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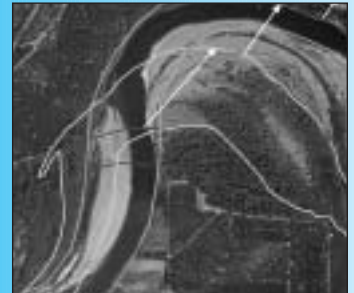
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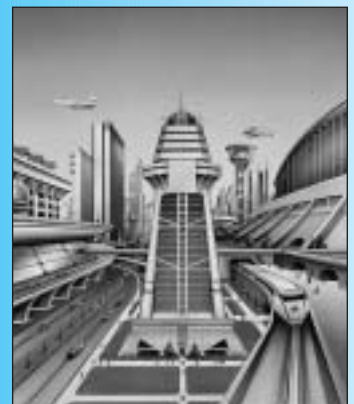
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COVER: Mid-20th century artist's rendering of a city of the future depicts active and vital roles for transportation. (Illustration: Ean Taylor, Getty Images)

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

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COMING NEXT ISSUE

Feature articles on bus industry standards, codes, and best practices and on consensus rulemaking by the Federal Railroad Administration are slated for the January–February 2005 *TR News*. In addition, TRB's technical activities staff, back from field visits, report on state-level developments, initiatives, and concerns affecting research.



PHOTO: WMATA

Alternative fuels for transit buses—such as compressed natural gas (above)—are the subject of new guidelines and codes to assure safety in design, maintenance, and operation of vehicles and facilities.

The Future That Never Was

Lessons from Visions of Transportation



CHRISTINE COSGROVE AND PHYLLIS ORRICK

Cosgrove is Senior Editor, Institute of Transportation Studies Review, University of California, Berkeley. Orrick is Editor of the Review and Senior Publications Manager at the Institute.

The cover illustration on the February 1951 issue of *Popular Mechanics* depicts a man returning from work and parking his compact yellow helicopter in the garage of his suburban home. The magazine article promises that personal helicopter coupes soon will be the cure for traffic congestion. The personal helicopters were reported to be in production but were prevented by the Korean War from entering the civilian market, where they were expected to sell for not much more than a medium-priced car.

Joseph J. Corn, senior lecturer in the Department of History at Stanford University, pointed to the helicopter coupe as an example of a transportation visionary's prediction that never materialized. Corn was the opening speaker at a session titled, "Yesterday's Tomorrows: Past Visions of America's Transportation Future," at the 2003

TRB annual meeting and cocurator of a traveling exhibition with the same title for the Smithsonian Institution.

The session, sponsored by the Committee on Transportation History and organized by Lyn Long, a research specialist at the Institute of Transportation Studies at the University of California, Irvine, attracted an overflow crowd. William Withuhn, Curator of Transportation for the Smithsonian Institution, Washington, D.C., served as moderator, and in addition to Corn, speakers included Mark S. Foster, Professor of History at the University of Colorado at Denver; and Gregory L. Thompson, Associate Professor in the Department of Urban and Regional Planning at Florida State University. Martin Wachs, Director of the Institute of Transportation Studies, University of California, Berkeley, served as the discussant for the presentations.



Influential visionary Lewis Mumford (1895–1990) advocated transportation strategies that would preserve “the living tissue of the city.” He was cited frequently as a source and an example in the TRB session. (Photo courtesy of Murry and Leonie Guggenheim Memorial Library and Sophia Mumford Estate, Monmouth University.)

Three Fallacies

In a conversation after the session, Long spoke about failures to appreciate the strength of a vision. She noted the example of the computer: “In the 1940s, designers of the early mainframe computer insisted that there would never be a market for the device among consumers, because computers were too large and complicated to be operated by the average person. They predicted that 5 or 10 computers easily could meet the country’s needs for the foreseeable future. It took young visionaries like Steve Jobs, Steve Wozniak, and Bill Gates to see beyond this and make the changes that have put personal computers in virtually every home and office.”

According to Long, proposals for the future always provoke “a battle between technocrats and visionaries.” Moreover, in democratic societies, few individuals voluntarily will adopt a technically or socially feasible innovation that does not meet personal needs or desires. “When the future is on trial, the ultimate judge always will be the consumer,” Long observed.

In his talk, Corn, who teaches the history of technology, elaborated similar themes. Transportation visions from the past generally suffer from at least one of three fallacies, he said. For example, the vision for the helicopter coupe commits the “fallacy of the technological fix, a utopian assumption that a vehicle that flies will somehow eliminate traffic congestion.”

The picture on the magazine cover shows a man in an overcoat and fedora sliding his helicopter coupe back into his suburban garage. The shadows and the man’s appearance indicate arrival home in the midafternoon after an easy flight. Only one other helicopter coupe appears in the sky, suggesting that rush hour in a helicopter is quick, efficient, and carefree.

Another fallacy in the vision of the helicopter coupe is the promise of social continuity, “the expectation that technology will change radically in the future, but social behavior and relationships will continue unchanged,” Corn explained. “The illustration depicts a tomorrow in which male breadwinners commute in helicopters instead of in Chevrolets or Fords, but everything else remains the same.”

The third fallacy Corn identified is the expectation of a “total technological revolution”—the “prophets assume that a new advance will completely supplant an earlier technology.” Instead, he noted, “the new inventions stimulate improvements in old technologies and end up coexisting with them for long periods of time.” The steamship, for example, did not render sailing ships obsolete but spurred improvements in design and size, so that sailing ships could operate profitably into the 20th century.

Conspiracy or Convergence?

Any one of the three fallacies may cause a transportation planner’s vision to fall short, but planners often are blamed unjustly in revisionist histories, according to Foster, author of *From Streetcar to Superhighway: American City Planners and Urban Transportation* and *A Nation on Wheels*.

Lewis Mumford, the renowned writer on architecture, urban planning, and technology, for example, claimed that planners and engineers had allowed mass transit to deteriorate and had helped to destroy the “living tissue of the city” by building superhighways and massive parking garages. Mumford articulated a conspiracy theory alleging that the automobile and oil companies deliberately sabotaged public transportation companies, particularly the railways, to promote car ownership and increase the sale of gasoline.

History, however, does not substantiate these claims, Foster noted: “In 1903 mass transit companies were not considered victims, but predators. Privately owned mass transit companies ruled the city streets and enjoyed close and intimate involvement with urban political machines.” Graft was common practice for monopolistic companies extending their routes, the speaker said.

Automobile manufacturers, in contrast, were the “little guys,” producing “only a handful of cars weekly, mostly for the wealthy.” Automobile technology lagged behind street rail technology for nearly two decades. Meanwhile, street rail ridership reached 17.2 billion in 1926—the highest peacetime peak until World War II.

Nonetheless, automobiles were viewed as an environmental improvement over horses—horses not only left manure and urine in the streets but often died in harness and were left to rot in the open. When automobile



Street rail technology predominated over automobile technology for nearly 20 years in the first part of the 20th century. Above, vintage postcard of streetcars in Norwich, Connecticut, circa 1905. (Photo courtesy of Thomas J. Dodd Research Center, University of Connecticut.)

Historic Effort to Conserve Transportation's History

ALAN E. PISARSKI

“We need to establish ways to conserve our history for the future benefit of the transportation community—that would be the main challenge of the task force.” This statement of purpose, in a 1995 letter to TRB Executive Director Robert E. Skinner, Jr., led to the establishment of TRB’s Transportation History Committee, first as a task force and then as a standing committee in the Technical Activities Division. Past Chair and longtime member of the TRB Executive Committee Lester A. Hoel of the University of Virginia played a key role in developing and advancing the idea for the committee.

At the time, TRB was about to mark its 75th anniversary, underscoring the need for and the value of maintaining an historical understanding of transportation and its related professions. Since its establishment, the committee has worked to promote appreciation and understanding of transportation history.

Shared Heritage

Most TRB technical committees provide a forum for professionals in a specialized field to meet with peers to exchange research-related ideas, strategies, and concerns. The Transportation History Committee fills that role in a limited way for archivists, museum curators, historians, and transportation professionals. A shared interest in history binds together the members’ disparate professional interests.

But the committee plays a broader, more significant, role by instilling in the transportation community a greater interest in, and appreciation for, a shared heritage. The committee’s primary goal is to establish a recognition among transportation professionals of the importance of maintaining a sense of history and of preserving historical archives. In pursuing this goal, the committee employs the skills of its members to place before the TRB community stimulating, useful, and fun ideas from transportation’s past.

The accompanying article by Cosgrove and Orrick describes a superb example of that goal at work—the well-attended TRB Annual Meeting program, “Yesterday’s Tomorrows,” developed by Lyn Long, a committee member. Long creatively assembled an extraordinary cast of speakers who presented intriguing and rewarding ideas.

Formidable Agenda

Although the committee can point to several significant accomplishments in its brief tenure, the tasks still on the agenda are formidable. One of the original stimuli for convening the committee was the need to capture the understanding and insights of many leading transportation professionals now reaching the age of retirement.

Recent experiences have demonstrated the richness and the fragility of the knowledge, recollections, and personal papers of some of the profession’s longtime leaders. The com-



The TRB History Committee seeks to encourage recognition and preservation of historic transportation sites in every state. Above, archival photograph shows construction of the Whiting River Arches, East Canaan, Connecticut, circa 1870. (Photo courtesy of Thomas J. Dodd Research Center, University of Connecticut.)

mittee is developing strategies to assemble, record, and archive the thoughts, ideas, and wisdom of distinguished elder achievers.

