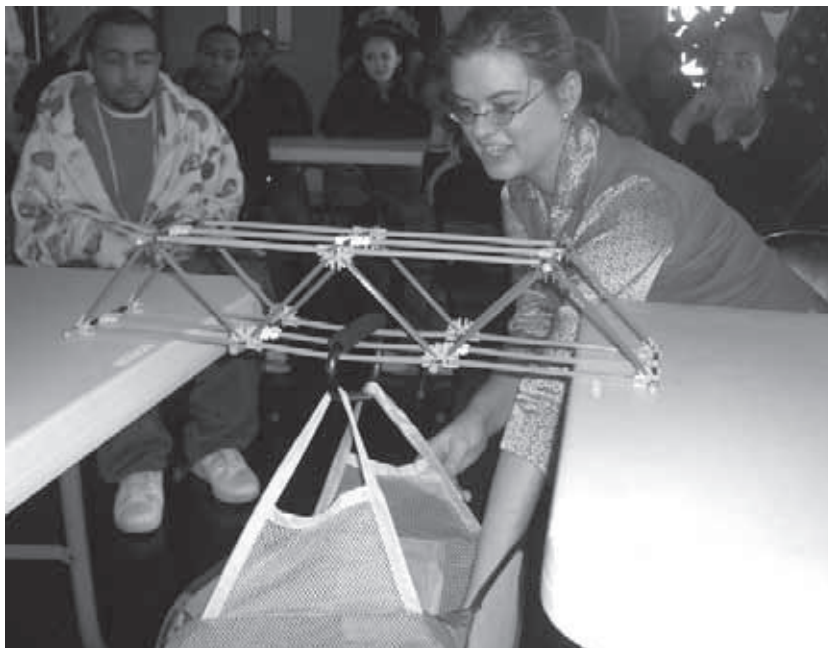


PHOTO: KENTUCKY TRANSPORTATION CABINET

“Most of us want to improve our community, but fear of the unknown and of making mistakes can be an obstacle,” McCleve observes. “We try to minimize the doubt and the likelihood of mistakes. As a result of our preparation, the Louisville District Office has had an increase in KEEN volunteers in recent years. Participation in the program is rewarding for everyone involved, and the coordinators and volunteers keep the program moving forward year in and year out.”

## Continuing the Success

The KEEN program receives \$2,500 yearly from the Kentucky Association of Transportation Engineers for handouts, pencils, pens, and other giveaway items. The State Highway Engineer’s office provides approximately \$2,000 for brochures, coloring books, and conferences. Each district budget allots \$500 to the district coordinator for supplies and souvenirs for students and teachers.

With this financial support, guidance from its board, and the extensive participation of volunteers, KEEN remains an ever-evolving organization, with goals that vary from district to district. The program reaches more than 20,000 students throughout the state each year. New and innovative presentations continue to be developed, and new volunteers from a variety of backgrounds will ensure KEEN’s continued success.

For more information about the KEEN program, please visit [www.transportation.ky.gov/Education/keen/home.htm](http://www.transportation.ky.gov/Education/keen/home.htm), or send an e-mail to Jamie Bewley Byrd, Statewide Coordinator, at [Jamie.BewleyByrd@ky.gov](mailto:Jamie.BewleyByrd@ky.gov).

Kentucky Transportation Cabinet Utilities Engineer Jennifer McCleve, KEEN coordinator for the Louisville District Office, helps students test the load-bearing capacity of a model bridge they have constructed. McCleve and fellow Louisville District Office KEEN coordinator John Callihan received the Outstanding Achievement Award at the 2007 KEEN workshop.

# BUILDING AN EDUCATION INFRASTRUCTURE FOR RAILWAY TRANSPORTATION ENGINEERING

## *Renewed Partnerships on New Tracks*

CHRISTOPHER P. L. BARKAN

The author is George Krambles Faculty Fellow and Associate Professor and Director, Railroad Engineering Program, Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign. A former chair of the TRB Technical Activities Division's Rail Group, he is a member of two National Research Council-appointed TRB committees—for Review of the U.S. Department of Transportation Strategic Plan for Research and Development, and for Review of the Federal Railroad Administration Research and Development Program.

Attracting a new generation of engineering and transportation professionals to replenish the ranks of the North American railroad industry has become a challenge. A large percentage of railroad industry employees are reaching retirement age, and the demand for railroad expertise has increased substantially with the growth in railroad traffic and in construction projects to expand capacity.

The railroad industry, other transportation modes, and other sectors need new engineers. But the situation for railroads is unusual and more problematic. The problem is solvable, however, and the solution could yield direct and indirect benefits.

To understand the situation with railroads, it is

instructive to consider highways, which are the principal competing form of land transport. Railroads compete for business with highway transport, especially with the trucking industry, and the competition extends to engineering talent and expertise.

### Academic Infrastructure for Highways

Each year, thousands of students graduate from U.S. colleges and universities having taken one or more introductory courses in highway transportation engineering. Many take advanced courses in highway planning and design, traffic engineering, intelligent transportation systems, pavement systems, and other aspects of transportation facilities and sys-



PHOTO: INTERNATIONAL ASSOCIATION OF PORTS AND HARBORS



Photo: UIUC

Eric Maple of CN (the Canadian National Railway) explains the dispatching system to a class during the 2008 Engineering Open House at the University of Illinois at Urbana-Champaign.

tems analysis that focus on highway transport. Many students complete summer internships on highway projects with state or local departments of transportation (DOTs) or with engineering firms. Hundreds more graduate with master's degrees that concentrate studies and research on an area of highway transportation engineering, analysis, or planning. More than 100 each year complete doctoral programs that explicitly or implicitly focus on topics in highway transportation.

These students—and the faculty who develop the curricula, teach the courses, serve as mentors, oversee graduate research, and present and publish research results—accept this as academic normalcy. Like many other academic subdisciplines, transportation engineering involves hundreds of faculty at universities throughout the United States and beyond. The faculty and students form an intellectual community that sustains a rich and vibrant dialogue on a variety of topics important to the field, and they often engage in cutting-edge research to advance the state of the art in highway transportation.

All of this benefits the individuals involved, the firms and agencies that use the results and that hire the graduates, and the nation's transportation system. A core function of the Transportation Research Board—as it was of its predecessor organization, the Highway Research Board—is to provide forums for the exchange of new results and information.

With such a network or infrastructure of people and organizations intensely engaged in and devoted to advancing highway transportation, thousands of engineering graduates each year choose to pursue careers in highway-related fields. Americans grow up with a world-class highway system. As a result, the extensive academic infrastructure devoted to

education and research related to highway engineering and transportation is not surprising to college students. Many are inspired to make highways their career goal as practitioners or academics.

The academic and practitioner communities have built and maintained this intellectual and institutional infrastructure in the past 60 years to create new knowledge for the improvement of the U.S. highway transportation system and to educate successive generations of engineering and transportation professionals to solve problems and advance new solutions for the highway transportation system. This marriage of the academic and highway practitioner communities has worked well.

## Railroads' Situation

Railroads are a critical element in the nation's transportation system, but several key differences reduce their visibility to students and university faculty. Highways are encountered daily, but the nation's rail system—especially its most successful element, the freight railroads—operates largely unnoticed. In some ways, this is a mark of success. The goods transported by rail reach their destinations reliably and economically and generally without incident, allowing the nation's commerce to function smoothly and efficiently.

What happens behind the scenes is not a concern to the general public—except when something goes awry. But because freight railroads function as a “stealth” mode, few understand or appreciate the role of rail and what railroads can offer in terms of interesting and rewarding careers in engineering and transportation.

The transportation community, including the highway sector, recognizes the importance of the railroad freight transportation system and its critical



Photo: UIUC

University of Illinois at Urbana-Champaign researcher Jeremiah Dirnberger documents the impact of misrouted and missorted railcars near the I-294 bridge in Bensenville, Illinois.



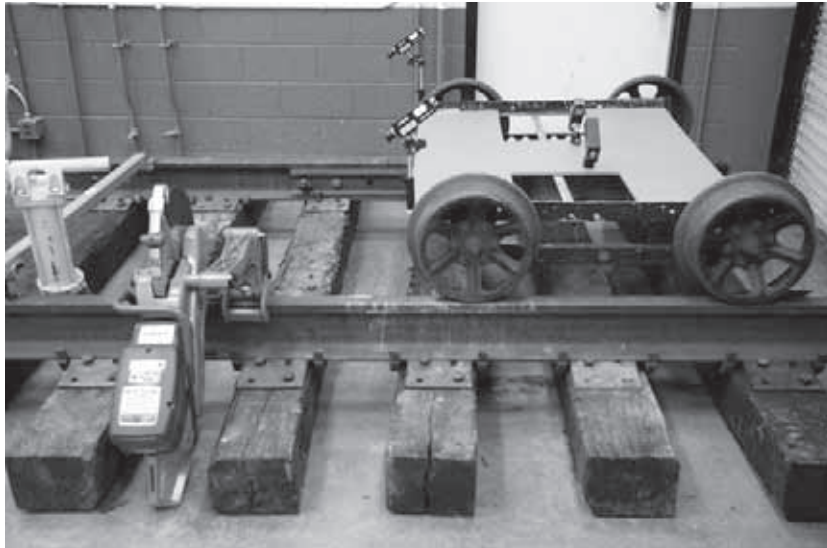


Photo: UNIC

NS track panel used for demonstrating tools and equipment to engineering students and trainees.

role in the future (1). Railroads not only are surviving but are beginning to thrive in a way not seen in the United States for nearly a century. Many in the railroad industry believe a railroad renaissance has begun in North America. Freight traffic—particularly intermodal freight—has been increasing steadily, and railroads have streamlined operations—trimming excess physical plant, renewing and upgrading the core network, and developing, testing, and implementing new technologies to enhance safety, efficiency, and reliability.

As a result, the profitability of the railroad industry is increasing, providing value to shareholders and encouraging new investment on Wall Street. As congestion mounts on the highways and airways, as fuel prices rise, and as concerns about safety, emissions, and land use become more pressing, railroads will take on a greater role in the transportation system, not only for freight but also for passenger service.

Society benefits from efficient, economical, and environmentally sustainable transport. But who is going to develop the technology to expand rail capacity and improve efficiency, and where are the skilled personnel for the necessary planning and engineering going to come from?

### Decline of a Relationship

In the first half of the 20th century, railroad transportation and engineering were well represented on college and university campuses. Several universities housed departments of railway engineering, and many universities included railroad transportation, engineering, and economics in their curricula. But after World War II, when highway and air transportation began their dramatic ascendancy, railroads were perceived as obsolete. Many in the academic community focused on the exciting new engineering

challenges and educational opportunities associated with the new modes.

Railroad programs, research, and classes disappeared as professors retired and were replaced by faculty interested in the newer modes. In academic circles, institutional knowledge of rail transport vanished almost completely. The omission from the curriculum is troubling from a public policy perspective. As faculty lost sight of the role of rail transport, transportation engineering classes evolved into classes in highway engineering, often without a change in the course title. Students consequently associated the discipline with the mode.

### Ramifications

According to an observation attributed to psychologist Abraham Maslow, “If the only tool you have is a hammer, you tend to see every problem as a nail.” For at least two generations, transportation engineering professionals have been taught to use tools primarily based on highway transport.

The implications are profound. As transportation professionals at the local, state, and federal levels had less knowledge of the rail mode, rail became less important in their thinking and planning. Questions involving rail met with less understanding about the exigencies of railroad infrastructure and operations.

The railroad industry encountered complementary problems. Public officials lack understanding of the industry’s needs, and the public often opposes industry plans for needed expansion. The industry is frustrated by an inability to hire young engineers educated in the principles of railway engineering and to find people willing to consider a career in what many still perceive as an obsolete and fading enterprise.

### Industry Retrenchment

These problems have been masked for half a century while the railroads retrenched. From 1956 to 2007, U.S. Class I railroad mileage shrank from about 210,000 to 94,000, and employment dropped from approximately 1 million to 167,000. Two generations of railroaders have spent their careers managing dwindling physical plants and work forces.

At the same time, however, railroad ton-miles tripled from 589 billion in 1956 to 1.772 trillion in 2006. Railroads survived this era partly through the development and implementation of technologies that enabled them to reduce physical plant and personnel yet increase output. The downsizing in personnel mostly occurred by attrition—employees who retired were not replaced, and recruitment was curtailed. Although this did not pose immediate problems, the results were an aging work force and a declining relationship with the academic community.

The demographics would have posed eventual difficulty for the railroads, but changes in Railroad Retirement have made the problem more acute. Allowing railroad employees to retire earlier with full benefits has generated an exodus of extensive engineering and institutional knowledge. Approximately 50 percent of railroad employees may become eligible for retirement within five years (Figure 1). This limits opportunities for senior personnel to mentor young employees and undermines the on-the-job learning that railroads depend on to educate new employees in the principles of railroad engineering.

### Documenting Practices

To address this, railroads have developed comprehensive documentation of their engineering practices. This is good, because many changes and innovations in railroad engineering practice had not been consistently well recorded and organized. The American Railway Engineering and Maintenance-of-Way Association (AREMA) has developed the *Practical Guide to Railway Engineering*, representing a multiyear effort by industry experts.

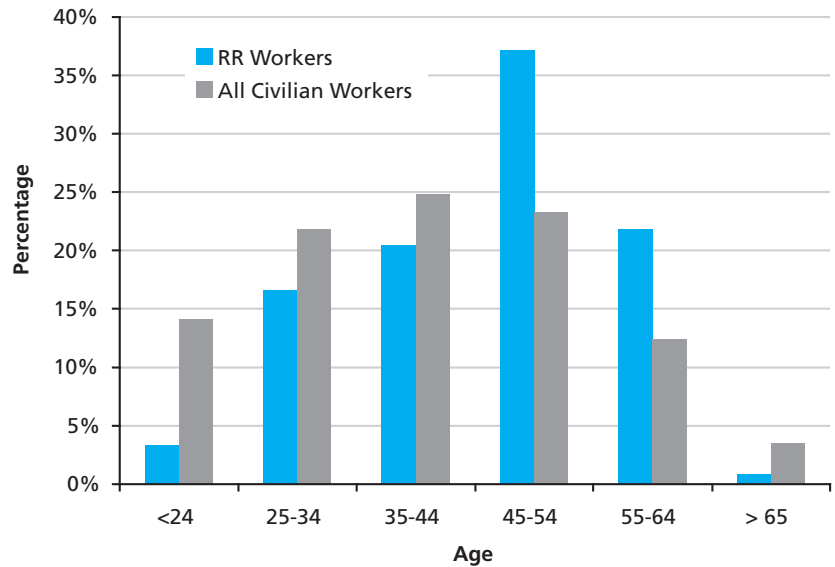
These measures will preserve and transmit much of the acquired knowledge of railroad practices. Nonetheless, the documents focus on what is done and how it is done but do not necessarily explain the why. As circumstances change and new situations or technologies arise, railroad professionals will need a deeper understanding of the principles to be able to adapt and respond—in other words, in addition to skilled craftsmen, railroads need knowledgeable engineers.

