

MARCH-APRIL 2002  
NUMBER 219

TRANSPORTATION RESEARCH BOARD  
NATIONAL RESEARCH COUNCIL

# TR NEWS

---

## TRB 81st Annual Meeting Highlights: Spotlight on Security

*Also*

**Mix for Extending Pavement  
Service Life**

**Road Work Ahead:  
Communication Paves the Way**

## THE NATIONAL ACADEMIES

National Academy of Sciences  
National Academy of Engineering  
Institute of Medicine  
National Research Council

The Transportation Research Board is a division of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. The Board's mission is to promote innovation and progress in transportation by stimulating and conducting research, facilitating the dissemination of information, and encouraging the implementation of research results. The Board's varied activities annually draw on approximately 4,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

The National Research Council was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities.

[www.TRB.org](http://www.TRB.org)  
[www.national-academies.org/trb](http://www.national-academies.org/trb)

## TRANSPORTATION RESEARCH BOARD 2002 EXECUTIVE COMMITTEE \*

**Chairman:** E. Dean Carlson, Secretary, Kansas Department of Transportation, Topeka  
**Vice Chairman:** Genevieve Giuliano, Professor, School of Policy, Planning, and Development, University of Southern California, Los Angeles

**Executive Director:** Robert E. Skinner, Jr., Transportation Research Board

William D. Ankner, Director, Rhode Island Department of Transportation, Providence  
Thomas F. Barry, Jr., Secretary of Transportation, Florida Department of Transportation, Tallahassee  
Michael W. Behrens, Executive Director, Texas Department of Transportation, Austin  
Jack E. Buffington, Associate Director and Research Professor, Mack-Blackwell National Rural Transportation Study Center, University of Arkansas, Fayetteville  
Sarah C. Campbell, President, TransManagement, Inc., Washington, D.C.  
Joanne F. Casey, President, Intermodal Association of North America, Greenbelt, Maryland  
James C. Codell III, Secretary, Kentucky Transportation Cabinet, Frankfort  
John L. Craig, Director, Nebraska Department of Roads, Lincoln  
Robert A. Frosch, Senior Research Fellow, Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University, Cambridge, Massachusetts  
Susan Hanson, Landry University Professor of Geography, Graduate School of Geography, Clark University, Worcester, Massachusetts  
Lester A. Hoel, L.A. Lacy Distinguished Professor, Department of Civil Engineering, University of Virginia, Charlottesville (Past Chairman, 1986)  
Ronald F. Kirby, Director of Transportation Planning, Metropolitan Washington Council of Governments, Washington, D.C.  
H. Thomas Kornegay, Executive Director, Port of Houston Authority, Houston, Texas  
Bradley L. Mallory, Secretary of Transportation, Pennsylvania Department of Transportation, Harrisburg  
Michael D. Meyer, Professor, School of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta  
Jeff P. Morales, Director of Transportation, California Department of Transportation, Sacramento  
David Plavin, President, Airports Council International, Washington, D.C.  
John Rebensdorf, Vice President, Network and Service Planning, Union Pacific Railroad Company, Omaha, Nebraska  
Catherine L. Ross, Executive Director, Georgia Regional Transportation Agency, Atlanta  
John M. Samuels, Senior Vice President, Operations Planning and Support, Norfolk Southern Corporation, Norfolk, Virginia (Past Chairman, 2001)  
Paul P. Skoutelas, CEO, Port Authority of Allegheny County, Pittsburgh, Pennsylvania  
Michael S. Townes, Executive Director, Transportation District Commission of Hampton Roads, Hampton, Virginia  
Martin Wachs, Director, Institute of Transportation Studies, University of California, Berkeley (Past Chairman, 2000)  
Michael W. Wickham, Chairman and CEO, Roadway Express, Inc., Akron, Ohio  
M. Gordon Wolman, Professor of Geography and Environmental Engineering, The Johns Hopkins University, Baltimore, Maryland

Mike Acott, President, National Asphalt Pavement Association, Lanham, Maryland (ex officio)  
Joseph M. Clapp, Administrator, Federal Motor Carrier Safety Administration, U.S. Department of Transportation (ex officio)  
Susan M. Coughlin, Director and Chief Operating Officer, The American Trucking Associations Foundation, Inc., Alexandria, Virginia (ex officio)  
Jennifer L. Dorn, Administrator, Federal Transit Administration, U.S. Department of Transportation (ex officio)  
Ellen G. Engleman, Administrator, Research and Special Programs Administration, U.S. Department of Transportation (ex officio)  
Robert B. Flowers (Lt. Gen., U.S. Army), Chief of Engineers and Commander, U.S. Army Corps of Engineers, Washington, D.C. (ex officio)  
Harold K. Forsen, Foreign Secretary, National Academy of Engineering, Washington, D.C. (ex officio)  
Jane F. Garvey, Administrator, Federal Aviation Administration, U.S. Department of Transportation (ex officio)  
Thomas J. Gross, Deputy Assistant Secretary, Office of Transportation Technologies, U.S. Department of Energy (ex officio)  
Edward R. Hamberger, President and CEO, Association of American Railroads, Washington, D.C. (ex officio)  
John C. Horsley, Executive Director, American Association of State Highway and Transportation Officials, Washington, D.C. (ex officio)  
Michael P. Jackson, Deputy Secretary, U.S. Department of Transportation (ex officio)  
James M. Loy (Adm., U.S. Coast Guard), Commandant, U.S. Coast Guard, Washington, D.C. (ex officio)  
William W. Millar, President, American Public Transportation Association, Washington, D.C. (ex officio) (Past Chairman, 1992)  
Margo T. Oge, Director, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, Washington, D.C. (ex officio)  
Mary E. Peters, Administrator, Federal Highway Administration, U.S. Department of Transportation (ex officio)  
Valentin J. Riva, President and CEO, American Concrete Pavement Association, Skokie, Illinois (ex officio)  
Jeffrey W. Runge, Administrator, National Highway Traffic Safety Administration, U.S. Department of Transportation (ex officio)  
Allan Rutter, Administrator, Federal Railroad Administration, U.S. Department of Transportation (ex officio)  
William G. Schubert, Administrator, Maritime Administration, U.S. Department of Transportation (ex officio)  
Ashish K. Sen, Director, Bureau of Transportation Statistics, U.S. Department of Transportation (ex officio)  
Robert A. Venezia, Earth Sciences Applications Specialist, National Aeronautics and Space Administration, Washington, D.C. (ex officio)

\* Membership as of April 2002

# TR NEWS

NUMBER 219

MARCH-APRIL 2002

## 3 Strategic Planning for Pavement Preventive Maintenance: Michigan Department of Transportation's "Mix of Fixes" Program

Larry Galehouse

Michigan's pavement maintenance program uses a "mix of fixes" approach, combining reconstruction, rehabilitation, and preventive maintenance—with the emphasis on preventive maintenance—to meet public expectations of safe, smooth, and well-maintained roads. By applying cost-effective treatments to correct minor pavement deficiencies before problems become major, the state is able to extend pavement service life and optimize available funds to meet network condition needs.

## 9 Arkansas' Interstate Rehabilitation Program: Research, Planning, and a Healthy Dose of Innovation

Farrell Wilson

Faced with the task of repairing 60 percent of the state's Interstate highways, the Arkansas State Highway and Transportation Department developed an innovative, comprehensive approach. Research, planning, and best practices have been hallmarks of the Interstate Rehabilitation Program, which has gained the necessary financing, improved rehabilitation methods, and launched an award-winning public information campaign.

## 13 2002 TRB Annual Meeting Highlights

With a program greatly expanded to include sessions spotlighting transportation security and featuring news-making presentations on policy developments and directions by the U.S. Department of Transportation Secretary and modal administration leaders, TRB's 2002 Annual Meeting drew a record number of attendees to Washington, D.C. Photographs and brief reports offer a glimpse of the high-energy sessions and collegial interactions.

## 31 New TRB Special Report The Federal Role in Highway Research and Technology: Time for a Change of Direction

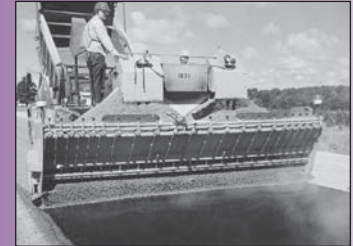
Walter J. Diewald

The Federal Highway Administration's research and technology program should focus on fundamental, long-term research aimed at achieving breakthroughs in understanding transportation-related phenomena, according to a TRB study. The Research and Technology Coordinating Committee examined the FHWA program's focus and activities in the context of the needs of the nation's highway system and of the roles and activities of other highway research programs.

## 35 New TRB Special Report A Process for Setting, Managing, and Monitoring Environmental Windows for Dredging Projects

Kris A. Hoellen

Environmental windows are periods in which the adverse environmental impacts of dredging a waterway and disposing of the dredged materials can be reduced below critical thresholds. A joint study committee of the TRB-Marine Board and the National Research Council's Ocean Studies Board has developed a template for a systematic process to achieve greater consistency, predictability, and reliability in decision making about setting, managing, and monitoring environmental windows for federal dredging projects.



3



39



**Cover:** U.S. Secretary of Transportation Norman Y. Mineta delivers a major policy speech on transportation security at TRB's 81st Annual Meeting—held January 13–17, 2002, in Washington, D.C. Meeting highlights begin on page 13. (Cover photo by Cable Risdon.)

# 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.

## **TR News is produced by the Transportation Research Board Reports and Editorial Services Office**

Nancy A. Ackerman, Director  
Javy Awan, Managing Editor  
Kristin C. Motley, Assistant Editor

## **TR News Editorial Board**

Neil F. Hawks, Chairman  
Nancy A. Ackerman  
Joseph A. Breen  
Walter J. Diewald  
Frederick D. Hejl  
Timothy Hess  
Stephen F. Maher  
Stephan A. Parker  
A. Robert Raab

## **Transportation Research Board**

Robert E. Skinner, Jr., Executive Director  
Suzanne B. Schneider, Associate Executive Director  
Mark R. Norman, Director,  
Technical Activities  
Stephen R. Godwin, Director,  
Studies and Information Services  
Michael P. LaPlante, Director, Finance and Administration  
Robert J. Reilly, Director,  
Cooperative Research Programs  
Neil F. Hawks, Director, Special Programs

**TR News** (ISSN 0738-6826) is issued bimonthly by the Transportation Research Board, National Research Council, 2101 Constitution Avenue, NW, Washington, DC 20418. Internet address: [www.TRB.org](http://www.TRB.org).

**Editorial Correspondence:** By mail to the Reports and Editorial Services Office, Transportation Research Board, 2101 Constitution Avenue, NW, Washington, DC 20418, by telephone 202-334-2972, or by fax 202-334-3495.

**Subscriptions:** North America: 1 year \$55.00; single issue \$9.50. Overseas: 1 year \$70.00; single issue \$13.00. Inquiries or communications concerning new subscriptions, subscription problems, or single-copy sales should be addressed to the Business Office at the address below, or telephone 202-334-3216, fax 202-334-2519. Second-class postage paid at Washington, DC.

**Postmaster:** Send changes of address to *TR News*, Transportation Research Board, 2101 Constitution Avenue, NW, Washington, DC 20418.

**Notice:** The opinions expressed in articles appearing in *TR News* are those of the authors and do not necessarily reflect the views of the Transportation Research Board. The Transportation Research Board and *TR News* do not endorse products of manufacturers. Trade and manufacturers' names appear in an article only because they are considered essential to its object.

Printed in the United States of America.

Copyright © 2002 Transportation Research Board. All rights reserved.

## ALSO IN THIS ISSUE

### 39 Research Pays Off

*Cynthia Levesque*

Improving Communications to Manage Incidents:  
A Solution for Rhode Island

### 41 Calendar

### 42 Profiles

Professor, researcher, and consultant Clinton V. Oster, Jr., and Texas Transportation Institute Deputy Director Dennis L. Christiansen

### 44 News Briefs

Free-flight tool takes off, "beast out back" tests pavements, carpools thrive in Bay Area, historic bridge gets new life, intermodal initiatives in Europe, pavement management in Thailand, and more; plus People in Transportation.

### 48 TRB Highlights

CRP News, 50

### 52 Bookshelf

TRB Publications, 52

## CORRECTION

Jane E. Lappin of the John A. Volpe National Transportation Systems Center should have been credited specifically as a member of the task force that defined, secured, and produced the feature articles for the special issue on Intelligent Transportation Systems (*TR News*, January–February 2002), under a charge from the TRB Committee on Intelligent Transportation Systems. This task force included Steven Shladover, Partners for Advanced Transit and Highways, as Chair; and William Johnson, Consultant, Ottawa, Canada; and Jane Lappin, Volpe National Transportation Systems Center, as members. Richard J. Weiland, Weiland Consulting Co., is Chair of the TRB Committee on Intelligent Transportation Systems.

## COMING NEXT ISSUE



Citizen and public agency advisory and policy group helps plan and develop a light rail system with the Transit Authority of River City, Louisville, Kentucky.

What role does the public play in transportation decision making? In the next issue, transportation professionals will examine some of the ideas and techniques used by today's practitioners. The accounts of those using these techniques reinforce the critical importance of building an informed public consent—not designing and implementing projects in a vacuum—to deliver a transportation system for the 21st century.

# Strategic Planning for Pavement Preventive Maintenance

*Michigan Department of Transportation's "Mix of Fixes" Program*

LARRY GALEHOUSE

The author is  
Manager, Capital  
Preventive  
Maintenance  
Program, Michigan  
Department of  
Transportation,  
Lansing.



Concrete  
freeways in  
Michigan's  
state  
network.

The amount of travel on the Michigan state highway system has increased more than 30 percent since 1986, yet the number of lane-miles to support the traffic has increased by only 3 percent. In the early 1990s, demands on Michigan's highway network increased, but the available resources decreased. Operating revenues failed to keep pace with needs, and Michigan Department of Transportation (DOT) staffing was reduced substantially.

In 1992, the Michigan DOT developed a program to preserve the highway network's pavement and bridge structures. Department leaders committed themselves to implementing the program and pledged revenues and staffing for the initiative.

The exclusive purpose of the Michigan Capital Preventive Maintenance Program is to preserve pavement and bridge structures, delay future deterioration, and improve overall conditions cost-effectively and efficiently. This article focuses on the state's pavement preventive maintenance program.

## Lane-Miles To Upkeep

Michigan DOT is responsible for a highway network of 27,345 lane-miles (44,008 lane-kilometers). The roadway pavements are asphalt, concrete, and composites of asphalt on concrete. The state highway system represents about 8 percent of the state's lane-miles of roads but carries approximately 55 percent of all travel and 72 percent of commercial travel in

Michigan—more than 50 billion annual vehicle-miles of travel (AVMT) and more than 4 billion AVMT of commercial travel.

In 1991, the Intermodal Surface Transportation Efficiency Act made highway preventive maintenance eligible for federal-aid funds. The National Highway System bill, which became law in November 1995, strengthened the provision: "A preventive maintenance activity shall be eligible for federal assistance...if the state demonstrates to the satisfaction of the Secretary that the activity is a cost-effective means of extending the useful life of a Federal-Aid Highway."

## "Mix of Fixes" Approach

Michigan DOT satisfies public expectations by implementing a comprehensive strategy for pavement preservation. The Department initiated a pavement preventive maintenance program in conjunction with a pavement management system. In the last decade, both programs have become integral in the Department's investment decision making.

The preventive maintenance program meets public expectations for safe, smooth, and well-maintained roads by applying cost-effective treatments to correct minor pavement deficiencies before the problems become major. The pavement management system departs from traditional approaches that had focused on reactive maintenance and reconstruction.

The strategy combines long-term fixes (reconstruction), medium-term fixes (rehabilitation), and

short-term fixes (preventive maintenance). In this “mix of fixes” approach, each fix category has a critical role in improving the future condition of the state highway network.

### Reconstruction

Reconstruction involves the complete replacement of the pavement structure with a new equivalent—a long-term action that is designed to last at least 20 years. Most favorable to the traveling public, reconstruction is also the most costly fix. Like most transportation agencies, Michigan DOT does not have sufficient funds to sustain the level of investment for continual reconstruction of the highway network.

In addition, directing available funds to highway reconstruction neglects the majority of the network. Figure 1 illustrates the consequence of using a long-term reconstruction strategy without rehabilitation and preventive maintenance programs—the roads remain predominantly in poor condition.

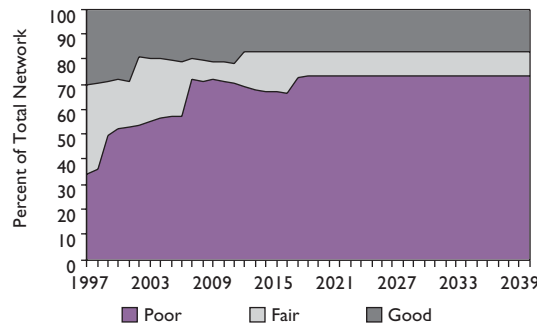


FIGURE 1 Projected condition of Michigan’s highway network under reconstruction-only strategy over 40-year period with funding of \$400 million per year (1997 highway budget; projections adjusted for inflation).

### Rehabilitation

Rehabilitation applies structural enhancements to improve a pavement’s load-carrying capability and extend the service life. Most rehabilitation projects are designed to last 10 to 20 years.

Although less costly than reconstruction, rehabilitation to improve the overall network condition still requires a prohibitive level of investment. Combined with a reconstruction program, rehabilitation can provide a marginal increase in pavement performance, but the results are not optimal, as illustrated in Figure 2.

### Preventive Maintenance

Preventive maintenance applies lower-cost treatments to retard a highway’s deterioration, maintain or improve the functional condition, and extend the pavement’s service life. With various short-term treatments, preventive maintenance can extend pave-

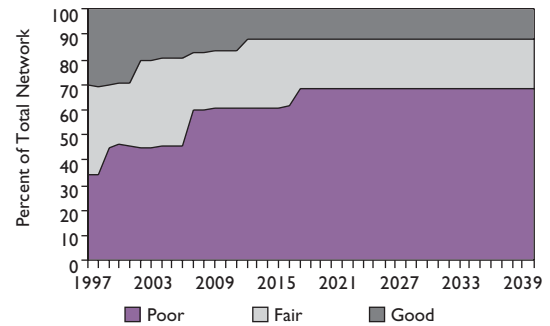


FIGURE 2 Projected condition of Michigan’s highway network with combined reconstruction and rehabilitation programs (10- to 30-year fixes), at funding of \$400 million per year (adjusted for inflation).

ment life an average of 5 to 10 years. Applied to the right road at the right time—when the pavements are mostly in good condition—preventive maintenance can improve the network condition significantly at a lower unit cost.

### Combining Components

Combining all three programs into a single comprehensive strategy achieves the most manageable highway network, as shown in Figure 3. The total funding in Figure 3 is exactly the same as for the strategies in Figures 1 and 2, but the roadway conditions are predominantly good and fair for the long term.

Preventive maintenance is perhaps the single most influential component of the network strategy, allowing the Department to manage pavement condition. Preventive maintenance postpones costly reconstruction or rehabilitation activities by extending the service life of the original pavement. The challenge is to ascertain the right time to apply a treatment to achieve maximum benefit or return on investment.

Routine maintenance is important for a highway; but routine maintenance is a holding action, main-

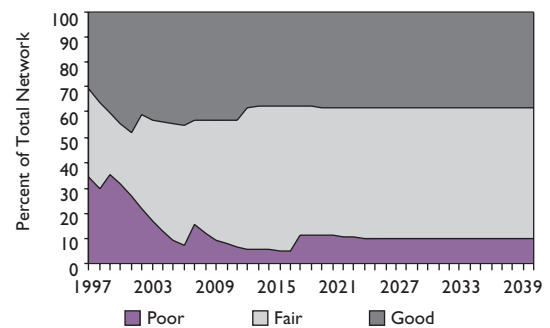


FIGURE 3 Projected condition of Michigan’s highway network with combined reconstruction, rehabilitation, and preventive maintenance programs (5- to 30-year fixes), at funding of \$400 million per year (adjusted for inflation).

taining the service level without extending the pavement life. Routine maintenance will not improve the overall condition of a highway network.

### **Partnerships for Training**

Many of the surface treatments and repair techniques adopted for the new program were not familiar at first to Michigan DOT personnel. For example, microsurfacing had been applied only to a limited number of locations in Michigan before 1992, and the benefits were not well known. Similarly, the Department did not have working knowledge and experience with chip seals and certain kinds of concrete repairs.

Established contractors and suppliers were asked to develop training workshops to educate Department personnel about the new treatments. The workshops have proved popular and successful. The training partnership with contractors and suppliers has continued and has contributed to improvements in products and materials.

### **Surface Treatments**

From the beginning, the program's emphasis has been on targeting pavement surface defects caused by the environment and by deficiencies in materials, not on deficiencies in the pavement structure caused by traffic loading.

Surface treatments for flexible pavement surfaces include microsurfacing, chip seals, slurry seals, crack sealing, 3/4-inch (20-mm) overlays of ultrathin hot-mix asphalt, and 1.5-inch (40-mm) hot-mix asphalt overlays. In some situations, it was cost-effective to treat curb and gutter pavement sections by cold-milling and resurfacing with a 1.5-inch hot-mix asphalt overlay.

Treatments for rigid pavements include full-depth concrete pavement repairs, joint resealing, dowel-bar retrofits, minor spall repair, crack sealing, and diamond grinding. Later, the removal and replacement of narrow bituminous shoulders (less than 1 meter) were added as acceptable treatments.

### **Building Up the Budget**

Since its inception in 1992, the Capital Preventive Maintenance Program has had a dedicated budget, assuring that funds are protected and used for their designated purpose. The first year, the program was funded at \$12 million, with \$6 million for pavement preventive maintenance and \$6 million for bridge preventive maintenance. With federal-aid eligibility, Michigan's funding obligation was approximately 20 percent of the program's total cost.

The pavement preventive maintenance budget has increased steadily, reaching \$25 million in 1997. In 1998, the Transportation Equity Act for the



Chip seal operation addresses pavement surface defects on flexible pavement.

21st Century revised the federal funding formulas, and Michigan received a much needed revenue increase.

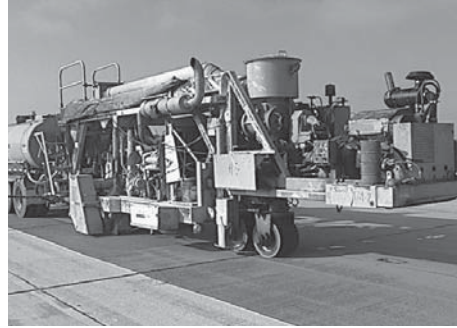
In addition, Governor John Engler obtained a gasoline tax increase to improve the state's transportation system. Michigan DOT leaders have demonstrated commitment to the program by designating a greater portion of funds for pavement preventive maintenance. Today the pavement preventive maintenance program has an annual budget of \$60 million, and the budget will increase to \$73.5 million in 2003.