One related committee project open to all is the compilation of lists of transportation-related historical sites in each state. Maryland has provided an initial example to serve as a stimulus and model.¹

Other challenges include assembling the experiences and historical records of state transportation institutions, as many approach 100th anniversaries. A clear understanding of the past efforts and achievements at the state level can inform and enhance current and future initiatives.

The Transportation History Committee invites participation and interest in pursuing these challenges.²

*The author, Chair of the TRB Transportation History Committee, is a transportation consultant in Falls Church, Virginia. He is known for his major studies, *Commuting in America* and *Commuting in America II*. He has served TRB in many capacities; currently he also chairs the Data and Information Systems Section and the National Cooperative Highway Research Program Project Panel on Using American Community Survey Data for Transportation Planning.*

¹ <http://gulliver.trb.org/committees/ABG50TTS.pdf>.

² See the History Committee web page, <http://gulliver.trb.org/committees/ABG50.pdf>.



Cars and streetcars through intersections at New York City's Times Square, circa 1930.

traffic began to overwhelm cities, urban decision makers relied on technological fixes—the first fallacy according to Corn's analysis. Starting with mounted police, then stationary police and manually operated traffic signals, the solutions moved on to mechanical signals, synchronized lights, and multilevel traffic arteries, like New York's West Side Highway.



The vision for San Diego's trolley defied the odds, succeeding in a decentralized city with a high level of car ownership. (Photo courtesy of San Diego Metropolitan Transit System.)

Between the World Wars, these approaches could be implemented more quickly and cheaply than subways and high-speed rail programs. Moreover, the approaches did not encounter resistance from politicians who wanted to avoid the perception of serving the downtown business interests that would benefit from mass transit. Street widening and expanding the road network created tangible benefits from the voters' perspective.

Contrary to the conspiracy theory, the reason that cars took over the American landscape was a matter of historical forces, Foster maintained: "The convergence of the timing of technological advances, the free enterprise system, and democratic decision-making made the triumph of the automobile almost inevitable in the first half of the twentieth century."

Discontinuity and Innovation

Transportation visionaries are not always thwarted, according to Thompson. In the 1950s, the recent past would have offered little hope for a new type of rail transit. Yet long after the triumph of the automobile and the disappearance of the streetcar, antirail movement started up, spurred by the political activism of the 1960s.

The visionaries responsible for the renaissance included Stewart Taylor, a transportation consul-

tant in Pennsylvania who read *Modern Tramways*, a magazine that featured articles about the light rail movement in Germany and other Northern European countries. Taylor visited Germany, met with transit experts, then returned and wrote an article that appeared in a 1970 issue of *Traffic Quarterly*.

He cast his story in the contexts of the antifreeway movement, the widely perceived horrors of sprawl, and the need for an intermediate form of transit between automobiles and heavy rail that would be less expensive to build than regional rapid transit lines. Taylor advocated the “rapid tramway,” which came to be called light rail.

In 1978 Edmonton, Alberta, became the first city in North America to implement modern light rail. Contributing to the breakthrough were the city’s healthy, municipally owned transit system, an unpopular freeway plan that would have obliterated several city parks, and the energy crisis of 1973, which enabled Alberta to command high prices for its oil reserves and to commit substantial funds to the light rail system.

No prophet could have foretold the success of light rail in San Diego, however, according to Thompson. Unlike Edmonton, San Diego was large and decentralized, served by a massive freeway sys-

tem. Car ownership was high, and the city’s arterial system was well developed.

But State Senator James R. Mills of San Diego County also was a reader of *Modern Tramways*, and he also visited Germany. Mills convinced the San Diego planning agency to consider light rail. Since the launch in the summer of 1981, weekday boardings on the 47-mile system have reached 75,000.

Thompson described the early proponents of light rail as visionaries who were “highly enthusiastic about their mission, public servants in the best sense of the word.” None was motivated by personal financial gain.

Vision Is Alive


Reflecting on the presentations, discussant Wachs maintained that visionary thinking is still at work, despite observations by critics that transportation planning is mired in formulaic approaches. For example, Michael Brooks, a professor of planning, had “decried the fact that the future is not what it used to be.”

Brooks maintained that the fields of transportation engineering and urban planning once “were dominated by visionaries, like Daniel Burnham and Lewis Mumford, whose visions were powerful and could move us and the future forward.” Brooks also argued that those visions achieved a necessary “disconnect”



Light rail transit vehicle crosses a dedicated bridge in Edmonton, Alberta, Canada, which proved the viability of a vision for “rapid tramways” in North America. (Photo courtesy of Edmonton Transit System.)






from the present; today's planners, by contrast, employ mathematical models that project the present into the future, no longer "envisioning a future and making something new from scratch."

"Brooks saw this as a terrible change," Wachs reported. "He concluded that the future is dead."

Wachs, however, disagreed: "This is a misunderstanding of what is happening—the coupling of Thompson's presentation on the emergence of light rail with the presentations by Corn and Foster makes that clear. In the past, vision emerged from a few intellectuals and appeared clear because maybe three or five percent of the population wrote or read about that vision."


But Wachs warned against romanticizing past descriptions of the future that issued from small groups: "Corn mentioned the democratization of thought about the future—that is important. Vision is alive in our field."

Competing Visions



Wachs drew two examples from his experience as director of a transportation research center: "My staff believes that resolving traffic congestion requires a dramatic discontinuity—the application of telecommunications, that is, intelligent transportation systems (ITS). They see a future of electronic toll collection and automated highways."

But "on the other side of the campus," he reported, graduate students in city and regional planning "talk about smart growth—they think the future of our cities requires transit-oriented development, discouraging the use of the automobile, encouraging higher density of settlement, and penalizing the profligate use of energy."



The two different visions "are powerful," Wachs observed. "We live with both visions daily, but we do not think of them in the same way we think of the visions of Burnham and Mumford." Instead, he said, people with competing visions work through governmental agencies and a complex democratic process to select and set priorities.

"We learn from criticizing one another's visions," he added. In Wachs's view, the latest visions have moved away from technological fixes to sustainability, in response to concerns about equality and environmental protection.

"The three visionary fallacies that Corn identified—the fallacy of the technological fix, the fallacy of social continuity, and the fallacy of total technological revolution—are hard to escape, whether looking forward or backward," Wachs said. "The commitment to ITS is a kind of technological determinism; but the notion that smart growth will solve all social economic problems in cities is a kind of physical determinism

that also falls short of the mark."

Spotting the fallacies is valuable in weighing debates about the future, Wachs noted: "It helps me see the shortcomings as the two sides line up—the future reflects the shortcomings in our visioning efforts. As Thompson pointed out, light rail transit in the United States was a movement, a product of a vision that might be described as discontinuous with the past. Many who were critical of light rail investments 10 and 15 years ago—and I was one—looked at the cost-benefit analysis and argued that the money could have been better spent on another form of transit or for another type of policy."

The Vision Emerging

Wachs distinguished an emerging trend in policy making, of "not favoring one technology over another but one mode of analysis over another—analysis is important, but in the end we will make decisions that sometimes override the analyses. We are moving away from technology and technological fixes as the centerpieces of our competing visions. Emerging is another vision, the vision of sustainability, which embraces concerns about environmental quality, environmental protection, and access for all groups of people. Technology is less in the center—in some ways, the emerging vision is critical of technology as a panacea."

Wachs concluded by applauding the panelists: "You have inspired visions of visions, which shows that this concept is valuable as we look into the future."

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A Vision for Light Rail Transit

Linking Up with Intelligent Transportation Systems

ERIC BRUUN

Some visions of the future can be dismissed outright. Serious analysis of the vision for personal helicopters would have shown that, at meaningful capacity, the numbers of aircraft would have guaranteed collisions. Faulty visions should be distinguished from visions that have a likelihood of success through supportive investments and public policies.

Another fallacy can be added to the three identified by Joseph J. Corn in his "Yesterday's Tomorrows" presentation (see accompanying article). The fourth fallacy is the "one or the other" fallacy—that is, ignoring the possibility that other forces may be at work simultaneously to bring about the same result.

A conspiracy by automobile manufacturers, like General Motors, and oil companies—cited in the presentation by Mark S. Foster—may not have been the main reason that streetcars disappeared. Streetcars were disappearing anyway. Nonetheless, in many places, General Motors and others sped up the process, making the shutdown of streetcars more complete and irreversible than it otherwise would have been.

Public investment, however, may have reflected the public desire for better motoring. But democratic response is only a partial explanation. Interests can and do find ways to manipulate the democratic process. For example, compare funding for stadiums to funding for light rail transit (LRT). In cities across the United States, politicians generally have tried to keep stadium funding off the ballot. At the same time, they almost always have required a ballot item for LRT projects, typically with an unpopular local funding source, like a property tax.

Envisioning Synergy

Martin Wachs's observation that different visions prevail on opposite sides of the campus—intelligent transportation systems (ITS) versus smart growth—holds true off campus as well. Projects that involve ITS originate from different staff and have different funding sources from transit projects that would facilitate smart growth.

Smart growth advocates suspect that the goal of ITS is to sneak more automobiles into the city and to facilitate more sprawl through increased road capacity. At the same time, ITS experts are frustrated that smart growth advocates do not appreciate the potential of ITS for managing demand, raising revenue, and improving transit service.

If regional planning can be elevated from the separate analysis and financing of individual transportation projects to multimodal planning, the distinct visions of ITS and smart growth can



be combined synergistically. ITS could administer practical congestion pricing; the tolls in turn would reduce peak highway demand and make the city friendlier to nonautomobile modes.