### Short-Term Research

Railroads have engaged mostly in short-term research addressing immediate, practical problems. In an era of survival and austerity, the most efficient way to obtain results was to rely on specialized experts to carry out most of the research. Industry and government programs alike depended on a small group of specialists employed by the Association of American Railroads (AAR), the Federal Railroad Administration (FRA), and a few consulting and technology development firms and organizations.

This approach has developed beneficial results that address many current problems. But railroads also paid a price—with the removal of most rail research from academia, faculty lost interest in, and understanding of, rail transportation, and this reinforced the perception that the industry was disappearing, increasingly irrelevant, and not interested in innovation.

The loss of railroad research funding for aca-



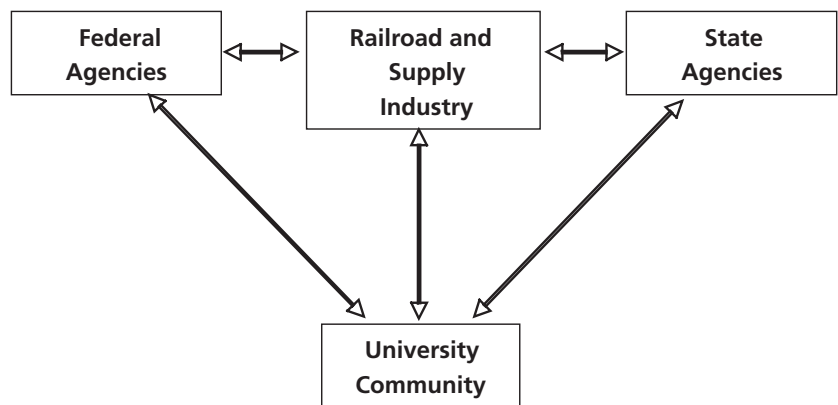
**FIGURE 1 Employee Age Groups: Rail Industry and Civilian Sector**  
(Sources: Railroad Retirement Board, U.S. Census Bureau, and AAR.)

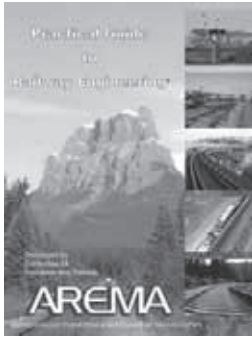
demics compelled faculty to look elsewhere. At major universities, faculty success is related to research funding, which supports the graduate students who conduct much of the work. Failure to obtain sufficient funding to support students and publish papers generally means no tenure or promotion. Transportation faculty therefore turned their attention to the funding available from state and federal agencies for highway-oriented research.

### Renewing the Partnership

The railroad and academic communities should renew and expand their relationship, to yield both short- and long-term mutual benefits (Figure 2). The railroad industry would be able to recruit from a larger number of students, who would be more informed and aware of railroad transportation and of the career opportunities available. The diversity of jobs and the excitement of involvement in rail transportation will attract many students. The industry, however, must do more than increase recruitment at universities—it must develop relationships with the

**FIGURE 2 New Railroad–Academic Partnership**





AREMA's *Practical Guide to Railway Engineering*, with contributions from more than 50 railroad professionals, provides in-depth coverage of railway fundamentals.

Amtrak President David Gunn (*right*) views a track section in the Newmark Structural Engineering Laboratory crane bay with University of Illinois at Urbana-Champaign graduate student Mike Koob (*left*), working to develop technology to assess contained stress in rails, and Professor Richard Weaver, Department of Theoretical and Applied Mechanics.



Photo: UIUC

faculty and the administrations, as the highway sector and other industries do.

Faculty can leverage interest in railroads—faculty members typically have contact with dozens to hundreds of students each year. In the near term, the number of students exposed to careers in the railroad industry will increase. In the longer term, visibility and understanding of the importance of rail transport will expand among students and faculty and will increase the acceptance and credibility of rail as a key element in well-rounded transportation programs.

### **Railroad Community's Role**

The railroad community—railroads, suppliers, consulting engineers, state DOTs, FRA, and industry organizations—should commit to a new partnership with the academic community. This will require a sustained commitment; hiring that does not ebb and flow in response to short-term business conditions; a competitive level of funding to support research and educational programs in railroad engineering and transport; and cooperative summer internship programs for students.

By developing a closer research relationship with the academic community, the railroad community can expand its range of intellectual interests and gain expertise in a wide array of new and emerging technologies. Most university research projects require extensive student involvement—in addition to the research deliverable, therefore, most projects also will produce students who have been intensively involved and educated in some aspect of railroad engineering or transportation. These graduates will enter employment with greater understanding and enthusiasm to apply their knowledge than would have been possible without the background received during their studies.

### **Academia's Role**

Universities also must commit to a sustained relationship with the railroad community. This includes hiring and promoting faculty who specialize in rail engineering and transport; undertaking research valuable to the short- and long-term interests of the railroad industry; developing courses focused on various aspects of railroad engineering and transport, as well as a curriculum for students interested in pursuing careers in the field; and encouraging student interest in rail transportation topics.

### **Working Models**

The AAR Affiliated Laboratory Program was created in the early 1980s by William Harris, Jr., and colleague Scott Harvey of the AAR Research and Test Department. The program has been an exception to the declining relationship between railroads and academia, supporting research at three universities: the University of Illinois at Urbana-Champaign (UIUC), Virginia Tech, and Texas A&M University. The support has allowed UIUC to maintain a century-old railroad engineering program.<sup>1</sup> The AAR program has provided consistent research funding and frequent contact between members of the industry and the academics engaged in research and teaching. The program also has paid off for the railroads—many new and emerging technologies for rail transportation originated as Affiliated Lab projects, and the railroad industry has developed and implemented many of these innovations.

### **Signs of Rebirth**

Two Michigan universities recently created new programs in rail engineering and transport. Michigan Technological University's rail transportation program has received industry support from CSX Transportation and from Union Pacific Railroad, and railroad executive Ed Burkhart has provided a generous endowment for the Michigan State University program in railroad transportation.

The University of Illinois has received industry support from BNSF, CN, CSX, NS, Hanson Professional Services, and the George Krambles Transportation Scholarship fund to reinvigorate and expand its research and educational program and add a second faculty position. These auspicious signs of a rebirth in rail education programs in the United States depend entirely on sustained industry support for continuation and success.

<sup>1</sup> The AAR program at the University of Illinois at Urbana-Champaign helped provide the rationale for hiring the author of this article 10 years ago to a faculty position devoted to teaching and research in rail transportation engineering.



### Other Initiatives

In addition, the University of Kentucky has conducted a teaching and research program for many years, and Massachusetts Institute of Technology has maintained a strong element of rail in its teaching and research in transportation engineering. A few other universities occasionally have offered courses, but reestablishing railroad engineering and transportation in academic programs requires more than a handful of schools.

AREMA has established a goal of 10 universities with full-semester courses in railroad subjects by 2010. More schools are needed with more depth and breadth in their programs to establish an infrastructure in railway education. The AREMA 10 × 10 initiative, however, offers an achievable, near-term goal for building. Accomplishing the goal will require support from industry, state DOTs, and FRA.

### Education Symposium

As a first step in renewing the relationship between academia and the railroad industry, AREMA's Education and Training Committee teamed with the University of Illinois at Urbana-Champaign, with assistance from the Rail Transportation Committee of the American Society of Civil Engineers' Transportation and Development Institute, to organize the first Railroad Engineering Education Symposium in June 2008. AAR, FRA, the Railroad Research Foundation, the University of Wisconsin Center for Freight and Infrastructure Research and Education, Norfolk Southern Corporation, and several other railroads, engineering firms, and individuals cosponsored the symposium. More than 30 faculty members from U.S. and Canadian colleges and universities attended lectures on railroad



Postdoctoral researcher Pooja Anand, University of Illinois at Urbana-Champaign, prepares to try an NS locomotive simulator.



PHOTO: MICHIGAN TECHNOLOGICAL UNIVERSITY

engineering principles, heard presentations about research opportunities, participated in discussions, and visited nearby railroad facilities to gain first-hand knowledge of railroad engineering and operating practices. Many plan to incorporate the material into their classes and curricula.

### New Era for Rail

A new era has begun that demands a talented generation of railroad engineering professionals who will adapt and apply new technologies to meet the challenges of 21st century railroads. The nation needs not only to maintain but also to expand the capacity of North American railroads to accommodate increased transportation demand safely, reliably, and efficiently. A new generation of capable, well-educated railway engineering professionals is essential to plan, design, build, maintain, and operate the rail transportation system, yet the academic resources to satisfy the educational demand are in short supply at North American universities.

To increase the visibility of rail engineering as a viable career path and to provide the education to pursue this career, more colleges and universities must teach the principles of railroad transportation engineering. A partnership between the academic and railroad communities can achieve this by building a new infrastructure in railroad engineering and transportation education.

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1. *Transportation: Invest in America—Freight-Rail Bottom Line Report*. American Association of State Highway and Transportation Officials, Washington, D.C., 2003. <http://freight.transportation.org/doc/FreightRailReport.pdf>.

Pasi Lautala (right), Director of the Michigan Tech Rail Transportation Program, talks with students at the Railway Engineering Activities Club model train exhibit during a student transportation showcase hosted by the Michigan Tech Transportation Institute.

# DEVELOPING A WATERWAYS CURRICULUM FOR YOUNG PEOPLE

## *Framework for Highlighting Careers in the Marine Industry*

WILLIAM C. EIDSON

The author is Traffic Operations Engineer, Christopher B. Burke Engineering, Ltd., Rosemont, Illinois.

**E**ngineering education occurs every day for children at all age levels. Many of the learning opportunities are informal, unstructured experiences, but the impressions can last a lifetime. With this approach, transportation professionals can interject focused transportation and engineering elements into children's learning experiences and can reach youthful audiences with an effective message.

At the 2007 Annual Meeting of the Transportation Research Board (TRB), the Marine Board and the Inland Water Transport Committee sponsored a session on educational programs to enhance the visibility of the marine industry among school-age children. One paper presented a waterways curriculum, a flexible approach for developing and presenting educational materials focused on marine transportation to children in a variety of settings (1). Although the paper stopped short of describing a turnkey educational product, it introduced key concepts and a road map for establishing a program.



Students explore riverine conditions and erosion at the National Mississippi River Museum and Aquarium, Dubuque, Iowa.



Tug, container ship, and U.S. Coast Guard cutter under way in Alaska. A core curriculum would prepare students for a variety of careers in marine transportation.

### Charting the Course

Developing the waterways curriculum must begin with marine professionals asking, "What images of the industry will inspire and encourage young people to consider maritime transportation as a career?" The answers will become the building blocks of the program and will identify topics to carry through. Core subjects should include elements for the industry's sustained growth and success, such as security, logistics, operations, design, marine biology, and applications of advanced technologies.

### Organizational Models

After identifying the fundamental subjects, the next step is to create a framework to accommodate the needs of participants and educators. The focus should be on delivering messages to youth in a fun, activity-driven way, and on crafting the message and the supporting materials.

Examples of successful techniques for engaging youth are evident in the major U.S. youth organizations, such as the Boy Scouts of America, the Girl Scouts of the USA, 4-H, and the Boys and Girls Clubs of America. Each provides positive outlets and rou-



Visitors can experience the legacy of the maritime industry in the boatyard and aboard the *Lilly Belle* at the National Mississippi River Museum and Aquarium.

tinely immerses participants in a culture of exploration and learning that makes it fun and rewarding to gain knowledge and discover career paths.

Many youth organizations offer fast-paced, age-appropriate programs that challenge participants and maintain their interest (2). The programs strike a balance between lectures and hands-on activities, including models and demonstrations of actual equipment. Many incorporate civics lessons, along with basic concepts of budgeting, managing workloads, and ethical decision making. Academic skills are often subtly employed through presentations and question-and-answer sessions.

By emulating the best elements of successful youth-oriented programs, the waterways curriculum can focus more on developing content and less on creating mechanisms for outreach. Many youth organizations nationwide can serve as models, and some may be open to partnering.

## Dividing the Audience

To present age-appropriate material, the waterways curriculum must be divided into age categories according to the complexity of the concepts. With participants separated into several age ranges, or cohorts, educators can tailor the program to specific needs. This also allows for coherent and consistent teaching nationwide. Typical cohorts are kindergarten to third grade, fourth to sixth grade, seventh to ninth grade, and tenth to twelfth grade.

The other age division, by curriculum modules, separates each grade level. The modules allow educators and youth to focus on waterway concepts appropriate to the students' ages, interests, and attention spans. Modules also ensure that students experience new programs and concepts from year to year. Students who do not participate in the curriculum regularly would not benefit from the modular system,

but those who do would experience fresh material each session. In addition, students would build on previously taught skills and concepts and would be introduced to more advanced topics year after year.

### Age-Appropriate Content

The age-appropriate concepts and activities developed for each cohort and module should challenge—but not overwhelm—the students. This program structure can be likened to building blocks.

The kindergarten to third grade cohort may not be able to grasp advanced marine industry concepts but can be introduced to key words and equipment through models, activities, diagrams, and tours. The fourth to sixth grade cohort is able to recognize the interrelationships between concepts—for example, using math to determine the time required to complete specific dockside tasks or identifying the geospatial relationship between cargo, ships, ports, and consumers.

The middle school cohort can apply current events or scientific principles to marine problems, such as changes in water levels, security measures, and just-in-time delivery. The high school cohort

## A Maritime-Focused High School Education

One of 14 schools offering maritime technology studies in the United States, Ballard Maritime Academy in Seattle, Washington, provides a specialized learning program for students in grades 10 through 12 that integrates maritime industry skills with history, language arts, and science to prepare students for careers in the marine sciences and the maritime industry.

The college-preparatory curriculum provides opportunities for interdisciplinary study, hands-on learning, practical experience, and research. Students can enter the program and take maritime-focused elective courses in their sophomore year; the academy offers paid internships to students during the junior and senior years. The sophomore year electives include marine biology and an introduction to maritime topics; the junior year curriculum includes classes in chemistry, physics, zoology, maritime skills, and maritime carpentry; and the senior year offers advanced marine science, as well as a deck license course for U.S. Coast Guard Operator of Uninspected Passenger Vessels.