### **Rating Conditions**

The rating of pavement conditions on the state-managed highway system is based on standard criteria such as distress, ride quality, friction, and rutting. Detailed data are collected for the pavement management system and used by pavement engineers, but usually the data are translated into ratings of "good" or "poor" for easier understanding by other agencies and the public.



Left: Applying sealant to a flexible pavement. Right: Continuous microsurfacing, applied to high-volume, flexible-pavement roads in Michigan, fills ruts, improves skid resistance, retextures surface, and removes distortions.



*Clockwise from above:*

Dowel-bar retrofit eliminates faulting in rigid pavements, allowing load transfer from one slab to another.

Diamond grinding improves ride quality of concrete road surfaces.

Resealing joints on portland cement concrete pavement.



In explaining the Michigan Road Strategy to the public, officials made a distinction between freeways and nonfreeways. Freeways referred to all Interstate highways, as well as other limited-access state highways. Nonfreeways represented all of the remaining highways that are not limited-access, including all two-lane roads.

Pavement condition data for 1996 indicated that 79 percent of Michigan's freeways and 56 percent of the nonfreeways were in good condition. In 1997, the State Transportation Commission established a specific 10-year condition goal—to have 95 percent of freeways and 85 percent of nonfreeways in good condition by 2007.

The only viable strategy was to implement a three-tiered program of reconstruction, rehabilitation, and preventive maintenance. The approach addresses the worst highways through reconstruction, the poor highways by rehabilitation, and the good highways with aggressive preventive maintenance.

### Optimizing Funds

The mix-of-fixes approach helps optimize available funds to meet network condition needs. In estimating the outcome of a mix-of-fixes strategy, Michigan DOT relies on the Road Quality Forecasting System, which uses current condition data from the pavement management system to predict future network conditions at different levels of investment. The forecasting model has proved an invaluable tool.

Integrating pavement preventive maintenance with reconstruction and rehabilitation produces dra-

matic results in the network's condition. Even the most skeptical traditionalist soon recognizes that preventive maintenance is the only cost-effective means to improve overall pavement condition. More than a program of short-term treatments, preventive maintenance is a management tool that optimizes funding allocations.

### Balancing Service Life

The bar chart in Figure 4 shows the remaining service life of a typical pavement network that failed to implement a mix-of-fixes strategy. The unequal distribution of remaining service life represents a significant future problem when the largest group approaches no remaining life. With no service life remaining, the pavements are candidates only for rehabilitation and reconstruction.

Large surges in construction can be devastating to overall maintenance. First, large fluctuations in funding are required—an unpopular alternative for the public. Second, the variation in construction activities from year to year creates staffing and logistical problems for the highway agency and the contractor. The practice of hiring and laying off personnel as workloads change hurts employees and disrupts the organization. Finally, contractors and suppliers need a stable source of work to survive in the marketplace. Years of heavy workloads followed by years of light workloads can force many contractors out of business.

Preventive maintenance can alter the distribution of a pavement's remaining service life. By targeting large concentrations of pavements with similar remaining service lives, preventive maintenance treatments can balance projected workloads before a management problem develops (Figure 5). Balancing the remaining life of the network pavements will ensure manageable workloads at available funding.

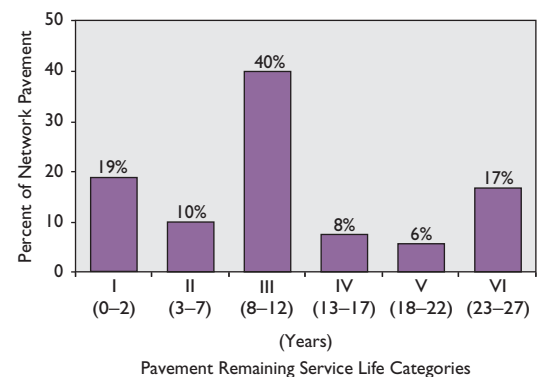


FIGURE 4 Remaining service-life distribution of typical pavement network maintained without mix-of-fixes strategy, based on current condition of roadways.



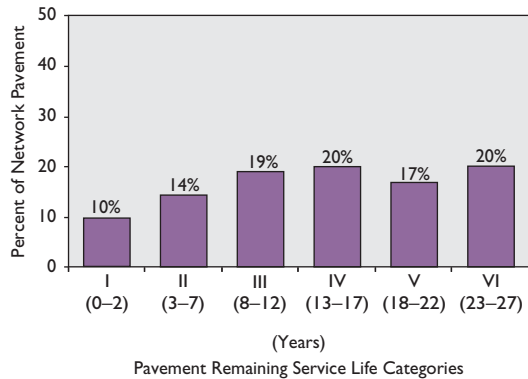


FIGURE 5 Remaining service-life distribution of pavement network that incorporates preventive maintenance approach.

## Managing the Process

### Data Collection

Every year pavement condition data are collected for half of the Michigan highway network, so that the entire network is surveyed every two years, and the cycle repeats. The survey collects information by videotaping one lane, providing a record of all distress in the pavement surface. The videotape is tagged by location and analyzed in 10-foot segments, with each segment assigned a distress index number that increases with the level of severity.

In addition, the survey collects ride quality and rut measurements for the pavement management system. The new data are compared with historical data to forecast future pavement conditions in terms of remaining service life.

Michigan DOT's seven regional offices are using the pavement condition data to create long-term strategies and projects to achieve the State Transportation Commission's 10-year condition goal. Each region's strategy relies on the Road Quality Forecasting System to recognize needs and variability within assigned budget targets.

### Call for Projects

The Department annually issues a call for projects, allowing the regions to introduce candidate projects for roads and bridges. Projects involving reconstruction and rehabilitation are planned for five years away. At the end of each construction season, new projects for reconstruction and rehabilitation supply the next fifth year. Preventive maintenance projects are identified only for one year away, because the projects must address pavement deficiencies early on, before the problems become serious.

The annual call for projects assures that the programs are consistent with the state's long-range plan and its Transportation Improvement Program. The

Department gains an opportunity to make midcourse corrections if program adjustments become necessary. But the call for projects also emphasizes the principle that preventive maintenance will improve the overall highway network's pavement condition cost-effectively.

## Evaluating Performance

The value of pavement preventive maintenance is anchored to the performance of the treatments—the key is not how long the treatments last but the life-extending value imparted to the pavement. Michigan DOT annually assesses the life-extending value of the different treatments. A team of independent engineers, experienced and knowledgeable about pavements, performs the evaluations.

### Data Analysis and Field Tests

The evaluations concentrate on treatments that are several years old. Before a field investigation of the treatment, information is gathered, including details about the original pavement section, construction history, historical and current traffic counts, and pavement management system condition data. The condition data on distress, ride quality, and rutting are of primary interest and include the years preceding and following the treatment application.

After the data analysis, the field phase begins. A representative number of segments are chosen to provide an accurate assessment of pavement surface condition. Each segment measures 0.1 mile (160 meters) in length. All of the selected segments are surveyed carefully and the extent and severity of each type of distress are recorded. Performance curves are developed, and the life-extending value of the treatment is extracted for each project.

Figure 6 provides a simplified depiction of the life-extending benefit of a treatment. The graph shows a typical deterioration curve interrupted when a preventive maintenance treatment is applied to a pavement in good condition. The preventive maintenance

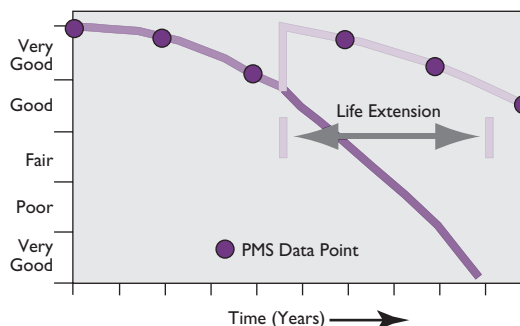


FIGURE 6 Life-extending benefit of preventive maintenance treatment.

improves the condition for a period, until the pavement returns to the condition before the treatment. The time the pavement condition was improved by the treatment is the life extension given to the original pavement, or the extended service life.

The pavement management system's measurements of pavement condition over a period of time before and after the application of preventive maintenance makes it possible to determine the extended service life of a treatment.

### Prescribing Treatments

Although evaluations continue, the extended service life of a preventive maintenance treatment depends

on the pavement's rate of deterioration. Pavement condition is possibly the most important factor in achieving the maximum benefit from a preventive maintenance treatment.

An engineer should evaluate a highway like a doctor diagnosing a patient—each patient has different physical traits, and the doctor prescribes a medication to fit the particular individual. Similarly, the engineer must select a preventive maintenance treatment that fits the unique condition of the pavement.

Michigan DOT prescribes treatments according to pavement condition measures, not by schedules for timely applications. The likely gains in extended service life from various treatments applied to different types of pavement are indicated in Table 1.

TABLE 1 Extended Service Life Gains for Preventive Maintenance Treatments

Treatment	Pavement Type	Extended Service Life (years) <sup>a</sup>
Overband crack filling	Flexible	Up to 2
	Composite	Up to 2
Crack sealing	Flexible	Up to 3
	Composite	Up to 3
	Rigid	Up to 3
Single chip seal	Flexible	3 to 6
	Composite	N/A <sup>b</sup>
Double chip seal	Flexible	4 to 7
	Composite	3 to 6
Slurry seal	Flexible	N/A <sup>b</sup>
	Composite	N/A <sup>b</sup>
Microsurfacing (single course)	Flexible	3 to 5 <sup>c</sup>
	Composite	N/A <sup>b</sup>
Microsurfacing (multiple course)	Flexible	4 to 6 <sup>c</sup>
	Composite	N/A <sup>b</sup>
Ultrathin hot-mix asphalt, .75-in. (20-mm) overlay	Flexible	3 to 5 <sup>c</sup>
	Composite	3 to 5 <sup>c</sup>
Hot-mix asphalt, 1.5-in. (40-mm) overlay	Flexible	5 to 10
	Composite	4 to 9
Hot-mix asphalt, 1.5-in (40-mm) mill and overlay	Flexible	5 to 10
	Composite	4 to 9
Joint resealing	Rigid	3 to 5
Spall repair	Rigid	Up to 5
Full-depth concrete repairs	Rigid	3 to 10
Diamond grinding	Rigid	3 to 5 <sup>c</sup>
Dowel-bar retrofit	Rigid	2 to 3 <sup>c</sup>
Concrete pavement restoration	Rigid	7 to 15 <sup>c</sup>

#### NOTES

<sup>a</sup>The time range is the expected life-extending benefit given to the pavement, not the anticipated longevity of the treatment.

<sup>b</sup>Sufficient data are not available to determine life-extending value.

<sup>c</sup>Additional information is necessary to quantify the extended life more accurately.

### Consolidating Gains

The mix-of-fixes approach provides the greatest flexibility to the highway agency in enhancing pavement performance, with a three-tier program of reconstruction, rehabilitation, and preventive maintenance. An agency can address the worst highways through reconstruction, improve poor highways by rehabilitation, and preserve good highways with timely preventive maintenance. Preventive maintenance can improve pavement performance cost-effectively and efficiently, as measured by such attributes as ride quality, safety, and remaining service life.

In Michigan, pavement preventive maintenance is now integrated into a strategy designed to meet long-term pavement condition goals. Funding for the pavement preventive maintenance program has grown steadily from \$6 million to \$73.5 million annually. The performance of the preventive maintenance treatments and the extension of service life imparted to the original pavements are evaluated regularly.

Michigan DOT has a strong partnering relationship with preventive maintenance contractors and suppliers for improving products and materials. As a result, even better-performing treatments are expected in the future.

### Resources

*Asset Management Primer*. Federal Highway Administration, December 1999.

*Five-Year Road and Bridge Program, Volume III: 2001 to 2005*. Michigan Department of Transportation, January 2001.

*Good News from MDOT: A Progress Report from the Michigan Department of Transportation*. Michigan Department of Transportation, December 2000.

# Arkansas' Interstate Rehabilitation Program

## Research, Planning, and a Healthy Dose of Innovation

FARRELL WILSON

The author is Special Projects Coordinator, Public Affairs Office, Arkansas State Highway and Transportation Department, Little Rock.

The Arkansas State Highway and Transportation Department (AHTD) has taken an innovative approach to rehabilitating Interstate highways. When the program began, more than 60 percent of the state's 35-year-old Interstates were in poor condition—patching and spot overlays could no longer repair the uneven seams.

“We started where everyone seems to begin—with financial constraints,” recalls AHTD Director Dan Flowers. “Then we moved to searching for and developing long-term methods for rehabilitation. Along the way, we discovered the importance of widespread communications. Combining research and best practices in several areas into one program is innovative in itself.”

Most of the program's individual components may not be new, but combining them under Arkansas' Interstate Rehabilitation Program (IRP) has produced unique results. Highway officials crafted an approach incorporating innovation—breaking the program down into elements and addressing each element in its own framework with established best practices. As a result, the IRP has stimulated innovative thinking, research, planning, and implementation that have made the Arkansas approach a national model.

Flowers explains why a quick fix was not an option: “This problem was going to take a lot of creative thought with participation and cooperation from several groups, including federal and state governments, as well as the consulting community, contractors, and the public—that's where all the research and homework paid off.”

### Creative Financing

Funding presented the first and most challenging obstacle. The cost for the state's original 542-mile Interstate system was \$837 million, with much of the funding from the federal government. The cost of repairing approximately 69 percent of those miles today (Figures 1, 2) was estimated at \$950 million,

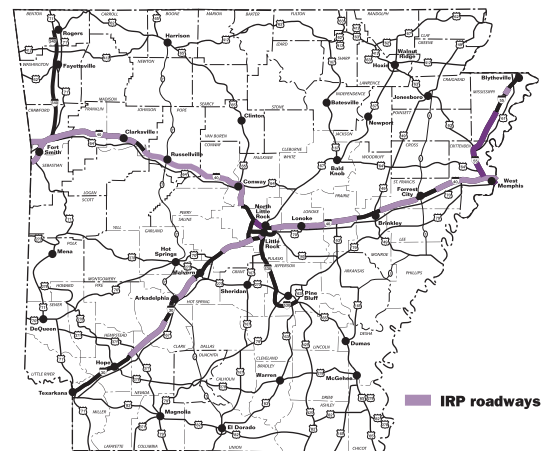


FIGURE 1 Roadways included in Arkansas' Interstate Rehabilitation Program (IRP).

with much of the financial burden on the proprietor, the state of Arkansas.

In early 1998, the Arkansas Highway Commission began exploring the use of Grant Anticipation Revenue Vehicle (GARVEE) bonds for the rehabilitation program. The bonds may be retired with future anticipated federal funds in a “buy now, pay later” payment arrangement.

“The funding commitment was substantial,” Flowers notes. “The Department recognized that it needed to go to a higher level and involve the gover-

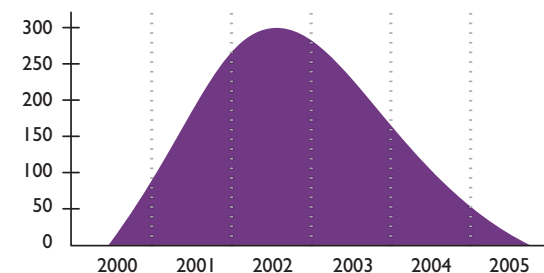


FIGURE 2 Average IRP miles under construction, per year, 2000–2005.

nor, the state legislature, and most likely the Arkansas voters. We determined to make a full-court press to get these roads rebuilt as rapidly as possible.”

In 1999, with the governor’s support, the legislature passed phased-in increases for a 3-cent gas tax over three years and diesel taxes of 4 cents over two years. Legislators also authorized the Highway Commission to sell GARVEE bonds subject to voters’ approval. The governor campaigned for the program and made Interstate rehabilitation a major part of his agenda for state infrastructure and roadways.

Well aware of the poor condition of the Interstates, voters approved the bond program overwhelmingly, by a margin of 4 to 1. The voter-approved IRP authorized the Highway Commission to sell up to \$575 million in GARVEE bonds. The initial bond issue was a competitive sale; however, throughout the multiyear program, the Commission will evaluate each successive bond sale to determine whether a competitive or negotiated sale is appropriate.

### Well-Researched Methods

With funding established, AHTD engineers worked to coordinate rebuilding plans quickly, efficiently, and safely for motorists and construction crews. What is the best way to repair an Interstate system constructed of reinforced, jointed concrete 9 to 10 inches thick? The state had spent millions of dollars in the past decade to patch and overlay the portland cement concrete (PCC) roadways, which continued to deteriorate because of increases in traffic and heavy loads and because of an unstable base.

Examining the results of both state and national research and drawing on past experience and positive outcomes in a few recent projects, AHTD officials identified a rehabilitation solution—rubblization. This construction technique breaks deteriorating PCC pavement into 2- to 6-inch pieces that become a base for a hot-mix asphalt overlay.

Rubblization also saves time and money—always a characteristic of best practices in project assessment and planning. Debris and unused material do not need to be removed to another site. Moreover, the crushed PCC base reduces the chance that cracks, joints, and other defects will reflect through the asphalt overlay, negatively affecting performance.

“Rubblization makes the base into an interlocked



Rubblizing allows reuse of deteriorating pavement: resonant breaker head reduces old concrete surface to rubble, which is compressed with vibratory roller and becomes the bed for layers of asphaltic concrete hot mix (ACHM).

matrix of pieces as the concrete breaks up,” explains AHTD Chief Engineer Bob Walters. “It functions much like a jigsaw puzzle with broken pieces fitting together.”

The six-step rehabilitation process includes setting up the work zone, installing underdrains, rubblizing, rolling the rubblized surface, paving or overlaying, and smoothing the surface. For each step, AHTD found payoffs in research and in reviewing improved practices.

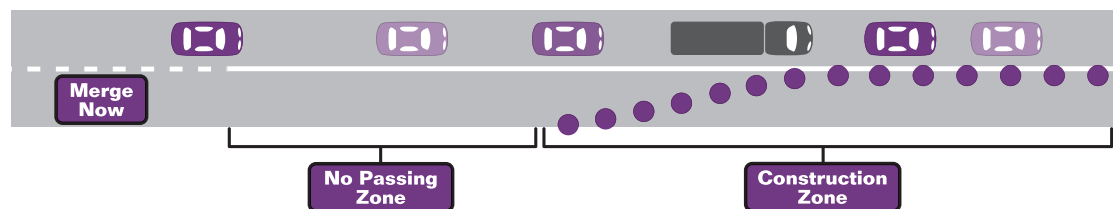
“Developing extensive quality control methods in a new state-of-the-art materials testing laboratory also added to the program’s success,” Walters observes. “Persistent testing of the asphalt mix to minimize rutting has ensured the highest-quality product.”

### Setting Up Work Zones

Setting up the work zones also required innovations. Nearly every Interstate work zone for the project is arranged the same way—so that approaching traffic merges to the left lane, with the right lane initially closed (Figure 3). As a result, motorists quickly recognize what to do when approaching work zones and act accordingly to maximize traffic flow.

“Merge Left” warning signs are placed 2 miles before the work zone, with “Merge Now” reminders 1 mile away and enforceable “No Passing Zones” 1,500 feet before the lane closure. Crews work one lane in a direction at a time; traffic is diverted first to the left and then gradually moved with strategically placed barrels and arrow signs.

FIGURE 3 Guiding traffic around a work zone.



To make sure that the taxpayers who voted to support the program—and who negotiate the barrels around the Interstate rehabilitation sites—are pleased with the final product, AHTD asked contractors to help identify improved practices and develop new ones.

## Lessons Learned

On the list of “what was learned in rubblization,” AHTD included the renewed attention to subsurface drainage. AHTD engineers have revised the underdrain materials and design and have instituted video inspection to ensure that the system functions properly. A dry base material has improved pavement performance. AHTD also has specified that contractors must roll the rubblized surfaces with a 10-ton vibratory roller to consolidate the rubblized PCC for paving.



Arkansas road work crews use stringline to double-check thickness, grade, and slope of the laydown of coarse first layer—or base course—of ACHM. Each successive layer uses more finely crushed aggregate.

In addition, use of stringline was found to be important in ensuring successful paving. When crews profile the PCC and then rubblize, the old PCC expands, but not uniformly. Stringline profiles based on the old PCC profile do not provide the proper thickness for the new surface. AHTD found the answer in a base-mix formula of a 1.5-inch top-size virgin aggregate from a state quarry, a binder mix with a 1-inch top size, and a surface mix of a 0.5-inch top size. Portable asphalt plants often are set up close to a job and the asphalt may be compacted with two double-drum vibratory rollers.

AHTD contracts also offer smoothness incentives of up to 3 percent and disincentives of up to 4 percent of the surface cost by measuring the accumulation of surface irregularities. Contractors use a profilograph not only on the finished surface but on every lift. This identifies any problem areas early, to be dealt with immediately.

AHTD also has incorporated roadway safety measures that were not available when the original Inter-

states were built. Rumble strips, reflective pavement striping designed to be visible under rainy conditions, and plowable reflectors have brought the new roadways in line with current best practices.

However, rubblization was not the answer to all of Arkansas' Interstate rehabilitation needs. In many locations, the subsurface conditions necessitated either a full-depth reconstruction or a complete redesign of the roadway. Concrete reconstruction was the best solution. Because research has played a key role in determining the best processes and materials for different conditions, drivers in Arkansas are on the way to smoother motoring.

## Excellence in Communications

To communicate with the public about this massive project, AHTD turned again to a best-practice model. The highway commissioners decided that hiring a communications expert would extend resources as well as ensure expertise. A full-service marketing and business communications firm came on board early in the planning.

“Having a communications partner to plan, guide, and implement the huge public education and media relations component of this campaign was a must,” Flowers observes. “This part of the overall program is another sure model for other states.”

The communications firm began with a survey, discovering that the public rated its own level of knowledge about the upcoming project most often as “little” or “none.” The other important finding was that most of the respondents constituted what professional communicators term a nontraditional audience.

How can the message reach such a diverse audience? Moreover, how can the message reach those already on the road who suddenly and unexpectedly encounter a construction zone? The challenge was twofold: how to communicate with an audience planning a trip and how to reach those already en route.

With the help of an advisory board of municipal, hospitality, emergency management, and business leaders from around the state, AHTD staff and the media consultant developed a multilevel campaign called “Pave the Way.” The campaign has received national awards for its creative format that offers information and safety tips, and for its innovative methods of reaching audiences.

Advisory board members included representatives from such diverse groups as the Arkansas State Chamber of Commerce, the Arkansas Trucking Association, and the travel and tourism sectors. The board members not only provided input but also distributed the messages to their constituencies and beyond through publications and presentations.





Drainage pipes installed along edge of the Interstate collect and remove water that soaks into pavement layers; renewed attention to underdrain materials, design, and inspection is preventing problems caused by temperature fluctuations.