Implementing tolls, however, is politically difficult. If LRT could provide an attractive alternative in the same corridors, the public might be more open to accepting congestion tolls. Furthermore, the revenues could finance both highways and transit, reducing the need for subsidies, which too often have proved both inequitable and inefficient.

LRT investments typically are justified as growth-focusing tools. In conjunction with ITS, LRT also can become a tool for serving lower-density suburbs. LRT could connect major destinations at frequent intervals, with connections to crosstown and community-based services. ITS could allow real-time management of timed transfers, passenger information, and distance-based fares. Eventually many connecting services would become ITS-assisted hybrids, somewhere between fixed-route and demand-responsive services. As a result, more disabled citizens and more difficult-to-serve markets could be addressed.

Sustainable Vision

LRT operating on trunk routes with smaller feeders and connectors creates a more comprehensive transit network than a traditional transit system focused on a central business district, with the same operating budget. First, it maximizes the number of origin-destination pairs that can be served, analogous to airline hub-and-spoke networks. Second, the shorter spokes allow connecting buses to make more frequent trips. Third, unlike buses, LRT can change consist size—that is, the makeup of the vehicle units—to handle peaks in demand, with only minor increases in operating costs.

This vision appears to avoid the fallacies that doom future prospects. It recognizes that public policy is at least as important as technological change. The vision does not depend on a continuity in lifestyles, because pricing and service possibilities on the combined highway and transit network would retain flexibility. Finally, the vision does not assume a revolution against the automobile-based city; instead, it reflects a move toward improved sustainability, accessibility, and equity.

The author, a member of the TRB Paratransit Committee and the Motorcycle Committee, is a consulting engineer with Delta Services Group, Philadelphia, Pennsylvania. The TR News Editorial Board invited him to comment on points raised in the feature article by Cosgrove and Orrick.

NEW NCHRP REPORT

A Matter of Course *Predicting River Change*

PETER F. LAGASSE

The author is Senior Vice President, Owen Ayres and Associates, Inc., Fort Collins, Colorado, and a member of the TRB Hydrology, Hydraulics, and Water Quality Committee. He was the Principal Investigator for National Cooperative Highway Research Program Project 24-16, Methodology for Predicting Channel Migration.

Riverbank erosion and channel migration have affected trade routes and transportation corridors for thousands of years. Active river channel migration still poses a significant threat to the stability of bridges and other highway facilities.

A 4-year research effort has developed a practical methodology for predicting the rate and extent of channel migration near transportation facilities. National Cooperative Highway Research Program (NCHRP) Project 24-16, Methodology for Predicting Channel Migration, was completed in July 2003.

The research produced not only a formal report describing the predictive methodology (1), but also a stand-alone handbook with aerial photographs and map comparisons (2) that provides a complete applications supplement. The comparison techniques in the handbook range from simple overlays to computer programs, including geographic information system (GIS) measurement and extrapolation routines for

assessing historical meander migration and predicting future migration.

Matter of Course

In bridges that span rivers and floodplains, often only the piers and pilings within the channelized section have deep foundations, and those on the floodplain or marginal to the channel may have shallow foundations. When channel migration removes a significant amount of bankline underneath a bridge, floodplain piers and pilings with shallow foundations may be exposed and undermined and may fail.

In some cases, the failure of only one pier may cause a significant portion of a bridge to collapse, as happened with a major highway bridge over the Hatchie River in Tennessee in 1989 (Figure 1). In addition, significant bankline loss associated with incremental channel migration (Figure 2) can undermine or flank bridge abutments that rest on floodplain soils or that have shallow foundations.



Typical meander bend on the San Joaquin River in California.



FIGURE 1 Failure of a bridge pier as a result of channel migration led to collapse of bridge over the Hatchie River, Tennessee, in 1989.

Most of the streams that present a hazard through lateral migration at road crossings are alluvial. The channel of alluvial streams is formed by the action of flowing water on boundary materials deposited by the stream. The boundary materials can be eroded and transported.

The banks of alluvial streams migrate through erosion and accretion; floodplains, islands, and side channels undergo modification with time. Actively meandering streams continually change position and shape as a consequence of fluvial processes and hydraulic forces on streambeds and banks. The changes may be incremental or episodic, gradual or rapid, and systemwide or local.

Meanders grow and move naturally, but human activities may accelerate the rate of change or may trigger new changes as a result of morphological response in the stream system. The migrating bends of actively meandering alluvial streams can cause serious impacts on highway infrastructure.

Evaluating the Options

An extensive literature review reveals that the only complete model of a river is the river itself. The past behavior of a meandering reach does not necessarily indicate future behavior; nonetheless, the historical record integrates the effects of all the variables in that location.

An evaluation of empirical (observation-based) and deterministic (process-based) approaches to predicting meander migration supports the conclusions of the literature review. Other investigators had concluded that limitations in data availability and model capabilities made it difficult to model in detail the variation of stream movement over time. An analysis of channel history, however, can reveal trends in stream alignment and in average rates of migration (3, 4).

Empirical approaches are more likely than deterministic approaches to yield a practical methodology.

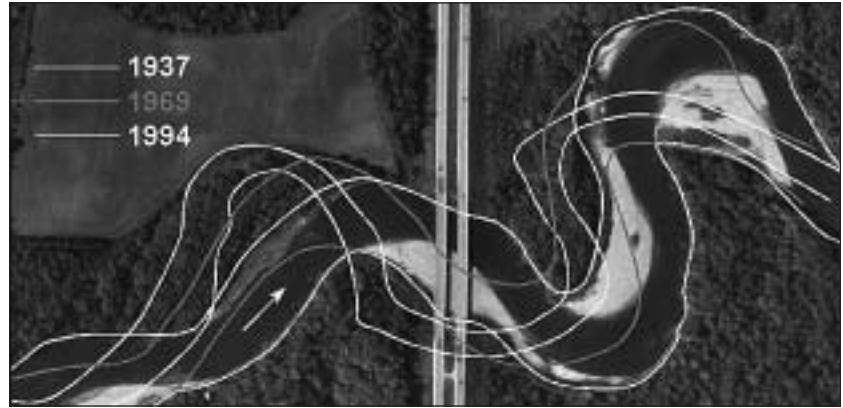


FIGURE 2 Channel migration can have wide-ranging effects on bridge abutments that rest on floodplain soils. Aboe, Wapsipinicon River near DeWitt, Iowa.

The research therefore emphasized enhancing and using empirical databases to develop techniques of photogrammetric comparison for predicting meander migration.

NCHRP Report 533, *Handbook for Predicting Stream Meander Migration Using Aerial Photographs and Maps*, a stand-alone guide for predicting stream meander migration, is the principal product of NCHRP Project 24-16. The handbook deals with incremental channel shift and provides a methodology for predicting the rate and extent of lateral channel shifting and the down-valley migration of meanders.

The methodology is based primarily on an analysis of bend movement from map and aerial photograph comparisons. As a result, practicing engineers can evaluate the potential for adverse impacts from incremental meander migration during the design life of a bridge or highway river crossing and can ascertain the need for countermeasures to protect the bridge from any hazards.

Classifying the Reach

An essential first step in applying the methodology is screening and classifying the river reach or reaches under consideration. Using a database of more than 1,500 meander bends on 89 rivers in the United States, the research team verified and extended the results of earlier research (5, 6). The investigation confirmed that meandering channels that do not vary significantly in width are relatively stable, but channels that are wider at bends are generally more active.

This simple stratification of meanders is valuable to the bridge engineer as a screening procedure, to identify meanders that are stable. The class of “equi-width” meandering streams does not require additional analysis. The more actively meandering streams can be analyzed with the photogrammetric comparison techniques presented in the handbook.

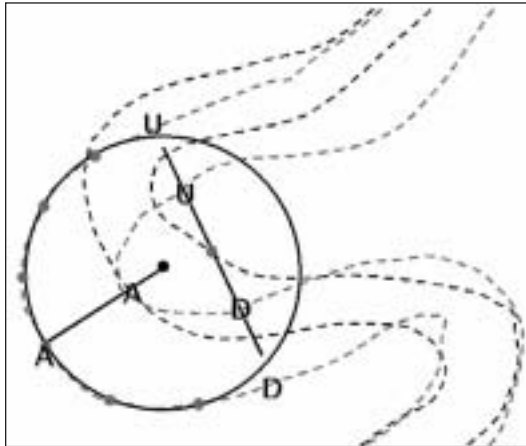


FIGURE 3 Measuring the change in radius and movement of the centroid of best-fit circles on the banklines yields a quantitative estimate of migration distance, rate, and direction.

Aerial Photo Comparisons

The methodologies require time-sequential aerial photographs or maps of the meander site. Historical and contemporary aerial photos and maps are available at low cost from several federal, state, and local agencies. The Internet also provides sites with links to data resources and searchable databases for maps and aerial photographs.

The availability of aerial photographs makes the methodologies presented in the handbook powerful and practical tools for predicting meander migration. A sampling of websites that provide historic aerial



FIGURE 4 Historic and predicted channel migration of Sacramento River, 1937–2012.

photograph resources appears at the end of this article.

The comparison of sequential historic aerial photographs, maps, and surveys provides an easy and relatively accurate method for determining stream migration rates and directions. The amount of detail available for analysis increases as the length of time between successive maps or photos decreases. Nonetheless, a longer period of record in a comparison will average-out any anomalies and will provide a better basis for predicting meander migration by extrapolation.