Students at three grade levels participate in adventure expeditions, which are offered at the beginning or end of school-scheduled breaks and involve research or problem-solving projects. A select group of Ballard students has the opportunity to visit the National Oceanic and Atmospheric Administration—a core sponsor—in Washington, D.C. The academy's educational, government, business, and industry partners include Zenith Maritime, the Seattle Maritime Academy, the University of Washington, the Pacific Maritime Institute, and the Port of Seattle.

For more information, visit [www.seattleschools.org/area/cte/academies/bmaindex.xml](http://www.seattleschools.org/area/cte/academies/bmaindex.xml).



Families tour the U.S.S. *Razorback* submarine at the Arkansas Inland Maritime Museum, North Little Rock, Arkansas. Onsite, firsthand learning opportunities would be integrated into the waterways curriculum.



can tackle advanced subjects, including labor relations, market economics, and historical industry challenges.

The same tiered structure would apply to the content of each grade's curriculum module. The materials and activities of each cohort, however, are not intended to be an aggregate of the related modules—instead, each cohort should have its own curricular identity, allowing participants to see unique material in every program path, in and out of the classrooms. Every curriculum cohort and module program should include diagrammatic materials, colorful handouts and exhibits, three-dimensional models, interactive exhibits or multimedia presentations, and hands-on discovery with actual equipment and tours of marine facilities.

The inherent flexibility of the framework is key for educators. If the industry provides access to a variety of age-appropriate alternatives for each program element, educators will be able to incorporate waterway concepts into their programs and lesson plans. By empowering educators to choose the best outlet for their own creativity under the waterways curriculum, the industry can reach out to the target audience of students.

### Program Pathways

The waterways curriculum includes four primary pathways: school programs, community outreach, onsite teaching, and expositions. Although the marine industry can share its message through one or two of these pathways, the strongest impression

on youthful participants will come from the comprehensive use of all four.

◆ The **school programs** pathway involves developing materials for classroom teaching and establishing a speakers bureau. The materials should be adaptable by teachers and should include recommendations on related academic subjects, on how to use the materials to enhance classroom experience, and on assignments, quizzes, experiments, and crafts to help students visualize aspects of the maritime industry.

The speakers bureau connects teachers with local maritime professionals who are interested in visiting a classroom, presenting real-world experiences, and sharing new perspectives with students. School programs generally would be presented at the curriculum module level, although the cohort level also would work.

◆ The **community outreach** pathway develops materials for community youth organizations, such as the Boy Scouts, Girl Scouts, 4-H, and Big Brothers–Big Sisters of America. The needs of these groups differ from those of the school programs, and the materials should include hands-on activities, models, and experiments to replace the assignments and quizzes appropriate to a classroom setting.

The speakers bureau can enhance understanding of industry concepts, serving as a network for community organizations to contact professionals willing to give demonstrations at meetings and to serve as mentors for the marine program. Community outreach programs would be presented at the curriculum cohort level, although the module level also may be appropriate.

◆ The **onsite teaching** pathway focuses on educational field trips. Many educators seek opportunities for their students to experience their subjects of study firsthand, and the marine industry can provide that experience at sites such as maritime museums,



View of the Arkansas River from atop the U.S.S. *Razorback* submarine at the Arkansas Inland Maritime Museum.

port facilities, natural resource agencies, and U.S. Coast Guard or U.S. Navy installations. The mission of the host facility would determine the content of the tour or demonstration, but the materials should cover topics appropriate to the students' ages and experience with the waterways curriculum.

The onsite teaching program would be presented at the curriculum cohort or module level. Presenters could work with educators to develop a program to complement the students' experiences. This pathway could be used in conjunction with the school programs or community outreach pathways, or separately.

◆ The **expositions** pathway is presented to a diverse and itinerant audience. The other pathways aim at essentially captive audiences, who experience a discrete program and remain involved until the conclusion. In contrast, expositions—such as a community event, boat show, school career day, or county fair—encourage participants to move from booth to booth, stopping only for a moment at each.

Colorful and engaging materials are necessary therefore to attract youth to pick up informational handouts and to discuss opportunities with the maritime professionals at the booth. Staff members can perform demonstrations and can exhibit models to describe operations and to provide hands-on opportunities to visitors. Exhibit staff should be prepared to discuss a variety of marine industry topics.

## Building Partnerships

Partnering with other organizations will give the waterways curriculum the best opportunity for success. Although the program could meet the industry's



goals without outside support, an immense outlay of resources will be required, and the message would be unlikely to reach the numbers of children who could participate if the development team establishes strategic relationships.

Establishing a nationwide network to achieve community-based connections will maximize the opportunity for children to experience the maritime industry locally, instead of learning about it from a textbook or from a television program. At the same time, national coordination between the maritime industry and youth organizations will provide consistency in the program and will allow for shared experiences among participants nationwide.

Partnerships should focus on organizations that share the goals of youth outreach, transportation

Port operations in Vancouver, British Columbia, Canada. A successful waterways curriculum will require maritime industry partnerships with schools.

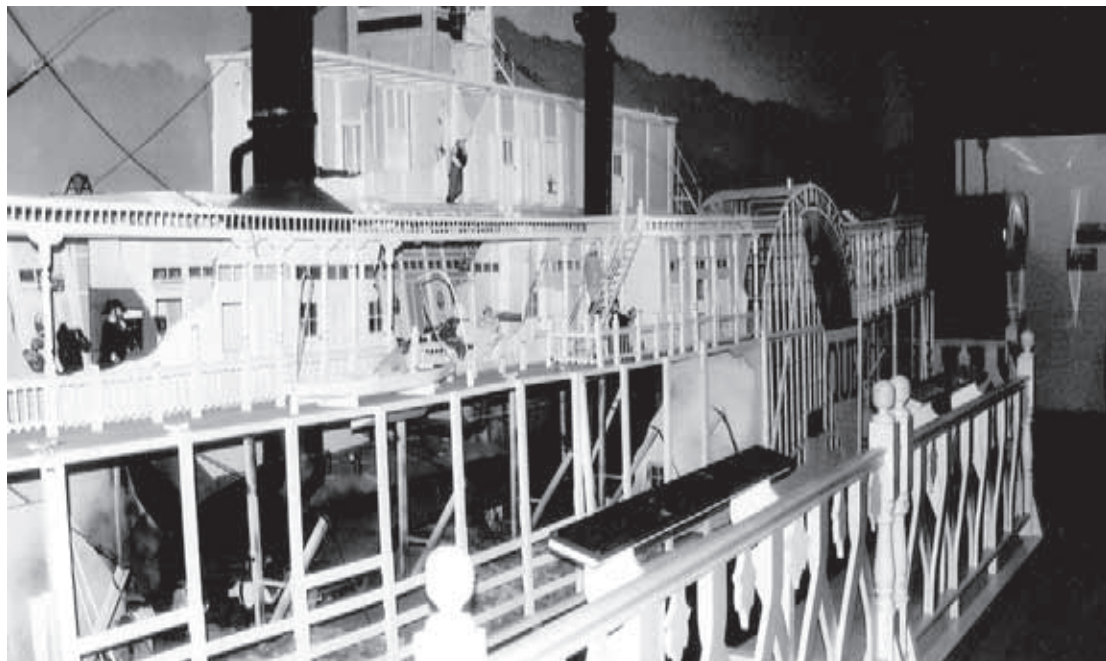
## Sea Perch Poised to Inspire Future Marine Engineers

**T**he Society of Naval Architects and Marine Engineers (SNAME) and the Office of Naval Research are collaborating on the hands-on Sea Perch Program, designed by the Massachusetts Institute of Technology, for middle and high school students. The program teaches engineering, science, and mathematics through the building of an underwater remotely operated vehicle (ROV). Students learn engineering concepts, problem solving, teamwork, and technical applications, and can participate in an end-of-the-term design competition. The students build an ROV with a propulsion system, develop a controller, and investigate weight and buoyancy.

The ROVs are made with PVC pipe and other small parts. The project teaches basic skills in ship and submarine design and encourages students to explore naval architecture and marine and ocean engineering concepts. The curriculum includes discussion of careers in engineering and technical fields, as well as related areas of study. The project is starting up in the Washington, D.C., Virginia, and Maryland area, with the goal of expanding into a national program within the next five years.

*To learn more about Sea Perch, go to [www.seaperch.org](http://www.seaperch.org); <http://web.mit.edu/seagrant/edul/seaperch/index.html>; or contact Susan M. Giver, Director of Outreach and Strategic Development, SNAME; 717-944-0497; [sgiver@sname.org](mailto:sgiver@sname.org).*

Interactive exhibits and models attract young people to explore the history of the maritime industry at the National Mississippi River Museum and Aquarium.



education, marine operations, maritime history, or engineering and applied science training. A variety of local and national groups could serve as partners for the waterways curriculum.

Community groups, such as the Boy Scouts of America, the Girl Scouts of the USA, and 4-H, have strong national and local structures that could highlight the role of the maritime community. Waterways curriculum participants, for example, could earn a special award or advancement. The partnerships initially may yield an increase in requests for marine facility tours and presentations, but in the long term, annual events may be established, such as weekend activity days or weeklong summer camps.

Marine industry professionals and organizations with a vested interest in the growth of the industry could supply local program volunteers, many of whom could give firsthand accounts that would interest children. Examples include the U.S. Army Corps of Engineers, the U.S. Coast Guard Auxiliary, the National Oceanic and Atmospheric Administration, the Ship Operations Cooperative Program, cruise and shipping lines, technical societies, marine law enforcement agencies, and marine labor organizations.

### Developing the Lessons

A diverse development team, representing marine companies and agencies, community groups, and educators, should be established to prepare the programs. Educators must be involved at an early stage if the program is to be successful. If experienced educators are not available within the maritime industry to create pedagogically sound content for the water-

ways curriculum, partnerships with educational specialists will need to be fostered.

An initial version of the waterways curriculum could be established quickly through partnerships that allow the use of materials and resources that are already available. For example, the American Society for Engineering Education's *K12 Engineering* program (3) and the Maritime Administration's Just for Kids and Teens website (4) provide a wealth of information and materials for introducing their subjects to students.

Through partnerships such as these, the waterways curriculum development team can focus on generating materials quickly for each pathway, cohort, and module. As the program becomes established, the focus could shift to refining the program, incorporating recommendations from educators and marine professionals, and integrating emerging educational techniques and marine technological advances.

### Program Implementation

An initial deployment of the waterways curriculum could be limited. For example, several test runs could be established with schools and community organizations in areas that have a strong maritime industry presence, such as along the coasts or in the Great Lakes region. If the program meets with success, any necessary changes can be made, and recommended practices can be shared for implementation nationwide, including regional variations in program elements and suggestions for how to network with industry speakers.

*(continued on page 30)*



## Maritime Education Shining as a Lighthouse

ARTHUR H. SULZER

In Baltimore, Maryland, 60 percent of students in the ninth grade do not graduate from high school. Programs in maritime education at the primary and secondary school level can illuminate a pathway to help students who otherwise would lose their way to participate and graduate instead into a rewarding and meaningful career in the maritime field.

In April 2008, the Ship Operations Cooperative Program (SOCP) sponsored a conference at the Maritime Institute of Technology and Graduate Studies facility outside of Baltimore, with the theme, Maritime and Intermodal Education for Primary and Secondary Schools in America: Onboard to a Future Career. More than 200 participants from government, industry, and education gathered to learn about developments in maritime education and to share knowledge with and assist a small group of pioneering schools scattered around the country.

Keynote speaker Congressman Elijah Cummings of Maryland, chair of the Congressional Subcommittee on Coast Guard and Maritime Transportation, has a maritime high school within his district, Baltimore's Maritime Industries Academy. Cummings examined the national problem of low graduation rates from city schools and stressed the need to expose students to maritime careers at an early age. Students in the fourth through sixth grades begin to examine career possibilities and to focus on and take interest in related courses and subjects; presenting a maritime career or program of higher education to high school juniors or seniors may be too late.

In a plenary session, Mission: Maritime-Intermodal Primary and Secondary School Programs, leaders from academia, industry, and government

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PHOTO: RAMI MAGEBRAN, SOCP



*Keynote speaker U.S. Rep. Elijah Cummings (D-Maryland) described the goals and successes of Baltimore's Maritime Industries Academy.*

echoed the Congressman's remarks, emphasizing the need to improve graduation rates and noting the shortages of skilled mariners, the excellent wages and benefits available in the industry, and the programs that agencies and institutions have established to assist the maritime schools. Session speakers included Vice Admiral Joseph D. Stewart, Superintendent of the U.S. Merchant Marine Academy; Tim Casey, CEO of K-Sea Transportation; Katharine Oliver, Assistant State Superintendent, Maryland Department of Education; and John V. Ladd, Administrator, Office of Apprenticeship, U.S. Department of Labor. Casey's company offers apprenticeship programs for maritime high schools in New York and Philadelphia; he urged other maritime employers to get involved.

PHOTO: RAMI MAGEBRAN, SOCP



*Rear Admiral James Watson, Director of Prevention Policy for Marine Safety, Security, and Stewardship, U.S. Coast Guard, was one of several leaders endorsing maritime training and education programs.*

The conference program offered workshops for participants to share ideas on such topics as curriculum development, maritime training assistance, shipyard apprentice programs, starting a maritime program, school public affairs, and marketing a school. Principals of 13 of the 18 primary and secondary maritime schools that have opened since 2001—when the movement escalated—were in attendance, as well as individuals from cities considering maritime programs, including New Orleans, Houston, and Detroit. Exhibits highlighted products and services for maritime training, the Maritime Academies, and union and community colleges that offer maritime training.

Other speakers on the two-day program included Rear Admiral Jonathan W. Bailey of the National Oceanic and Atmospheric Administration and Rear Admiral James Watson of the U.S. Coast Guard. Independent film producer and luncheon speaker Maria Brooks showed an inspiring clip from her film, *The Men Who Sailed the Liberty Ships*, about the contributions of civilian sailors in the U.S. merchant marine during World War II. In a dinner speech, Maritime Administrator Sean Connaughton committed his agency to working with groups such as SOCP and industry partners to develop a model curriculum and courses for maritime schools and to facilitate the development of additional schools through outreach programs.

The conference was designed to bring together and connect individuals and institutions that have an interest in and commitment to increasing awareness about the nation's rich maritime heritage and about the opportunities that a maritime education and career can offer. As a result of the conference, the Maritime Administration, SOCP, and others have formed a Maritime Education Consortium to work with educators and the industry to provide resources, curriculum content, and courses.

## Sample Program Elements

Several curricular activities could be incorporated into the waterways curriculum. A sampling is highlighted below.

### **Individual Materials**

Materials for individual use by participants could be collected, to offer youth resources for exploring the marine industry on their own. Coloring and activity books, interactive web pages with animations, educational games, and reference Internet hyperlinks are examples applicable to any of the pathways.