The campaign message interweaves practical safety information with an emphatic subtheme of “Think Ahead.” The campaign encourages drivers to think seconds and minutes ahead—when approaching and navigating work zones; hours ahead—by learning about construction locations before traveling; and years ahead—to some of the best Interstates in the country.

A website was developed for drivers planning a trip or seeking the most up-to-date roadway information ([www.ArkansasInterstates.com](http://www.ArkansasInterstates.com)). The user-friendly website offers information such as recent travel times between major cities, as well as printable maps indicating active construction zones and lane closures.

Users also can download information from a resource center with everything from printed materials, web-link graphics, and ready-to-use newsletter articles, logos, and graphics. A regularly updated press room page serves the media with easy-to-access updates and photos.

An electronic newsletter is sent out every month via fax or e-mail to all who request it. The IRP Advisory Board, Tourist Information Centers, and other partners in the AHTD Pave the Way advocacy team distribute the information and keep contacts informed through brochures, posters, and collateral materials. Humorous radio spots also have attracted interest.

The public information campaign reaches motorists already behind the wheel with radio spots, electronic and standard roadside signs, highway advisory radio (HAR), and intelligent transportation systems reports of real-time conditions via AM radio. A statewide network of 12-by-24-foot roadside signs announces, “There’s a Whole Lot of Paving Going On,” and informs drivers to tune the car radio to one of eight Pave the Way HAR stations for an overview of what to expect on the Interstate.

In heavily populated areas, AHTD’s roving Motorist Assistance Patrol performs a frontline public relations function, moving disabled vehicles safely off the roadway to keep traffic flowing. Helping stranded motorists call for help, arrange for a tow, replenish fuel, change tires, restart vehicles, extinguish fires, or render first aid are all a part of keeping Interstate motorists safely on their way.

### Accolades and Kudos

Documenting results is one of AHTD’s best practices and is vital to research. The consultant tracks all media involvement; the reports on media coverage since the campaign’s launch in April 2001 include the following:

- ◆ More than 2,500 inches of print in newspapers statewide, with more than 21 IRP stories in Arkansas’ largest newspaper, which has a circulation of 189,000 readers.

- ◆ More than 1 hour of television coverage statewide with stories ranging from the launch of the Pave the Way campaign to the opening of construction zones.

- ◆ More than 4,000 subscribers to the monthly *Interstate Update* electronic newsletter.

- ◆ More than 260 inches of coverage in specialty publications, from *The Trucker* to the *Governor’s Electronic Newsletter*.

- ◆ More than 90,000 visits to the AHTD Pave the Way website.

- ◆ Many website stories and links to information partners, including the websites of television stations.

- ◆ Favorable airing of radio spots through the Arkansas Broadcasters Association’s Nonsustaining Commercial Announcement Program.

National and regional awards have confirmed that the program is progressive, innovative, and results-oriented. The campaign and its components have received such national recognition as

- ◆ An International Roadway Work Zone Safety Awareness Award from the American Road and Transportation Builders Association (ARTBA) and the National Safety Council;

- ◆ A first-place Public Affairs Skills Award from the American Association of State Highway and Transportation Officials (AASHTO) for three public-service radio announcements;

- ◆ Website of the Day chosen by *Transportation Communications Newsletter*, a national electronic publication sponsored by Yahoo! Groups; and

- ◆ ARTBA’s annual Pride in Transportation Construction Award.

The campaign also fared well in nontransportation industry contests: Pave the Way has received a Bronze Quill Award of Excellence from the International Association of Business Communicators and a Prism Award from the Public Relations Society of America in the category of statewide public affairs campaigns. In December 2001, the AASHTO President’s Award for Highway Safety recognized Pave the Way as the “best of the best” nationwide in highway department communications.

With requests for assistance continuing from other states and with experience as cosponsor with FHWA of a national conference on rubblization, AHTD officials are eager to share the knowledge gained from the program. For more information about the Arkansas IRP or the Pave The Way campaign, visit the website ([www.ArkansasInterstates.com](http://www.ArkansasInterstates.com)) or contact the AHTD Public Affairs Office, 501-569-2227.

# 2002

## TRB Annual Meeting

# Highlights

The 81st Annual Meeting of the Transportation Research Board, January 13–17, 2002, in Washington, D.C., attracted more than 9,000 participants from the United States and abroad, including transportation researchers, practitioners, and administrators representing government, industry, and academia. There were more than 500 sessions, 250 TRB committee meetings, and 1,900 speakers. In addition, more than 50 program events convened on the weekend preceding the start of the formal Annual Meeting sessions.

To present the government's response to the terrorist attacks of September 11, 2001, the U.S. Department of Transportation conducted a special session, Spotlight on Security and Recovery. The session addressed the issues of security, preparedness, and recovery across modes, including the steps taken during and immediately after the events of September 11, actions under way, and what the future may hold. This special session set the context for more than 25 other sessions and workshops specifically addressing transportation security. More details and program highlights appear on the following pages.



From left: C. I. MacGillivray, Iowa DOT; David Albright, New Mexico State Highway and Transportation Department; and Dennis Judycki, Director of Research, Development, and Technology, FHWA, greet each other at the Joint Meeting of the AASHTO Standing Committee on Research and the Research Advisory Committee (SCOR-RAC).



David Huft, South Dakota DOT, Chair, AASHTO Research Advisory Committee, addresses SCOR-RAC meeting attendees.



Above: At the Human Factors in Transportation 35th Annual Workshop Luncheon, Hiroshi Tsuda, Director, Intelligent Transportation Systems Research, Nissan Technical Center North America, Inc., presents "A Personal Perspective on Human-Machine Interaction: The Intelligent Transportation Systems Case."



The Human Factors in Transportation Workshop planning committee: (from left) Helmut Zwahlen, Ohio University; Richard Pain, TRB; Alexander Landsburg, Maritime Administration; Peggy Drake, Baltimore City Department of Planning; Thomas Raslear, Federal Railroad Administration; Jerry Wachtel, The Veridian Group; Richard Schwab, consultant; Harvey Sterns, University of Akron; Essie Wagner, NHTSA; Neil Lerner, Westat, Inc.; Christopher Monk, NHTSA; Michael Perel, NHTSA; and Kathryn Lusby-Trebor, NETS.



Dario Salvucci, Drexel University, discusses driver distraction, its assessment, and potential solutions during one of the Human Factors Workshop breakout sessions.



Panel members at the Welcome Session—a program that provides an overview of TRB, including the role of TRB in career development, followed by an informal reception—(from left): Anne Canby, Cambridge Systematics, incoming Chair, Division A (Technical Activities) Council; Robert E. Skinner, Jr., TRB Executive Director; Mark Norman, Director, Division A, TRB; and Harold (Skip) Paul, Louisiana DOT, outgoing Chair, Division A Council.





2002 Division A Council (from left): Gale Page, Florida DOT; Michael Bronzini, George Mason University; Anne Canby, Cambridge Systematics, Chair; Bruce Smith, Apperson Crump & Maxwell; Katherine Turnbull, Texas Transportation Institute; and Jonathan Upchurch, University of Massachusetts.



Arrigo Mongini, Federal Railroad Administration, poses a question to the panel members of workshop on Railroad Capacity and Corridor Planning.

## DISTINGUISHED LECTURE McKelvey Presents Perspectives on Air Transportation System



Francis X. McKelvey, Professor Emeritus, Michigan State University, delivers the 2002 TRB Distinguished Lecture.

Francis X. McKelvey, who retired in 2000 as Professor Emeritus of Civil and Environmental Engineering at Michigan State University, delivered the eleventh Transportation Research Board Distinguished Lecture, "A Perspective on Our National Air Transportation System: The Past, the Present, and the Future," on January 14.

In his 40-year career as teacher, researcher, and author, McKelvey has focused on the planning and design of airports. For more than 25 years, he taught courses in airport engineering at Michigan State University, exciting students about airports and airport-related careers; many of his students have become leaders in air transportation engineering around the world.

McKelvey conducted research and special studies for the Federal Aviation Administration on the planning and design of terminal and ground access systems at airports; he also served as a consultant on many airport improvement projects. Other research interests have included transportation for the elderly and for persons with limited mobility, public transportation, and highway safety.

McKelvey has testified before Congress on airport capacity needs and has advised other countries on the development of airport systems. He is coauthor, with the late Robert Horonjeff, of the third and fourth editions of the authoritative *Planning and Design of Airports*.

A graduate of Manhattan College with a bachelor's degree in civil engineering, McKelvey earned a master's degree in civil engineering from New York University and a Ph.D. in transportation engineering from Pennsylvania State University. He joined the faculty of Michigan State University

in 1974 and spent his academic career there, retiring in 2000. He currently is an independent consultant in airport design and a senior aviation consultant for Reynolds, Smith and Hills, Inc.

McKelvey has been active in TRB since the late 1970s. He served as chairman and member of the Committee on the State Role in Air Transport, the committee on Intergovernmental Relations in Aviation, and the Selection Panel for the Graduate Research Award program on Public-Sector Aviation Issues. McKelvey was a member of the Airport Capacity Study Committee and also served on the standing Committees on Transportation Education and Training, Airport Landside Operations, and Aircraft-Airport Compatibility.

A registered professional engineer in several states, he is a charter member of the Michigan Aviation Hall of Fame and a member of the engineering honor societies Chi Epsilon and Tau Beta Pi. In 2001, he received the Robert Horonjeff Award from the Air Transport Division of the American Society of Civil Engineers.

The Distinguished Lectureship is an annual award that recognizes the career contributions and achievements of an individual in one of five areas covered by TRB's Technical Activities Division. Honorees are provided the opportunity to present an overview of their technical area, including its evolution, present status, and prospects for the future.



From left: Joseph Breen, TRB; Michael Bronzini, George Mason University, Chair, Group I, Division A Council; McKelvey; John M. Samuels, outgoing Chairman, TRB Executive Committee, Norfolk Southern Corporation; and Robert E. Skinner, Jr., TRB Executive Director.

The 81st Annual Meeting's "Spotlight on Security and Recovery" offered more than 25 events addressing the full range of transportation security and critical infrastructure protection issues. Beginning with a workshop on "Critical Infrastructure Protection: A National Priority," on January 13, the meeting sessions examined vulnerability and risk assessment, preparedness, response, prevention, technology, procedures and applications, as well as the integration of security considerations into the planning and operation of the nation's transportation system.

Deputy Secretary of Transportation Michael P. Jackson presided at the keystone of the theme sessions, Session 148, which featured presentations by each of the administrators of the U.S. DOT operating agencies and was broadcast on the C-SPAN cable television network. The administrators summarized the most critical security concerns facing their agencies. They described actions that have been taken or are planned to address those concerns; summarized steps taken during and immediately after the September 11 terrorist attacks; provided information on federal assistance programs and guidance for enhanc-



At the session on Security in the Nation's Ports and on the Waterways, Captain Anthony Regalbuto, U.S. Coast Guard, tells of specific security challenges and how they can be tackled.



Panel member Stephen Flynn, U.S. Coast Guard Academy, in session on the Challenges and Impact of Increased Border Security on Trade and Transportation.



Edward Fraga, Gartner, listens to question posed at session on Critical Issues in Information Security: When Does Sharing Data and Information Become a Security Risk?

Attendance was high at security sessions. Right: session on Railroad Security.



Below: Members of the panel on Security Within the Nation's Aviation System (from left): Anthony Vacchione, Skidmore, Owings & Merrill Architects; Saleh Mumayiz, The MITRE Corporation, presiding; James Wilding, Metropolitan Washington Airports Authority; Billie Vincent, Aerospace Services International, Inc.; James Underwood, U.S. DOT; and Paul Busick, FAA.



Incident Management, a workshop sponsored by the Committee on Freeway Operations, dealt with important issues regarding successful management of traffic incidents. Captain Ed Blunt (left), Arlington Fire, EMS, participates.



ing security at the state and local levels; and identified opportunities for research in the areas of security practices and technology, incident preparedness, response, and recovery.

Jane F. Garvey, Federal Aviation Administrator, focused on airport and aviation security issues. A panel of three administrators—Admiral James M. Loy, Commandant of the U.S. Coast Guard; Bruce J. Carlton, Acting Deputy Maritime Administrator; and Joseph M. Clapp, who heads the recently established Federal Motor Carrier Safety Administration—addressed security issues relating to the nation's borders and points of entry. Domestic security was the focus of remarks by Mary E. Peters,

*continued on page 18*



John Vickerman, TranSystems Corporation, presents options for funding critical marine transportation system research needs at the workshop on Outlining a Research Agenda for the Marine Transportation System and SEA-21.



James O'Donnell, New York City Metropolitan Transportation Authority Police Department, lectures on commuter rail security. Paul Lennon, Los Angeles County Metropolitan Transportation Authority, and Jennifer L. Dorn, FTA Administrator, presiding, also participate in the session on Transit Operating Agencies on the Front Line in Security.



Security for Transportation of Hazardous Materials panelists (from left) Bill Quade; John Allen, Battelle, presiding; Fritz Wybenga, RSPA; Cherry Burke; and William Lucas, Military Traffic Management and Command, defined security threats, discussed potential approaches to mitigation, and examined whether there are technology solutions.

## New Unit To Focus on Transportation Security

On November 19, 2001, President George W. Bush signed into law the Aviation and Transportation Security Act (ATSA) establishing a new Transportation Security Administration (TSA) within the U.S. Department of Transportation. The new law also defines a series of challenging but critically important milestones for achieving secure air travel.

John W. Magaw, former Director of the Secret Service, was appointed Under Secretary of Transportation for Security in January and will head TSA. One of his principal tasks will be to oversee the development and deployment of new security equipment at airports.

"John Magaw is a superb appointment," Secretary Mineta said. "He brings decades of wisdom, experience, and leadership to our new Transportation Security Administration."

Magaw served in the Secret Service for 26 years and was named director in 1992. He headed the Bureau of Alcohol, Tobacco, and Firearms from 1993 to 1999. Most recently, he held a senior position at the Federal Emergency Management Agency.

ATSA fundamentally changes the way transportation security will be performed and managed in the United States. The continued growth of commercial transportation, tourism, and the world economy depends on the effective application of transportation security measures not only to counter threats from those motivated by political or social concerns but also to prevent other criminal acts.

ATSA emphasizes the importance of security for all forms of transportation and related infrastructure elements. This requires partnerships among federal, state, and local government officials, and the private sector to reduce vulnerabilities and to adopt best practices.

Infrastructure protection of critical assets such as pipelines and more than 10,000 Federal Aviation Administration facilities is another key mission of TSA. Along with rail and highway bridges, many other national assets are critical to our economic and national security and vital for the free and seamless movement of passengers and goods throughout the country.

For further information on TSA call 866-289-9673 or visit [www.tsa.dot.gov/](http://www.tsa.dot.gov/).

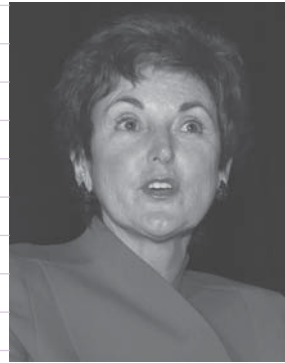
continued from page 17

Federal Highway Administrator; Allan Rutter, Federal Railroad Administrator; Jennifer L. Dorn, Federal Transit Administrator; and Ellen G. Engleman, Administrator of the Research and Special Programs Administration, the agency that oversees hazardous materials and pipeline transportation, as well as emergency transportation in times of civil and natural disasters.

Additional sessions throughout the week focused on particular modes and aspects of transportation security, including airport and aviation; ports and waterways; highways, bridges, and tunnels; transit systems; transportation of hazardous materials; and railroads.

Other sessions covered transportation and emergency services, privacy concerns associated with enhanced security, and the impact of increased border security on trade and transportation.

Audio files from Session 148 are available online at [http://gulliver.trb.org/am/session\\_148.asp/](http://gulliver.trb.org/am/session_148.asp/). Also, C-SPAN videotaped three sessions—*Spotlight on Security and Recovery*, *Port Security*, *Aviation System Security*—and Secretary Mineta's luncheon address. Tapes can be requested through the C-SPAN archives (C-SPAN Archives, PO Box 2909, West Lafayette, IN 47996-2909).



From left: During Spotlight on Security and Recovery keynote session, Admiral James M. Loy, U.S. Coast Guard Commandant, Bruce J. Carlton, Acting Deputy Maritime Administrator, and Joseph M. Clapp, FMCSA Administrator, each discuss transportation security at the nation's entry points; Jane F. Garvey, FAA Administrator, addresses steps taken during and immediately after the events of September 11; and Mary E. Peters, FHWA Administrator, talks about issues related to preparedness and recovery.

### CHAIRMAN'S LUNCHEON ADDRESS Mineta Offers Insights into Transportation Security Initiatives

"We are building an airline security system staffed by dedicated and competent federal aviation security agents, led by highly experienced senior security and law enforcement professionals," said Norman Y. Mineta, the 14th U.S. Secretary of Transportation, who was the featured speaker at the Chairman's Luncheon.

"The system will be robust and redundant, and we will be relentless in our search for improvements. It is better today than yesterday; and, it will be better still tomorrow."

In addition to overseeing the agency that addresses air, maritime, and surface transportation missions, Mineta took on the added responsibility of establishing the new Transportation Security Administration (TSA) to ensure the security of the nation's transportation systems (see box, page 17).

Mineta's remarks included a progress report on the measures being implemented for increased airport security, including "Go-Teams," which work on specific tasks, present decision options, and then disband; new screener training requirements; and more comprehensive screening techniques.

Mineta pointed out that TSA will develop heightened security procedures and awareness across all modes of transportation—rail, highways, transit, maritime, and pipeline. He spoke to an overflow



U.S. Secretary of Transportation Norman Y. Mineta delivers Chairman's Luncheon address.

audience including a large cohort of media, and his address received national news coverage.

Secretary Mineta's address can be requested through the C-SPAN archives (C-SPAN Archives, PO Box 2909, West Lafayette, IN 47996-2909; request ID#168225).



Robert E. Skinner, Jr. (left), TRB Executive Director, confers with Michael P. Jackson, Deputy Secretary of the U.S. DOT, and Jennifer L. Dorn, FTA Administrator, before the Spotlight on Security and Recovery session.



Michael P. Jackson listens as John W. Magaw highlights the role and responsibilities of the Transportation Security Administration.



John W. Magaw, Under Secretary for Transportation Security, responds to reporters' questions at the end of the session.



Mark Norman, Director, Technical Activities Division, TRB, greets Admiral James M. Loy, U.S. Coast Guard Commandant.



From left: Ellen G. Engleman, RSPA Administrator; Allan Rutter, FRA Administrator, and Jennifer L. Dorn, FTA Administrator, discuss the roles that security will have in their respective areas of domestic transportation.



Daniel O'Neil, CRADA Corporation, speaks on an expert panel for the session on Critical Infrastructure Protection: The Role of States in Addressing This National Priority, focusing on a state-by-state survey by TRB's Task Force on Critical Transportation Infrastructure Protection and AASHTO's Task Force on Transportation Security and reporting on the results of an earlier related workshop.



David Edmunds, Fed Ex Services, talks about the changing dynamics of the freight industry at session on Freight Issues, Needs, and Responses: A Decade of Experience After ISTEA, Part I.



Panelists for Part 2 of the session included John Horsley (left), American Association of State Highway and Transportation Officials, and Gregori Lebedev, U.S. Chamber of Commerce.

## Forty-Three Annual Meetings, and Counting!

### Former FHWA Administrator Reminisces

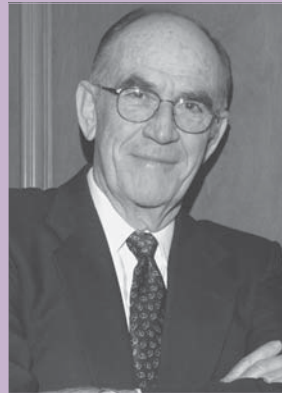
“In 1959, my graduate school professor, Calvin Reen, said, ‘Tom, you should go to the Highway Research Board’s [HRB’s] meeting in Washington this January.’ I replied, ‘What is HRB? Why should I go? How much will it cost?’ After Professor Reen persuasively answered the first two questions, I mentioned that I couldn’t afford the cost. He paid the full tab. The rest is history.”

Thomas D. Larson, the 12th Federal Highway Administrator, as well as a former Chairman of TRB’s Executive Committee, has attended 43 consecutive TRB Annual Meetings. Larson recalls some of his fondest memories of his long involvement with the Board:

◆ “January 1959 was a great time to begin what has become an annual pilgrimage. In the early years I met giants—many of their names now are attached to TRB awards: D. Grant Mickle; K. B Woods; W. H. Carey, Jr.; Bryant Mather; Stanton Walker; Francis H. Hveem; O. K. Normann; Eldon Yoder; and Wilbur Smith. The list could go on and on.”

◆ “More than just meeting giants of the business, I got involved with others to launch NCHRP and its publication series. The first work in that program, *Special Report 80: A Critical Review of Literature Treating Methods of Identifying Aggregates Subject to Destructive Volume Change When Frozen in Concrete and a Proposed Program of Research*, carried my name and was published before the real series began.”

◆ “The year 1979 was special. After my years of guiding Penn State’s Pennsylvania Transportation Institute, the newly elected governor of Pennsylvania, Richard Thornburgh, offered me a chance to lead the Pennsylvania DOT. I was invited—or directed—to attend the inaugural ball. However, the ball conflicted with TRB’s annual



Thomas D. Larson

meeting, so I said sorry—and made the trip to Washington, D.C. The Governor joked about the situation for the next eight years (had things gone less well at Pennsylvania DOT, it would never have been a joke).”

◆ “Each year has been special. Yearly pilgrimages to Washington, D.C., sometimes fighting severe weather—1996 comes to mind—meeting a growing number of friends and now clients as I morphed from bureaucrat to consultant. The pull is extraordinarily strong.”

Larson describes his first 20 years at the meeting as research-centered, presenting papers, serving on and learning from various committees. During the next 15 or so years he was devoted to shaping policy. Currently he attends the Annual Meeting as a consultant, networking and interacting socially. Recently, he volunteered to participate on TRB’s Committee on Transportation History.



Cynthia Burbank, FHWA, addresses a question about global perspectives in session on Metropolitan Capacity-Building Initiative.



At the session on Issues Affecting Women's Travel and Mobility, Talia Melanie McCray, Laval University, Canada, focuses on clinic destination choice for prenatal care access in rural South Africa.



Richard Nelson (left), University of Idaho, and Robert Clarke, U.S. DOT, presiding, confer before the start of session on Assessing and Mitigating Infrastructure Impacts of Large Trucks.



Panelists for session on Data Research and Advanced Transportation Technology Needs for National Parks and Public Lands (from left): Michael Seaby, Public Works and Government Services, Canada; E. Vaughn Stokes, U.S. Department of Agriculture; Gary Ritter, Volpe National Transportation Systems Center; Stephen Albert, Montana State University, presiding; and Kevin Percival, U.S. National Park Service.