Abrupt changes in migration rate and major shifts of position often can be accounted for by analyzing

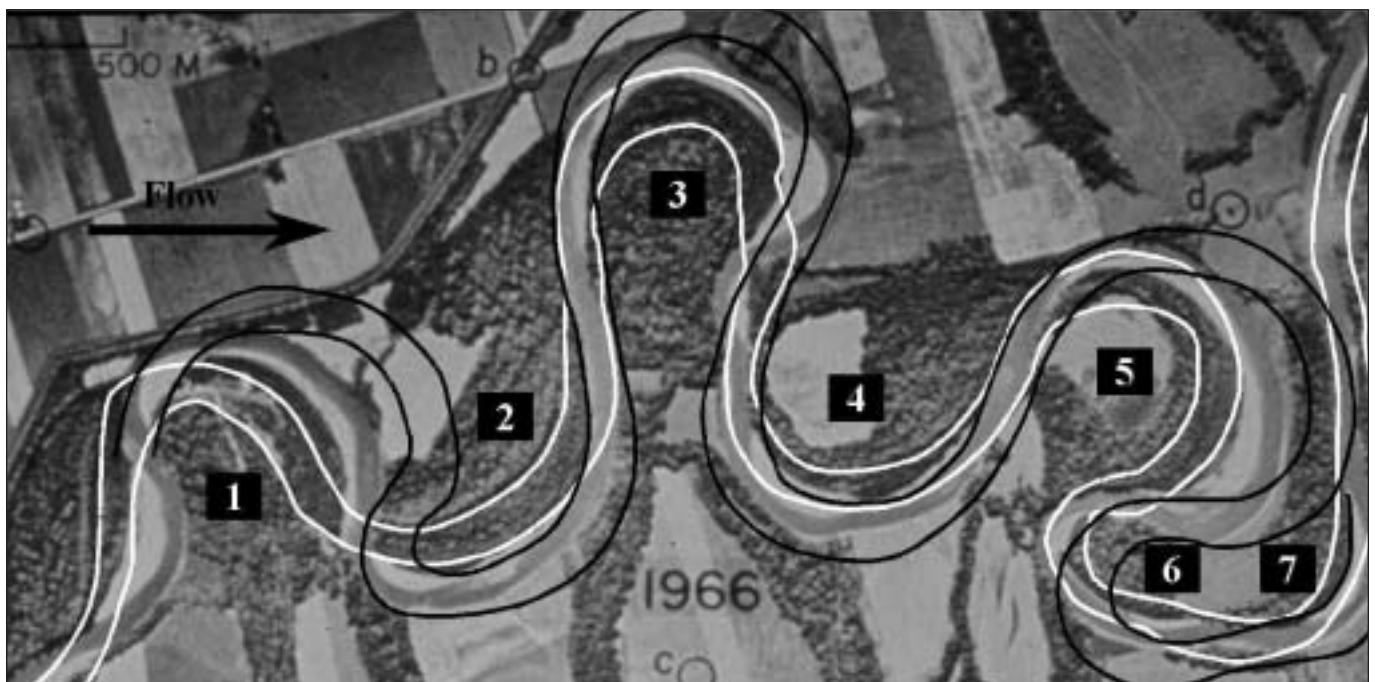


FIGURE 5 Aerial photograph of White River in 1966 superimposed with 1937 bankline position (in white) and bankline prediction for 1995 (in black).

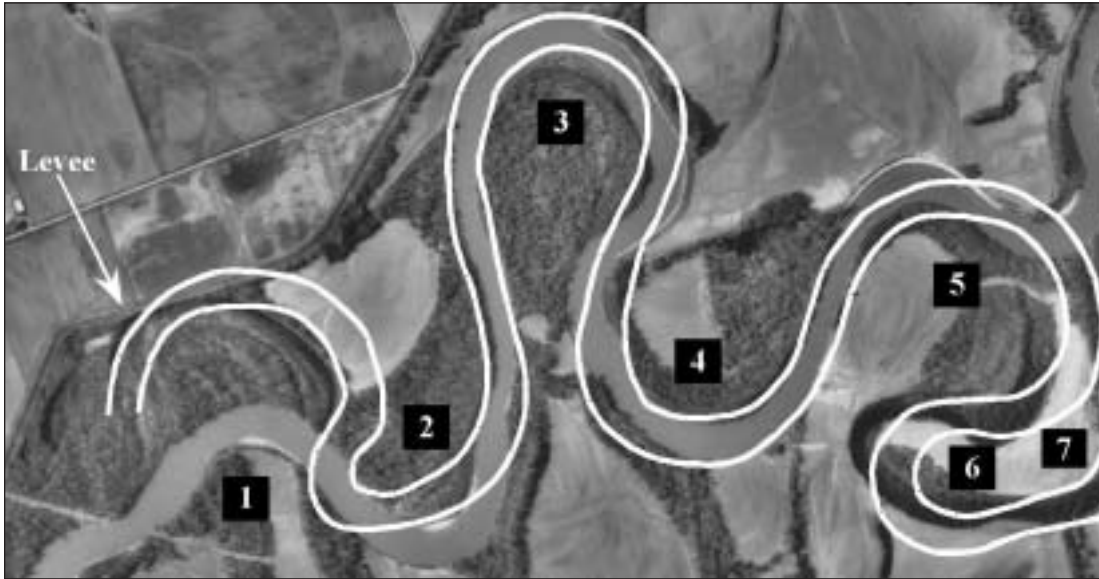


FIGURE 6 Predicted 1995 bankline position (in white) superimposed onto a 1995 photograph of White River. Anomalies are attributable to man-made and natural cutoffs and bank protection.

maps and photos for changes in land use; in addition, gage records of nearby streams can reveal extreme flow events. Predicting migration for channels that have been modified extensively, or that have undergone major adjustments because of land use changes, will be less reliable than those made for channels in relatively stable watersheds.

Overlay Comparisons

An overlay comparison coordinates channel banklines or centerlines traced from successive historic maps or photos, enlarged or reduced to a common scale. Common reference points are identified, and the banklines of the meander bend are delineated on successive photos. The banklines are overlaid or superimposed by matching the common reference points.

The superimposed bankline positions can be evaluated by measuring the change in radius and movement of the centroid of best-fit circles on the banklines (Figure 3), to provide a quantitative estimate of migration distance, rate, and direction over time. The information and data obtained from this analysis inform predictions about the future position of the river (Figure 4).

The process can be completed manually by tracing the stream bends and the inscribed circles on clear mylar overlays. Importing the bends and circles into a GIS, however, presents the comparisons with greater precision and accuracy.

The Data Logger, a menu-driven template for inscribing the circles, was developed to streamline the measurement and analysis of bend migration data and to aid in predicting channel migration. The Data Logger provides a quick way to gather and archive data on

the river planform—that is, the river’s contour seen from above.

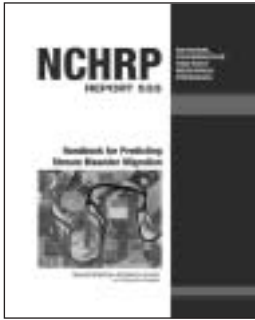
Using the data archived by the Data Logger, the Channel Migration Predictor forecasts the magnitude and direction of bend migration at a specified time in the future. The Channel Migration Predictor examines a table of data for several bends, as well as two or three historical records per bend, and then predicts rates of change in bend radius and bend center position.

Testing the Techniques

Aerial photograph comparisons and the GIS prediction tool were used to predict meander migration by the White River in Indiana. Aerial photographs from 1937 and 1966 were obtained for a reach of the river; the banklines were delineated on each set of photographs; and the banklines were registered for comparison. The GIS meander migration prediction tool was used to estimate the bankline position for 1995.

Figure 5 shows the 1937 bankline position of seven meander bends and the 1995 bankline positions of the same bends as predicted by the GIS meander migration prediction tool, superimposed on the 1966 aerial photograph. The 1995 bankline positions of the bends predicted by the GIS meander migration prediction tool were then superimposed onto a 1995 photograph of the river (Figure 6).

A comparison of the actual bankline locations with the predicted bankline positions reveals that the GIS tool can predict meander migration accurately for unconstrained bends—that is, for streams without revetment (banks with stone or concrete facing) or hard points. Figure 6 shows the accuracy of the pre-



ditions for the 1995 bankline positions of Bends 3 and 4 and for the cutoff at Bend 5.

The unexpected and anomalous bankline positions are attributable to a man-made cutoff (Bends 1 and 2), a natural cutoff (Bends 5, 6, and 7), and, possibly, bank protection (Bends 3 and 4) before 1995. The man-made cutoff of Bend 1, probably a response to the major threat posed by meander migration to a nearby levee, also has caused the distortion of Bend 2 in comparison with the predicted shape.

The cutoff of Bend 5 has caused the distortion of Bend 5 and the abandonment of Bends 6 and 7. The migration of the outer bank along the downstream limb of Bend 3 and at the apex of Bend 5 appears to have been halted in part by a protective bank revetment. The bankline positions of Bends 1 and 2, as well as the revetted portions of Bends 3 and 4, probably would have matched the predicted positions if not for human interference.

Reality Check

Much work remains before statistical or deterministic methods can predict the impacts of meander migration on transportation infrastructure with certainty and ease. The methodology developed in this research, employing a comparative analysis of maps and aerial photographs, may be viewed as an interim approach; nonetheless, the methodology will not be replaced by more sophisticated analytical techniques soon. The techniques presented in the handbook will always be useful for reconnaissance or for a “reality check” on other approaches to predicting meander migration.