Individual activities also can include family events, such as a trip to a boat show or a local maritime history museum, with ideas for activities during a day trip to a marine facility. For example, a scavenger hunt at a maritime museum would encourage families to work together to follow clues while exploring the exhibits.

In the classroom, individual activities can reinforce concepts explored in group sessions, hands-on activities, and lectures. Educators could challenge individual participants through routine homework assignments and ultimately through more complicated projects for science fairs or community outreach programs, such as 4-H or the Boy Scouts of America. Materials should include sample quiz ques-

tions and research topics related to each subject in a cohort or module, as well as appropriate supporting lecture materials. Individual materials could be distributed as part of all four waterways curriculum pathways.

### **Group Activities**

Materials for group activities should engage students and encourage participation and learning through shared experiences. Classroom games or computer-based games, for example, can challenge participants collectively to explore different marine concepts related to curricular topics.

Younger participants may enjoy a card game matching marine industry images with letters, such as a tug boat with the letter T. Older participants could play a computer game loading freight onto a ship—students could assign berths to ships based on cargo capacity and could calculate what percentage of cargo remains to be handled for each vessel, reinforcing lessons in fractions and percentages, as well as clock skills. A more advanced level might challenge students with loading delays, increases in the frequency of arriving vessels, the routing of ships, and the assignment of cargoes to ships according to final destinations—this would assist in teaching geography, critical thinking, mathematics, and operational concepts.

Role-playing games are valuable for teaching a range of topics concurrently. Participants would be assigned different port operation roles, be given specific instructions, and then would interact with each other as marine professionals within the game to find the solution to a problem. The educator can adjust the complexity of the game through varied plots and challenges.

Traditional classroom techniques—lectures, videos, and computer animations—also would be part of group activities. The materials should be synthesized into structured presentations and prepared lesson plans for use by community outreach educators and marine professionals, who often are amateur instructors. A combination of traditional classroom experiences and activities in a fast-paced and dynamic session that can be quickly prepared and easily adjusted for specific needs will prove an excellent resource for educators. Group activities would be conducted in the school programs, community outreach, and onsite teaching pathways.

### **Hands-On Demonstrations**

Hands-on demonstrations should accompany every topic in every curriculum cohort and module, allowing for student exploration and for educator-facilitated activities.

## Great Lakes Summer Institute Educates the Educators

**T**eachers and educators gathered July 20–24 at Lake Superior, Duluth, Minnesota, for the Great Lakes Maritime Transportation Summer Institute. Sponsored by the Great Lakes Maritime Research Institute (GLMRI) and Michigan Technological University, the summer institute offers teachers and educators the opportunity to explore the historical, economical, and environmental aspects of Great Lakes shipping and to meet with industry representatives to gain insights into management and regulation.

Sessions provided information on Great Lakes cargo shipping; environmental concerns; the role of the vessel traffic control system in vessel tracking and homeland security; social, economic, and environmental issues for all transportation modes; the history of cargo shipping; principles of ship design; and career opportunities in the maritime transportation industry.

Highlights included presentations by GLMRI codirector Richard Stewart; Ron Johnson, Duluth Seaway Port Authority; and Mary Balcer, University of Wisconsin–Superior, as well as port captain Ken Geraiosimos of Great Lakes Fleet–Key Lakes, Inc., and a tour of an iron ore mine, a taconite processing plant, the Murphy Oil Corporation’s northern refinery, and a retired lake freight cargo ship, S.S. *William A. Irvin*.

*For additional information, visit [www.glmri.org/downloads/GLMT\\_brochure08.pdf](http://www.glmri.org/downloads/GLMT_brochure08.pdf).*

The student exploration demonstrations should be designed so that educators can guide students to model and visualize marine concepts. Sample demonstrations could include creating models of locks using plastic containers of water and a model boat, or conducting classroom experiments to study the scientific impact of pollution on marine species.

The educator-facilitated demonstrations would be led by a marine professional who would present an activity for the youth to experience. This could be something on a grander scale than the student exploration activities—such as a full-scale demonstration of the operation of an actual lock and dam or bringing a specialized piece of equipment to class and demonstrating its use.

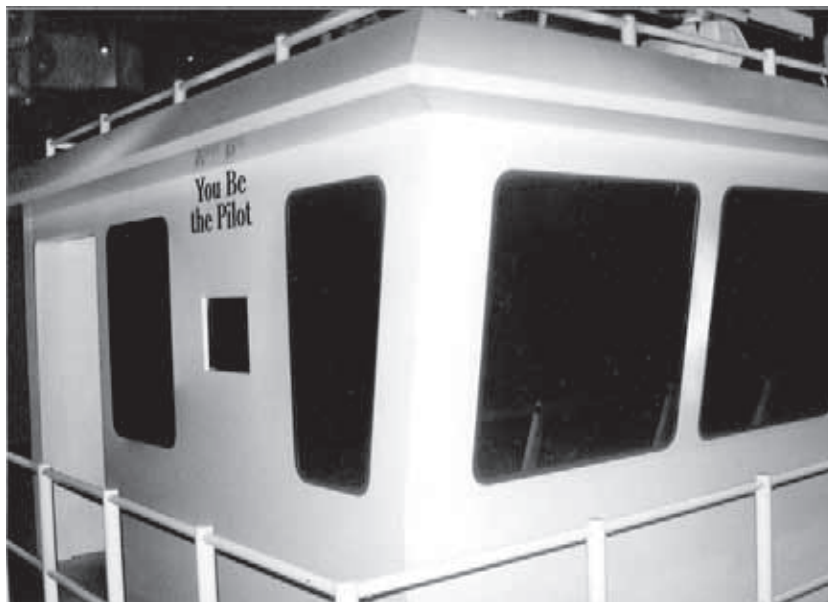
### Elements for Success

The waterways curriculum concept is not ready to implement but can serve as a starting point for marine professionals in creating a detailed program with materials for distribution to educators nationwide. Through developmental workshops, education specialists and subject matter experts can work together to establish the specific content, following the flexible framework for delivering marine concepts to children.

The list of topics that could be included in the waterways curriculum is extensive. The examples presented here are neither a comprehensive list nor the minimum requirements. Any subject within the domain of the marine industry would be a candidate for inclusion, although the focus should be on topics that support the marine industry's mission of outreach and the pedagogical goals of educators. Although every topic is likely to have educational value, some will be more interesting to participants than others. Certain topics may not be convenient to explore because of time, resources, complexity, age diversity of the participants, or the educator's experience.

Some elements of the framework will need to be thoroughly developed for a successful program—notably the national clearinghouse and the speakers bureau. The development team should identify an institution or facility to serve as a national clearinghouse, a distribution center for educators to access the most up-to-date program materials. The clearinghouse also would simplify the maintenance efforts to keep the program functional.

Establishing a waterways curriculum speakers bureau also should be a priority for the program development team. The team should establish criteria that make clear the commitment involved when speakers agree to participate. For example, some may make presentations at only one event, but others



may be expected to return to reinforce the concepts for participants and to serve as mentors.

The development team should provide guidance for creating the waterways curriculum elements. The team should establish dialogues at regional or national levels with the potential partner organizations and should serve as a point of contact in dealing with national youth organizations and educational specialists, exchanging ideas and making forward-thinking decisions. The development team's ability to make timely decisions and to represent the opinions of the marine industry is critically important to a successful start for the program.

After the waterways curriculum program is implemented, a variety of opportunities may be pursued, and a strategic review should be undertaken to determine the future course. The program will require a major investment of time and resources by maritime professionals and educators. If the program is well designed, if it engages the participants, and if it is presented by enthusiastic marine professionals, the benefits to the industry will be enormous.

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Visitors can test their skills handling a Mississippi River barge with the hands-on pilot simulator at the National Mississippi River Museum and Aquarium. Simulations and live demonstrations help students model and visualize marine concepts.

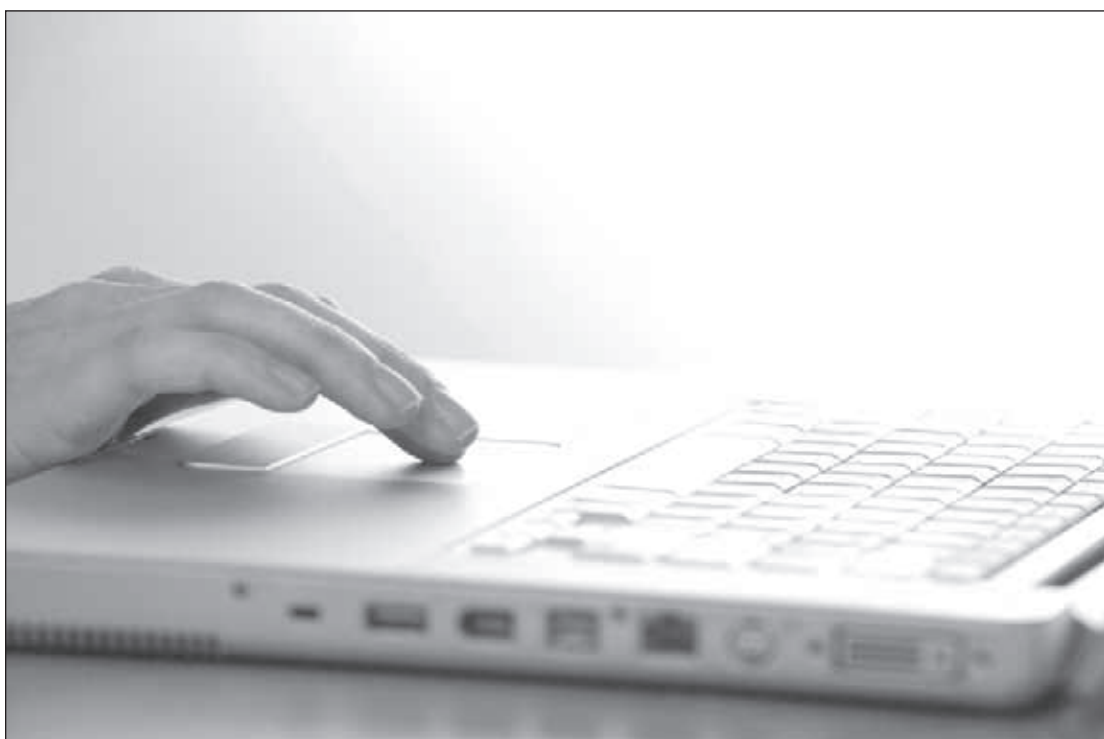


# EDUCATING THE TRANSPORTATION LEADERS OF THE 21<sup>ST</sup> CENTURY

## *The Transportation Leadership Graduate Certificate Program*

THOMAS F. HUMPHREY

*The author is Program Manager and a Past President (1992–1993), Council of University Transportation Centers, and retired Founding Director of the New England University Transportation Center at Massachusetts Institute of Technology.*



**A**n innovative pilot program for a graduate education certificate in multimodal transportation, delivered via distance learning, is nearing implementation. The goal is to educate the transportation leaders of the 21st century. The program theme is transportation policy, management, and operations.

The cooperative program is designed to address a well-documented priority for the transportation workforce. The founding directors of the Regional University Transportation Centers (RUTCs) have volunteered to lead the implementation effort. The anticipated success of the transportation leadership graduate certificate program may lead to similar certificate programs in theme areas such as security, infrastructure, safety, and the environment.

The main features of the three-year pilot program are as follows:

- ◆ Four theme-related graduate level courses taken for credit at participating universities;
- ◆ A range of courses to provide breadth of knowledge in topics such as policy, systems engineering, operations, safety, security, planning, and finance;
- ◆ Courses delivered on a national scale via distance-learning media;
- ◆ Courses taught by outstanding graduate faculty from outstanding universities.

Recognized and endorsed by public-sector and private-sector industry leaders, the certificate awarded

from this enterprise will carry and convey prestige.

The implementation of the program marks the culmination of a process and plan of action supported by years of studies, conferences, workshops, and reports. The program already has received continuing support and endorsement from key transportation industry leaders in the public and private sectors, as well as from transportation-related associations.

## Program Concept

Accomplished, highly regarded university graduate faculty will present the multimodal, interdisciplinary, graduate-level curriculum, via distance-learning media on a national and perhaps international scale. The first group of theme-related graduate education courses will be delivered through a national consortium of universities led by the RUTCs.

As soon as the founding RUTCs have agreed on all details of the certificate program, they will invite all universities with graduate transportation programs to participate. An interim, central administrative infrastructure is in place; the faculty and students will be located throughout the country.

All graduate education courses will be taken for

full credit and will be semester-length, leading to an award of credits by the university at which the tuition-paying student is enrolled. The RUTCs will award the certificate after the completion of the four required courses. The goal is for the certificate to be supported by the U.S. Department of Transportation, transportation associations, and leading public- and private-sector organizations.

The target audience consists of early-career professionals who are on the leadership track in the public and private sectors and who have earned a bachelor's degree in one of many disciplines—such as transportation engineering, systems engineering, operations research, environmental analysis, political science, economics, financial analysis, planning, social sciences, and other supporting disciplines. At many universities, tuition-paying students in the program will be able to apply a portion of the credits earned for the certificate to an advanced degree.

The Federal Highway Administration's (FHWA) National Highway Institute provided the seed funding for the development of the concept, the preliminary design of the program, and a draft operations and business plan. Impressed with the con-

## Genesis of the Concept

The initial idea for the development of the graduate-level certificate program occurred in the late 1990s, when the U.S. Department of Transportation's Intelligent Transportation Systems (ITS) Joint Program Office (JPO) in Washington, D.C., decided to establish and implement the ITS Professional Capacity Building Program. The initiative made clear that

- ◆ Traditional transportation engineers understood relatively little about the underlying disciplines needed for ITS deployment;
- ◆ ITS professionals in systems engineering, operations research, and information technology understood relatively little about transportation engineering;
- ◆ Each professional spoke a different language and needed to understand the other's; and
- ◆ A cross-fertilization of competencies was needed.

In the early 2000s, the University of Rhode Island College of Business began to develop an interdepartmental master's degree in trans-

portation policy, management, and operations, incorporating faculty from the graduate programs in business, engineering, and the social sciences. Research into the need and demand for the program required collecting information from public- and private-sector senior executives. The results of that research, along with other documentation, confirmed that many common competencies and skills are required in both the public and private sectors and that technical professionals need nontechnical breadth and depth to progress from technical to management to leadership roles (7).

The concepts developed in these early efforts provided the motivation to seek seed funding from the National Highway Institute to develop the distance-learning graduate education certificate program.