During the session on Developments in European Intermodal Freight Movement on Land and Water, Sander Dekker, Delft University of Technology, Netherlands, describes the expansion of the Port of Rotterdam. Other speakers are Bryan Stone (center), Stone Intermodal Consulting, Switzerland, presiding, and George Giannopoulos, Aristotle University of Thessaloniki, Greece.



Don Jauquet, Wayne State University, presents a paper at session on Full International Truck Operations Across the Mexican Border: Impacts on Drivers and Motor Carriers. Seated, from left: Michael Belzer, Wayne State University, presiding; Martin Rojas, American Trucking Associations; Todd Spencer, Owner-Operator Independent Drivers Association, Inc.; Michael Conyngham, International Brotherhood of Teamsters; and Timothy Lynch, Motor Freight Carriers Association.



Mingling at the Marine and Intermodal Forum are (from left): Mary Brooks, Dalhousie University, Canada, incoming Chair, Committee on International Trade and Transportation; Lewis Roach, Sandia National Laboratories, Chair, Task Force on Critical Transportation Infrastructure Security; Joedy Cambridge, TRB; Paul Bingham, DRI-WVEFA, Inc., Secretary, Committee on Freight Transportation Data; Ben Hackett, DRI-WVEFA, Inc.; and Arlene Dietz, U.S. Army Corps of Engineers, Chair, Committee on Military Transportation.



The Marine and Intermodal Forum provides opportunities for informal collegial discussions: Reinhard Pfliegl (left), via donau, Austria, and James McCarville, Port of Pittsburgh Commission.



Emmanuel Horowitz (far left), CANAC, Inc., asks a question of Vukan Vuchic, University of Pennsylvania, during Vuchic's session on Livable Cities—Special Challenge for Transportation Professionals.



Victor Mendez, Arizona DOT, speaks about TRB's Long-Term Pavement Performance Committee Report *Fulfilling the Promise of Better Roads* at the session on Long-Term Pavement Performance: Challenge, Benefits, and Progress, while the rest of the panel listens (from left): Aramis Lopez, Jr., FHWA, presiding; Allan Abbott, City of Lincoln, Nebraska; Tommy Beatty, FHWA; Judith Corley-Lay, North Carolina DOT; and Gary Taylor, Michigan DOT.

Gale Page (left), Florida DOT, incoming Chair, Group 2, Division A Council, outgoing Chair, Group 2, Bituminous Section, receives Testimonial of Appreciation certificate from Fred Hejl, TRB.





Susan Mortel, Michigan DOT, presides at the session on Innovations in Statewide and Corridor Planning.



JR East Professor at Massachusetts Institute of Technology, Joseph M. Sussman describes MIT's new Master of Science degree program during session on Multidisciplinary Transportation Education: Theory and Practice.



Above: Meeting of the Committee of Bituminous Materials, chaired by Michael Zupanick (right), Technologic Resources, Inc., is one of the many TRB committee meetings that take place during the Annual Meeting.



King Mak (left), Chair, Committee on Roadside Safety Features, with the recipients of 2001 Roadside Safety Features Best Paper, "Compliance Testing of a Bullnose Median Barrier System: NCHRP Report 350." Recipients were (from left) Ron Faller, Bob Bielenberg, Midwest Roadside Safety Facility, and John Red, University of Nebraska.



Christine Johnson, FHWA, explores a topic in session on Status of the Intelligent Transportation Systems Industry.



TRB's Executive Committee heard presentations by David Greene (left), Oak Ridge National Laboratory; Mark Schwartz (center), Exxon Mobil Corporation; and James Sweeney, Stanford University, at the policy session on U.S. Petroleum Dependence: Issues and Prospects for the Transportation Sector.



TRB Executive Committee members David Plavin (left), Airports Council International, and James Wilding, Metro Washington Airports Authority, converse during a break in the meeting.



Susan Coughlin, The American Trucking Associations Foundation, Inc., makes a statement during the policy session on U.S. petroleum dependence.



Members of the TRB Executive Committee's Subcommittee for National Research Council Oversight meet during the 81st Annual Meeting. From left: John M. Samuels, John L. Craig, Genevieve Giuliano, Lester A. Hoel, M. Gordon Wolman, and E. Dean Carlson.



From left: E. Dean Carlson, Kansas DOT, incoming Chairman, TRB Executive Committee; John M. Samuels, Norfolk Southern Corporation, outgoing Chairman, TRB Executive Committee; and Robert E. Skinner, Jr., during Executive Committee business meeting.



Robert Reilly (left), Director, Cooperative Research Programs, TRB, and Dennis Judycki, Director of Research, Development, and Technology, FHWA, at the Executive Committee meeting.



Stephen Godwin, Director, Policy Studies and Information Services, TRB, gains insights into future initiatives from incoming Executive Committee Vice Chairman Genevieve Giuliano, University of Southern California.



Joseph Sussman (left), listens to Kumares Sinha, Purdue University, during a break in the Executive Committee session.



Catherine Ross, Georgia Regional Transportation Agency, offers comments during the Executive Committee business session.



Martin Wachs, Institute of Transportation Studies, University of California, Berkeley, discusses points raised by the rapporteur during Executive Committee's policy session.

## Honoring Achievements in Transportation Research

Awards were presented at the Chairman's Luncheon to recognize distinguished service to the transportation community and to acknowledge authors of outstanding papers published by TRB in 2001.

### *Distinguished Service Awards*

The *Sharon D. Banks Award*, named for the late Chairwoman of the TRB Executive Committee, was established in 2001 to recognize sustained leadership accomplishments and innovations that exemplify Banks' caring nature and depth of character. **Naomi W. Ledé**, Senior Research Scientist at the Texas Transportation Institute, was the first recipient of the award and was honored for her extraordinary accomplishments in transportation research and education, including contributions to mentoring and training programs.

The *Roy W. Crum Distinguished Service Award*, named for the Executive Director of the Highway Research Board 1928–1951, honors outstanding achievement in transportation research. This year's award was presented to **Joseph M. Sussman**, who holds the JR East Professorship in the Department of Civil and Environmental Engineering and the Engineering Systems Division at the Massachusetts Institute of Technology, for his significant contributions to research on railroads, intelligent transportation systems, and other large integrated systems.

The *W. N. Carey, Jr., Distinguished Service Award*, named in honor

of TRB's Executive Director 1967–1980, recognizes outstanding leadership and service to transportation research and TRB. **Lillian C. Borrone**, former Assistant Executive Director of the Port Authority of New York and New Jersey, was this year's honoree.

### *Outstanding Paper Awards*

Named for the 23rd Chairman of the Highway Research Board, the *Pyke Johnson Award* spotlights the outstanding paper published in the field of transportation systems planning and administration. **G. Michael Fitch** and **John E. Anderson** were the 2002 recipients for their paper, "Use of Digital Multispectral Videography to Capture Environmental Data Sets for Virginia Department of Transportation." This paper appears in *Transportation Research Record: Journal of the Transportation Research Board*, No. 1756.

The *K. B. Woods Award*, named for the 19th Chairman of the TRB Executive Committee, goes to the outstanding paper in the field of design and construction of transportation facilities. This year's recipients were **Sabine Werkmeister**, **Frohmut Wellner**, and **Andrew R. Dawson** for their paper, "Permanent Deformation Behavior of Granular Materials and the Shakedown Concept," published in *Transportation Research Record: Journal of the Transportation Research Board*, No. 1757.

The *D. Grant Mickle Award*, named for the 1964–1966 TRB Executive Director and the 1970 Executive Committee Chairman, rec-

## E. Dean Carlson To Chair TRB Executive Committee in 2002

**E.** Dean Carlson, Secretary, Kansas Department of Transportation (DOT), is Chairman of the TRB Executive Committee for 2002.

Carlson has been actively involved in TRB for many years. He has been a member of TRB's Executive Committee since 1993 and served as Vice Chairman in 2001. He served on the Group 2 Council on Design and Construction of Transportation Facilities, the National Cooperative Highway Research Program (NCHRP) Project Committee on Synthesis of Information Related to Highway Problems, and the NCHRP Project Panel on Research Program Design—Administration of Highway and Transportation Agencies. Carlson also has seen service as an ex officio member of the Strategic Highway Research Program Executive Committee.

Carlson was appointed Secretary of the Kansas DOT in January 1995, following his retirement in 1994 as Executive Director of the Federal Highway Administration (FHWA). As FHWA Executive Director from 1990 to 1994, Carlson helped guide the effort to establish a strategic vision for reshaping the nation's highway and highway safety programs. Under his leadership, FHWA conducted a strategic planning initiative, reassessing its mission in light of the completion of the Interstate Highway System and redefining its stewardship role with state and local partners. He was centrally involved in developing the U.S. DOT's proposal for legislation to reauthorize fed-

eral highway programs in the period that preceded enactment of the landmark Intermodal Surface Transportation Efficiency Act of 1991.

TRB's Vice Chairman for 2002 is **Genevieve Giuliano**, Professor, School of Policy, Planning, and Development, University of Southern California, Los Angeles.



E. Dean Carlson (right) accepts the gavel from John M. Samuels.

ognizes the outstanding paper in the field of operation, safety, and maintenance of transportation facilities. **Bhagwant Persaud**, **Richard A. Retting**, **Per Gårder**, and **Dominique Lord** were the 2002 recipients for their paper, "Safety Effect of Roundabout Conversions in the United States: Empirical Bayes Observational Before-After Study," published in *Transportation Research Record: Journal of the Transportation Research Board*, No. 1751.

The *John C. Vance Award* is named in honor of TRB's Counsel for Legal Research, 1968–1978, and is presented for an outstanding paper published in the field of transportation law. **Ross D. Nether-ton** received this year's award for his paper, "Reexamination of the

Line Between Governmental Exercise of Police Power and Eminent Domain," published as *National Cooperative Highway Research Program Legal Research Digest No. 44* (October 2000).

The *Fred Burggraf Award*, named for TRB's 1951–1963 Executive Director, recognizes excellence in transportation research by researchers age 35 or younger whose papers have been published under the sponsorship of any Division A Standing Group. Receiving awards this year were **Dario D. Salvucci**, **Andrew Liu**, and **Erwin R. Boer** for their paper, "Toward an Integrated Model of Driver Behavior in a Cognitive Architecture," published in *Transportation Research Record: Journal of the Transportation Research Board*, No. 1779.



E. Dean Carlson welcomes U.S. DOT Secretary Norman Y. Mineta, the Chairman's Luncheon featured speaker. Looking on are (back row, from left to right) Bruce Alberts, NAS President; Joseph M. Sussman; and John M. Samuels.



Secretary Mineta's address on transportation security attracted national media coverage.



Harold Paul, Louisiana DOT, outgoing Chair, Division A Council, presented the outstanding paper awards. From left: Andrew Liu, Erwin Boer, Dario Salvucci, G. Michael Fitch, Richard Retting, Per Gårder, Bhagwant Persaud, Dominique Lord, Andrew Dawson, Sabine Werkmeister, Frohmut Wellner, Harold Paul, and Ross Nether-ton. Not pictured, John E. Anderson.



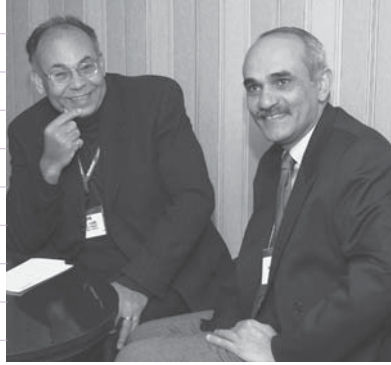
Joseph M. Sussman, Jr. East Professor, Massachusetts Institute of Technology, received the 2001 Roy W. Crum Distinguished Service Award, and Lillian C. Borrone, former Assistant Executive Director, Port Authority of New York and New Jersey, received the 2001 W.N. Carey, Jr., Distinguished Service Award.



Naomi W. Ledé, Texas Transportation Institute, received the first Sharon D. Banks Award for Innovative Leadership in Transportation.



Zale Anis (left), Volpe National Transportation Systems Center, and Eric Miller, Transsolutions, discuss points in session on aviation security.



Nabil Kamel (left), Petro-Canada, and Hussain Bahia, University of Wisconsin at Madison, pause between sessions.



Browsing the meeting program and discussing session itineraries are FHWA employees (from left): Katiann Wong-Murillo, Lorrie Lau, and Joseph Werning.



Ilene Payne (foreground), National Highway Institute, talks with (from left) Nathaniel Perry, Hector Williams, Jr., Bonita Karina Casterlow, and Chrystal Lee, North Carolina A&T State University, at the conclusion of the Dwight David Eisenhower Transportation Fellowship Program Research Showcase.



From left: Stacy Eisenman, George List, Rensselaer Polytechnic Institute; Bruce Robinson, Lee Rodegerdts, Kittelson & Associates, Inc.; and Rod Troutbeck, Queensland University of Technology, Brisbane, Australia, gather to share ideas.



From left: Yehuda Gur, Egged, Israel; Theo Muller, Delft University of Technology, Netherlands; and Stephan Parker, TRB, meet informally.



Bjorn Birgisson, University of Florida, and Shirley Zhang, AB Consultants, Inc., compare notes after a presentation.

POSTERS AND EXHIBITS



Attendees listen to Douglas Mann, HNTB Corporation, discuss “Case Studies in Context-Sensitive Design: Transportation Enhancement Success Stories from Around the World” during poster sessions on Public Involvement in Transportation.



Victor Gallivan, FHWA, answers a question posed by meeting participant at Superpave® exhibit.



Eric Herzog, Environmental Protection Agency, Office of Transportation and Air Quality, demonstrates a computer program to Zena Hernandez, University of Texas at Austin, at “The COMMUTER Model: A New Tool for Estimating Air Quality and Congestion Relief Benefits of Commuter Choice Programs” presentation.



Alan Ho (right), FHWA, looks on as Patricia Timbrook, Street Smarts, and Leveson Boodjal, FHWA, chat about an informational CD-ROM available at exhibit on pedestrian safety.



From right: Srikalyan Challa, Govardhan Muthyalagari, and Ravi Kirngorti, University of Florida, prepare their poster presentation on travel behavior; “Exploration of Relationship Between Timing and Duration of Maintenance Activities.”



Kelvin Wang, University of Arkansas, describes research being performed at the University's Mack-Blackwell National Rural Transportation Study Center.

## TRB Standing Committees Appoint Emeritus Members

**T**RB's emeritus membership category recognizes the significant, long-term contributions of individuals who have provided outstanding service through leadership on the Board's standing committees. The 2002 honorees are listed below.

### Group 1: Transportation Systems Planning and Administration

- George T. Lathrop, Committee on Strategic Management (A1A07)  
Edward K. Morlok, Committee on Freight Transportation Planning and Logistics (A1B02)  
C. Michael Walton, Committee on Motor Vehicle Size and Weight (A1B04)  
Arun Chatterjee, Committee on Urban Freight Transportation (A1B07)  
Rolf Schmitt, Committee on Freight Transportation Data (A1B09)  
Thomas F. Golob, Committee on Traveler Behavior and Values (A1C04)  
David T. Hartgen, Committee on Traveler Behavior and Values (A1C04)  
Peter R. Stopher, Committee on Traveler Behavior and Values (A1C04)  
Vergil G. Stover, Committee on Access Management (A1D07)  
Frank J. Koepke, Committee on Access Management (A1D07)  
Edson Leigh Tennyson, Committee on Commuter Rail Transportation (A1E07)  
Donald O. Eisele, Committee on Commuter Rail Transportation (A1E07)  
Thomas J. McGean, Committee on New Transportation Systems and Technology (A1E14)  
Rolland D. King, Committee on New Transportation Systems and Technology (A1E14)  
Phillip D. Patterson, Committee on Transportation Energy (A1F01)  
Winfield M. Lindeman, Committee on Transportation-Related Noise and Vibration (A1F04)

### Group 2: Design and Construction of Transportation Facilities

- David H. Fasser, Committee on Landscape and Environmental Design (A2A05)  
Ernest J. Barenberg, Committee on Rigid Pavement Design (A2B02)  
B. Frank McCullough, Committee on Rigid Pavement Design (A2B02)  
Marshall R. Thompson, Committee on Strength and Deformation Characteristics of Pavement Sections (A2B05)  
Perry M. Kent, Committee on Highway Traffic Monitoring (A2B08)  
John W. Fisher, Committee on Steel Bridges (A2C02)  
J. Claine Petersen, Committee on Characteristics of Bituminous Materials (A2D01)  
Vytautas P. Puzinauskas, Committee on Characteristics of Bituminous Materials (A2D01)  
Michael M. Sprinkel, Committee on Properties of Concrete (A2E03)  
Richard M. Weed, Committee on Management of Quality Assurance (A2F03)

### Group 3: Operation, Safety, and Maintenance of Transportation Facilities

- Dennis L. Christiansen, Committee on High-Occupancy Vehicle Systems (A3A06)  
Daniel S. Turner,\* Committee on Operational Effects of Geometrics (A3A08)  
Joseph M. McDermott,\* Committee on Freeway Operations (A3A09)  
Robert E. Dewar, Committee on Vehicle User Characteristics (A3B02)  
Herbert Moskowitz, Committee on Vehicle User Characteristics (A3B02)  
Raymond C. Peck, Committee on Operator Education and Regulation (A3B03)  
A. James McKnight, Committee on Operator Education and Regulation (A3B03)  
Wayne G. McCully, Committee on Roadside Maintenance (A3C07)  
W. Douglas Nielsen, Committee on Maintenance Equipment (A3C08)

### Group 5: Intergroup Resources and Issues

- William M. Spreitzer, Committee on Intelligent Transportation Systems (A5009)



Peter Briglia (right), Chair, Committee on Freeway Operations, Washington State DOT, presents Member Emeritus certificate to Joseph McDermott.



Ronald Cominsky (right), Chair, Committee on Management of Quality Assurance, Pennsylvania Asphalt Pavement Association, presents Member Emeritus certificate to Richard Weed, New Jersey DOT.



Edward Nawy (right), Chair, Committee on Properties on Concrete, Rutgers University, presents Member Emeritus certificate to Michael Sprinkel, Virginia Transportation Research Council.

**Mark Your Calendar**  
**TRB 82nd**  
**Annual Meeting**  
**January 12-16, 2003**

Advance registration information for the 82nd Annual Meeting will appear in future issues of *TR News* and on TRB's website ([www.TRB.org](http://www.TRB.org)).



## NEW TRB SPECIAL REPORT

# The Federal Role in Highway Research and Technology

## Time for a Change of Direction

WALTER J. DIEWALD

Change, improvement, and innovation based on highway research have long been important to the highway system. Developing and implementing highway innovations through research is primarily a public-sector activity—the public sector generally owns and manages the highway system. However, research activities often are undertaken in conjunction with the highway industry's private sector.

Yet highway research and technology (R&T) is not a single, centrally managed program but consists of many individual programs, including a federal highway R&T

program,<sup>1</sup> the various state R&T programs, the National Cooperative Highway Research Program (NCHRP), and many private-sector activities. Universities also contribute significantly to highway research.

TRB's Research and Technology Coordinating Committee (see sidebar, page 29) was established to provide a continuing, independent assessment of the Federal Highway Administration's (FHWA's) R&T program. The committee recently examined the program's focus and activities in light of the needs of the nation's highway system and the roles and activities of other highway R&T programs. *Special Report 261: The Federal Role in Highway Research and Technology* presents the findings and a proposal for a change in direction to strengthen the overall R&T enterprise.

### Roster of Programs

Each highway R&T program has its own role and specific responsibilities based on ownership and purpose. Nonetheless, the programs are not isolated from each other, and all benefit from professional interaction and the exchange of information.

◆ FHWA's R&T program responds to the agency's mission and responsibilities for carrying out the federal-aid highway program authorized by Congress. The R&T program addresses a range of topics, predominantly aimed at incremental improvements to trim construction and maintenance costs, boost system performance, add highway capacity, reduce highway fatalities and injuries, minimize adverse environmental impacts, and offer various user benefits, such as faster travel times and fewer hazards. Only a small portion of the program funding, however, supports research on breakthrough technologies to improve highway performance and reduce costs.



*Special Report 261: The Federal Role in Highway Research and Technology* is available from TRB (see Publications Order Form in this issue).

<sup>1</sup> The term "federal highway R&T program" refers to the combined responsibilities and actions of Congress, the administration, and FHWA in funding federal highway research, determining research needs, setting research program priorities, and executing the research program.

◆ Each state highway agency has a research program that addresses technical questions or problems of immediate concern to the agency in terms of local needs and conditions. The state programs share results with other states, often generating considerable interest.

◆ NCHRP's applied research addresses issues common to most states and appropriate for a single, focused investigation.

◆ Private-sector research encompasses individual programs conducted or sponsored by (1) companies that design and construct highways and supply highway-related products, (2) national highway industry associations, and (3) engineering associations active in construction and highway transportation. The research tends to focus on near-term issues with a goal of improving business operations or creating a business advantage.

◆ Finally, university researchers work under contract to FHWA, state, NCHRP, and private-sector highway R&T programs and also provide education and training opportunities for future transportation professionals.

The roles described above are logical for the individual programs, beneficial to the national highway R&T effort, and unlikely to change because of successful track records and strong constituencies.

### **Assessment of Federal Program**

Four contextual features of the highway industry and highway innovation are important for understanding what the federal role is and what it could be:

◆ First, federal highway R&T has many external and internal stakeholders, including Congress, highway users, the highway industry, the people and communities served and affected by highways, as well as FHWA offices, other U.S. Department of Transportation modal administrations, and other federal agencies.

◆ Second, the federal program is one of more than 50 programs that sponsor highway research in the United States. Federal highway R&T cannot operate autonomously.

◆ Third, highway innovation is difficult because the industry is decentralized, its procurement practices provide little incentive for innovation, and the public sector is averse to risk. Widespread implementation of innovations often requires proactive technology transfer.

◆ Finally, for many decades the federal government—primarily through FHWA—has provided substantial funding for highway R&T, has supported state R&T through the State Planning and Research (SP&R) and other programs, and has gathered and

disseminated information about research activities and promising results.

### **Recommendations**

The federal role in highway R&T is vital to innovation. Only the federal government has the resources to undertake and sustain high-risk—but potentially high-payoff—research, and only the federal government has the incentives to invest in long-term, fundamental research. FHWA's R&T program must address this critical responsibility.

#### **Focus and Funding**

FHWA's R&T program should focus on fundamental, long-term research aimed at achieving breakthroughs in understanding transportation-related phenomena. At least one-quarter of the funds should be invested in research that has potential for high payoffs, although riskier and more time-consuming. Current expenditures in this area are less than 0.5 percent of the agency's R&T budget—too low for an activity that is appropriate to a federal agency and that is unlikely to be pursued by state and private-sector R&T programs.

FHWA should undertake research aimed at (1) gaps not addressed by other highway R&T programs, and (2) emerging issues with national implications. State, private-sector, and university highway R&T programs encompass successful problem-solving efforts, but they do not invest in certain kinds of research for several reasons, including scope, scale, and time frame.