The handbook contains guidance on the applications of the analytical products of NCHRP Project 24-16, along with examples; describes map and aerial photograph comparison techniques; and offers guide-

lines for predicting channel migration near transportation facilities. The methodology will be useful in the reconnaissance, design, maintenance, and inspection of highway facilities and will help reduce the cost of construction, repair, rehabilitation, and countermeasures for lateral channel instability.

The screening procedure to identify the stable reaches of meandering streams will prevent the unnecessary allocation of resources for engineering and inspection. The result will be a more efficient use of highway resources and a reduction in the costs associated with the impacts of channel migration on highway facilities.

Acknowledgments

The research described in this article was sponsored by the American Association of State Highway and Transportation Officials (AASHTO), in cooperation with the Federal Highway Administration (FHWA), and was conducted under the National Cooperative Highway Research Program administered by the Transportation Research Board (TRB), a division of the National Research Council (NRC) of the National Academies. The opinions and conclusions expressed or implied in this article are those of the author and are not necessarily those of TRB, NRC, FHWA, AASHTO, or the individual states participating in the National Cooperative Highway Research Program.

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edcwww.cr.usgs.gov
- U.S. Department of Agriculture: Aerial Photo Field Office
www.apfo.usda.gov/filmcatalog.html

Practical Products from Channel Migration Research

◆ *NCHRP Report 533: Handbook for Predicting Stream Meander Migration* describes the application of the stream prediction methodology with illustrated examples. An accompanying CD-ROM contains an ArcView-based data logger and channel migration predictor.

◆ *NCHRP Web Document 67: Methodology for Predicting Channel Migration* contains the final report and is accessible online.

◆ *CRP-CD-49: Archived River Meander Bend Database*, a four-CD set, is a companion product to the web document and contains a database of 141 meander sites with 1,503 bends on 89 U.S. rivers.

To purchase the handbook or CD set, or to view the handbook or web document online, go to www4.trb.org/trb/onlinepubs.nsf.

The Roberts Management and Leadership Model

TOM LARSON



The author, 2003 recipient of the Frank Turner Medal for Lifetime Achievement in Transportation, is a former head of the Federal Highway Administration. He also taught and served as an administrator at Pennsylvania State University, was the state's Secretary of Transportation, and chaired the TRB Executive Committee, among many leadership positions. A consultant, he serves on several TRB committees and lives in Lemont, Pennsylvania.

At a summer program for local and state government officials at Harvard University's John F. Kennedy School of Government in 1986, toward the end of my 8 years as Secretary of Transportation for the Commonwealth of Pennsylvania, I learned about a management and leadership model that has proved practical and valuable. Marc Roberts, then the principal professor of the program, was a gifted teacher—what he taught in those sessions has stuck with me—and he made the model come to life. Because the origins of the model are unknown to me, I always have credited it to Roberts as the introducer.

Putting into practice the information presented at any brief program is remarkable. The experience has led to a standard bit of advice: to enjoy lasting gain from a learning opportunity that is not presented in a classic, long-term academic program, make sure that at least one of the key points stays with you. A good program offers many memorable gems, but grafting at least one principle into your consciousness and adopting it immediately and tenaciously will change your working life.

That is what happened to me when, after exposure to the genius of Professor Roberts, I returned to apply his management and leadership model in a challenging assignment. The term, management and leadership model, may give pause—are management and leadership the same? No, they are not.

"Signals" is a guest editorial column, published on an occasional basis, that offers thought-provoking commentary by organizational leaders, to stimulate discussion on topics related to transportation research, practice, and policy. Reader response is encouraged in the form of letters to the editor.

The model, however, assists managers who need to develop a structural approach that ensures attention to vital details. On the leadership side, the model encourages seeing the larger picture—taking the view as if from 40,000 feet. The genius of the model, however, is its rationality and simplicity—the model works and therefore will be remembered and used again and again.

Strategic planning is at best a dark art of fact and fiction, but strategic planning will deliver on its promise if and only if it is followed by strategic management and strategic leadership. The Roberts model presents an ideal approach to accomplish this follow-up. Implemented aggressively and intelligently, the model can ensure the cost-effectiveness of a major investment in strategic planning.

Drawing the Model

Models often rely on presentation graphics. The graphics for this model, however, are basic—only three circles.

The first circle is labeled Vision (Figure 1). Leaders must have a strong, clear vision. Great leaders may be able to see into the future of their enterprise. But even such strong vision is at best like a flickering holograph. Constant attention is necessary to keep the vision close, clear, and accurate enough to motivate those who are following.

The second circle is labeled Authorizing Environment (Figure 2). The authorizing environment permits an enterprise to progress; the authorizing environment includes the enterprise's family of stakeholders.

The temptation is to draw the boundaries of the stakeholder family too narrowly. Yet imagining only a small stakeholder family as authorizing an enterprise is a danger, because nearly everything is interconnected. Overestimating the size of the family also

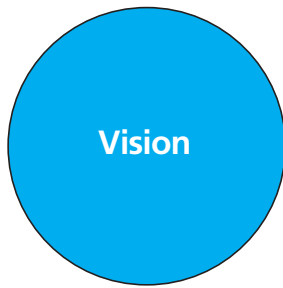


Figure 1



Figure 2



Figure 3

may cause problems but is less dangerous than underestimation.

The third in the group of circles is labeled Organizational Capacity (Figure 3). This label is not mysterious. Can the organization do the job? Can it measure up to the vision? Can it satisfy the critical attention of the stakeholders?

At this point, leadership and management blend into one another. Leaders focus on “that vision thing” and on relating the vision to the authorizing environment—that is, to the stakeholder family. Managers, however, must make the organization work and must ensure the capacity to deliver the goods. In the ideal scenario, one person may handle all of these responsibilities; but even in the ideal, recognizing the distinctive nuances of the leadership and management roles is helpful.

The size of the three circles is not significant when a general case is represented. In a particular case, however, the size of the circles may be adjusted to indicate priorities. The genius of this model is apparent when the three circles are brought together in a single figure (Figure 4). As the circles merge, the common area defines a working space, where good things can be expected to happen.

Vision standing alone is of little value. An autho-

rizing environment without anything worth authorizing is scarcely significant. A vision and a family of expectant stakeholders without the organizational capacity to satisfy the demands of both will lead to frustration and failures.

Exploring the Model

The manager’s and leader’s tasks are now clear. First, the vision: is it right, timely, challenging, and possible? The vision must be studied, articulated, and changed when conditions merit change.

These are not small tasks. An illustration of the model may portray the leader at the top of the diagram, attempting to hoist the vision, but considering all the while whether the working space for success will allow it. Will the vision be raised beyond practical relevance to the stakeholders and beyond the capacity of the organization?

The next consideration is the authorizing environment. Many techniques are available to gauge directions: focus groups, surveys by a variety of means, visits by leaders, and regular contacts with key stakeholders. For example, when I was at the Pennsylvania Department of Transportation (PennDOT), I asked my administrative assistant to keep a rolling list of approximately 100 persons. At least once each month I had contact with these 100—by phone, fax, or visit (this was before e-mail)—as a way to convey their importance to the PennDOT enterprise.

Organizational capacity is a “two yards and a cloud of dust” kind of activity, never completed because conditions change. Sometimes the change proceeds from a demanding vision. Other times, the family of stakeholders may change or the stakeholders may change their expectations. Finally, the task of placing the best persons where they can make a difference—and be rewarded—never ends.

The common working space as shown in the figure is small. This means that there is almost no room to maneuver any of the three components. An enlargement of the vision, for example, may place it beyond the capabilities of organizational capacity.

(continued on page 17)

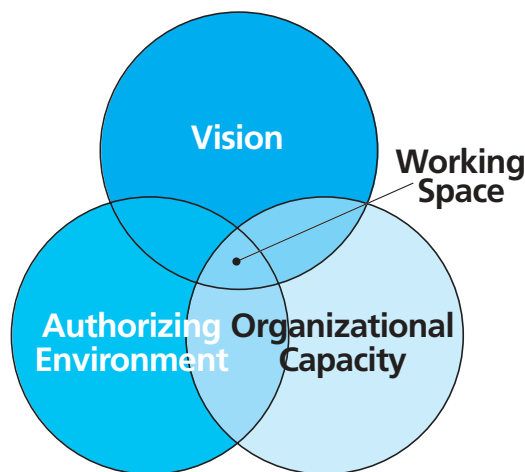


Figure 4

ROBERTS MANAGEMENT AND LEADERSHIP MODEL (continued)

Lessons and Challenges

Therefore always ask, "How large is the working space for this enterprise?" There are no metrics, because working space is a concept. Persons with experience can approximate and apply the concept, but with caution. In a rightly managed, strongly led enterprise, the space is large enough to accommodate adjustments to the vision and to the organizational capacity and even to tolerate changes in the authorizing environment.

The challenge for managers and leaders in every enterprise is to develop a deft, creative touch for making adjustments that improve the enterprise. But caution—making adjustments sounds deceptively easy. In most cases, adjusting will be more dangerous than easy. Why? Adjustments involve changes in people, positions, budgets, opportunities, or—most threatening of all—culture, which comprises the organization's norms, values, philosophy, traditions, standards, interactions, and the like.

In my long exposure to management and leadership issues, culture change has presented the most provocative opportunities and the most insidious, profound threats. The worlds of business and government demand adjustments and change. Leaders and managers must face up to the required changes and perform as their roles demand. But when the changes have an impact on organizational culture, the situation becomes a litmus test for success in leadership and management.