### Reference

1. Humphrey, T. F. Transportation Skills Needed by Private-Sector and Public-Sector Organizations: Some Common Themes. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1924, Transportation Research Board of the National Academies, Washington, D.C., 2005, pp. 46–51.



cept, the RUTC founding directors volunteered to lead the development of the program and to work out the details of the implementation.

The founding RUTCs funded the next stages of development and made implementation a priority, consistent with their objectives and responsibilities as centers of excellence for education and research. The RUTCs have taken the following actions:

- ◆ Signed a cooperative memorandum of understanding;
- ◆ Established a board of directors and an interim leadership team;
- ◆ Appointed a program manager;
- ◆ Established an advisory committee to guide the program, comprising leaders from public- and private-sector industry, transportation associations, and the academic community;
- ◆ Established an academic curriculum committee;
- ◆ Prepared the first-level curriculum and course outlines;
- ◆ Began development of a website; and
- ◆ Through the curriculum committee, have begun the selection of graduate-level courses for delivery in spring 2009.

Although much has been accomplished, much remains to be done.

### Program Competencies

Two decades of workshops, conferences, research, and published studies on transportation education and workforce development have identified common themes. Individuals with a bachelor's or even a master's degree must continue their education to move from technical to management and on to leadership roles. Seasoned professionals are retiring, and recent graduates are being hired—studies have confirmed a growing knowledge gap between newer technical professionals with limited experience and senior-level management professionals and industry leaders.

A synthesis of the research indicates that the competencies to be stressed in a graduate-level education program for transportation leaders in the public and private sectors must include

- ◆ Multimodal transportation systems, logistics, and supply chain management;
- ◆ The role of the political process in transportation decision making;
- ◆ Organizational and management principles;
- ◆ Systems engineering principles;
- ◆ Operations research principles;

- ◆ Transportation finance;
- ◆ The role of technology applications;
- ◆ Conflict resolution among competing interests; and
- ◆ Social, environmental, and economic considerations.

The certificate program was designed for several reasons. First, transportation professionals and industry leaders need a breadth of knowledge beyond a bachelor's degree, and this knowledge must be updated continually. Second, not enough professionals are entering the transportation industry, and retention is a continuing problem.

The proposed program will provide essential graduate education for professionals, especially those with potential to become industry leaders; it will attract new people to the industry from nontraditional disciplines; and it will expand university transportation graduate education programs. Moreover, distance learning has become a well-accepted and widespread medium for graduate-level education programs that appeal to busy professionals.

### Requirements and Courses

The basic program requires completion of four semester-length, theme-related, graduate-level courses, taken for credit at the offering university. The tuition-paying student must meet a minimum grade requirement consistent with the university's academic policies. The courses must consist of

- ◆ Two courses selected from a group of seven core courses—although a single unifying course from the core group may be required of all enrollees; and
- ◆ Two courses, selected from one of seven elective course types, covering a variety of theme-related topics.

A first-level curriculum with topic outlines has been developed for each of the courses. The student must select at least two of the following seven generic core courses for the certificate:

1. Transportation policy and planning,
2. Transportation systems analysis,
3. Transportation economics,
4. Transportation operations and safety,
5. Transportation management,
6. Transportation security, and
7. Climate change and energy.

The following seven elective courses also have been outlined—two could be chosen to meet the



certificate requirements:

- ◆ Freight logistics,
- ◆ Project management,
- ◆ Advanced modeling techniques,
- ◆ Infrastructure management,
- ◆ Information technology management,
- ◆ Environmental analysis, and
- ◆ Multimodal studies—either one general overview course, or one of a variety of full-semester courses such as
  - Transit planning and operations,
  - Airport planning and operations,
  - Water port planning and operations,
  - Bikeways and pedestrian planning and operations, and
  - Rail freight and passenger rail planning and operations.

The participating universities will offer courses from their catalogues that incorporate the generic course topics. Prospective students will apply to a participating university for admission; when accepted, the students will pay the course tuition directly to the university.

### Certificate Versus Degree

A certificate program was chosen for the following reasons:

- ◆ A nondegree program is more accessible to more people, at more universities, without formal admission processes.
- ◆ A certificate program encourages professionals to test graduate education, which may lead them eventually to apply to a graduate degree program, expanding the number of professionals in the workforce with advanced degrees.
- ◆ A certificate can fill an educational gap between a completed undergraduate degree and formal graduate degree programs.

This type of graduate education assists in addressing workforce needs.

### Relationship to Other Programs

A frequent question has been how the certificate relates to other training and certificate programs offered by universities and professional organizations and whether it will compete with these programs. Several university graduate education programs incorporate many courses similar to those planned for the certificate.

The effort is not in competition with the many excellent, essential training programs and short

courses sponsored by many universities and professional organizations but should be viewed as an opportunity to expand the numbers of individuals who may be interested in, or need training in, transportation-related topics. The program is designed to attract new people to the transportation profession, as well as to broaden and expand the competencies of those with undergraduate degrees in transportation and complementary disciplines. The program can be carried out only by universities with graduate education programs and graduate education faculty.

The program addresses an important workforce need—increasing the supply of professionals for both the public and private sectors. Many leaders of organizations that sponsor educational and training programs have endorsed the certificate program; many

### Leading the Way

**T**he founding RUTCs that have made commitments to implement the certificate program are as follows:

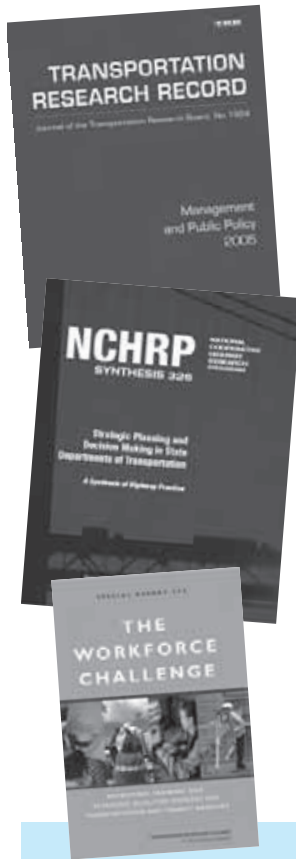
- ◆ The New England UTC at Massachusetts Institute of Technology;
- ◆ The University Transportation Research Center at the City University of New York;
- ◆ The Mid-Atlantic Universities Transportation Center at Pennsylvania State University;
- ◆ The Southeastern Transportation Center at the University of Tennessee;
- ◆ The Midwest Regional University Transportation Center at the University of Wisconsin;
- ◆ The NEXTRANS Center at Purdue University;
- ◆ The Southwest Region UTC at Texas A&M University–Texas Transportation Institute;
- ◆ The Midwest Transportation Center at Iowa State University;
- ◆ The Mid-America Transportation Center at the University of Nebraska–Lincoln; and
- ◆ The Mountains Plains Consortium at North Dakota State University.

In addition, the RUTCs at the University of California Transportation Center and TransNow, representing the Pacific Northwest region, have supplied intellectual and financial support.

The interim leadership team\* includes

- ◆ Denver Tolliver, North Dakota State University, Chair;
- ◆ Martin Pietrucha, Pennsylvania State University; and Michael Meyer, Georgia Tech, Curriculum Committee Cochairs;
- ◆ John Mason, Pennsylvania State University, Distance Learning Delivery Media Committee Chair; and
- ◆ Dock Burke, Texas A&M University–Texas Transportation Institute, Finance Committee Chair.

\* The author serves as consultant to the leadership team as founder and program manager under contract to Pennsylvania State University.



are members of the advisory committee and have stated that this is the kind of graduate education program that their employees and members need. Some also have committed to market the program and plan to offer tuition reimbursement to their employees. As the program progresses, additional organizations will be encouraged to participate.

## A Unique Enterprise

The certificate program is a unique enterprise:

- ◆ It provides opportunities for a university to broaden its curriculum and courses to appeal to an expanded tuition-paying student group, as well as to already-enrolled students.
- ◆ No single university has the resources to offer such a wide array of courses delivered by a national group of noted and outstanding faculty.
- ◆ Completion of the interdisciplinary, multi-modal program will be viewed as a prestigious credential.
- ◆ Graduate-level courses are taken for a grade and delivered via distance-learning media.

◆ Endorsement by public and private transportation organizations adds professional value and recognition.

◆ An administrative structure governs the selection of courses, verifies course completion, and awards the certificate.

◆ The program contributes to transportation workforce development and will attract more attention to graduate education.

◆ Completed courses could be eligible for transfer to formal graduate degree programs, as decided by the accepting university.

◆ The program does not compete with current training, graduate education, or other education programs but will help to expand and enhance those initiatives.

## Status of Program

The cooperative memorandum of understanding signed by the RUTC directors represents commitments from the university transportation centers (see box, page 35). The program will be an inclusive enterprise, with membership available to other uni-

## Program Resources

Since 1985, with the publication of TRB Special Report 207, *Transportation Professionals: Future Needs and Opportunities*, a series of conferences, workshops, summits, meetings, and publications have addressed transportation workforce needs, covering topics related to attracting, training, educating, hiring, and retaining professionals. Also addressed has been the shortage of professionals from many disciplines entering and remaining in transportation positions. Graduate education is a clear-cut need in the workforce.

Following is a list of recent publications, in chronological order, that support the need and demand for the proposed distance-learning transportation leadership graduate certificate program:

- Polzin, S. E., and B. G. Ward. Designing an Interdisciplinary Educational Program to Support Transportation Workforce Development. In *Transportation Research Record: Journal of the Transportation Research Board, No. 1812*, Transportation Research Board of the National Academies, Washington, D.C., 2002, pp. 143–150.
- TRB Special Report 275, *The Workforce Challenge: Recruiting, Training, and Retaining Qualified Workers for Transportation and Transit Agencies*. Transportation Research Board of the National Academies, Washington, D.C., 2003.
- NCHRP Synthesis 323, *Recruiting and Retaining Individuals in State Transportation Agencies*. Transportation Research Board of the National Academies, Washington, D.C., 2004.
- NCHRP Synthesis 326, *Strategic Planning and Decision Making in*

- State Departments of Transportation*. Transportation Research Board of the National Academies, Washington, D.C., 2004.
- NCHRP Synthesis 349, *Developing Transportation Agency Leaders*. Transportation Research Board of the National Academies, Washington, D.C., 2005.
- Humphrey, T. F. Transportation Skills Needed by Private-Sector and Public-Sector Organizations: Some Common Themes. In *Transportation Research Record: Journal of the Transportation Research Board, No. 1924*, Transportation Research Board of the National Academies, Washington, D.C., 2005, pp. 46–51.

The National Cooperative Highway Research Program (NCHRP) has sponsored several related projects\*:

- NCHRP Project 17-40: Safety Workforce Training Development;
- NCHRP Project 20-24(14): Managing Change in State Departments of Transportation;
- NCHRP Project 20-24(40): Analysis and Benchmarking of Recruitment and Hiring Practices of State Departments of Transportation;
- NCHRP Project 20-24(48): Analysis and Benchmarking of State DOT Human Resource Activities;
- NCHRP Project 20-24(50): In-Service Training for State DOTs;
- NCHRP Project 20-72: Tools to Aid State DOTs in Workforce Challenges;
- NCHRP Project 20-77: Transportation Operations Training Framework; and
- NCHRP Synthesis Project 36-07: Training Program Processes, Policies and Practices.

\* For more information and for links to project reports posted online, go to [www.TRB.org/CRP/NCHRP/NCHRPProjects.asp](http://www.TRB.org/CRP/NCHRP/NCHRPProjects.asp).

versities with graduate transportation programs as soon as the operational details are established to ensure success. The founding RUTC directors serve as the program's board of directors.

With the concurrence of the 10 signatories to the memorandum of understanding, Pennsylvania State University, through the Thomas D. Larson Pennsylvania State Transportation Institute, submitted a competitive proposal to FHWA in August 2007, requesting the funds to implement the program. FHWA awarded the grant in April 2008.

The tasks to be implemented under the FHWA grant include the following:

- ◆ Establish the administrative structure to operate the program, with input from transportation industry leaders.

- ◆ Establish standards and procedures for selecting courses, building on the first-level curriculum. This includes evaluating theme-related courses. The first set of courses selected will be available for delivery in spring 2009.

- ◆ Establish incentives for faculty to teach each course and provide the technical assistance to convert a traditional classroom delivery to a distance-learning medium.

- ◆ Establish the delivery protocols and guidelines.

- ◆ Develop and implement a marketing program, working with industry leaders.

- ◆ Establish quality control and evaluation strategies, including standards, policies, and procedures to maintain the highest possible quality of outcomes.

- ◆ Establish precedents and benchmarks to transition the pilot program into an intellectually and financially self-sustaining program.

- ◆ Update and improve the operations and business plan with the guidance of the program advisory committee.

- ◆ Launch the program in spring 2009, and continually monitor and improve it.

## Marketing the Program

If we build it, will they come? The program has been in development for more than three years, with input from the public- and private-sector industry groups intended as the primary customers. This engenders confidence of a significant response in terms of applications for admission to the program.

Another reason for optimism is that the program's goals are consistent with the aims of the strategic plans adopted by many leading transportation-related organizations. In addition, the larger private-sector consulting firms that provide many of the professional services required by public agencies have developed education and training strategies that

are consistent with this effort. A coordinated marketing strategy is being developed with all stakeholders, including universities, associations, private-sector interests, and federal agencies.

## Win-Win Enterprise

Every industry in America is dealing with workforce issues at all levels. This focus on transportation professionals is not another study, workshop, or national summit, but an action-oriented, win-win enterprise designed to assist many:

- ◆ For students, it offers an unprecedented opportunity to expand the breadth and depth of their knowledge; to take graduate education courses for credit at their place of employment or at home, from some of the best university faculty in the nation; and to move from technical competencies to management responsibilities and eventually to leadership roles.

- ◆ For universities, it stimulates an increase in the number of tuition-paying students who enroll in graduate courses; provides incentives for students to continue on to graduate education; and can attract new, young faculty to transportation education programs.

- ◆ For transportation associations, the program offers an opportunity to address a well-documented need to increase the supply of professionals; is consistent with associations' strategic plans; and can increase the numbers of new members.

- ◆ For the surface transportation industry, the certificate program addresses some well-documented and well-known education needs in workforce development.

## Acknowledgments

The FHWA National Highway Institute funded the research into the development of a distance-learning graduate education certificate program, as well as a follow-on project to expand the concept. Joseph Toole, Moges Ayele, and Deborah Gwaltney were instrumental in the funding decisions.