FHWA should allocate approximately one-half of its R&T resources to these types of research. This leaves one-quarter of FHWA's R&T resources for other activities related to the agency's mission, including research related to policy and regulations, technology transfer and field applications, education and training, and technical support.

#### **Shareholder Involvement**

FHWA's R&T program should be more responsive to—and influenced by—the major stakeholders in highway innovation. Stakeholder involvement should begin with the identification of the problem and then continue through to implementation of the solution. To maintain an appropriate focus on fundamental, long-term research, decision making should balance stakeholder requests with expert, external technical review of research areas and directions that hold promise for breakthroughs.

Decisions also should reflect a strategic vision for the national transportation system. Substantive stakeholder involvement in decision making, priority setting, and resource allocation is essential to ensure that FHWA's research program addresses the prob-

lems faced by those who build, maintain, use, and are affected by the nation's highways. Informing Congress about stakeholder perceptions of highway research needs and priorities poses a significant challenge for the agency.

### **Competition for Funds**

FHWA's R&T program should be based on open competition, merit review, and systematic evaluation of outcomes. Competition for funds and merit review of proposals are the best ways of ensuring the maximum return on investment and of addressing strategic national transportation system goals.

Designating specific projects or research institutions without open competition may bypass creative proposals prepared by the most qualified individuals and organizations throughout the nation and may not reflect the consensus of national highway stakeholders. Merit review and evaluation should include panels of external stakeholders and technical experts.

### **Technology Scans**

FHWA's highway R&T program should promote innovation by surveying research and practice worldwide to identify promising technologies, processes, and methods for use in the United States. The information from the surveys or technology scans should be disseminated to all highway stakeholders.

FHWA's research managers are well positioned to assume this role because of their extensive interactions with state highway agencies, private industry, other federal agencies, universities, and key highway research organizations throughout the world. Through these

interactions, research managers can identify and promote promising innovations and can disseminate the information to all highway stakeholders.

### **University Research**

The University Transportation Centers (UTC) are a key element of the federal highway R&T program. The UTC program provides one of few opportunities for highway and transportation researchers to pursue investigator-initiated research. Although the amount of funding available for individuals is modest, the funds are vital for attracting some of the nation's best young minds to highway and transportation research and play an important role in supporting graduate education.

University transportation research funded under the UTC program should be subject to the same guidelines as FHWA's R&T program—open competition, merit review, stakeholder involvement, and continuing assessment of outcomes—to ensure maximum return on the funds invested.

### **State Program**

The SP&R program began more than 60 years ago and has become an important component in the national highway R&T effort. The research portion of the SP&R program forms the cornerstone of state highway agency R&T programs. The federal SP&R research funds, which amounted to \$185 million in 2001, are matched by state funds on at least a 20:80 (state-to-federal) basis. Although this contribution is significant, some states spend additional state funds on highway research.

## **Research and Technology Coordinating Committee**

**C. Michael Walton** (NAE), University of Texas at Austin, *Chair*

**Joel D. Anderson**, California Trucking Association, West Sacramento

**Dwight M. Bower**, Idaho Transportation Department, Boise

**John E. Breen** (NAE), University of Texas at Austin

**Forrest M. Council**, University of North Carolina Safety Research Council, Chapel Hill

**Frank L. Danchetz**, Georgia Department of Transportation, Atlanta

**Reid Ewing**, Rutgers University, New Brunswick, New Jersey

**Irwin Feller**, Pennsylvania State University, University Park

**Jack Kay**, Transportation Consultant, Orinda, California

**Leon Kenison**, Transportation Consultant, Bow, New Hampshire

**Joe P. Mahoney**, University of Washington, Seattle

**Karen M. Miller**, District I Commission for Boone County, Columbia, Missouri

**Sandra Rosenbloom**, University of Arizona, Tucson

**James E. Roberts** (NAE), California Department of Transportation, Sacramento

**Michael M. Ryan**, Pennsylvania Department of Transportation, Harrisburg

**David Spivey**, Asphalt Paving Association of Washington, Inc., Seattle

**Dale F. Stein** (NAE), Michigan Technological University, Tucson, Arizona

**David K. Willis**, AAA Foundation for Traffic Safety, Washington, D.C.

### *Liaison Representatives*

**John Horsley**, American Association of State Highway and Transportation Officials, Washington, D.C.

**Dennis Judycki**, Federal Highway Administration

**Marci Kenney**, Federal Highway Administration



The committee found that research is needed in many areas, including such traditional topics as the composition of highway pavement materials. At FHWA's Turner-Fairbank Highway Research Center in McLean, Virginia, highway research engineers use accelerated loading facility machines to run tests on alternative pavement designs (structures or materials) or on identical pavement designs in alternative loading configurations.

The SP&R program not only facilitates individual state highway R&T programs, but also fosters research collaboration and partnering among the states in pooled-fund projects. Congress should continue to authorize the program.

### **Strategic Highway Research**

The committee also endorses the findings and recommendations of the congressionally requested study to determine the need for and focus of a future strategic highway research program (F-SHRP). TRB's *Special Report 260: Strategic Highway Research: Saving Lives, Reducing Congestion, Improving Quality of Life* calls for a large-scale, fixed-duration strategic research initiative aimed at the most important problems currently facing public highway agencies.<sup>2</sup>

<sup>2</sup> Available from TRB Bookstore, [www.TRB.org/trb/bookstore/](http://www.TRB.org/trb/bookstore/), or see Publications Order Form in this issue. See also *TR News*, January–February 2002, pp. 69–71.

F-SHRP is designed to yield research products for immediate use. It will complement a federal highway R&T program focused on long-term, fundamental research. The proposed funding for the F-SHRP research derives from federal-aid highway program allocations that otherwise would be spent on construction, maintenance, and other authorized activities. These allocations should not be used to fund other state and federal highway R&T programs.

### **Implementing Reforms**

The Research and Technology Coordinating Committee advocates a strong federal highway R&T program designed to maximize the investment of public funds in a research effort that is vital to the nation's economy and quality of life. FHWA must provide strong leadership, clear vision, stakeholder involvement, and accountability in all facets of the program.

If these reforms are implemented, the committee would support a significant increase in the agency's R&T budget. An FHWA R&T budget at twice the current level—although significant—would amount only to about 1 percent of annual total public highway expenditures. Even this increase would leave the funding low compared with research expenditures in other important sectors of the economy or other federal mission agencies.

Finally, the committee recognizes that reforming the federal highway R&T program according to the recommendations will require the cooperation and contributions of Congress, FHWA, and highway R&T stakeholders. Congress provides the funding and the funding flexibility; FHWA manages the program and conducts research; and highway R&T stakeholders contribute in many ways, including implementing innovations.

Therefore if Congress agrees with the committee's recommendations for an improved federal highway R&T program, it should provide FHWA with the funding and the funding flexibility necessary to undertake the recommended changes. Without the changes in the R&T funding and funding flexibility, FHWA will be unable to reform its R&T program as the committee has recommended.

If FHWA's highway R&T program cannot be reformed, highway R&T stakeholders should explore with Congress other mechanisms for carrying out federal highway research. Highway transportation is too important, the stresses are too severe, and the need for innovation is too critical to do anything less.

*Walter J. Diewald, Senior Program Officer, TRB, served as study director for this project.*

# A Process for Setting, Managing, and Monitoring Environmental Windows for Dredging Projects

KRIS A. HOELLEN

**E**nvironmental windows are periods in which the adverse environmental impacts of dredging a waterway and disposing of the dredged materials can be reduced below critical thresholds. During an environmental window—which is determined by federal and state regulators—dredging is permitted. However, when seasonal restrictions apply—or the increase in potential harm to aquatic resources rises above critical thresholds—dredging and disposal activities are prohibited.

Since the National Environmental Policy Act

became law in 1969, federal and state government resource agencies have increased requests for environmental restrictions on dredging and disposal activities. More than 80 percent of the federal contract dredging program is now subject to some type of restriction.

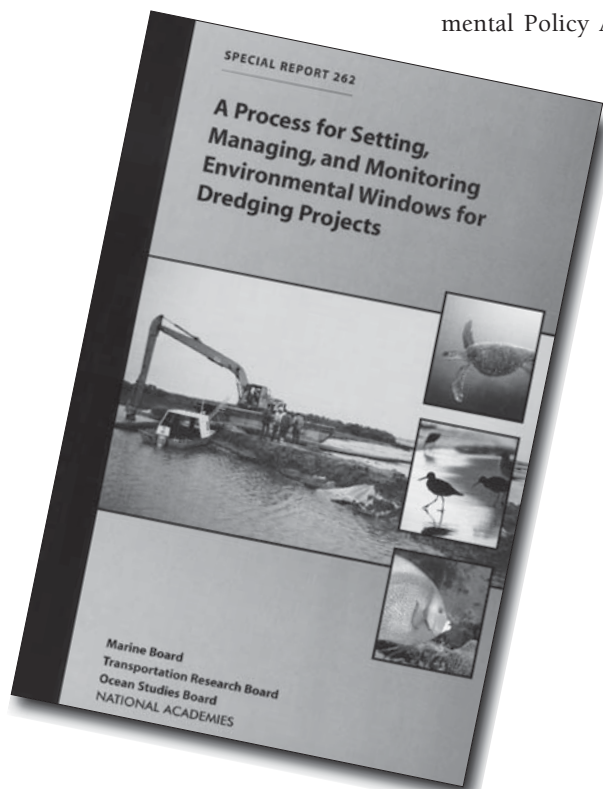
## Risk-Reducing Tool

Environmental windows are one of several management and technological tools that can be used individually or in combination to reduce the environmental impacts of dredging and disposal operations on living resources, aesthetics, and recreation and tourism. Environmental windows are a simple means of reducing the risk to biological resources and are designed to protect against several primary stressors that may occur during dredging and disposal:

- ◆ Entrainment of fish eggs and larvae, juvenile fishes, sea turtles, and other threatened or endangered species;
- ◆ Suspended sediments and turbidity, which may affect fish and shellfish spawning, disrupt anadromous fish migrations, and reduce water quality;
- ◆ Resuspension of buried contaminated sediments, which may release toxins and nutrients that can have acute and chronic effects on living resources;
- ◆ Loss of habitat by burial, removal, or degradation; and
- ◆ Collisions with marine mammals.

## Improving the Process

As a management tool, however, windows can have significant cost implications for the United States Army Corps of Engineers (USACE) and the local sponsors of dredging projects. For example, the imposition of environmental windows can prolong the completion of dredging projects, delay the project deadlines, and increase the risk to personnel by shifting the dredging to periods of potentially inclement weather or adverse sea conditions.



*Special Report 262: A Process for Setting, Managing, and Monitoring Environmental Windows for Dredging Projects* is available from TRB (see Publications Order Form in this issue).

## Committee for Environmental Windows for Dredging Projects

**Jerry R. Schubel**, New England Aquarium, Boston, Massachusetts,  
*Chair*

**Henry J. Bokuniewicz**, State University of New York at Stony Brook

**Peter F. Bontadelli, Jr.**, PFB Associates, Sacramento, California

**Robert J. Diaz**, Virginia Institute of Marine Science, Gloucester Point

**Marcelo H. Garcia**, University of Illinois at Urbana-Champaign

**Ram K. Mohan**, Blasland, Bouck, & Lee, Inc., Annapolis, Maryland

**Denise J. Reed**, University of New Orleans, Louisiana

**Susan-Marie Stedman**, National Oceanic and Atmospheric Administration, Silver Spring, Maryland

**Nils E. Stolpe**, Garden State Seafood Association, Doylestown, Pennsylvania

**John B. Torgan**, Save the Bay, Providence, Rhode Island

**Thomas H. Wakeman III**, Port Authority of New York and New Jersey, New York

**Michael P. Weinstein**, New Jersey Marine Sciences Consortium, Fort Hancock

With increases both in the number of recommendations to impose environmental windows and in the cumulative economic effects, USACE decided to challenge the efficacy of the windows-setting process. USACE also requested that the National Research Council's (NRC's) Transportation Research Board-Marine Board form a committee of experts to conduct a workshop to explore the decision-making process for establishing environmental windows and to provide suggestions for improvements.

Working in conjunction with the NRC's Ocean Studies Board, the TRB Marine Board formed a committee with expertise in port operations, dredging, benthic and wetland ecology, commercial fishing, sedimentology, ichthyology, environmental protection, and federal and state environmental regulation to conduct the project (see sidebar above). The committee was briefed by the National Oceanic and Atmospheric Administration (NOAA) and USACE on the status of the windows-setting process. In addition, the committee conducted case studies of dredging projects and participated in outreach activities,<sup>1</sup> which provided important input for the content and design of the workshop.

### Case Study Results

For each case study, the committee solicited infor-

<sup>1</sup> Members of the committee participated in the Sea Grant Conference on Dredged Material Management: Options and Environmental Considerations and also organized and participated in a half-day session at the 2001 National Dredging Team Conference.

mation from USACE and NOAA. USACE districts provided specific, basic information on projects, including the involvement of state resource agencies, the resources at risk, the perceived impact, the habitat type, the life-history stages, the technical evidence, and the procedures for setting environmental windows. Some cases included examples of the resource agencies' decisions, and for some case studies, committee members obtained additional information through discussions with USACE personnel, state resource agency representatives, and others familiar with the projects.

The findings from the case studies supported USACE's reservations about the efficacy of the windows-setting process. Districts reported substantial variations in the number of projects that have windows, in the effort spent to develop the windows, in the extent of interagency coordination and cooperation, and in the level of regulatory restrictions. Although some districts have better-developed processes than others, the exercise revealed a lack of consistency in the windows-setting process.

The case studies also revealed considerable differences in the scientific evidence for setting windows. In some instances, no evidence was provided. Some decisions were based on outdated data and information, some were based on the authority or opinion of the resource agency, and yet others were based on scientific observations.

USACE generally accepted the proposed windows as unavoidable restrictions on the projects and rarely raised formal objections, since there was no reliable process to resolve disputes. Economic considerations generally were not factored into the windows-setting process. Disputes among agencies over the interpretation of data were more common, but the resolutions seldom included input from the range of other stakeholders.

Although some windows were set on the basis of environmental conditions that could be monitored—such as temperature—there was relatively little monitoring to verify biological impacts. In some cases, the resource concerns and the windows changed over time, indicating active review of the conditions as the project progressed.

All parties cited as a shortcoming the lack of participation by certain resource agencies in the windows-setting process. Some agencies did not send representatives to meetings or were late in entering the process, causing delays and disruptions. Many resource agency representatives commented that staff or fiscal resources were not available for participating fully on a project-by-project basis. Other shortcomings in coordination and communication among agencies also were noted.

## Template for a Process for Setting, Managing, and Monitoring Environmental Windows

### Step 1

All stakeholders are identified, and commitments to the integrity and completion of the process are secured from all agencies with advisory and decision-making roles.

### Step 2

The stakeholders are convened. The following tasks should be completed during the first meeting or shortly thereafter:

- A. Agree on the time period for the evaluation.
- B. Define the specific geographic area(s) of interest or concern within a region.
- C. Identify and rank the resources of concern.
- D. Conduct a systematic evaluation of proposed dredging projects, as well as existing and proposed window applications, and rank the projects in terms of such factors as economic importance and sensitivity to timing.
- E. Form a science team whose expertise will make it possible to identify and evaluate the threats to the resources of concern. Select or elect a chairperson. Prepare a charge to the team outlining its assignment, deliverables, and timetable.
- F. Form an engineering team, including contractors and USACE personnel whose expertise will allow them to identify the most appropriate technological options (i.e., equipment, management controls, and operational procedures) for conducting dredging and disposal activities to meet the resource goals specified by the science team, and to assess the costs associated with the options identified. Select or elect a chairperson. Prepare a charge to the team outlining its assignment, deliverables, and timetable.

### Step 3

The science and engineering teams conduct biological and engineering evaluations of the proposed dredging projects. All potential adverse impacts, along with the biological resources of concern, should be identified. Close coordination between the two teams should be sought, and overlap should be created by having the chairperson of each team serve as an adviser to the other team.

A. The science team identifies those biological resources predicted to be adversely impacted by each dredging project and provides this information to the engineering team.

B. The science team documents the temporal variability of the species and the vulnerable habitats. The science team also identifies the acceptable levels of impact (e.g., “takes”) and the specific stressor(s) responsible for the impacts, and provides this information to the engineering team.

C. The engineering team, using information from the science team on the stressors involved, recommends strategies for reducing the stressors to acceptable levels (e.g., technology, contracting, operational methods, equipment selection). The engineering team provides cost estimates for these strategies. The results of the engineering team review are provided to the science team.

D. The science team reviews the information developed by the engineering team and notes any resulting changes in the expected impacts.

The science team recommends acceptable dredging periods (i.e., environmental windows).

E. A formal consultation under Section 7 of the Endangered Species Act is conducted if listed species may be adversely affected.

F. The science team prioritizes the recommendations for windows and provides this information to the stakeholder group in areas where multiple windows for varying species are recommended.

### Step 4

The stakeholder group reviews the alternative strategies—including windows—identified by the science and engineering teams and endorses a plan of action.

### Step 5

The recommended plan is implemented.

### Step 6

The stakeholder group reviews the season’s dredging activities to evaluate monitoring data and to identify changes that can be incorporated to refine future dredging and disposal activities.

## Workshop Design

The workshop was designed to solicit the views of the different parties involved in and affected by the process of setting windows. Participants included representatives from ports, federal and state environmental regulatory agencies, environmental interest groups, dredging operations, and academic experts from relevant fields.

Breakout sessions covered such topics as how to evaluate trade-offs between environmental benefits and operational costs, the strengths and weaknesses of current decision-making processes, the scientific and technical justifications for establishing windows, and dredging technologies that minimize environmental impacts.

The workshop goals were to maximize dialogue and participation by attendees; facilitate information exchange; identify the major categories of unresolved research questions; and produce the raw materials to develop a process for setting, managing, and monitoring environmental windows for federal dredging projects.

Before the workshop, the committee drafted a template for a systematic process to achieve greater consistency, predictability, and reliability in decision making about setting, managing, and monitoring environmental windows. Workshop participants were asked to review, revise, and refine the template, or to develop an entirely different alternative.

## Proposed New Process

The revised template that resulted from the workshop (see box, page 37) presents an ongoing process involving all stakeholders and is based on the principles of adaptive management. According to the committee, the adaptive management approach should achieve the consistency, predictability, and reliability that have been lacking and also should provide flexibility.

The proposed method does not depend on conducting new scientific or technical research at the start and can be incorporated into other, ongoing stakeholder processes. Although the method can stand on its own, piloting the process in a few districts would be useful. A pilot program should include training sessions as well as workshops on how to integrate the proposed method into current processes.

The process was designed to be implemented in congressionally mandated or approved dredging projects. The starting point is not whether to dredge, but how and when. There are two keys to successful implementation.

First, each stakeholder must be committed to the integrity and completion of the process (see Step 1). Unless each government agency—particularly an

agency with advisory and decision-making roles—is committed to dedicate the necessary financial and staff resources to the process, the method will not succeed and should not be attempted.

Second, the interaction between the science and engineering teams—specified in Steps 2 and 3—distinguishes this from other windows-setting processes. Dredging experts often must attempt to develop technologies for reducing biological impacts without the benefit of clearly specified goals. The interaction among biologists, environmental scientists, dredging technology experts, and those responsible for safe ship operations is critical.

The method calls for the formation of a science team to identify the biological resources most likely to be adversely affected by dredging. The science team also must identify acceptable levels of impact for any species identified as most vulnerable.

With the information from the science team, the engineering team then recommends strategies—such as technology, contracting, operational methods, or equipment selection—for meeting the target levels of acceptable stress. From the strategy recommended by the engineers, the scientists reassess potential biological impacts and recommend windows.

The committee is confident that by integrating the knowledge provided by scientists and engineers, the proposed process will establish windows predicated on a higher degree of scientific certainty.

## Additional Insights

Although focusing on a process for establishing environmental windows, the committee also articulated several key findings. Among these were the needs to

- ◆ Improve cross-training of biological-resource professionals and dredging engineers;
- ◆ Provide sufficient funding for resource agencies to participate fully, thoroughly, and actively;
- ◆ Exploit all scientific data and information available in establishing windows; and
- ◆ Identify tools for structured decision making in complex sociopolitical situations and evaluate the applicability to the windows-setting process.

Finally, the justification for windows must be reviewed periodically. Adaptive management requires that all windows remain subject to change as new data and information are incorporated routinely into the windows-setting process.

---

*Kris A. Hoellen served as study director for this project. She recently became Director of Environmental Programs for the American Association of State Highway and Transportation Officials.*





# IMPROVING COMMUNICATIONS TO MANAGE INCIDENTS

## *A Solution for Rhode Island*

CYNTHIA LEVESQUE

The author is Manager, Rhode Island Transportation Management Center, Providence.

The Rhode Island Transportation Management Center documented a dramatic improvement in incident response after a state police trooper was assigned to support traffic monitoring. The study results proved that communication between the highway agency and incident responders is critical to effective freeway traffic management.

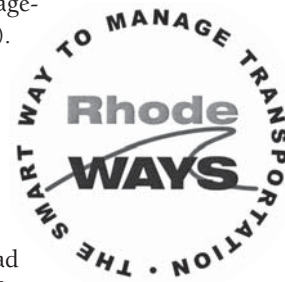
Congestion on Rhode Island highways, especially in the Providence area, has become an everyday event—the demand for roadways far exceeds capacity. In Rhode Island, traffic incidents resulting in lane closures account for as much as 60 percent of all vehicle hours lost to congestion. To reduce the amount of time wasted by motorists in traffic, the Rhode Island Department of Transportation (DOT) improved communications between the two state agencies responding to incidents and evaluated the effectiveness of the improvements.

### Problem

Communication between Rhode Island DOT and the Rhode Island State Police—the major responders to incidents on state roads—was inefficient. Incidents were not being reported to the newly constructed

Transportation Management Center (TMC).

As a result, TMC operators were compelled to rely on media reports, police scanners, and surveillance cameras for information on road conditions. The lack of incident information delayed notification of motorists through highway advisory radio and variable message signs, reducing motorists' ability to make alternate driving decisions.



### Solution

The solution to improving communications was to assign a Rhode Island state police trooper to the TMC to assist operators in obtaining information from the police responding to incidents. The trooper monitors the state police radio and the traffic surveillance cameras and, most importantly, handles all communications between the TMC and state police in the field. Effective communication with police at the time of an incident has proved to be critical to the TMC's ability to respond.

The TMC commissioned a study of the effectiveness of this collaboration to justify the funding for state police personnel. The research analyzed the number of incidents reported by the state police to the TMC and the benefits and costs of the change in reported incidents. The research periods compared were September through November 1999 and 2000—the only change in practices between 1999 and 2000 during those months was the introduction of the trooper at the TMC. Only incidents resulting in a lane closure were considered for the evaluation.