Applying the Model

My experience applying the principles of the model was largely successful, but I found early on that ignoring one part of the model would lead to failure. Near the end of my term as PennDOT Secretary, my awareness of the authorizing environment became clouded. Working with the staff and several outside groups, I started planning a new safety campaign.

Then a friend from an outside group of stakeholders—the president of the Pennsylvania Chamber of Commerce—took me aside and said, "Tom, your term is about up, and you should not plan this initiative in a vacuum." That was a bitter realization, but it turned me back to the Roberts model, which made clear that the initiative lacked the work space for success. The vision was there, and the stakeholders were prepared, but the organizational capacity was lacking to back up the initiative.

With persistent study and application, the Roberts model will nourish strategic leadership and management. Applying the model will enlarge the pool of effective managers and leaders. Has there ever been a time when these were needed more?

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The Marine Transportation System and the Federal Role

Measuring Performance, Targeting Improvement

THOMAS R. MENZIES, JR., AND JOCELYN N. SANDS

Menzies is Senior Program Officer, TRB Studies and Information Services, and served as Study Director for this project. Sands is Research Associate, TRB Studies and Information Services.

Much of the freight transported within the United States and almost all the nation's international commerce relies on the marine transportation system (MTS). The system is varied and immense, comprising thousands of miles of navigable channels, hundreds of port complexes, and thousands of terminals along lakes, rivers, and coastal waterways. Tens of thousands of U.S. and international shippers and carriers operate a range of vessels—from barges to cargo ships—on these waterways.

Commodities essential to the economy and the daily lives of Americans—from minerals and building supplies to energy and farm products—are moved in bulk vessels across the country and to and from other regions of the world via waterways. Finished goods are brought into and shipped out of the country in containers transported by the thousands in ocean-crossing vessels. Interconnected with other modes of transportation, the MTS is a crucial component in a vast freight system.



Joint Enterprise

The MTS is as much a joint private- and public-sector enterprise as other parts of the nation's transportation system. The private sector owns and operates the vessels and most of the terminals and is responsible for the commerce that flows through the system. The public sector provides much of the infrastructure at ports and on the waterways and is responsible for keeping the system functioning for commerce in a safe, secure, and environmentally sound manner.

The federal government's roles in the MTS include

- ◆ Constructing, operating, and maintaining the navigable channels;
- ◆ Managing the traffic on the waterways;
- ◆ Providing mariners with aids to navigation, charts, and information on water and weather conditions;
- ◆ Regulating the safety and environmental compatibility of vessels;
- ◆ Responding to marine accidents that threaten public safety and the environment;
- ◆ Helping to finance the highways that connect marine ports and terminals to the larger transportation system; and
- ◆ Ensuring the security of the MTS and its many components.

Improving Coordination

These federal responsibilities are substantial, but widely dispersed and not easily coordinated. They are fulfilled through many federal programs administered by various federal agencies and governed by many statutory requirements—sometimes reflecting historical interests and institutional arrangements. These agencies often lack good information and analyses to support and coordinate their decision making.

The federal agencies and Congress need to know how well the MTS is meeting the demands of com-

merce, safety, environmental protection, and national security. They need ways to identify shared goals, to assess progress, and to plan actions that meet these goals.

Several federal agencies—including the U.S. Coast Guard, National Oceanic and Atmospheric Administration, U.S. Department of Homeland Security, U.S. Maritime Administration, U.S. Department of Transportation (DOT), U.S. Department of Agriculture, and U.S. Army Corps of Engineers—therefore asked the Transportation Research Board (TRB) to advise them on ways to improve coordination of federal government planning and decision making on the MTS. Under the auspices of the National Academies, TRB convened a 14-member committee with expertise in economics, marine transportation, environmental protection, port management and planning, waterways management, and transportation policy and finance, to conduct the study (see box, page 20).

Information and Analysis

In its report, *The Marine Transportation System and the Federal Role: Measuring Performance, Targeting Improvement* (TRB Special Report 279), the committee identifies an urgent need to strengthen the information and analyses for federal decision making about the MTS. Safety, environmental protection, commerce, and security are concerns that require coordinated decisions across federal programs. Federal policy makers must understand how well the system is performing in each of these areas. Moreover, policy makers must know how the MTS is used and how it functions within the broader transportation system and the economy.

With so many responsibilities spread among so many programs, federal policy makers need to know how the programs are working collectively to further national interests and need to determine where the programs may be working at cross-purposes. Policy makers must be able to identify emerging problems and to take timely actions in response.

Demands on the MTS are growing and changing continuously. Growth in international trade is propelling traffic demand. In addition, environmental, safety, and security issues are changing. An expanding and increasingly integrated system requires more information of better quality to support decision making.

The committee finds that information on system performance is mostly program- and project-specific. For example, much information is collected on the incidence and length of delays at individual locks on the inland waterways, yet the data are not applied in assessing congestion and delays on the system as a whole or in determining the impacts on national freight transportation patterns and costs.

The available data can and should be used to assess the performance of the nation's navigation infrastructure in facilitating commerce, as well as to guide investments and policies to improve performance. For example, information collected on vessel groundings, collisions, and oil spills in U.S. waters is helpful in assessing the safety of vessel operations and design, but the information also could guide federal investments in hydrographic data and in channel dredging to improve the safety and efficiency of the marine operating environment.

Galvanizing Role

Expecting individual agencies to collect and analyze system-level performance information is not realistic—each agency defines its information needs by specific program objectives, budgets, and statutory obligations. Nevertheless, U.S. DOT is the one federal entity that has a clear and unambiguous responsibility to ensure that national and system-level performance information is made available and used for federal transportation policy making.

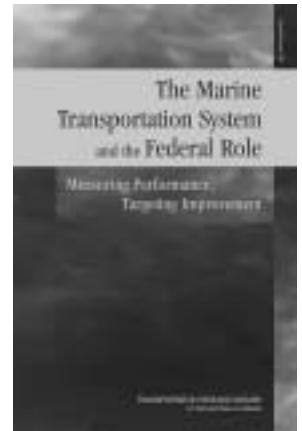
U.S. DOT has the expertise and capability to develop the information by drawing on data collected by other federal agencies and by nonfederal entities. U.S. DOT also is responsible for viewing the operations and performance of the MTS within the context of the nation's transportation system and the national interests. No other federal agency involved in the MTS has this overarching perspective and charge. U.S. DOT can communicate this information to Congress and to the Office of Management and Budget, which connects federal agency budgets with policies.

In its report, the committee urges the Secretary of Transportation to seek a mandate from Congress for U.S. DOT to take the lead in measuring, monitoring, and assessing options to strengthen the contribution of the MTS to key national interests, including commerce, environmental protection, safety, and security. In assuming this leadership role, U.S. DOT should consult with the other federal agencies and users of the system to establish performance goals for the MTS that relate to national interests and should seek a formal endorsement of these goals from Congress.

A better-informed Congress would be able to support these goals by committing resources and by making appropriate changes in the responsibilities, organization, and expectations of the federal programs and agencies. This would ensure that federal policies and programs can be developed in the context of the MTS's role in the national freight system.

Conditions and Performance

Good information on system performance is not enough to bring about more rational and coordinated



TRB Special Report 279, *The Marine Transportation System and the Federal Role: Measuring Performance, Targeting Improvement*, is available from TRB; to view the book online, www.TRB.org/publications/sr/sr279.pdf.

Committee for a Study of the Federal Role in the Marine Transportation System

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federal decision making, but it is a start, with precedents in other federal transportation programs. For example, Congress has demanded regular reports on the performance and needs of the nation's aviation and surface transportation systems.

The committee proposes as a model for a report on the MTS the long-standing, biennial *Report to Congress on the Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance* (C&P report).¹ U.S. DOT develops the C&P report with the help of the Federal Highway Administration and the Federal Transit Administration, under a mandate from Congress to provide regular national-level information on system performance—not only measuring conditions and performance, but also assessing future demands, expectations, and policy options.

The committee recommends that U.S. DOT begin immediately to develop reports on the use, condition, performance, and demands of the MTS, modeled after the biennial C&P reports on highways and transit, and that the department seek a mandate from Congress to produce the reports regularly. In the committee's view, these reports also should assess the funding levels and investments needed to improve system conditions and performance.

A range of metrics, data, and analyses are necessary to measure and monitor MTS performance relating to national interests. The focus should be on metrics that translate into performance—such as trends in safety and transportation costs—instead of on measures of program output, such as miles of channel dredged or number of vessels inspected.

¹ www.fhwa.dot.gov/policy/2002cpr/es.htm.

Gathering, synthesizing, and analyzing performance-related information should prompt explicit and critical thinking about the scope and effect of federal involvement in the MTS. Many insights should be gained into system performance patterns and trends that are not now apparent because of the scattering of information across the system.

With credible, objective, and accessible information provided on a regular basis on MTS conditions and performance, decision makers can prioritize investments and establish policy in the national interest. Federal policy makers will be in a better position to ensure that programs are well devised and resources well placed.

The C&P reports for highway and transit provide important intangibles, drawing notice to national needs in these modes. The experience suggests that analyses and regular performance reporting also will draw the attention of the public and Congress to the needs of the MTS.

Related Considerations

Regular system condition and performance analysis and reporting will help Congress in decision making. The committee recommends that Congress pay close attention to the following topics:

- ◆ Reinvesting user-generated revenues into the MTS;
- ◆ Developing a more balanced set of tools to make national transportation investment and policy decisions, recognizing the increased integration of the transportation modes;
- ◆ Undertaking applied research to further the capacity, safety, environmental protection, and security of the nation's ports, intermodal connections, and other marine facilities and services; and
- ◆ Developing a more thorough understanding of the operations, capacity, and use of the MTS—and of the freight system in general—to identify ways to improve the integration of security, environmental protection, and safety features and capabilities into the system as it facilitates the nation's commerce.