Mark Norman, TRB Director of Technical Activities, chaired the project steering committee, now called the advisory committee, which includes leaders from the academic community, federal and state agencies, private-sector consulting firms, and transportation-related associations. John Mason, Pennsylvania State University; Dennis Christiansen, Texas A&M University-Texas Transportation Institute; and Gene Griffin, North Dakota State University, were the leading advocates for the RUTCs to lead the program; the founding RUTC directors funded the program's continuation. FHWA is now funding the program's implementation.





## Thomas M. Welch

### *Iowa Department of Transportation*

Iowa state transportation safety engineer Tom Welch has a passion for highway safety founded on personal experience: in the early 1990s, Welch and his wife followed a life flight helicopter to a hospital trauma center. The helicopter carried their son, who was broadsided by an inattentive driver on a rural road. In 2007, the Welch's daughter was also involved in a serious car accident.

"Although both accidents were nonfatal, these events were preventable," Welch explains. "The loss of 43,000 lives every year in this country is a public health epidemic; it is the disease of mobility. We must change our safety culture or we will continue to have empty chairs at family holiday gatherings every year."



**"Quality research assists safety practitioners in gaining approval to implement new and sometimes controversial countermeasures."**

In addition to his work as a highway safety engineer and researcher, Welch manages the Iowa Traffic Safety Alliance—a multidisciplinary and multiagency safety research partnership of public- and private-sector highway safety organizations. He manages the state-funded Iowa Traffic Safety Program, which provides funding for safety research and for safety projects to cities and counties throughout the state. The program has been highlighted in the Federal Highway Administration's 2002 report on best practices in highway safety.

Welch has taught courses in highway design and transportation planning at Iowa State University and maintains that the teaching and mentoring he has provided to young safety professionals has been one of the most rewarding aspects of his transportation career. He advises transportation students, as well as new safety engineers, to challenge the status quo and to work to advance highway safety and meet safety goals by identifying and implementing new and innovative countermeasures.

"Quality research assists safety practitioners in gaining approval to implement new and sometimes controversial countermeasures," Welch comments. "Recent safety research findings have been key factors in our ability to implement new

countermeasures, including 4 lane to 3 lane conversions, J-turn expressway intersections, centerline rumble strips, and shoulder rumble strips."

Welch has been involved in TRB activities since 1993. He chairs the National Cooperative Highway Research Program (NCHRP) Project Panel on Median Intersection Design for Rural High-Speed Divided Highways and has served as a member of the NCHRP Project Panels on Safety and Other Implications of Changed Speed Limits on High-Speed Roads, on 2006 American Association of State Highway and Transportation Officials (AASHTO) Bottom Line Scoping, on Detailed Planning for Research on Making a Significant Improvement in Highway Safety, and on Strategic Highway Safety Plan Implementation and Support. He is a member of the Safety Data Analysis and Evaluation Committee, the Strategic Highway Research Program 2 Technical Coordinating Committee for Safety Research, and of the Transportation Safety Management Committee.

In addition to his work with TRB, Welch also chairs the AASHTO Subcommittee on Highway Safety Management, as well as the Task Group on Safety Data Systems and Analysis and Safety Work Force Development. He cochairs the AASHTO Technology Information Group Program for Road Safety Audits and is a member of the AASHTO Standing Committee on Highway Traffic Safety and of the National Highway Traffic Safety Administration's Expert Panel on Building Consensus on Traffic Safety Performance Measures.

In 2000, Welch received an Outstanding Council Paper Award from the Institute of Transportation Engineers for coauthoring a research paper on the conversion of four-lane undivided roadways to a three-lane cross section—one of the first research papers on the subject. In 2004, he received the AASHTO President's Special Award of Merit for outstanding and exemplary contributions to the association. In 2004, he proposed and organized the first National State DOT Safety Engineers Peer Exchange, and he established a national highway safety engineers e-mail discussion group to provide outlets for networking and for the sharing of the latest industry concerns and information.

Welch received a bachelor's degree in civil engineering from the University of Wisconsin-Platteville in 1973 and has completed course work towards a master's degree in transportation engineering at Iowa State University.

## Mary R. Brooks

Dalhousie University

**P**rofessor of marketing and transportation and William A. Black Chair of Commerce at Dalhousie University, Halifax, Nova Scotia, Canada, Mary Brooks works to improve awareness of management and policy issues in all modes of transportation, particularly for maritime industries, and to emphasize the importance of transportation to the North American economy.

Since 1979, Brooks has held research positions at Dalhousie University, including research associate positions in the Ocean Studies Program; at the Canadian Marine Transportation Center; and at the Oceans Institute of Canada. She served as a visiting fellow at the Institute of Southeast Asian Studies in Singapore in 1984; as director of Dalhousie's Cen-



**“Those of us performing quality research need to have our voices heard, and this is more difficult when a research community is small.”**

ter for International Business Studies from 1993 to 2001; and as an expert adviser to the Bureau of Economics and Agreements Analysis, Federal Maritime Commission, Washington, D.C., in 1998.

Brooks' current research includes examining the impact of security, border, and transportation issues on North American businesses, the governance and performance of ports, and short sea shipping in the North American context. The general focus for all of her research is the relationship between buyers and sellers of transport services, and how an understanding of the buyer-seller relationship can foster effective public policy decision making.

In 2001, Brooks helped establish an informal network of port researchers to investigate the link between port governance and performance, and the group's efforts resulted in the 2007 publication of *Devolution, Port Governance, and Port Performance*, a 26-chapter book on the state of port governance. The group's work on tools for assessing port performance is ongoing, and Brooks and several Dalhousie colleagues are monitoring the development of short sea shipping on the North American continent.

“North American short sea shipping has not developed in

a coherent way,” Brooks explains. “In spite of a Canada-U.S.-Mexico memorandum of cooperation, the issue has not become a priority for any of the North American Free Trade Agreement-participant governments. I am pleased to see that TRB's National Freight Cooperative Research Program has concluded that the field is ripe for further research, and my colleagues at Dalhousie continue to work to keep the issue at the front and center of industry circles.”

A proponent of transportation research, Brooks is active in TRB. She recently completed two terms as chair of the International Trade and Transportation Committee and has served as a member of the Freight Systems Group. She is a member of the Committee for the Study of Funding Options for Freight Transportation Projects of National Significance and a member of the *Transportation Research Record* Publication Board. She has attended all TRB Annual Meetings since 1994.

“Transportation research has a higher profile in both Europe and Asia than it does in North America,” Brooks comments. “Those of us performing quality research need to have our voices heard, and this is more difficult when a research community is small. Organizations like TRB provide excellent net-

working opportunities, which enable transportation researchers to hear and to be heard.”

Brooks holds a master's degree in international business from Dalhousie University and a doctorate in maritime studies from the University of Wales, Cardiff, United Kingdom. She won the International Intermodal Expo Distinguished Professor Fellowship in 1993; was a Canada-U.S. Fulbright scholar at George Mason University, Fairfax, Virginia, in 2005; received the A. Gordon Archibald Award for Teaching Excellence in 2005; and was named to Canada's Most Powerful Women Top 100 list by the Women's Executive Network in 2006.

Brooks has written more than 50 articles for publications that include *The Logistics and Transportation Review*; the *International Journal of Transport Economics, Maritime Policy, and Management*; and the *International Journal of Physical Distribution and Materials Management*. She has authored or edited more than 20 books or monographs, and worked to develop a software package for the international marketing and distribution field. Her book, *North American Freight Transportation: The Road to Security and Prosperity*, was published in June 2008.

## NEWS BRIEFS



### Railroad Investment Study Completed

An investment of \$148 billion (in 2007 dollars) is needed for rail freight infrastructure expansion, to keep pace with economic growth and to meet U.S. Department of Transportation–forecasted freight demand through 2035, according to findings in the recently completed National Rail Freight Infrastructure Capacity and Investment Study by Cambridge Systematics, Inc.

Commissioned by the Association of American Railroads at the request of the National Surface Transportation Policy and Revenue Study Commission, the study focused on 52,340 miles of primary rail freight corridors and assessed the long-term capacity expansion needs of continental U.S. freight railroads. Highlighted is the need for investment in new tracks, signals, tunnels, terminals, and service facilities, as well as the need to reduce highway congestion, lower transportation-generated emissions and energy costs, and ease stress on highway infrastructure.

Class I railroad needs account for \$135 billion of the needed \$148 billion, with \$13 billion projected for short line and regional freight railroads. The study has been submitted to the National Surface Trans-

portation Policy and Revenue Study Commission and is the first report to benchmark the national rail network freight capacity and the levels of investment needed to meet projected demand.

For more information, visit [www.camsys.com](http://www.camsys.com).

### Goals Set for Highway Research and Development

The U.S. Federal Highway Administration's (FHWA) Office of Infrastructure Research and Development has released *Highways of the Future—A Strategic Plan for Highway Infrastructure Research and Development* to guide the agency's highway research and development activities. The plan serves as a framework to support FHWA's reauthorization efforts before the expiration of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users.

Research goals include developing knowledge, guidelines, analytical and physical tools, and test methods and procedures to enable the delivery of safe, environmentally friendly, long-term, disaster-resilient, and cost-effective highway infrastructure; supporting end-user efforts to maintain and manage infrastructure; and providing specialized technical assistance to address infrastructure issues of national importance.

Within 5 years, the Office of Infrastructure Research and Development will deliver research products that advance the state of the practice, by improving engineering tools for analysis and design; developing more durable materials; and providing construction, maintenance, and rehabilitation guidelines that aid infrastructure reliability and durability. To ensure that the program addresses agency goals and requirements and delivers timely and ready-to-implement products, the Office of Infrastructure Research and Development will partner with other FHWA offices and with highway stakeholders.

For more information, visit <http://www.tfhrc.gov/infrastructure/pubs/08068.htm>.

**SAFETY AWARENESS**—The Federal Highway Administration conducted a Motorcycle Highway Travel Monitoring and Operations Demonstration on May 5, in McLean, Virginia. The event focused on issues in motorcycle safety and offered attendees the opportunity to participate in sessions on motorcycle production and manufacturing trends; to observe in situ data generation and processing; and to understand sensor and monitoring technology and the associated costs, maintenance, and installation. A field demonstration offered the opportunity for interaction with motorcycle manufacturers, distributors, and state and federal officials responsible for the highway travel monitoring program.





## CALENDAR

TRB Meetings  
2008

## September

- 17–19 11th National Conference on Transportation Planning for Small and Medium-Sized Communities: Tools of the Trade  
Portland, Oregon
- 22–23 North American Freight Flows Conference: Understanding Changes and Improving Data Sources  
Irvine, California
- 24–26 National Workshop on Highway Asset Inventory and Data Collection\*  
Durham, North Carolina

## October

- 1–3 3rd International Conference on Accelerated Pavement Testing\*  
Madrid, Spain
- 6–7 Northeast Traffic Monitoring Workshop  
Woods Hole, Massachusetts
- 6–8 European Transport Conference\*  
Leiden, The Netherlands  
*Martine Micozzi*
- 19–22 18th National Rural Public and Intercity Bus Transportation Conference  
Omaha, Nebraska
- 20–22 10th International Bridge and Structure Management Conference  
Buffalo, New York

27–28 Impact of Changing Demographics on the Transportation System  
Washington, D.C.

28–29 Rethinking Transportation for a Sustainable Future\*  
Louisville, Kentucky

## November

- 11–14 Gulf Coast Hurricane Preparedness, Response, Recovery, and Rebuilding\*  
Mobile, Alabama
- 20 Developing a Theoretical Understanding of Highway Crash Causation\*  
(*by invitation*)  
Washington, D.C.  
*Richard Pain*

## December

- 1–4 2008 Highway Geophysics–Nondestructive Evaluation Conference\*  
Charlotte, North Carolina  
*G. Jayaprakash*
- 2–3 International Summit on Agricultural and Food Transportation\*  
Washington, D.C.
- 9–11 Strategic Highway Safety Plan Peer Exchange and State Department of Transportation Safety Engineer Peer Exchange  
(*by invitation*)  
Houston, Texas  
*Richard Pain*

10–12 Advancing Regional Traffic Operations and Management  
Washington, D.C.  
*Richard Cunard*

15–17 International Conference on Integrated Transport for Sustainable Urban Development\*  
Beijing, China  
*Martine Micozzi*

## 2009

## January

11–15 TRB 88th Annual Meeting  
Washington, D.C.

## March

24–25 Midwest Traffic Monitoring Workshop  
Columbus, Ohio

## April

TBD Smart Rivers 2009\*  
Vienna, Austria  
*Joedy Cambridge*

19–22 11th Joint Light Rail Transit Conference\*  
Los Angeles, California

22–24 National Conference on Preservation, Repair, and Rehabilitation of Concrete Pavements\*  
St. Louis, Missouri  
*Stephen Maher*

22–24 Teamwork in U.S. Railroad Operations  
Irvine, California  
*Richard Pain*

Additional information on TRB meetings, including calls for abstracts, meeting registration, and hotel reservations, is available at [www.TRB.org/calendar](http://www.TRB.org/calendar)). To reach the TRB staff contacts, telephone 202-334-2934, fax 202-334-2003, or e-mail [lkarson@nas.edu](mailto: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.

# TRB HIGHLIGHTS

TRB Freight Systems Group Chair Paul Bingham, Global Insight, thanks author and journalist Sarah Murray, keynote speaker for the TRB Joint Summer Meeting and the Summer Ports, Waterways, Freight, and International Trade Conference.

PHOTO: LINDA KARSON



## Joint Summer Meeting Covers Hot Topics

The TRB Joint Summer Meeting, June 15–18 in Baltimore, Maryland, engaged more than 335 attendees with 36 group, section, committee, subcommittee, and task force meetings. The meeting was sponsored by the Federal Transit Administration.

Focus areas included surface transportation funding; identification and abatement of asbestos in transportation facilities; the global credit crisis and the impact on transportation investment; sustainability practices in transportation planning, construction, and maintenance; technology to reduce congestion; U.S.–Canadian border crossings; and integrating freight transportation interests by scale.

The keynote luncheon address was presented by *Financial Times* correspondent Sarah Murray, author of *Moveable Feasts: From Ancient Rome to the 21st Century, the Incredible Journeys of the Food We Eat*. The

session combined audiences from the Joint Summer Meeting and from the 33rd Annual TRB Summer Ports, Waterways, Freight, and International Trade Conference.

## Globalization Is Theme of Ports and Freight Program

The TRB 33rd Annual Summer Ports, Waterways, Freight, and International Trade Conference, held in Baltimore, Maryland, June 18–20, provided 150 transportation professionals with the opportunity to network and participate in sessions, group discussions, and TRB standing committee meetings on a variety of topics.