From left: William D. Ankner, Director, Rhode Island Department of Transportation; Robert Cahill, TMC operator, Corporal Scott Hemingway, Rhode Island State Police; and Cynthia Levesque, TMC Manager, review data incident logs on the TMC bridge.

Corporal Rohan (*right*), Trooper, Rhode Island State Police, and Lou Fiore, Lead Operator, Transportation Management Center (TMC), communicate incident information to support personnel. Surveillance cameras and state police radio system located on the TMC bridge provide timely information.



The study found that the presence of the trooper had a large effect on the number of incidents reported to the TMC. There was a 77 percent increase in police-reported incidents—from 92 in the 1999 period to 163 in the 2000 period. The number of incidents reported from other sources grew by 25 percent, from 51 to 64. Most significantly, the number of incidents for which the TMC could provide driver information, through highway advisory radio and variable message signs, increased by more than 200 percent, from 24 to 76. TMC staff confirm that this increase in responses is largely attributable to the timeliness and specificity of the police reports.

Data from the incident logs maintained at the TMC disclosed that the average delay per vehicle during peak hour incidents was 48 minutes. According to the *Traffic Management Handbook*, published by the Federal Highway Administration, 10 to 20 percent of drivers will change their routes after receiving information via highway advisory radio and variable message signs.

Average traffic volume on the roads monitored at the times of incidents was estimated to be 5,400 vehicles per hour. It was therefore estimated that 540 cars would use alternate routes during incidents for which the TMC issued notification.

The time saved per vehicle taking an alternate route was estimated to be 38 minutes. The time savings from the additional 52 incidents for which TMC was able to provide driver information during September–November 2000 is estimated to have a value of \$200,000 to travelers.

The cost of the police presence in the TMC was the troopers' salaries for the time spent in the center. Comparing this cost to the travel time savings showed a benefit–cost ratio of 16 to 1.

## Application

The initial commitment was to have police in the TMC for a one-year period. The contract between Rhode Island DOT and the Rhode Island State Police has been extended as a result of the documented benefits. The research findings are being disseminated to policy makers to validate the incident management program and are heightening awareness of the benefits of intelligent transportation systems to motorists.

## Qualitative Benefits

The research has shown that the state police presence has reduced travel time. Other benefits cannot be calculated in terms of dollars. The state police report that access to the TMC's traffic surveillance cameras helps to reduce response time and permits a more accurate assessment of incidents to ensure that appropriate response teams are dispatched.

*For further information contact Cynthia Levesque, Manager, Transportation Management Center, 2 Capitol Hill, Providence, RI 02903 (telephone 401-222-5826, ext. 4010; e-mail clevesq@dot.state.ri.us). The author acknowledges the contribution of John Tarasovich, a student at University of Texas at Austin.*

EDITOR'S NOTE: Appreciation is expressed to Joseph Morris, Transportation Research Board, for his efforts in developing this article.

Suggestions for "Research Pays Off" topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, 2101 Constitution Avenue, NW, Washington, DC 20418 (telephone 202-334-2952, e-mail gjayapra@nas.edu).

# CALENDAR

## TRB Meetings 2002

### June

- 2-4      Visibility and Simulation Symposium  
Iowa City, Iowa  
*Richard Cunard*
- 13-14    Using Spatial Information Technologies to Improve Security, Safety, and Mobility  
Seattle, Washington  
*Thomas Palmerlee*
- 21-24    Roadside Safety Features Committee Meeting  
Pacific Grove, California  
*Stephen Maher*
- 23-26    5th National Access Management Conference  
Austin, Texas  
*Kimberly Fisher*
- 23-26    27th Annual Summer Ports, Waterways, Freight, and International Trade Conference  
Pittsburgh, Pennsylvania  
*Joedy Cambridge*
- Surface Properties-Vehicle Interaction Committee Meeting  
Salt Lake City, Utah  
*Stephen Maher*
- 26-29    Highway Capacity and Quality of Service Committee 2002 Midyear Meeting and Conference  
Milwaukee, Wisconsin  
*Richard Cunard*
- 30-July 3   41st Annual Workshop on Transportation Law  
San Francisco, California  
*James McDaniel*

- 30-July 3   Geometric Design Committee Meeting  
Santa Fe, New Mexico  
*Stephen Maher*

### July

- 7-9      Joint Summer Meeting and Conference of the Committees on Energy, Air Quality, and Alternative Fuels  
Port Huron, Michigan  
*Kimberly Fisher*
- 7-10      Transportation-Related Noise and Vibration Summer Meeting  
Austin, Texas  
*Kimberly Fisher*
- 8-10      Hydrology, Hydraulics, and Water Quality Committee Meeting  
Croabas, Puerto Rico  
*Stephen Maher*
- 11-13     Joint Summer Meeting of the Planning, Economics, Finance, Freight, and Management Committees  
Providence, Rhode Island  
*Kimberly Fisher*
- 14-16     1st International Conference on Bridge Maintenance, Safety, and Management\*  
Barcelona, Spain  
*Frank Lisle*
- 21-23     Freeway Operation and Traffic Signal Systems Midyear Meeting  
Salt Lake City, Utah  
*Richard Cunard*
- 28-Aug. 1   Photogrammetry, Remote Sensing, Surveying, and Related Automated Systems Committee Meeting  
Cody, Wyoming  
*Stephen Maher*

- 29-Aug. 1   Committee on Environmental Analysis in Transportation Summer Meeting  
Durham, New Hampshire  
*Kimberly Fisher*

- 30-31      Safety Conscious Planning Leadership Conference (by invitation)\*  
Washington, D.C.  
*Richard Pain*

- 30-Aug. 1   Utilities Committee Meeting  
Marco Island, Florida  
*Stephen Maher*

### August

- 2-6      7th International Conference on Application of Advanced Technology in Transportation\*  
Cambridge, Massachusetts  
*G. P. Jayaprakash*
- 4-9      T2002: 16th International Conference on Alcohol, Drugs, and Traffic Safety\*  
Montreal, Canada  
*Richard Pain*
- 13        Design and Construction of Transportation Facilities in Melange: Block in Matrix  
San Luis Obispo, California  
*G. P. Jayaprakash*
- 17-22     9th International Conference on Asphalt Pavements\*  
Copenhagen, Denmark  
*Stephen Maher*
- 17-22     National Community Impact Assessment Conference  
Madison, Wisconsin  
*Claire Felbinger*

Additional information on TRB conferences and workshops, including calls for abstracts, registration and hotel information, lists of cosponsors, and links to conference websites, is available online ([www.TRB.org/trb/calendar](http://www.TRB.org/trb/calendar)). Registration and hotel information usually is available 2 to 3 months in advance. For information, contact the individual listed at 202-334-2934 (fax 202-334-2003; e-mail [lkarson@nas.edu](mailto:lkarson@nas.edu)).

\*TRB is cosponsor of the meeting.

## Clinton V. Oster, Jr.

*School of Public and Environmental Affairs, Indiana University*

In his role as Professor in the School of Public and Environmental Affairs at Indiana University, Bloomington—where he has taught since 1979—Clinton V. Oster, Jr., communicates four tenets to his students and younger colleagues:

1. In transportation, interdisciplinary research is likely to be more valuable than research confined to a single discipline.
2. Do not let theoretical research go too far without testing against data and real-world observation.
3. Be aware that there is more than one mode of transportation.
4. Couple respectful skepticism with a willingness to believe in the results of properly conducted research.



**“In fields like transportation, much of the most useful research comes from the combined efforts of people trained in several different disciplines.”**

Oster models these tenets through his own work as a much-published researcher and sought-after consultant. His current research covers aviation safety, airline economics and competition policy, international aviation, aviation infrastructure, and environmental and natural resource policy. He has served as a consultant on aviation and other transportation issues to the U.S. Department of Transportation, the Federal Aviation Administration, the National Aeronautics and Space Administration, the European Bank for Reconstruction and Development, state and local governments, and private-sector companies in the United States and abroad.

“In fields like transportation, much of the most useful research comes from the combined efforts of people trained in several different disciplines,” notes Oster, who has a bachelor’s degree in chemical engineering from Princeton University, a master’s in urban and public affairs from Carnegie Mellon University, and a doctorate in economics from Harvard University. “All areas of transportation can benefit from bringing more perspectives to bear on a problem.”

He points to the TRB and National Research Council study committees as a good example, having served as a member of seven and chair of two: “Combining people from different disciplines is one of the great strengths of the study commit-

tees and the key to why their reports are often so valuable.”

Valuable research is also “applicable to the problems of the world around us,” Oster observes. “In transportation economics there is a temptation to adopt simplifying assumptions to make the theoretical models more tractable, but this also may make them less applicable. The best way to guard against that is to test theory against data early and often.”

Oster also warns transportation researchers about focusing on only one mode: “I confess that I too find one mode more interesting to study than the others, but all of our research would benefit from a less provincial attitude toward the modes.”

Similarly, researchers should be “willing to change views if the research runs counter to previous beliefs or previous conclusions,” Oster advises. “Research that produces surprising and unexpected results should be welcomed because it also provides the best opportunity to learn something new.”

Oster is also a part-time professor at the Indiana University School of Business and served as Associate Dean of the School of Public and Environmental Affairs from 1989 to 1992. He was Associate Director of the university’s Highway and Transportation Management Institute from 1988 to 1992, Director of its Transportation Research Center from 1985 to 1989, and Associate Director of its Center for Urban and Regional Analysis from 1982 to 1985.

His engagements guiding research outside the university include service on the Office of Technology Assessment’s Advisory Panel on Federal Aviation Research and Technology and as Research Director for the Aviation Safety Commission. He is a past president of the Transportation Research Forum and a current member of its National Council.

Oster’s TRB activities include serving as Chair of the Committee for the Study of the Federal Employers’ Liability Act, and as a member of the Committee on Intercity Bus Transportation and of study committees on such topics as the federal transportation science and technology strategy, setting and enforcing speed limits, and air passenger service and safety after deregulation. He also has served on study committees for two former NRC commissions: Engineering and Technical Systems and the Commission on Behavioral and Social Sciences and Education. He is coauthor of the textbook *American Public Policy Problems: An Introductory Guide* and has coauthored four books on aviation safety and the U.S. airline industry’s adaptation to deregulation.

## Dennis L. Christiansen

*Texas Transportation Institute*

**D**eputy Director of the Texas Transportation Institute (TTI), Dennis L. Christiansen is responsible for the day-to-day operation of the largest university-affiliated transportation research center in the United States. But he also retains the title of Research Engineer, continuing his extensive research in such areas as traffic operations, transportation planning, and transit planning.

“A key benefit of university research is that it not only develops useful research materials but also supports the education and training of the next generation of transportation professionals,” he points out. “With significant workforce capacity issues now facing the field of transportation, this byproduct of research is increasingly important.”

Clearly Christiansen finds professional rewards in contact with students and in TTI’s research partnerships with the

His early research showing that park-and-ride and high-occupancy vehicle (HOV) facilities would work in Texas overcame considerable doubts, and the state has become a leader in developing these congestion-relieving improvements. “Anything done new in the transportation world will generate some public debate,” he comments. “The relatively small amount of money invested in research to collect accurate before-and-after data and analyze costs and benefits has paid off whenever the implementing agencies are asked to explain why certain facilities have been developed.”

Bringing his insights and experience to the national level, Christiansen is cochair of the Operations and Mobility Working Group of the National Highway Research and Technology Partnership. “It’s encouraging to see transportation operations receive the attention it has long deserved,” he says. “As we face

increasing urban congestion with somewhat limited options, effectively operating the system warrants high priority.”

Other leadership roles include past International President and former International Board member of the Institute of Transportation Engineers (ITE), current President of the Research and Education Division of the American Road and Transportation Builders Association, and Vice President of the Council of Univer-



**“A key benefit of university research is that it not only develops useful research materials but also supports the education and training of the next generation of transportation professionals.”**

sity Transportation Centers. Christiansen recently was appointed to the TRB Research and Technology Coordinating Committee, which provides outside advice on FHWA’s research program, and is a member of the National Steering Committee on Transportation Operations.

“If anyone ever loses confidence in the future of the profession, I advise walking down our hallways to see quality students with an exceptional work ethic pursuing studies while involved in a research program.”

Praising the “innovative” state DOT, he notes, “Through its substantial cooperative research program [with TTI], many significant developments have occurred in all aspects of transportation, giving us the opportunity of seeing research results implemented, assessing the effectiveness of the research, and then making modifications as necessary.”

But he also looks beyond the “valuable incremental improvements that result from this kind of applied research” to “more opportunities for basic research that might lead to fundamental breakthroughs.” He acknowledges that this “longer run” research will require “modest additional funding.”

In his 30 years at TTI, Christiansen has specialized in multimodal research with an emphasis on identifying cost-effective approaches to urban mobility. He has served as principal investigator on several major research projects under such sponsors as the Federal Highway Administration (FHWA), the Federal Transit Administration, Texas DOT, and Houston’s Metropolitan Transit Authority.

One message that he emphasizes in national forums is the need for investing in “significant, robust research programs addressing infrastructure deterioration, safety, environment, and congestion,” particularly with the approaching reauthorization of the Transportation Equity Act for the 21st Century.

Christiansen has been involved with TRB for more than 25 years, serving as the first secretary of the HOV Task Force and then of the succeeding HOV Systems Committee—and recently was named an Emeritus Member. He also has served on the Urban Goods Movement Committee.

Christiansen received TRB’s Fred Burggraf Award in 1978 for an outstanding paper by a young researcher, a Technical Paper Award from the International ITE, and two Technical Council Awards. The Texas section of ITE named him Transportation Engineer of the Year in 1989. He earned a bachelor’s degree in civil engineering from Northwestern University and master’s and doctoral degrees, also in civil engineering, from Texas A&M University.



Demonstrating the User Request Evaluation Tool first implemented in Kansas: Air Traffic Controller Rick Sauer (center), Bruce Hoover (left), and Greg Hale, coleads of the Federal Aviation Administration's Kansas City Air Traffic Facilities implementation team.

## Free-Flight Tool Aids Direct Routes

The User Request Evaluation Tool (URET), a hardware and software program that allows pilots to select more direct routes to destinations, began daily use at the En Route Traffic Control Center, Kansas City, Kansas, in December. Part of the Federal Aviation Administration's (FAA's) free flight program, URET is expected to improve the efficiency and capacity of the U.S. aviation system.

With URET, controllers can project 20 minutes into the future of a flight path and can find out immediately if a pilot's request for a more direct route or different altitude is safe. The quick response—controllers previously relied on paper flight strips and mental calculations—saves airlines time and money and benefits passengers.

A URET prototype demonstrated in Memphis, Tennessee, and Indianapolis, Indiana, airspace produced a 20 percent increase in direct routings and savings of \$1.5 million per month for airlines

through less flying time and less fuel consumption. Reduction in airspace restrictions saved \$1 million per year in Indianapolis. Deployment of the new technology is slated also for Atlanta, Georgia; Cleveland, Ohio; and Washington, D.C.

"When the industry came to us three years ago, they laid the challenge of free flight at our doorstep," recalls FAA Administrator Jane Garvey. "We've met that challenge. URET technology works, for the controller, the pilot, and the passenger."

For further information contact Fraser Jones, FAA (telephone 202-267-3462).

## "Beast out Back" Tests Florida Pavements

The Florida Department of Transportation (DOT) has established an Accelerated Pavement Testing and Research Program at the new State Materials Research Park in Gainesville. The testing site allows the monitoring of a pavement system's performance and response to the controlled application of wheel loading, which simulates long-term, in-service traffic conditions.

The testing site consists of 8 linear test tracks 150 feet long and 12 feet wide, with two additional tracks to gauge water table control within the pavement's supporting base and subgrade layers. An electrically powered heavy vehicle simulator—dubbed "BOB," for the "beast out back"—can apply the equivalent of 20 years of vehicle loads in only 3 months. The simulator is highly mobile and includes automated laser profiling and test track temperature controls.

Testing began at the facility in October to evaluate the effects of polymer modifier on the performance of Superpave® fine-graded mixtures. Early results of the tests, conducted in partnership with the

Heavy vehicle simulator at new State Materials Research Park in Gainesville, Florida, applies equivalent of 20 years of vehicle loads in only 3 months.



University of Florida and the asphalt industry, suggest that rutting has developed at a higher rate in the unmodified sections.

The program seeks to improve the performance of Florida's pavements, cost-effectively extending useful service life and preventing premature distresses. Florida DOT is establishing an advisory board of stakeholders to provide counsel, review strategic research plans, and provide feedback on the operation of the program. Plans also call for research partnerships with the Federal Highway Administration, industry, academic institutions, and other interested constituencies.

For further information contact Bouzid Choubane, Florida DOT (telephone 352-955-6302).

### Bay Area Commuters Like Carpool Advantages

More people are carpooling to work in California's San Francisco Bay Area, and the carpoolers who are using high-occupancy vehicle (HOV) lanes are saving more time than in previous years, according to *Commute Profile 2001*, the ninth annual regionwide commuter survey conducted by the nonprofit RIDES for Bay Area Commuters. The findings show that 17 percent of commuters regularly carpool, up from 14 percent in 2000 and 15 percent in 1999, and that carpoolers using HOV lanes estimate a time savings of 23 minutes one way, up from 21 minutes in 2000 and 16 minutes in 1999.

Carpooling is highest among the 700,000 Bay Area commuters who travel 21 to 40 miles one way to work each day. Although the amount of travel time saved by using HOV lanes has increased, commuter estimates indicate that travel speeds in other lanes are slowing, a symptom of increased traffic congestion. Respondents' perceived travel time has increased almost 18 percent since 1992, from 28 minutes to 34 minutes, even though commute distance has remained about the same.

The survey also shows that HOV lanes appear to influence commuter decisions not to drive alone: 69 percent said they carpool, vanpool, or use transit to take advantage of the HOV lanes, and 6 out of 10 said they would not continue to rideshare if the HOV lanes were eliminated.

For further information contact Julia Maglione, RIDES for Bay Area Commuters (telephone 510-273-2088), or visit [www.rides.org](http://www.rides.org) (click on Commute Research).

### Institute Continues Port Executive's Legacy

The state of New York has established a graduate-level program in international relations and commerce in honor of Neil D. Levin, executive director of the Port Authority of New York and New Jersey, who was killed in the September 11 terrorist attack on the World



Trade Center. The Neil D. Levin Graduate Institute of International Relations and Commerce, part of the State University of New York, will work with the United Nations, representatives of foreign nations, international organizations and agencies, corporations, and federal and New York state and city governments in the areas of diplomatic relations and international business, banking, law, and finance.

Levin was appointed to the Port Authority post in March 2001 after a distinguished career in business, banking, and insurance. The Port Authority, which operates the area's major airports, port facilities, bridges, and tunnels, was the landlord of the World Trade Center complex.

### Historic Bridge Gains a Future

Named one of the "Ten Most Endangered Historic Resources" in 2000 by *Historic Massachusetts*, Old Danforth Street Bridge in Framingham is being dismantled, removed, and restored offsite for reinstallation as a pedestrian bridge. Closed to traffic for 20 years, the 75-foot-long structure was built in 1890 and is one of the oldest Pratt-pony-through-truss bridges in New England.

The offsite restoration will involve design of new members and replacement of deteriorated or previously repaired members to replicate the original structure as closely as possible. The restoration strategy also eliminates the cost of temporary shoring and scaffolding, provides greater accessibility for item repairs, reduces cleaning and painting expenses, and protects the environment if the structure has any coats of lead paint. The cost savings are expected to exceed the expense of bridge removal and reinstallation.

The refurbished bridge will serve as the gateway to the "wild and scenic" portion of the Sudbury River trail system.

For further information contact Evan Lowell, Lichtenstein Consulting Engineers, Inc. (telephone 508-647-0500).

The Old Danforth Street Bridge in Framingham, Massachusetts—likened to an "erector set" by a local official—will be removed and renovated offsite for reinstallation as pedestrian bridge.

## INTERNATIONAL NEWS

### Europe Promotes Intermodal Transport

The European Commission has inaugurated the European Reference Centre for Intermodal Freight Transport (EURIFT) to provide independent, comprehensive information supporting intermodal development. The European Union is promoting intermodality—the efficient integration and complementary functioning of all modes—as part of its strategy for a sustainable transportation system that provides freight mobility, relieves roadway congestion, reduces carbon dioxide emissions, and decreases dependency on oil fuels.

Headquartered in Hamburg, Germany, EURIFT will correlate and integrate data from the European intermodal industry, which is now fragmented by the modal and national systems of the European Union countries as well as by a lack of interoperability among modal systems. The center also will serve as a forum for information exchange and will promote best practices and promising innovations, maintaining neutrality toward the modes.

A team of experts will manage the EURIFT office, develop and maintain a website, organize conferences, and provide services to customers, backed by an international network of institutions and universities in member countries, Norway, and Switzerland. Funded by the European Union, the cities of Hamburg and Bremen, as well as by the academic and private sectors, EURIFT is expected to become a self-supporting non-profit organization within three years.

### Pavement Management Advances in Thailand

The Danish Road Directorate (DRD) recently completed a three-year project assisting and training personnel in the Thailand Department of Highways to implement falling-weight deflectometer (FWD) technology along with analytical pavement analysis and design methods. The project has worked to reduce maintenance costs for Thailand's national road network and has included field and laboratory research and training in Thailand and Denmark.

The first stage of the project determined FWD calibrations to fit Thailand's pavement materials, climate, and subgrade. DRD supplied five FWD units and towing vehicles for the testing of the highways' bearing capacity. Danish engineers assisted in correlating historical data from Thailand's Benkelman beam tests of pavements with the new FWD results, establishing a foundation for a future pavement maintenance and management system.

The project is expected to reduce the maintenance

costs of Thailand's highways by 20 percent, through improved pavement and overlay design. Other benefits include the increased efficiency of pavement measurements, the ability to make measurements on highways with high traffic volumes, a 50 percent reduction in the number of personnel on measurement crews, improved safety for the crews performing field tests, and the introduction of advanced technologies and methods to Thailand's road sector.

*Summarized from an article by Robin Macdonald in Nordic Road & Transport Research, October 2001.*

### Japanese Cargo Routes Get High-Speed Ferries

The Techno Super Liner (TSL) high-speed cargo ferry will ply two domestic routes in Japan by 2003, connecting Tokyo with the outlying Ogasawara Islands, and Aomori on the northern part of the main Honshu Island with Hakodate on Hokkaido Island. The Tokyo route will use a 443-foot, 15,000-gross-ton vessel that can travel at 50 knots, reducing the trip from 25.5 to 15 hours. The Aomori-Hakodate service will reduce the trip from 4 to less than 2 hours.

Because of the high operating costs, the Tokyo ferry will be managed by a public-private company—the Japanese government will have an equity stake—that will lease the TSL to a private operator. A wholly private venture will operate the Aomori-Hakodate line.