The integration of the nation's transportation modes, particularly for the movement of freight, may compel changes in federal responsibilities and institutions. Meanwhile, much can be done to ensure that the federal government remains responsive to the needs of commerce and the public. The committee's recommendations represent first steps in ensuring that the MTS—and recognition of intermodalism in general—has a meaningful influence on federal policies and decision making.



Faster Response After Landslides on Highways

Caltrans Tests Portable Field Mapping Systems

LOREN L. TURNER

Portable field mapping systems significantly reduced the time to deliver engineering solutions for maintenance and construction after landslides affecting highways in California, minimizing costly delays.

The author is Senior Transportation Engineer, GeoResearch Group, Division of Research and Innovation, California Department of Transportation, Sacramento.

Landslides can be difficult to predict, and their effects on roadways can be significant. Responding quickly and effectively is key to minimizing costs and traffic delays.

Problem

Repairs and maintenance after landslides on U.S. highways cost an estimated \$106 million annually. With an estimated 1,200 miles of landslide-prone highways, the California Department of Transportation (Caltrans) spends approximately \$22 million each year on managing an average of 200 landslides and 10 road closures.

An extreme example is the Mill Creek landslide, which closed State Route 50 east of Sacramento in the winter of 1997 for more than one month and dammed up the American River for several hours. Smaller landslides, however—like the one on High-

way 20 in Colusa County (photo, below)—occur more often and demand more resources.

Detailed mapping of landslides is essential for understanding slope failures and for designing effective repairs. Data from maps that show cross sections assist in slope stability analyses and in designs for effective mitigation.

Landslides usually occur without warning. Engineers must respond rapidly, develop mitigation strategies within hours or days, and direct the construction and maintenance crews to carry out the repair work and restore traffic service safely. Rigorous surveys often are needed but are difficult because of the time constraints.

Solution

The Caltrans GeoResearch Group (GRG) initiated a research project to test innovative mapping technologies. GRG acquired two field mapping systems and evaluated them during deployments on landslides from October 2001 through October 2002.

The first system relied on differential Global Positioning System (GPS) and laser ranging hardware, providing accuracy within 1 meter. The second system employed real-time kinematic GPS hardware with centimeter-level accuracy.

Each system offered its own advantages in accuracy, user interaction, system complexity, training requirements, and cost. A goal therefore was to identify equipment with a good balance of these characteristics.

In a typical field mapping system, the operator carries the GPS unit and a ruggedized computer in a backpack or belt pack. The interface with the computer is through a handheld touch screen or pen screen. The GPS antenna, mounted in the backpack or on a pole, and the GPS receiver together provide the operator's position. An optional handheld or pole-



Cut slope failure on Highway 20, Colusa County.



Field mapping in progress.

mounted laser ranging device allows the operator to stand in one position and acquire the relative coordinates of surrounding points that otherwise would be difficult to obtain with the GPS (photo, above).

As coordinate points are acquired, the software generates a digital terrain model, or topographic map, in real time on the computer's display. The basic training for an operator typically requires a two- to three-hour field orientation with an experienced staff person but does not require a background in surveying.

The real-time maps provide a distinct advantage—before leaving the site, the operator can determine immediately if the map details are satisfactory. With real-time topographic map data in the field, the user also can generate map cross-sections quickly.

Other data can be incorporated into the maps, such as field notes, digital photos, and hand sketches. These data then can be used for comprehensive mapping, slope stability analysis, and earthwork calculations.

Application

Both of the field mapping systems were deployed successfully in response to more than 30 landslides. In November 2002, for example, a cut slope failed on State Route 20 in Colusa County. On an emergency contract to develop slope grading plans, Caltrans engineers used the field mapping system to survey the slope, develop cross sections, perform slope stability analyses, and provide grading recommendations. One person completed the field mapping work in less than one day and generated a topographic map before leaving the site.

Benefits

In addition to producing higher quality data and maps, the systems realize an economic benefit. The labor cost for a single operator mapping the November 2002 Colusa County landslide over the course of one day was about \$300. A conventional survey would have required a crew of three surveyors for one full day; after that, one person would need two more days to process the data and generate a map; the total labor would have cost \$1,500.

Assuming 200 landslides per year, the mapping system would cost \$180,000 to deploy for a 3-year period (200 landslides x \$300 labor x 3 years); in contrast, conventional surveys would cost \$900,000 (200 landslides x \$1,500 labor x 3 years). Even including the initial cost of one mapping system (\$15,000) and the cost of the research project (\$80,000), the potential net savings would be \$625,000, or a benefit of \$3.30 for every \$1 spent.

The direct and indirect economic benefits and costs to the traveler are difficult to quantify; however, quicker landslide response reduces the significant cost of congestion. For example, the month-long closing of the highway after the Mill Creek landslide cost more than \$1 million per day.

The GRG research demonstrated the effectiveness of portable field mapping systems with successful test deployments on rapid-response landslide projects. These systems significantly cut the time required for staff to deliver engineering solutions for maintenance and construction work, reducing the delays to traffic.

Moreover, the systems performed in many situations for which conventional surveying procedures were not feasible. In these situations in the past—before the availability of portable field mapping systems—Caltrans engineers would have relied on crude estimates of landslide geometry from tape measurements and compass bearings.

For more information contact Loren L. Turner, Senior Transportation Engineer, GeoResearch Group, Division of Research and Innovation, California Department of Transportation, 5900 Folsom Boulevard, MS-5, Sacramento, CA 95819; telephone 916-227-7174, e-mail loren.turner@dot.ca.gov.

EDITOR'S NOTE: Appreciation is expressed to G. P. Jayaprakash, 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, 500 Fifth Street, NW, Washington, DC 20001 (telephone 202-334-2952, e-mail gjayaprakash@nas.edu).

TRB Meetings 2005

January

8 Data Analysis Working Group Forum on Pavement Performance Data Analysis
Washington, D.C.

9–13 TRB 84th Annual Meeting
Washington, D.C.
Mark Norman, Linda Karson

March

TBD Hazardous Materials Transportation Safety Workshop*
Las Vegas, Nevada
Frank Lisle

23–24 Future Truck and Bus Safety Research Opportunities Conference (by invitation)
Washington, D.C.
Richard Pain

April

4–6 17th Biennial Symposium on Visibility and Traffic Control Devices
Washington, D.C.
Richard Cunard

13–15 International Conference on Best Practices for Ultra-Thin and Thin Whitetoppings*
Denver, Colorado

24–28 2005 Transportation Planning Applications Conference
Portland, Oregon
Kimberly Fisher

May

1–4 10th International American Society of Civil Engineers Conference on Automated People Movers: Moving to Mainstream*
Orlando, Florida

8–11 International Workshop on Life-Cycle Cost Analysis and Design of Civil Infrastructure Systems*
Cocoa Beach, Florida
Stephen Maher

11–13 Census Data for Transportation Planning: Preparing for the Future
Irvine, California
Tom Palmerlee

22–25 National Roundabout Conference
Vail, Colorado
Richard Pain

June

20–24 7th International Symposium on Utilization of High Strength-High Performance Concrete*
Washington, D.C.
Frederick Hejl

27–30 3rd International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design*
Rockport, Maine
Richard Pain

27–
July 2 3rd International Symposium on Highway Geometric Design
Chicago, Illinois
Richard Cunard

July

11–13 Symposium on Stormwater Management for Highways
Florida
Stephen Maher

17–20 6th International Bridge Engineering Conference
Boston, Massachusetts

August

13–18 8th International Conference on Concrete Pavements*
Colorado Springs, Colorado

September

15–16 Railroad Operational Safety Research Update
(by invitation)
Irvine, California
Richard Pain

TRB Annual Meetings

- 85th, January 22–26, 2006
- 86th, January 21–25, 2007
- 87th, January 13–17, 2008

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). 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, or e-mail lkarson@nas.edu. Meeting listings without TRB staff contacts have direct links from the TRB calendar web page.

*TRB is cosponsor of the meeting.

Rodney K. Lay

Mitretek Systems, Inc.

In an article in the November–December 1999 TR News, featuring forecasts for the new millennium, Rodney K. Lay predicted that early in the 21st century, vehicle–highway automation would provide enhanced accessibility and mobility for users of the surface transportation system. By implementing a range of advanced technologies integrating vehicle and infrastructure performance improvements, vehicle–highway cooperation would represent the most important upgrade of the nation’s surface transportation system since the advent of the Interstate highway system, he maintained.

Through his research with Mitretek Systems, Inc., in Falls Church, Virginia, and his committee work in TRB, Lay is helping to realize the goal of intelligent transportation systems (ITS). Since joining MITRE Corporation in 1969 and Mitretek in 1996, Lay has designed and managed much of the support to the U.S.



“Driving and commuting need rethinking. And the future roles of operators, drivers, and travelers need massive rethinking.”

Department of Transportation (DOT), specifically to the National Automated Highway System Consortium (NAHSC) and the Intelligent Vehicle Initiative. He also has managed the Mitretek site at the Federal Highway Administration’s (FHWA) Turner–Fairbank Highway Research Center (TFHRC).

Lay was the program manager for Mitretek’s automated vehicle safety and control systems tasks until 2000, when he was promoted to Fellow in the Mitretek Center for Telecommunications and Advanced Technology. His current focus is on improving highway safety with ITS and advanced research within FHWA.