Guided by the meeting theme—the impact of globalization on transportation—sessions focused on such topics as integrating freight transport interests by scale; expanding all-water trade routes; resolving conflicts in waterfront development; international food aid transport; transport and supply chain security; global warming; waterborne passenger services; public–private partnerships at ports; the future maritime workforce; maintenance and expansion of the marine transportation system under the Water Resources Development Act; and marine safety and human factors.

In addition, the conference included informative waterside and landside tours of the Port of Baltimore and the Inner Harbor. Select presentations and photos from the conference can be found at [www.trb.org/conferences/2008/PW/O8PWFIT.pdf](http://www.trb.org/conferences/2008/PW/O8PWFIT.pdf).

**OKLAHOMA PORT**—Participants at the TRB Marine Board Spring Meeting tour the M/V *Charley Border*, a towboat in service for more than 30 years and the centerpiece of a new inland waterway educational center at the Tulsa Port of Catoosa, May 2008. Marine Board Member Robert Portiss, Executive Director, Tulsa Port of Catoosa, coordinated an informative program that included a focus session on the McClellan-Kerr Arkansas River navigation system and its importance to the nation. Sessions also included presentations from ports, carriers, and users of the system; from the Minerals Management Service; and from the U.S. Army Corps of Engineers and the U.S. Coast Guard.



PHOTO: JOSEPH CAMBRIDGE

PHOTO: JOEY CAMBRIDGE



Participants in the TRB 33rd Annual Summer Ports, Waterways, Freight, and International Trade Conference toured Baltimore Harbor aboard the vessel *Prince Charming*, gaining views of a range of port operations, including Dundalk Marine Terminal, North and South Locust Point, and the Seagirt Container facility (left to right): Barbara Nelson, Richmond Metropolitan Planning Organization; Burr Stewart, Port of Seattle; Scott Drumm, Port of Portland; Ellen Johnck, Bay Planning Coalition; Mary McGuire, CTI Leveraged Finance; Tom Wakeman, Stevens Institute; Jim Kruse, Texas Transportation Institute Center for Ports and Waterways; and Evangelos Kaiser, Florida Atlantic University.

## COOPERATIVE RESEARCH PROGRAMS NEWS

### Including Pavement in Noise Mitigation

Despite high costs, noise barriers have been used for many years to mitigate highway noise when the noise impacts can be identified and when the noise abatement is constructible, effective, and is sought after by the public. Advances in pavement technology have made quiet pavement a viable alternative to noise barriers.

Although the U.S. Code of Federal Regulations requires a noise analysis for projects near potential noise receivers, and although the code identifies several noise mitigation measures, it does not include pavement noise abatement measures. As a result, pavement technologies are not options for reducing noise on federal-aid highway projects. Methodologies are needed to incorporate pavement and barrier noise-abatement strategies and to com-

pare acoustic and economic features.

Illingworth and Rodkin, Inc., Petaluma, California, has been awarded a \$299,655, 24-month contract [National Cooperative Highway Research Program (NCHRP) Project 10-76, FY 2008] to develop methodologies for evaluating the feasibility, reasonableness, effectiveness, and longevity of acoustic and economic features of pavement strategies and barriers for noise mitigation. Methodologies will demonstrate the potential of quiet pavement technology as a noise abatement measure and will assist in the selection of noise-abatement technologies that provide the desired acoustic characteristics and cost savings.

For more information, contact Amir N. Hanna, TRB, 202-334-1892, [ahanna@nas.edu](mailto:ahanna@nas.edu).



PHOTO: DAVE NEWCOMB

Quiet pavement and noise barriers in the Netherlands.

### Improving Agency-Tribe Communications

Throughout the United States, roads operated by transportation agencies pass through lands of interest to or under the jurisdiction of Native American tribes. The relationship between government agencies and tribes historically has been complex, and transportation projects influence and are influenced by tribal communities.

Results-oriented strategies are needed to increase public involvement, as well as consultations between government agencies and tribal communities. Also needed are strategies for immediate

implementation by parties developing transportation projects.

The Alliance for Transportation Research Institute at the University of New Mexico has been awarded a \$200,000, 18-month, contract (NCHRP 08-65, FY 2008) to develop a guidebook to provide strategies for communication, cooperation, and coordination between transportation agencies and tribal communities to facilitate successful transportation projects.

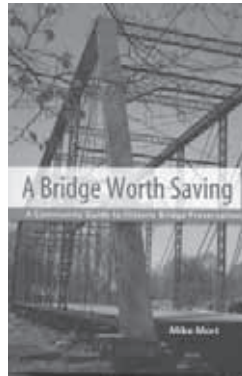
For more information, contact Chris Hedges, TRB, 202-334-1472, [chedges@nas.edu](mailto:chedges@nas.edu).



***A Bridge Worth Saving:  
A Community Guide to  
Historic Bridge  
Preservation***

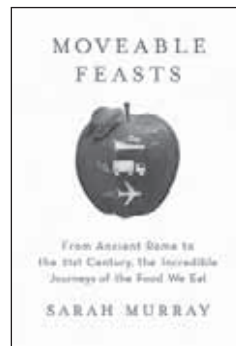
Mike Mort. Michigan State University Press, 2008; 143 pp.; \$24.95; 978-0-87013-828-7.

This step-by-step guide is a call to action for the restoration and preservation of historic, metal-truss bridges. Presented in 9 chapters are case studies, preservation and restoration guidance, a comprehensive checklist, methods for gaining project support and for raising funds, job descriptions for volunteers, and interview questions for potential project participants. Also included are 41 photographs of historic bridges and bridge preservation projects in the United States, models, bridge diagrams, and an appendix of truss-bridge types.

***Moveable Feasts***

Sarah Murray. St. Martin's Press, 2008; 256 pp.; \$24.95; 978-0-312-35535-7.

Longtime *Financial Times* contributor Sarah Murray, keynote speaker at TRB's Joint Summer Meeting and Summer Ports, Waterways, Freight, and International Trade Conference, examines the history of food transportation in 12 chapters with a series of essays on such topics as the export of Norwegian



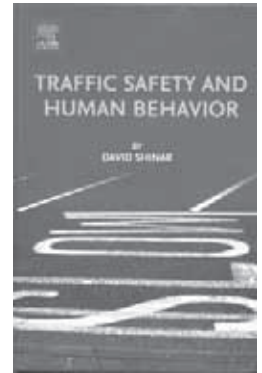
salmon to China; the Berlin Airlift; refrigerated container ships; Central American export crops; the technical challenges of food shipment; sustainability; the invention of the barrel; and more.

***Traffic Safety and  
Human Behavior***

David Shinar. Elsevier, 2008; 813 pp.; \$99.95; 978-0-08045-029-2.

Shinar presents a theoretical framework and a critical evaluation of the most recent research findings on the roles of automobile operators, cyclists, and pedestrians in maintaining traffic safety. Divided into six parts—Background, Methods, Models; Driver Capacities and Age Effects; Driving Style; Driver Temporary Impairments; Other Road Users; and Crash Causation and Countermeasures—the text examines driver behavior, its relationship to traffic safety, and the relationships between safety and drivers' limited information-processing capabilities, vision and perception abilities, personalities, and ages.

More than 250 tables, charts, and figures contribute to evaluations of driving styles and the effects of driver distraction, fatigue, intoxication, and drug use on crash involvement. Effective crash countermeasures are provided. The author was the keynote speaker for the Human Factors in Transportation program at the 2007 TRB Annual Meeting and is a member of the TRB Task Force on Highway Safety Workforce Development.



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

**TRB PUBLICATIONS*****Effects of Subsurface Drainage on Pavement Performance: Analysis of the SPS-1 and SPS-2 Field Sections***

NCHRP Report 583

The effects of subsurface drainage features on pavement performance are inspected and evaluated, and test results are provided for surface drainage features in the Long-Term Pavement Performance SPS-1 and SPS-2 field sections.

2007; 190 pp.; TRB affiliates, \$38.25; nonaffiliates, \$51. Subscriber category: pavement design, management, and performance (IIB).

***Full-Depth Precast Concrete Bridge Deck Panel Systems***

NCHRP Report 584

Examined are recommended guidelines and American Association of State Highway and Transportation Officials load and resistance factor design specifications for the design, fabrication, and construction of full-depth, precast concrete bridge deck panel systems.

2008; 110 pp.; TRB affiliates, \$39; nonaffiliates, \$52. Subscriber category: bridges, other structures, and hydraulics and hydrology (IIC).

**TRB PUBLICATIONS** *(continued)***Rail Freight Solutions to Roadway Congestion—  
Final Report and Guidebook**

NCHRP Report 586

This report offers guidance on evaluating the feasibility, cost, and benefits of investing in rail freight solutions to alleviate heavy-truck traffic congestion on highways.

2007; 239 pp.; TRB affiliates, \$41.25; nonaffiliates, \$55. Subscriber categories: *planning and administration (IA)*; *highway operations, capacity and traffic control (IVA)*; *rail (VII)*; and *freight transportation (VIII)*.

**Countermeasures to Protect  
Bridge Abutments from Scour**

NCHRP Report 587

Countermeasures for scour are identified, construction options are indicated, and designs associated with the layout and dimensions of the countermeasures are provided. Also presented are guidelines for abutment countermeasures, including riprap, cable-tied blocks, geobags, parallel walls, spur dikes, and abutment collars.

2007; 220 pp.; TRB affiliates, \$39.75; nonaffiliates, \$53. Subscriber categories: *design (II)*; *materials, construction, and maintenance (III)*.

**The Impact of Legislation, Enforcement,  
and Sanctions on Safety Belt Use**

NCHRP Report 601

The effectiveness of mandatory approaches to safety belt use is examined.

2008; 68 pp.; TRB affiliates, \$30.75; nonaffiliates, \$41. Subscriber category: *safety and human performance (IVB)*.

**State DOT Crash Reconstruction Practices**

NCHRP Synthesis 369

Presented are data on the extensiveness of state department of transportation (DOT)-performed crash reconstructions, the level of expertise available to perform reconstructions, and the ways in which reconstructions are used by state DOTs to improve highway safety.

2007; 32 pp.; TRB affiliates, \$22.50; nonaffiliates, \$34. Subscriber category: *operations and safety (IV)*.

**Preserving Freight and Passenger Rail Corridors  
and Service**

NCHRP Synthesis 374

This synthesis explores issues in the retention of railroad rights-of-way and in the restoration of rail services.

2007; 31 pp.; TRB affiliates, \$25.50; nonaffiliates, \$34. Subscriber category: *rail (VII)*.

**Bridge Inspection Practices**

NCHRP Synthesis 375

Bridge inspection practices in the United States and selected foreign countries are examined, and data are presented on inspection personnel, including staff titles and functions, qualifications, training and certification, inspection teams, and assignments; inspection types, including focus, methods, and frequency; and inspection quality control and quality assurance.

2007; 199 pp.; TRB affiliates, \$39.75; nonaffiliates, \$53. Subscriber categories: *bridges, other structures and hydraulics and hydrology (IIC)*; *maintenance (IIIC)*.

**Improving American Disabilities Act  
Complementary Paratransit Demand Estimation**

TCRP Report 119

Information is provided on tools and methods for predicting demand for complementary paratransit service provided by public transit agencies that comply with the level-of-service requirements in the Americans with Disabilities Act of 1990.

2007; 104 pp.; TRB affiliates, \$33.75; nonaffiliates, \$45. Subscriber categories: *planning and administration (IA)*; *public transit (VI)*.

**Racial and Gender Diversity in State DOTs and  
Transit Agencies: A Benchmark Scoping**

TCRP Report 120–NCHRP Report 585

This report documents and analyzes data on racial and gender diversity to establish a baseline for state DOTs and transit agencies. Gaps in existing data are identified and a conceptual framework addresses the data required to establish a benchmark.

2007; 52 pp.; TRB affiliates, \$27; nonaffiliates, \$36. Subscriber categories: *planning and administration (IA)*; *transportation law (IC)*; *public transit (VI)*.

**Toolkit for Integrating Nondedicated Vehicles  
in Paratransit Service**

TCRP Report 121

This user's manual describes the nondedicated vehicle optimization model for assisting transportation managers in decision making for dedicated and nondedicated paratransit service.

2007; 59 pp.; TRB affiliates, \$28.50; nonaffiliates, \$38. Subscriber category: *public transit (VI)*.

**Understanding How to Motivate Communities  
to Support and Ride Public Transportation**

TCRP Report 122

Methods and strategies that public transportation



## TRB PUBLICATIONS (continued)



agencies in the United States and Canada apply to enhance the agency's public image and to stimulate the use of public transportation are examined.

2008; 81 pp.; TRB affiliates, \$32.25; nonaffiliates, \$43. Subscriber category: public transit (VI).

### **Understanding How Individuals Make Travel and Location Decisions: Implications for Public Transportation**

TCRP Report 123

Individual decision making in the choice of residential location and in travel behavior is explored.

2008; 137 pp.; TRB affiliates, \$39.75; nonaffiliates, \$53. Subscriber category: public transit (VI).

### **Mobile Data Terminals**

TCRP Synthesis 70

The state-of-the-practice of mobile data terminals in transportation and the capabilities of mobile data computers are described. Also provided is information on wireless communications infrastructure for the deployment of mobile data terminals in transit systems.

2007; 150 pp.; TRB affiliates, \$35.25; nonaffiliates, \$47. Subscriber category: public transit (VI).

### **Use of Biodiesel in a Transit Fleet**

TCRP Synthesis 72

This synthesis explores the benefits of biodiesel fuel and aids transit agencies in making informed decisions on biodiesel use.

2007; 61 pp.; TRB affiliates, \$28.50; nonaffiliates, \$38. Subscriber category: public transit (VI).

### **Counting Aircraft Operations at Nontowered Airports**

ACRP Synthesis 4

Methods and new technologies used by states, airports, and metropolitan planning agencies to count and estimate aircraft operations at nontowered airports are described and evaluated.

2007; 33 pp.; TRB affiliates, \$25.50; nonaffiliates, \$34. Subscriber category: aviation (V).

### **The Role of Safety Culture in Preventing Commercial Motor Vehicle Crashes**

CTBSSP Synthesis 14

This synthesis assembles information on influential practices for developing and enhancing a safety culture for commercial motor vehicle drivers.

2007; 49 pp.; TRB affiliates, \$27; nonaffiliates, \$36. Subscriber categories: operations and safety (IV); freight transportation (VIII).

### **Pavement Rehabilitation, Strength and Deformation Characteristics, and Surface Properties—Vehicle Interaction 2007**

Transportation Research Record 2005

Divided into three sections—Pavement Rehabilitation, Pavement Strength and Deformation Characteristics, and Pavement Surface Properties—Vehicle Interaction—this volume contains research on an ultrathin, bonded wearing course for jointed concrete pavement preservation; rubblized pavement segments in Michigan; seismic methods for strip detection in asphalt pavements; artificial neural network–based, backcalculation-type flexible pavement analysis models to evaluate nonlinear pavement data sets; the effects of finite slab size and load transfer in backcalculation analysis of jointed concrete pavements; and more.