*Summarized from an article by Jim Shaw in Pacific Maritime, August 2001.*

## PEOPLE IN TRANSPORTATION



Michael P. Jackson

As Deputy Secretary of the U.S. Department of Transportation (DOT), **Michael P. Jackson** is the Department's chief operating officer, responsible for the day-to-day operations of the 11 modal administrations and the work of 100,000 employees in the United States and abroad. He works closely with U.S. DOT Secretary Norman Y. Mineta to carry out the Department's major missions and to provide leadership in the areas of strategic management, regulatory reform, and research and development.

Jackson previously served at U.S. DOT from 1992 to 1993 as Chief of Staff for Secretary Andrew Card, Jr., and held several other Executive Branch positions under President George H.W. Bush, including Special Assistant to the President and Executive Secretary for Cabinet Liaison, as well as Deputy Chief of Staff to the Secretary of Education. Before returning to U.S. DOT, he was Senior Vice President and Gen-



eral Manager for business development at Lockheed Martin IMS Transportation Systems and Services.

“Michael’s experience in both the private sector and the government as well as his strong transportation background make him a valuable asset to the Department’s senior management team,” Secretary Mineta noted at Jackson’s confirmation in May 2001.

From 1993 to 1997, Jackson was senior vice president and Counselor to the president of the American Trucking Associations, handling issues involving freight, technology, and international trade. A former political science teacher at the University of Georgia and Georgetown University, he also was a researcher at the American Enterprise Institute. Jackson is a graduate of the University of Houston and received a doctorate in political science from Georgetown University.



Ellen G. Engleman

**Ellen G. Engleman** is Administrator of the Research and Special Programs Administration (RSPA) of the U.S. DOT, overseeing an agency responsible for conducting transportation research, advancing intermodal technology, protecting the public from the dangers of hazardous materials transportation, ensuring the safety and controlling the environmental risks of liquid and gas pipelines, providing emergency transportation preparedness for natural and civil disasters, and offering training and technical assistance in transportation safety.

“RSPA is a multifaceted agency, and our future will focus on substantive issues concerning public safety,” Engleman states. “We will analyze old business practices to increase responsiveness to our stakeholders and create a results-oriented RSPA.”

Engleman has nearly 20 years of experience in public and governmental affairs, public policy, and administration. She is an accomplished business leader, attorney, and accredited public relations professional.

Speaking at Engleman’s swearing-in ceremony in September, U.S. DOT Secretary Mineta cited her “immense skill in strategic planning and business development,” and noted, “RSPA will greatly benefit from her ability to educate, communicate, and develop successful partnerships to increase the agency’s visibility in the transportation community.”

Engleman previously was president and chief executive officer of Electricore, Inc., a nonprofit Indiana-based research and development consortium involved in developing advanced transportation and energy technologies through federal and public-private partnerships. In six years, Engleman guided the Electricore consortium’s expansion to include major U.S. automotive manufacturers, large and small businesses

in 17 states, and more than 25 universities, with 70 projects receiving a total of \$160 million from federal research-and-development partnerships.

Before that, as a board member and director of corporate and governmental affairs for Direct Relief International, the nation’s oldest nonsectarian medical relief agency, Engleman increased in-kind medical donations by 100 percent for programs in more than 100 countries and founded the Vitamin Angel alliance addressing the nutritional needs of women and children. She also has served as a public affairs executive for the telecommunications corporation GTE.

An officer in the U.S. Navy Reserves—her unit supports the Pentagon’s Chief of Naval Information—Engleman is a graduate of Indiana University, where she also earned a law degree. She received a master’s degree in public administration from the Kennedy School of Government at Harvard University.



Allan Rutter

**Allan Rutter** brings 18 years of experience in transportation policy to his post as Administrator of the Federal Railroad Administration, including service as Director of Transportation Policy for the state of Texas under then-Governor George W. Bush and five years as Deputy Executive Director of the Texas High-Speed Rail Authority. As Administrator, Rutter heads the regulatory and enforcement agency responsible for promoting safe and successful rail transportation in the United States and for advancing the President’s policies on freight and passenger rail.

“Allan’s comprehensive knowledge of transportation and his extensive background in rail policy will be invaluable in achieving the Department’s strategic goals and in meeting the challenge of improving the nation’s railroad system,” U.S. DOT Secretary Mineta observed at Rutter’s confirmation in August 2001.

As Director of Transportation Policy in the Texas governor’s office—he also served under Governor Rick Perry, President Bush’s successor—Rutter worked with state and national industry groups, state and local elected officials, and state and federal agency administrators in developing and implementing policy across all modes of transportation. He also was responsible for managing workers compensation insurance issues.

From 1985 to 1990, Rutter was senior analyst in the Texas Office of Budget and Planning, focusing on transportation. Before that, he worked for the Texas House Transportation Committee. Rutter is a graduate of the University of Texas at Austin and also earned a master’s degree in public affairs from the university’s Lyndon Baines Johnson School of Public Affairs.



Jonathan Upchurch, Chair, Group 3, Division A Council, makes a point during discussion on strategic planning at TRB Executive Committee meeting in January.

## TRB Updates Strategic Plan

The TRB Executive Committee approved and released an updated Strategic Plan in January. In the 18-page document, the TRB leadership affirms the organization's mission and goals, assesses performance—including strengths, limitations, challenges and threats, and opportunities—defines gaps to be addressed, and identifies issues and trends affecting transportation and TRB's role.

Working from these findings, the Executive Committee developed an action plan comprising a variety of initiatives, many of which require additional consideration and follow-up by the Executive Committee itself, the Technical Activities Division (Division A) Council, or the TRB staff. The four major, cross-cutting activities to be considered by the Executive Committee are

- ◆ Developing a study series addressing “big issues in transportation”;
- ◆ Convening a research leadership roundtable;
- ◆ Assessing opportunities for expanded international activities; and
- ◆ Assembling and disseminating material on the value and successes of transportation research.

The action plan calls on the Technical Activities Division's Council, which oversees the organization and work of the Board's 200 standing technical committees, to

- ◆ Develop and implement strategies to position TRB standing committees at the forefront of emerging issues;
  - ◆ Develop strategies to respond to the integration of transportation into the logistics process;
  - ◆ Conduct more state-of-the-art and state-of-the-practice conferences, seminars, and workshops;
  - ◆ Consider instituting regular, specially focused summer meetings of related groups of standing committees;
- ◆ Effect more aggressive and visible treatment of high-technology transportation applications throughout TRB's core programs;
- ◆ Continue to improve the stature of TRB's peer review process; and
- ◆ Identify next steps to build on the presence of the Marine Board.

The TRB Executive Director and staff are responsible for follow-up on several other proposed activities. These include launching an electronic newsletter on research-related news; marketing TRB and its programs more aggressively; fostering partnerships with

industry and professional groups and strengthening relationships with other constituencies; providing electronic notification and dissemination of TRB reports; and improving and expediting the reporting of research results to practitioners.

“To remain relevant to sponsors and constituents, the Board must focus on providing programs and services that are considered highly useful by customers and sponsors—especially programs and services that it is uniquely well suited to provide,” the Executive Committee noted. In general, the Committee found that “outside demand for TRB products and services has probably never been greater,” observing, however, that the Board's dissemination of research results and other information is critically important and could be improved.

The complete Strategic Plan is available on the TRB website, [www.TRB.org](http://www.TRB.org) ([http://gulliver.trb.org/publications/admin/2002\\_strategic\\_plan.pdf](http://gulliver.trb.org/publications/admin/2002_strategic_plan.pdf)).

## New Partnership To Aid Homeland Security

In March, TRB and its Marine Board, along with more than 50 public and private organizations, participated in a signing ceremony establishing the charter for The Infrastructure Security Partnership (TISP). An “association of associations and agencies,” TISP will collaborate on issues related to the security of the nation's built environment.

The Partnership will facilitate dialogue on domestic infrastructure security and offer sources of technical support and sources for comment on public policy related to the security of the nation's built environment. TISP will leverage members' collective technical expertise, as well as research-and-development capabilities. A fundamental goal of the Partnership is to reach and include all stakeholders potentially affected by any disaster and to provide technical assistance and information to the Office of Homeland Security.

*For further information on TRB's security activities contact Joedy Cambridge (telephone 202-334-3205, e-mail [jcambrid@nas.edu](mailto:jcambrid@nas.edu)) or Mark Norman (telephone 202-334-2935, e-mail [mnorman@nas.edu](mailto:mnorman@nas.edu)). For more information on TISP, go to [www.tisp.org](http://www.tisp.org).*

## TRB Conducts Summit on Technical Activities

More than 40 leaders of the TRB Technical Activities Division gathered in Washington, D.C., in March 2002 for a 2-day summit. The group developed a series of recommendations on what TRB's Technical Activities Division should look like in five years and how to achieve that goal specifically for

- ◆ The Annual Meeting and other convening activities (conferences, workshops, and committee meetings);
- ◆ Papers and publications, both traditional and electronic;
- ◆ Standing committee structure and committee management;
- ◆ Communications, both internal and external; and
- ◆ New initiatives, crosscutting and otherwise, not adequately addressed in the Division's portfolio.

The summit was part of the Technical Activities Division Quality Improvement Program. Initiated in 2001 by Skip Paul, then-Chair of the Technical Activities Division Council, this effort has paralleled the TRB Strategic Planning effort. The purpose of the program is to enhance the quality of service to TRB's customers and to participants in Division activities.

A summary of the recommendations generated at the summit will be available on the TRB website ([www.TRB.org](http://www.TRB.org)). The recommendations will be considered by TRB's Division A Council and Executive Committee and implemented as appropriate during 2002.

For further information contact Mark Norman (telephone 202-334-2935, e-mail [mnorman@nas.edu](mailto:mnorman@nas.edu)).

### Interim Planning Begins for Strategic Highway Research

The National Cooperative Highway Research Program (NCHRP) has initiated Project 20-58 to perform interim planning activities for the Future Strategic Highway Research Program (F-SHRP) proposed in TRB *Special Report 260: Strategic Highway Research: Saving Lives, Reducing Congestion, Improving Quality of Life*. The objectives of this interim work are to develop (1) detailed research plans to allow requests for proposals to be released as soon as the research funding is available, and (2) an administrative structure for the program.

F-SHRP will be focused in the following areas: accelerating the renewal of America's highways; making a significant improvement in highway safety; providing a highway system with reliable travel times; and providing highway capacity in support of the nation's economic, environmental, and social goals. The program is expected to be included in the next surface transportation authorizing legislation, due in October 2003.

The interim work is jointly funded by NCHRP and the Federal Highway Administration and is being carried out as four studies, one for each research area. Five panels provide leadership and technical guidance for the interim work.

The leadership guidance for the overall program is provided by an oversight panel of highway industry leaders. This panel will function both as an NCHRP panel and as an American Association of State Highway and Transportation Officials (AASHTO) task force. The panel is responsible for the overall direction of the program, development of an administrative structure for F-SHRP, and decisions about overall funding and coordination matters.

Technical guidance is provided in each research topic area by a technical panel with the appropriate mix of expertise. The four technical panels provide oversight and guidance to contractors who are developing the research plans. The contractors' plans are due in February 2003 and a final report for the entire effort will be completed by September 2003.

### Academy Groups Induct TRB Volunteers

#### **National Academy of Engineering**

Election to the National Academy of Engineering (NAE) is one of the highest professional distinctions that can be accorded an engineer. Membership honors those who have made "important contributions to engineering theory and practice" and those who have demonstrated "unusual accomplishment in the pioneering of new and developing fields of technology." Four TRB volunteers were among the 2002 NAE inductees:

**Jacques S. Gansler**, Professor and Roger C. Lipitz Chair, Center for Public Policy and Private Enterprise, School of Public Affairs, University of Maryland, College Park, was recognized for public and private leadership in the U.S. Department of Defense and major contributions in missile guidance and control systems. He was active on TRB's Committee on the Federal Transportation Research and Development Strategic Planning Process and the Steering Committee for a Conference on Setting an Intermodal Transportation Research Framework.

**William H. Hansmire**, Principal, Jacobs Associates, was cited for pioneering leadership in the integration of the design and construction of tunneling projects, including the first design-build demonstration project for the U.S. Department of Transportation. He was a member of TRB's Committee on Soils and Rock Instrumentation and participated on the Committee for Tunnel and Underground Structures.

**Adib K. Kanfani**, Edward G. and John R. Cahill Professor of Civil Engineering, and Chair, Department of Civil and Environmental Engineering, University of California, Berkeley, made outstanding contributions to national and international air transportation, the development of U.S. research on intelligent transportation, and the education of trans-

portation professionals. Kanafani has participated on many TRB committees, including Aviation Forecasting, Intermodal Transfer Facilities, Airfield and Airspace Capacity and Delay, and the Selection Panel for the Graduate Research Award Program on Public-Sector Aviation Issues.

**M. Gordon Wolman**, Professor, Department of Geography and Environmental Engineering, The Johns Hopkins University, Baltimore, was recognized for significant contributions to the study of fluvial processes, water resources management and policy, and environmental education. Wolman, who was elected to the National Academy of Sciences in 1988, is a member of TRB's Executive Committee and Subcommittee for National Research Council Oversight.

### ***Institute of Medicine***

**Robert B. Wallace**, Professor, Department of Epidemiology, The University of Iowa College of Public Health, has been elected to the Institute of Medicine of the National Academies. Wallace served as a volunteer on TRB's Committee on Safe Mobility of Older Persons and on the Task Force on Safety and Mobility of Older Drivers.

Wallace's transportation-related articles include "Cognitive Change, Medical Illness, and Crash Risk Among Older Drivers: An Epidemiological Consideration" and "The Search To Improve Safe Vehicular Operation Among Older Drivers: Are We Reaching Our Destination?"

## Cooperative Research Programs News

### **Reducing Highway Injuries and Fatalities: Is There a Better Way?**

State organizations carry out many independent safety initiatives that individually help to reduce injuries and fatalities on highways. However, because highway safety responsibilities are divided among multiple agencies (departments of transportation, motor vehicles, state police, and others), most states do not have a comprehensive strategic approach. Many initiatives focus only on strategies that the agency is responsible for implementing and do not address effectively the entire safety problem. A further concern is the effective coordination of safety efforts outside of the state highway system. Thus, there is a need to organize a coordinated, comprehensive management approach to integrating engineering, education, and enforcement efforts that more effectively address major crash problems and are likely to result in a greater reduction of overall injuries and deaths.

Currently, NCHRP Project 17-18(3), Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, is developing guidelines to assist state and local agencies in implementing strategies (edgelines, rumble strips, access management at intersections, and more) to reduce crashes and fatalities in targeted areas. The emphasis of the project is on 13 areas: aggressive driving, head-on crashes on two-lane roads, run-off-the-road crashes on two-lane roads, drivers with suspended or revoked licenses, hazardous trees, signalized intersections, unsignalized intersections, truck-related fatalities, pedestrian fatalities, utility pole fatalities, curve-related crashes, older drivers, and unbelted drivers and occupants. An integrated management process is needed to determine the most effective combination of strategies to deploy at the state and local levels.

iTRANS Consulting, Ltd., has been awarded a \$250,000, 18-month contract [NCHRP Project 17-18(05), FY 2001] to develop a management process that will address major highway-related crash problems by effectively integrating engineering, education, and enforcement activities within a governmental organization.

### **Designing Safe Highways Through Rural Areas**

The AASHTO publication *A Policy on Geometric Design of Highways and Streets*—also known as the "Green Book"—provides detailed guidance and control values for the design of new alignments or of major reconstruction. Most of the design controls represent minimum and maximum limits; however, in some instances, a range of design values or even a single value is recommended. For most controls, the Green Book indicates that a combination of theory, measurement, and practice has shown the recommended control to provide a safe, comfortable, and aesthetically pleasing roadway.

When highways pass through rural communities, questions arise as to the appropriate values for geometric design elements (in this project the term "rural communities" refers to developed areas, which may or may not be incorporated, and to the transition zones between high-speed operations in undeveloped surroundings and the lower speed operations in the developed area).

Research is needed to provide information on the safety consequences (positive and negative) of varying geometric design values in rural communities. Emphasis should be given to the major geometric elements.

Flexibility in design is one of the tools designers can use to achieve context-sensitive design. Information from this study will be useful to designers involved with resurfacing, restoration, rehabilitation, and reconstruction projects that often employ flexibility in design.

The University of Kentucky has been awarded a \$500,000, 30-month contract (NCHRP Project 15-22, FY 2001) to develop guidance to enable project planners and designers to estimate the safety consequences of varying geometric design values for highways through rural communities.

## Experience Adds Up for New Financial Director

Former TRB Assistant Director, Administration and Finance, Michael P. LaPlante, has been appointed Director, Finance and Administration. He succeeds Marcia A. Appel, who retired in January after 15 years of service.

LaPlante, who has been with TRB for eight years, started in the Business Office as a financial clerk. He moved to the Cooperative Research Programs Division where he served as financial assistant and then returned to the Business Office as financial associate two years later.

LaPlante's current responsibilities include negotiating and processing proposals and awards, overseeing TRB cost centers, and preparing and managing an annual budget of more than \$47 million.



Michael P. LaPlante

LaPlante holds a bachelor of science degree in finance from Central Connecticut State University and a Certificate of Business from Sheffield City Polytechnic in Sheffield, England.

## Ensuring Reduced Fatalities: Plan Takes Bold Steps

In December 1997, AASHTO's Board of Directors endorsed a Strategic Highway Safety Plan developed by the AASHTO Standing Committee on Highway Traffic Safety. This plan represents a bold step toward a concerted effort across all aspects of highway safety to achieve the goal of reducing fatalities by 5,000 to 7,000 per year by 2004. This goal is ambitious because there have been only slight fluctuations from the level of about 42,000 fatalities per year for more than a decade.

The plan is bold also in that it recognizes that AASHTO, through its traditional focus on the highway infrastructure, cannot unilaterally achieve these reductions in fatalities. In addition to efforts to improve the design, operation, and maintenance of the highway system, the plan requires increased focus on (1) the driver, (2) the processes used to educate and regulate drivers, (3) the special needs of older drivers and pedestrians, (4) enforcement, (5) enhanced vehicle safety, and (6) better data and tools to analyze safety data.

NCHRP Project 17-18(03), Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, is developing guidelines in 13 emphasis areas to assist state and local highway agencies in reducing injuries and fatalities. In addition, NCHRP Project 17-18(05), Model Approach to Reducing Statewide Injuries and Fatalities, is developing an integrated management process for coordinating the engineering, enforcement, and education efforts within a jurisdiction. A technology transfer plan targeted at appropriate levels within the transportation community is needed to implement the products from these two projects.

Roy Jorgensen Associates, Inc., has been awarded a \$150,000, 12-month contract [NCHRP Project 17-18(07), FY 2001] to develop a technology transfer plan to implement the products from NCHRP Projects 17-18(03) and 17-18(05).

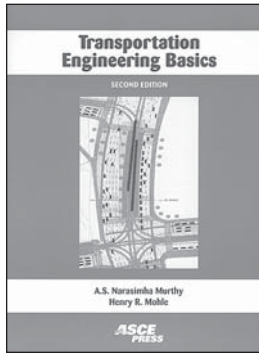
## Better Roadside Design: Can It Lead to Fewer Fatalities?

The primary goal of roadside design is to limit the number of serious injuries and fatalities associated with run-off-the-road crashes. Roadside geometrics and safety features have a strong influence on the frequency and severity of crashes. To design optimum roadside geometrics and to determine which roadside safety features are appropriate, it is imperative to identify impact characteristics associated with serious injury and fatal crashes. This information has a direct bearing on safety-evaluation criteria used to assess the performance of roadside safety features.

However, the impact speeds, angles, and orientations used in the current testing procedures are selected to represent a worst-case situation. It is unclear to what degree this worst-case situation represents real world conditions. Consequently, it is important to have definitive data on whether there are real relationships between the selected test impact conditions and actual crashes involving serious injuries and fatalities.

Crash data will be useful in refining guidelines for roadside safety countermeasures and calibrating roadside safety models (e.g., Roadside Safety Analysis Program) and crash and vehicle dynamics simulation models. It will also be helpful in focusing designers' attention on the roadside features that are involved in the greatest number of serious injury and fatal crashes. Crash data will help designers spend safety dollars on improvements that will have the greatest likelihood of reducing serious injuries and fatalities.

The University of Nebraska, Lincoln, has been awarded a \$500,000, 18-month contract (NCHRP Project 17-22, FY 2001) to identify the vehicle types, impact conditions, and site characteristics associated with serious injury and fatal crashes involving roadside features and safety devices and to create a robust relational database for future research.



**Transportation Engineering Basics,  
Second Edition**

A. S. Narasimha Murthy and Henry R. Mohle. ASCE Press, American Society of Civil Engineers, Reston, Virginia: 2001; \$34 (\$40.80 outside the United States), softcover; ISBN 0-7844-0464-X; 184 pages.

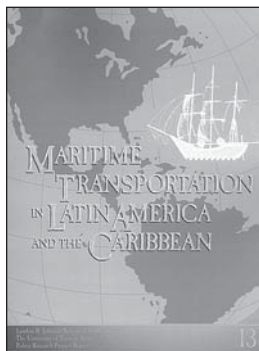
This comprehensive, practical resource of 22 laboratory exercises requiring field work and data collection in such topical areas as congestion, air pollution, transit, financing, politics, and signals, is designed to assist engineering students in applying classroom knowledge to real-life transportation and traffic problems. Each lab provides essential theory, background information, figures, tables, worksheets, and questions. The second edition is revised and expanded, including 10 new labs and incorporating changes that have resulted from recent legislation. Also featured are information about job opportunities, a section on software use, summaries of transportation websites, and a glossary of terms.



**Vehicle Emission Reductions**

European Conference of Ministers of Transport, OECD Turpin, Letchworth, United Kingdom: 2001; \$30, softcover; ISBN 92-821-1363-9; 135 pages.

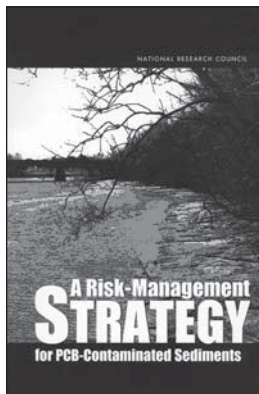
Through a comparison of vehicle emissions standards in Europe, Japan, and the United States, this report provides an international context for assessing trends in emissions reduction. Also described are the impact of vehicle emissions on health and the environment, the adequacy of emissions limits for new passenger car and heavy-duty diesel engines, and emissions control technologies. The incentives for sulphur-free fuels, which can contribute to reducing conventional as well as carbon dioxide emissions, are presented. The book comprises three reports approved by the European Conference of Ministers of Transport in May 2000.



**Maritime Transportation in Latin America  
and the Caribbean**

University of Texas at Austin: 2001; \$22, softcover; Policy Research Project Report No. 138; ISBN 0-89940-751-X; 288 pages.