2007; 182 pp.; TRB affiliates, \$46.50; nonaffiliates, \$62. Subscriber category: pavement design, management, and performance (IIB).

### **Transit: Intermodal and Capacity; Light Rail, Commuter Rail, and Rail Transit; and Major Activity Center Circulation**

Transportation Research Record 2006

Papers are organized into three sections and include such topics as modeling the effects of commuter rail–subway system transfers on travel behavior in Boston, Massachusetts; successes and challenges in modernizing streetcar systems in Melbourne, Australia, and Toronto, Canada; ridership on the Los Angeles, California, green line; the development of a specification for crash energy management features in commuter rail passenger equipment; and a framework for the application of rail simulation that includes calibration, validation, evaluation, and interpretation of results.

2007; 121 pp.; TRB affiliates, \$37.50; nonaffiliates, \$50. Subscriber category: rail (VII).

### **Aviation 2007**

Transportation Research Record 2007

Logit models for forecasting nationwide intercity travel demand in the United States; passenger market equilibrium as a policy analysis tool for competing airports in a multiple airport region; a new consumer protection metric for passenger on-time performance in air travel; a multinomial logit model for joint choice of airline itinerary and fare product; and a decision support system for airport performance assessment and capacity management represent some of the topics presented in this volume.

2007; 125 pp.; TRB affiliates, \$39; nonaffiliates, \$52. Subscriber category: aviation (V).



**TRB PUBLICATIONS** *(continued)***Freight Systems****Transportation Research Record 2008**

This selection of papers presents information on a comprehensive, online electronic freight-theft management system for the state of Florida; an evaluation and comparison of the cost-effectiveness of a common type of consolidation scheme in countries outside the United States and a peddle-run system; an estimation of origin–destination matrices of light and heavy trucks in Tokyo, Japan, using commodity-based and empty-trip models; and use of rail freight to reduce roadway congestion.

2007; 109 pp.; TRB affiliates, \$37.50; nonaffiliates, \$50. Subscriber category: freight transportation (VIII).

**Highway Safety, School Transportation, and Emergency Evacuation****Transportation Research Record 2009**

Research topics include the effects of driving experience on eye-movement patterns of novice teen drivers; perceptions of older drivers' driving skills in the United Kingdom; older drivers and the decision to limit or stop driving; the effectiveness of speed-monitoring displays and speed cameras on reducing automobile speeds; an evaluation of the intersection safety camera program in Edmonton, Canada; safety-related effects of a citywide red-light violation enforcement program; the effect of seat belts on cost injuries and on other characteristics of motor vehicle crash victims; and more.

2007; 135 pp.; TRB affiliates, \$41.25; nonaffiliates, \$55. Subscriber category: safety and human performance (IVB).

**Behavioral Responses to Policy and System Changes 2007****Transportation Research Record 2010**

The influence of predictive travel time information on road network traffic flow; causes and facets of multimodal transportation use; New Jersey Turnpike time-of-day pricing impacts on driver behavior and travel patterns; a panel survey for obtaining information on the timing and nature of responses to a new urban public transportation service; and the impact of carpooling on trip-chaining behavior and on emission reductions are some of the topics explored in this volume.

2007; 132 pp.; TRB affiliates, \$41.25; nonaffiliates, \$55. Subscriber category: planning and administration (IA).

**Environmental Issues 2007****Transportation Research Record 2011**

This volume presents findings on the evolution of the environmental management system at departments of transportation; alternative methods for creating high-albedo concrete for pavement applications; the concentration of particle number emissions from a hybrid diesel–electric bus in real-world operating conditions; diesel truck idling emissions on I-40 in Knoxville, Tennessee; the impact of asphalt rubber friction course overlays on tire wear emissions and air quality in Phoenix, Arizona; and more.

2007; 209 pp.; TRB affiliates, \$48; nonaffiliates, \$64. Subscriber category: energy and environment (IB).

**Freeway Operations and High-Occupancy Vehicle Systems 2007****Transportation Research Record 2012**

This volume includes the 2007 D. Grant Mickle Award-winning paper on the effects of displaying license plate and 10-digit telephone numbers in amber alert messages on changeable message signs in the United States. Also examined are the performance of open road tolling compared to main-line toll plazas; a freeway bottleneck simulation for assessing traffic-flow improvement scenarios; the effects of highway ramp metering on automobile merging operations; and the use of high-occupancy vehicle lanes by hybrid vehicles.

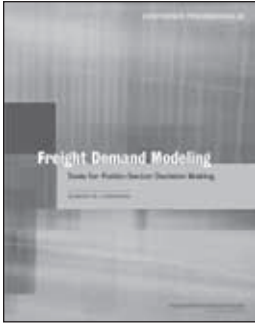
2007; 133 pp.; TRB affiliates, \$41.25; nonaffiliates, \$55. Subscriber category: highway operations, capacity, and traffic control (IVA).

**Environmental Justice, Social and Economic Factors, Women's Travel, and Accessibility and Mobility 2007****Transportation Research Record 2013**

Papers cover a variety of topics, including the design of emergency response and evacuation plans to address the needs of populations with limited English language proficiency; the challenges of incorporating environmental justice in metropolitan transportation planning; the long-term social sustainability of transportation and land use strategies; the socioeconomic and demographic characteristics that increase the potential for extreme commuting; the role of gender in car use and distances driven in Germany; and more.

2007; 79 pp.; TRB affiliates, \$35.25; nonaffiliates, \$47. Subscriber category: planning and administration (IA).





## TRB PUBLICATIONS (continued)

### **Activity and Time Use Analysis 2007**

Transportation Research Record 2014

A 2007 Fred Burggraf Award-winning paper on modeling household vehicle transaction behavior is included in this volume. Also presented are papers on defining sampling districts for household travel surveys in the Baltimore, Maryland, metropolitan area; an alternative method for determining choice set generation in mixed, multimodal transportation networks; gender-based differences in time allocation among residents of Shenzhen, China; and adjusting travel demand models to accommodate the behavioral dynamics of the baby boom generation.

2007; 101 pp.; TRB affiliates, \$36.75; nonaffiliates, \$49. Subscriber category: *planning and administration (IA)*.

### **Maintenance Operations: Work Zones, Pavement Markings, and Weather**

Transportation Research Record 2015

Part 1: Work Zones includes research on the development and evaluation of a speed-activated sign to reduce vehicle speeds in work zones. Part 2: Pavement Markings presents findings on the visibility of pavement markings at night and in wet weather conditions. Part 3: Weather contains an analysis of the geometric, operational, and weather effects on urban freeway crash numbers and crash severity.

2007; 140 pp.; TRB affiliates, \$41.25; nonaffiliates, \$55. Subscriber category: *maintenance (IIIC)*.

### **Geology and Properties of Earth Materials 2007**

Transportation Research Record 2016

This two-part volume addresses such topics as the use of a light falling weight deflectometer device for measuring the in situ elastic modulus of pavement layers and subgrades; mechanistic classification of unbound soil materials; skid resistance on unpaved roads; locating debonding in concrete slabs with impact echo and ultrasonic surface wave techniques; a new approach for estimating rock slope stability using binary logistic regression analysis; and more.

2007; 126 pp.; TRB affiliates, \$41.25; nonaffiliates, \$55. Subscriber category: *soils, geology, and foundations (IIIA)*.

### **Sustainability, Energy, and Alternative Fuels 2007**

Transportation Research Record 2017

Paper topics include procedures for overcoming institutional, political, informational, financial, and

legislative and regulatory barriers to sustainable transportation; the selection of indicators for comprehensive and sustainable transportation planning; measuring sustainable transportation accessibility; the use of Global Positioning System travel data to assess real-world energy consumption of plug-in hybrid electric vehicles in the St. Louis, Missouri, metropolitan area; and an examination of factors affecting greenhouse gas emissions in the United States.

2007; 60 pp.; TRB affiliates, \$33.75; nonaffiliates, \$45. Subscriber category: *energy and environment (IB)*.

### **Freight Demand Modeling: Tools for Public-Sector Decision Making**

TRB Conference Proceedings 40

This volume summarizes a September 25–27, 2006, conference held in Washington, D.C., that focused on freight modeling methodologies, applications of existing models, and related data needed to support modeling efforts. The proceedings also includes five peer-reviewed papers prepared for the conference, covering such topics as the characteristics of effective freight models, an overview of international experiences, and a tour-based microsimulation of urban commercial vehicle movements. Suggested areas for research and a freight model use matrix are provided.

2008; 105 pp.; TRB affiliates, \$36.75; nonaffiliates, \$49. Subscriber categories: *planning and administration (IA)*; *freight transportation (VIII)*.

### **Interagency-Aviation Industry Collaboration on Planning for Pandemic Outbreaks**

Conference Proceedings 41

This summary of a September 5–7, 2007, workshop that took place in Washington, D.C., explores issues related to the state of the practice for pandemic planning by airports and airlines, coordination among various agencies and the aviation sector to implement plans, and the potential areas for public- and private-sector cooperation in pandemic planning. Discussion topics include minimizing the spread of disease via air travel through screening and in-flight measures; and maintaining air service as a critical infrastructure during a pandemic event. The book concludes with comments on the discussion sessions by stakeholder representatives, an outline of the next steps, and an extensive list of reference materials.

2008; 41 pp.; TRB affiliates, \$30; nonaffiliates, \$40. Subscriber category: *aviation (V)*.

To order TRB titles described in Bookshelf, visit the TRB online Bookstore, at [www.TRB.org/bookstore/](http://www.TRB.org/bookstore/), or contact the Business Office at 202-334-3213.

## INFORMATION FOR CONTRIBUTORS TO

# TR NEWS

*TR News* welcomes the submission of manuscripts for possible publication in the categories listed below. All manuscripts submitted are subject to review by the Editorial Board and other reviewers to determine suitability for *TR News*; authors will be advised of acceptance of articles with or without revision. All manuscripts accepted for publication are subject to editing for conciseness and appropriate language and style. Authors receive a copy of the edited manuscript for review. Original artwork is returned only on request.

**FEATURES** are timely articles of interest to transportation professionals, including administrators, planners, researchers, and practitioners in government, academia, and industry. Articles are encouraged on innovations and state-of-the-art practices pertaining to transportation research and development in all modes (highways and bridges, public transit, aviation, rail, and others, such as pipelines, bicycles, pedestrians, etc.) and in all subject areas (planning and administration, design, materials and construction, facility maintenance, traffic control, safety, geology, law, environmental concerns, energy, etc.). Manuscripts should be no longer than 3,000 to 4,000 words (12 to 16 double-spaced, typed pages). Authors also should provide appropriate and professionally drawn line drawings, charts, or tables, and glossy, black-and-white, high-quality photographs with corresponding captions. Prospective authors are encouraged to submit a summary or outline of a proposed article for preliminary review.

**RESEARCH PAYS OFF** highlights research projects, studies, demonstrations, and improved methods or processes that provide innovative, cost-effective solutions to important transportation-related problems in all modes, whether they pertain to improved transport of people and goods or provision of better facilities and equipment that permits such transport. Articles should describe cases in which the application of project findings has resulted in benefits to transportation agencies or to the public, or in which substantial benefits are expected. Articles (approximately 750 to 1,000 words) should delineate the problem, research, and benefits, and be accompanied by one or two illustrations that may improve a reader's understanding of the article.

**NEWS BRIEFS** are short (100- to 750-word) items of interest and usually are not attributed to an author. They may be either text or photographs or a combination of both. Line drawings, charts, or tables may be used where appropriate. Articles may be related to construction, administration, planning, design, operations, maintenance, research, legal matters, or applications of special interest. Articles involving brand names or names of manufacturers may be determined to be inappropriate; however, no endorsement by TRB is implied when such information appears. Foreign news articles should describe projects or methods that have universal instead of local application.

**POINT OF VIEW** is an occasional series of authored opinions on current transportation issues. Articles (1,000 to 2,000 words) may be submitted with appropriate, high-quality illustrations, and are subject to review and editing. Readers are also invited to submit comments on published points of view.

**CALENDAR** covers (a) TRB-sponsored conferences, workshops, and symposia, and (b) functions sponsored by other agencies of interest to readers. Notices of meetings should be submitted at least 4 to 6 months before the event.

**BOOKSHELF** announces publications in the transportation field. Abstracts (100 to 200 words) should include title, author, publisher, address at which publication may be obtained, number of pages, price, and ISBN. Publishers are invited to submit copies of new publications for announcement.

**LETTERS** provide readers with the opportunity to comment on the information and views expressed in published articles, TRB activities, or transportation matters in general. All letters must be signed and contain constructive comments. Letters may be edited for style and space considerations.

**SUBMISSION REQUIREMENTS:** Manuscripts submitted for possible publication in *TR News* and any correspondence on editorial matters should be sent to the Director, Publications Office, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001, telephone 202-334-2972, or e-mail [jawan@nas.edu](mailto:jawan@nas.edu).

- ◆ All manuscripts should be supplied in 12-point type, double-spaced, in Microsoft Word 6.0 or WordPerfect 6.1 or higher versions, on a diskette or as an e-mail attachment.

- ◆ Submit original artwork if possible. Glossy, high-quality black-and-white photographs, color photographs, and slides are acceptable. Digital continuous-tone images must be submitted as TIFF or JPEG files and must be at least 3 in. by 5 in. with a resolution of 300 dpi or greater. A caption should be supplied for each graphic element.

- ◆ Use the units of measurement from the research described and provide conversions in parentheses, as appropriate. The International System of Units (SI), the updated version of the metric system, is preferred. In the text, the SI units should be followed, when appropriate, by the U.S. customary equivalent units in parentheses. In figures and tables, the base unit conversions should be provided in a footnote.

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# TRANSPORTATION RESEARCH BOARD 88TH ANNUAL MEETING

WASHINGTON, D.C.

JANUARY 11–15, 2009

## TRANSPORTATION, ENERGY, AND CLIMATE CHANGE

The twin issues of energy and climate change are among the most significant public policy issues facing the transportation profession today and in the coming decades. To address these challenges, it is critical to develop and share knowledge and experiences on ways to mitigate the adverse impacts of transportation on energy resources and the climate—and to adapt transportation to the new realities. The spotlight theme for the TRB 88th Annual Meeting will explore these issues—and more.

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- » Examine how energy and climate change issues will affect transportation policy making, planning, design, construction, operations, and maintenance; and
- » Learn what federal, state, regional, and local transportation agencies are doing—and can do—to address these issues.

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