An examination of the role of maritime transportation and ports in fostering international trade, economic integration, and sustainable development in Latin America and the Caribbean, the report addresses trade liberalization and the formation of regional trade blocs, liner shipping services, ports and port reform, current and emerging transshipment hubs, the Mercosur Atlantic Corridor Consortium, and cabotage law in the Americas.



**A Risk-Management Strategy for  
PCB-Contaminated Sediments**

Division of Earth and Life Studies, National Research Council, Washington, D.C.: 2001; \$46, softcover; ISBN 0-309-07321-9; 452 pages.

A seven-stage, risk-based framework for developing and implementing strategies to manage PCB-contaminated sediments is presented, from problem definition to assessment of risks and management options and a final evaluation of the strategy. The study does not recommend a default risk-management option, but advocates for the appropriate combination of technical and nontechnical solutions, including in situ treatments such as capping and ex situ treatments involving dredging and treatment of dredged materials. Key to the framework is the continuous active involvement of all affected parties—particularly communities.

**Spills of Emulsified Fuels**

Division of Earth and Life Studies, Marine Board-Transportation Research Board, National Research Council, Washington, D.C.: 2002; \$27.75, softcover; ISBN 0-309-08301-X; 118 pages.

Emulsified fuels are multicomponent fuels developed as an alternative to fuel oils and include coal-water slurries, water-in-oil emulsion, and bitumen-water emulsions. The study examines the potential environmental impacts of transportation-related spills of emulsified fuels—particularly Orimulsion, a bitumen-water emulsion used for power generation in Canada, Japan, China, and other nations. Spill scenarios, potential effects on marine and fresh waters, and proposed response strategies and equipment for Orimulsion spills are presented, along with a survey of the literature on the physical and chemical characteristics of Orimulsion.

**TRB Publications**

**Performance Measures to Improve Transportation Systems and Agency Operations: Report of a Conference Conference Proceedings 26**

The resource papers, panel presentations, and workshop summaries come from an October 2000 conference convening government, academic, and business leaders experienced in the use of performance measures and performance-based planning and programming for transportation systems. The four main topics are linking performance measures with decision making; implementing transportation system performance measures in agencies; selecting measures, determining data needs, and defining analytical issues; and con-

necting system performance measures to wider goals. Included are organizational approaches, implementation experiences reflecting the state of the practice, customer perspectives, application of multimodal measures, and related technical issues.

2001; 219 pp.; TRB affiliates, \$39; nonaffiliates, \$52, softcover. Subscriber category: planning and administration (IA).

#### ***Advances and Issues in Snow-Removal and Ice-Control Technology***

##### **Transportation Research Record 1741**

Papers from the Fifth International Symposium on Snow-Removal and Ice-Control Technology, September 2000, cover policy and management, environmental issues, intelligent transportation systems, customer-based performance measures, innovative equipment, and general snow- and ice-removal topics. Papers are authored by maintenance engineers and researchers from Canada, Denmark, Finland, Japan, Norway, Switzerland, the United Kingdom, and the United States.

2001; 215 pp.; TRB affiliates, \$47.25; nonaffiliates, \$63. Subscriber category: maintenance (IIIC).

#### ***Intercity Passenger Rail; Freight Rail; and Track Design and Maintenance***

##### **Transportation Research Record 1742**

Papers covering international subjects include: the franchising and refranchising of passenger rail in Britain; the history, characteristics, and forecasts of railroads in Greece; the compatibility of high-speed passenger trains and traditional freight trains in Europe; and new railway technology and grain transportation in Western Canada. Additional topics are risk and train control, estimating the track and structure investments for 286,000-lb railcars, track-load deflection behavior, track degradation assessment, the state of the practice in concrete slab track, and more.

2001; 96 pp.; TRB affiliates, \$25.50; nonaffiliates, \$34. Subscriber category: rail (VII).

#### ***Hydrology, Hydraulics, and Water Quality; Roadside Safety Features***

##### **Transportation Research Record 1743**

Water issues relating to highway construction are covered, including the impact of runoff from highway construction and repair, the effects on surface water and groundwater, the management of litter, and stream morphology in culvert and bridge design. Other research examines barriers and guardrails: bull-nose median barrier systems, cable median barriers, W-beam guardrails, W-beam splices, European Union standards for roadside safety barriers, and bridge rail-

ings on transverse glue-laminated deck bridges, among other subjects.

2001; 139 pp.; TRB affiliates, \$34.50; nonaffiliates, \$46. Subscriber category: highway and facility design (IIA).

#### ***Issues in Aviation: Airports, Capacity, and Air Traffic Control and Management***

##### **Transportation Research Record 1744**

Models are key to several papers: a mathematical model using perceived and observed time to measure the level of services at airport passenger terminals, a simulation model of air traffic controller workload to estimate the capacity of Europe's airspace, and modeling airside-airport operations with discrete-event simulation tools. The prospects for increasing the average size of aircraft at congested airports, near-term procedural enhancements in air traffic control, short-term delay mitigation strategies, and the information needs of departing air passengers are among the other topics of research.

2001; 81 pp.; TRB affiliates, \$24.75; nonaffiliates, \$33. Subscriber category: aviation (V).

#### ***Transportation Work-Zone Safety and Winter Services***

##### **Transportation Research Record 1745**

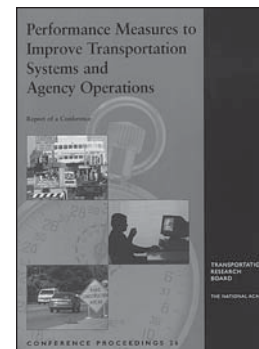
Work-zone safety innovations and approaches are presented, including a quality assurance program for work-zone traffic control, supplementary traffic control measures for freeway work-zone approaches, dynamic late-merge control for work zones in rural interstates, evaluations of speed displays and rumble strips, and sequential warning light systems for lane closures. Papers on winter services cover the delivery of road weather information to travelers, the use of mobile video to investigate winter weather vehicle speeds, and factors in multivehicular collisions during snowstorms.

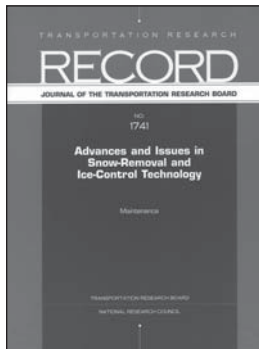
2001; 66 pp.; TRB affiliates, \$24; nonaffiliates, \$32. Subscriber category: maintenance (IIIC).

#### ***Highway Safety: Modeling, Analysis, Management, Statistical Methods, and Crash Location***

##### **Transportation Research Record 1746**

Contains papers on incorporating crash risk into congestion-mitigation strategies, neural network models to predict driver injury severity in traffic accidents at signalized intersections, models for estimating crashes as a function of access management, and computing and interpreting accident rates for vehicle types or driver groups. Also presented are analyses of Interstate highway crash injuries during snow and nonsnow events, fatal run-off-the-road crashes, and multivehicle rear-end crashes, as well as identifying high-risk intersections for older drivers, an automated accident





detection system, and improving crash location data through Global Positioning System units.

2001; 101 pp.; TRB affiliates, \$25.50; nonaffiliates, \$34. Subscriber category: safety and human performance (IVB).

**Transportation and Public Policy 2001  
Transportation Research Record 1747**

Part 1 offers papers on finance: a financial analysis of the value of Arizona's state highway system and road financing and management in the Baltic States. Part 2 turns to pricing issues: value pricing, congestion pricing, variable pricing, and the effect of tolls. Strategic management is the subject of Part 3 with papers on sustainable intermodal transportation and strategic planning for transit. Part 4 covers economics and economic development: the economic benefits of new pavement construction methods, determining load- and non-load-related shares of expenditures for pavement rehabilitation, the benefits of advanced vehicle location for public transit, the effect of proximity to light rail, and the economic impact of rural inland waterways. Part 5, on asset management, offers lessons on applying the Governmental Accounting Standards Board Statement 34.

2001; 128 pp.; TRB affiliates, \$30; nonaffiliates, \$40. Subscriber category: planning and administration (IA).

**Advanced Traffic Management Systems and  
Vehicle-Highway Automation 2001**

**Transportation Research Record 1748**

Traffic signal management gets the green light with papers on such topics as stakeholder requirements for traffic signal preemption and priority, comparison of signal simulation models, a real-time offset transitioning algorithm for coordinating signals, signal timing during inclement weather, and more. Other papers in the platoon examine driver understanding of abbreviations in changeable message signs, mining loop detector data for freeway performance measurement, operational algorithms for coordinated ramp metering, monitoring urban freeway incidents with wireless communications, and modeling the effects of driver control assistance systems on traffic.

2001; 174 pp.; TRB affiliates, \$36; nonaffiliates, \$48. Subscriber category: highway operations, capacity, and traffic control (IVA).

**Maintenance of Transportation  
Pavements and Structures**

**Transportation Research Record 1749**

Lessons from field tests characterize the contents of this volume, with reports on improved road quality through focused daily maintenance, the service life of durable pavement markings, life-cycle cost compar-

isons of asphalt and concrete pavements on low-volume roads, deciding when to seal pavement joints, using stone matrix asphalts for thin overlays, maintenance of concrete bridges, and removing lead paint from bridges. Highway bridge inspection is another topic, with findings from a state-of-the-practice survey and papers on the reliability and accuracy of routine and in-depth inspections.

2001; 107 pp.; TRB affiliates, \$25.50; nonaffiliates, \$34. Subscriber category: maintenance (IIIC).

**Redundancy in Highway Bridge Substructures  
NCHRP Report 458**

The findings of a study to develop a methodology for considering substructure redundancy in the design and evaluation of highway bridges are presented. The report builds on bridge superstructure redundancy research in NCHRP Report 406 and integrates the findings into a single recommended design specification.

2001; 98 pp.; TRB affiliates, \$28; TRB nonaffiliates, \$36. Subscriber category: bridges, other structures, and hydraulics and hydrology (IIC).

**Characterization of Modified Asphalt Binders in  
Superpave Mix Design**

**NCHRP Report 459**

The report presents the finding that AASTHO MP1, Standard Specification for Performance Graded Asphalt Binder, underestimates the potential performance of modified asphalt binders. As a remedy, changes to the specification and its supporting test methods are recommended. Binder parameters that more effectively relate binder to performance are derived from an exploration of viscous flow and energy dissipation. Suggested specification parameters and test protocols for permanent deformation, fatigue cracking, and low-temperature cracking are included, along with a practice for characterization of modified asphalt binders and new test methods for storage stability, particulate additive content, and laboratory mixing and compaction temperatures.

2001; 165 pp.; TRB affiliates, \$34.50; TRB nonaffiliates, \$46. Subscriber category: materials and construction (IIIB).

**Guidelines for the Implementation of Multimodal  
Transportation Location Referencing Systems**

**NCHRP Report 460**

The report offers the next step in location referencing systems (LRS) data models, documenting a comprehensive model that accommodates the use, storage, operation, and sharing of transportation-based multi-dimensional spatiotemporal data. The LRS data model presented was developed from stakeholder-driven functional requirements and formulated in the context



of current geospatial standards. Implementation guidelines, which provide the tools to support consistent location referencing across the transportation community, are included.

2001; 81 pp.; TRB affiliates, \$24; TRB nonaffiliates, \$32. Subscriber category: *planning and administration (IA)*.

**Light Rail Service: Pedestrian and Vehicular Safety**  
TCRP Report 69

The report presents results of a study to improve the safety of light rail transit (LRT) in semiexclusive rights-of-way where light rail vehicles operate at speeds greater than 35 mph through crossings with streets and pedestrian pathways. Included are results of field tests for improving the safety of higher-speed LRT systems through grade-crossing design, results of a before-and-after evaluation of the effectiveness of presignals on motorist behavior at highway-rail grade crossings, and presignal installation guidelines for designing new LRT systems or retrofitting and extending systems.

2001; 141 pp.; TRB affiliates, \$30; nonaffiliates, \$40. Subscriber category: *public transit (VIA)*.

**Guidebook for Change and Innovation at Rural and Small Urban Transit Systems**

TCRP Report 70

The guidebook offers resources for adapting new concepts to community public transportation. Much of the information is from a review of innovative public transportation initiatives in rural and small urban communities throughout the United States. The guidebook is divided into two parts: Part I addresses the culture for change and innovation, and Part II presents more than 40 initiatives and innovations implemented by public and nonprofit transit systems, regional planning agencies, state transit associations, state departments of transportation, and others.

2001; 249 pp.; TRB affiliates, \$27; TRB nonaffiliates, \$36. Subscriber categories: *planning and administration (IA)*; *public transit (VIA)*.

**Simulators and Bus Safety: Guidelines for Acquiring and Using Transit Bus Operator Driving Simulators**

TCRP Report 72

If student bus operators can be trained more efficiently using simulation, both training and operations costs can be reduced. This report provides guidance for transit managers on the decision to purchase a driving simulator and, if advisable, what kind, and on how to use simulation to improve bus operator training and safety.

2001; 52 pp.; TRB affiliates, \$18.75; TRB nonaffiliates, \$25. Subscriber category: *public transit (VIA)*.

**Recent Geometric Design Research for Improved Safety and Operations**  
NCHRP Synthesis 299

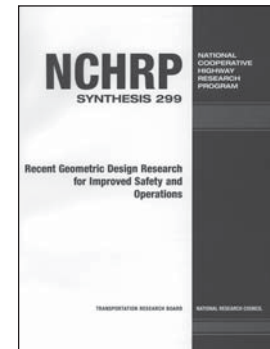
The last decade produced a considerable amount of research on all aspects of geometric design: how roadways are designed, how they operate, and the safety of the facilities. But the sheer volume of information published is a potential limitation to the application of the research. This synthesis reviews and summarizes the geometric design research published during the 1990s, with particular attention to safety and operational implications. The findings are grouped similarly to key chapters of AASHTO's *Policy on Geometric Design of Highways and Street* (the *Green Book*): Design Controls and Criteria, Elements of Design, Cross Sections, Intersections, and Interchanges.

2001; 134 pp.; TRB affiliates, \$30; nonaffiliates, \$40. Subscriber categories: *highway and facility design (IIA)*, and *highway operations, capacity, and traffic control (IVA)*.

**Electronic Surveillance Technology on Transit Vehicles**  
TCRP Synthesis 38

On a typical workday, as many as 13 million people in the United States ride transit. Passengers expect and demand safe and secure buses, heavy and light rail vehicles, ferries, and other vehicles as well as public transportation environments. This synthesis describes the state of the practice concerning onboard surveillance technologies to address safety and security issues at public transportation agencies, including a review of current and emerging technologies. The report touches on the successes and failures of systems in meeting transit needs, and discusses the benefits and costs of implementing surveillance systems on transit vehicles.

2001; 57 pp.; TRB affiliates, \$21; nonaffiliates, \$28. Subscriber category: *public transit (VI)*.



**New International Journal Paves Its Way**

*IJP: International Journal of Pavements* was launched in January by the Centro Federal de Educação Tecnológica de Sao Paulo, Brazil, and the Center for Advanced Infrastructure Technology of the University of Mississippi. The journal, which promotes professional excellence in pavement engineering, including education, research, construction, and preservation of the transportation infrastructure, publishes research findings in all aspects of pavements for an audience of educators, researchers, transportation engineers, industry professionals, and agency officials.

The first issue of *IJP* contains nine peer-reviewed technical papers from the Second International Symposium on Maintenance and Rehabilitation of Pavements and Technological Control. The publishers of *IJP* seek original paper submissions in the field of transportation engineering and infrastructure asset management, along with discussions, reviews, news, and related items of interest. An electronic version of the journal is available at [www.olemiss.edu/pubs/ijp/](http://www.olemiss.edu/pubs/ijp/).

# Publications Order Form

Please send the following:

Qty	Title	Price	
		Nonaffiliates	Affiliates
_____	TR News: <input type="checkbox"/> Annual Subscription <input type="checkbox"/> Single Copy (TRN___)	\$ 55.00 <sup>1</sup> 9.50	No charge <sup>2</sup> \$ 7.13
_____	SHRP Product Catalog	No charge	No charge
_____	Bridge Aesthetics Around the World <input type="checkbox"/> Hardcover (BAATHC) <input type="checkbox"/> Softcover (BAATSC)	85.00 65.00	63.75 48.75
_____	<input type="checkbox"/> Highway Capacity Manual, 2000 ed. (HCM 2000), U.S. customary print version (HCM2KE)	100.00 <sup>3</sup>	75.00 <sup>3</sup>
_____	<input type="checkbox"/> HCM 2000, Metric print version (HCM2KM)	100.00 <sup>3</sup>	75.00 <sup>3</sup>
_____	<input type="checkbox"/> HCM 2000, Multimedia CD-ROM (includes both versions) (HCM2KC)	90.00	67.50
_____	<input type="checkbox"/> HCM 2000, U.S. customary print version and CD-ROM (HCM2EC)	145.00 <sup>3</sup>	108.75 <sup>3</sup>
_____	<input type="checkbox"/> HCM 2000, Metric print version and CD-ROM (HCM2MC)	145.00 <sup>3</sup>	108.75 <sup>3</sup>

## SPECIAL REPORTS

_____	260 Strategic Highway Research: Saving Lives, Reducing Congestion, Improving Quality of Life (SR260)	23.00	17.25
_____	261 The Federal Role in Highway Research and Technology (SR261)	21.00	15.75
_____	262 A Process for Setting, Managing, and Monitoring Environmental Windows for Dredging Projects (SR262)	20.00	15.00

## CONFERENCE PROCEEDINGS

_____	26 Performance Measures to Improve Transportation Systems and Agency Operations: Report of a Conference (CP26)	52.00	39.00
-------	--	-------	-------

## NCHRP REPORTS

_____	406 Redundancy in Highway Bridge Superstructures (NR406)	23.00	17.25
_____	458 Redundancy in Highway Bridge Substructures (NR458)	36.00	28.00
_____	459 Characterization of Modified Asphalt Binders in Superpave Mix Design (NR459)	46.00	34.50
_____	460 Guidelines for the Implementation of Multimodal Transportation Location Referencing Systems (NR460)	32.00	24.00

## TCRP REPORTS

_____	69 Light Rail Service: Pedestrian and Vehicular Safety (TC069)	40.00	30.00
_____	70 Guidebook for Change and Innovation at Rural and Small Urban Transit Systems (TC070)	36.00	27.00
_____	72 Simulators and Bus Safety: Guidelines for Acquiring and Using Transit Bus Operator Driving Simulators (TC072)	25.00	18.75

## NCHRP SYNTHESIS OF HIGHWAY PRACTICE

_____	299 Recent Geometric Design Research for Improved Safety and Operations (SYH299)	40.00	30.00
-------	--	-------	-------

## TCRP SYNTHESIS OF TRANSIT PRACTICE

_____	38 Electronic Surveillance Technology on Transit Vehicles (TS038)	28.00	21.00
-------	---	-------	-------

## TRANSPORTATION RESEARCH RECORDS

_____	1741 Advances and Issues in Snow-Removal and Ice-Control Technology (R1741)	63.00	47.25
_____	1742 Intercity Passenger Rail, Freight Rail, and Track Design and Maintenance (R1742)	34.00	25.50
_____	1743 Hydrology, Hydraulics, and Water Quality; Roadside Safety Features (R1743)	46.00	34.50
_____	1744 Issues in Aviation: Airports, Capacity, and Air Traffic Control and Management (R1744)	33.00	24.75
_____	1745 Transportation Work-Zone Safety and Winter Services (R1745)	32.00	24.00
_____	1746 Highway Safety: Modeling, Analysis, Management, Statistical Methods, and Crash Location (R1746)	34.00	25.50
_____	1747 Transportation and Public Policy 2001 (R1747)	40.00	30.00
_____	1748 Advanced Traffic Management Systems and Vehicle-Highway Automation 2001 (R1748)	48.00	36.00
_____	1749 Maintenance of Transportation Pavements and Structures (R1749)	34.00	25.50

<sup>1</sup> \$70.00 overseas.

<sup>2</sup> One subscription included in affiliate fee; additional subscriptions, \$35.00.

<sup>3</sup> HCM only: for overseas orders, add \$18.00 per book for surface mail and \$38.00 per book for airmail to Central & South America & Europe; \$50.00 for all other destinations.

Payment must accompany orders. Foreign payments must be in U.S. funds drawn on a U.S. bank or by international money order (payer must bear all bank charges). Return this form with payment to Transportation Research Board, Lockbox 289, Washington, DC 20055 (telephone 202-334-3213, fax 202-334-2519). **Orders may also be placed through the TRB online bookstore: [www.TRB.org/trb/bookstore](http://www.TRB.org/trb/bookstore).**

Payments for deliveries to Calif., D.C., Fla., Md., Mo., Tex., and Canada must include applicable sales tax/GST.

For surface delivery outside North America, add \$4.00 for first item and \$1.00 for each additional item, except as noted.

- Please send information on TRB affiliates program  
 Check or money order enclosed  
 Charge to:  Visa  MasterCard  American Express

\_\_\_\_\_  
 CARD NUMBER / / / EXPIRATION DATE

\_\_\_\_\_  
 SIGNATURE

\_\_\_\_\_  
 DATE AFFILIATE NO.

\_\_\_\_\_  
 NAME

\_\_\_\_\_  
 AGENCY

\_\_\_\_\_  
 STREET

\_\_\_\_\_  
 CITY

\_\_\_\_\_  
 STATE ZIP

\_\_\_\_\_  
 TELEPHONE

## 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. Page proofs will be provided for author review and original artwork 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, typewritten pages), summarized briefly but thoroughly by an abstract of approximately 60 words. Authors should also 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 help readers better understand 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 photographic 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 is used. 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. Because of the lead time required for publication and the 2-month interval between issues, notices of meetings should be submitted at least 4 to 6 months before the event. Due to space limitations, these notices will only appear once.

**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, and price. Publishers are invited to submit copies of new publications for announcement, and, on occasion, guest reviews or discussions will be invited.

**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 directed to the Director of Reports and Editorial Services, Transportation Research Board, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418; telephone 202-334-2972. All manuscripts must be submitted in duplicate, typed double-spaced on one side of the page and accompanied by a word-processed diskette in Microsoft Word 6.0 or Word Perfect 6.1. Original artwork must be submitted. Glossy, high-quality black-and-white photographs are preferred; if not available, we will accept color photographs. Slides are our third choice. Digital camera photographs and computer-generated images are not acceptable. A caption must be supplied for each graphic element submitted. Any graphs, tables, and line art submitted on disk must be created in Microsoft PowerPoint (do not use Harvard Graphics software). Required style for units of measurement: The International System of Units (SI), an updated version of the metric system, should be used for the primary units of measurement. In the text, the SI units should be followed, when appropriate, by the U.S. Customary equivalent units in parentheses. For figures and tables, use only the SI units, providing the base unit conversions in a footnote.

**NOTE:** Authors are responsible for the authenticity of their articles and for obtaining written permissions from publishers or persons owning the copyright to any previously published or copyrighted material used in their articles.