For TRB, Lay chairs the Vehicle–Highway Automation (VHA) Committee, which focuses on the development, application, and operation of driver assistance and automated control to the vehicle and highway system. The committee scope includes all forms and levels of control, ranging from driver assistance systems on streets and highways to full vehicle control systems on freeways and dedicated lane facilities. Lay helped prepare the TFHRC strategic research agenda framework and the VHA Committee’s research problem statements, reporting on the outcomes at annual ITS World Congress meetings.

Lay’s current work with TRB focuses on two elements of future ground transportation, each of which demands immediate, innovative attention: vehicle–infrastructure cooperation and the future role of the driver. Cooperation was the subject of the VHA

Committee 2004 midyear workshop. Lay anticipates debate and research into the new roles for drivers in VHA systems, the skills that may be required, and the impacts of these changes.

“Driving needs rethinking. Commuting and ‘living on the move’ need rethinking. And the future roles of operators, drivers, and travelers need massive rethinking,” he notes.

Lay anticipates that vehicle–infrastructure cooperation will be implemented during the next several years through

- ◆ Collision warning systems that provide auditory, haptic, and visual warnings and that control vehicle position and speed in defined situations;
- ◆ Guidance systems that help drivers avoid obstructions and stay in lane;
- ◆ Transit and commercial vehicles that can be fully automated within designated corridors;
- ◆ Road systems operations that improve safety and productivity through sharing and acting on information generated in vehicles and by the infrastructure.

A native of England, Lay began his engineering career at the age of 17 as an apprentice with the Metropolitan Vickers Company in Manchester. Twelve years later, in 1967, Lay received a doctorate in electrical engineering at the University of Aston in England and moved to the United States to work at General Electric’s large steam-turbine generator design office in Schenectady, New York.

In 1969, he joined MITRE Corporation to work on linear induction motors for the U.S. DOT’s high-speed ground transportation program at Pueblo, Colorado; while there he gave then-Secretary of Transportation John A. Volpe a high-speed ride. He also contributed to automated guideway and personal rapid transit projects.

During the 1980s, Lay worked with the Department of Energy and the Environmental Protection Agency on fossil and renewable energy and power conversion systems. He also served on the Public Policy Committee of the American Nuclear Society and on a U.S. technical advisory committee of the International Electrotechnical Commission.

After 2 years in the commercial world, Lay rejoined MITRE in 1991 and began work on automated highway systems. He participated in the seminal U.S. DOT Precursor Systems Analysis contracts and in the NAHSC. At the 1997 AHS demonstrations at San Diego, Lay chaired the program for the first annual meeting of the International Task Force on Vehicle–Highway Automation. In all, Lay worked for MITRE for 25 years in various staff and management positions, before departing for Mitretek in 1996.

Lay is the author or coauthor of more than 30 research papers and has participated in several national and international conferences on transportation, communications, energy, the environment, and futures and risk analysis.

Amy A. O'Leary

Virginia Transportation Research Council

Unlike many of her transportation research colleagues, Amy A. O'Leary has not spent years solving one particular problem. Instead, in her 15 years with the Virginia Transportation Research Council (VTRC), O'Leary has conducted and managed research on the ways that transportation issues affect people, including older drivers; transportation finance; construction project scheduling; right of way; public involvement; and the social, economic, and environmental effects of transportation systems. With a background in sociology, not in engineering, O'Leary finds the diversity in research assignments ideal.

"I've gotten involved in varied research projects that tapped my understanding of how organizations work and how groups influence individuals," she notes. "I sometimes remind my engineer colleagues about how issues are black-and-white in their



"Research is the key to making every transportation dollar go as far as possible to meet society's needs as long as possible."

world, but in a sociologist's world, many issues are relative to the organization, social group, or culture."

Policy questions often frame her work. As one of the five associate directors of research at VTRC, O'Leary has led research teams that produce deadline-driven briefing documents on sensitive policy questions for the commissioner and top managers of the Virginia Department of Transportation (DOT). One of her first assignments at VTRC was to participate in a highly visible two-year study on the equity of the state's formulas for allocating transportation funds to localities.

Her current team—comprised of scientists with backgrounds in environmental science, transportation history, economics, and policy—conducts research on environmental and business practices issues important to Virginia DOT's managers and field staff.

Many of O'Leary's studies have involved face-to-face meetings, interviews, or focus groups with state residents or Virginia DOT staff. In right-of-way studies, for example, O'Leary attended several condemnation court hearings to examine how citizen juries and litigant-selected panels differ in deciding fair monetary compensation for property owners when a negotiated settlement cannot be reached. She presented her findings in a report prepared for the Courts of Justice Committees of the Virginia Gen-

eral Assembly. She coauthored a subsequent right-of-way study that examined the equity of payments to businesses displaced by highway improvements; the results were published in the *Transportation Research Record: Journal of the Transportation Research Board* in 2003.

O'Leary also has conducted research on the processes of construction project scheduling and public involvement, examining the impacts of the various steps, hand-offs, and groups involved in taking a transportation project from concept to ribbon-cutting. Her assessment of Virginia DOT's public involvement processes and public hearing formats were published in VTRC reports and in a *Record* paper in 2003.

O'Leary interviewed focus groups of elderly drivers from small towns and cities in Virginia to collect views on road signs, markers, and behaviors of other drivers. After a study of visually impaired pedestrians, O'Leary coauthored an article on evaluating detectable warning surfaces for sidewalk curb ramps, which was published in the *Record* in 1996.

O'Leary received a master's degree and a doctoral degree in sociology from the University of Virginia, where she worked as a Medical Center research evaluator from 1983 to 1989. She joined VTRC in 1989 as a research associate and has been promoted progressively to research scientist, senior research scientist, media group manager, and, currently, associate director for environment and business practices.

"My colleagues at Virginia DOT were extremely willing to educate me about transportation—and still are," she observes. "Young professionals with solid analytical and writing skills from nonengineering fields can be very valuable in transportation research."

O'Leary also has used her research skills through her involvement in several TRB committees. She has participated on the Social and Economic Factors Committee for 12 years, currently as chair. The committee examines direct and indirect social and economic effects of transportation systems.

She also serves as paper review chair for the Public Involvement in Transportation Committee, which she joined in 2001 after studying Virginia DOT's public involvement processes. The committee examines the practice of public involvement in transportation planning and project development activities.

O'Leary is also serving a 3-year term as a public member of the Board of Directors for the Accreditation Board for Engineering and Technology (ABET). She values that opportunity, she says, because DOTs depend greatly on the continuing supply of engineering and technology graduates.

"The magnitude of transportation needs and the significant financial constraints that face nearly every state make transportation research an essential activity," O'Leary points out. "Research is the key to making every transportation dollar go as far as possible to meet society's needs as long as possible."



Among the 43 participants at the October 29 meeting on earmarking of transportation research were (*left to right*) Eric Webster, U.S. House of Representatives Committee on Science; Barbara Sisson, Federal Transit Administration; TRB Executive Committee Chair Michael Townes, Hampton Roads Transit; TRB Executive Director Robert Skinner; TRB Senior Program Officer Ann Brach; Ruth Van Mark and Jeff Squires, U.S. Senate Committee on Environment and Public Works; and Rod Diridon, San Jose State University.

Group Discusses Research Earmarking

At the request of the Executive Committee, TRB convened a meeting on October 29 to discuss the growing trends and potential impacts of congressional earmarking in transportation research programs. More

than 40 individuals participated in the session at the National Academy of Sciences Building in Washington, D.C., including current and former congressional staff, university researchers and administrators, transportation providers, construction and materials suppliers, and representatives of federal agencies.



HEALTHY DEBATE—The Committee on Physical Activity, Health, Transportation, and Land Use held its final meeting, August 16–17, at the Keck Center, in preparation for releasing its report in early January. The 2-year study reviewed the broad trends affecting the interrelationships of physical activity, health, land use, and transportation; summarized what is known about these relationships and their implications for future policy decisions at the local, state, and federal levels; and identified priorities for future research. (*Left to right*) Committee members Ken Powell, Georgia Department of Human Resources; Pat Mokhtarian, University of California–Davis; Steve Blair, The Cooper Institute; Jane Stutts, University of North Carolina–Chapel Hill; and Don Chen, Smart Growth America, review the study's recommendations.



INFO TO GO—The Committee for a Future Strategy for Transportation Information Management initiated a 15-month policy study that will advise the federal government and states on a sustainable administrative structure and funding mechanism for meeting the information services needs of the transportation sector. The committee will define the core services that need to be provided, identify how the services should be provided, and suggest options for funding. At the first meeting, October 11–12, at the Keck Center, Nina McLawhorn (*far right*), Wisconsin Department of Transportation, provides input to fellow committee members, guests, and committee Chair Frank Francois (*far left*), retired Executive Director of the American Association of State Highway and Transportation Officials.



AIRING THOUGHTS—TRB convened an expert panel to discuss U.S. Air Traffic Control (ATC) modernization before an audience of staff from the U.S. Government Accountability Office (GAO), October 7, at the National Academies' Keck Center in Washington, D.C. Scholars and practitioners from the public and private sectors of the United States and abroad examined the Federal Aviation Administration's (FAA) plans to enhance the safety,

capacity, and efficiency of its air traffic services.

The panel, moderated by Clinton Oster (*top center*), Indiana University, covered topics such as FAA's new performance-based air traffic organization, the impact of budget constraints on modernizing, and the experiences with ATC reorganization in Canada and Western Europe. TRB and other divisions of the National Academies convene expert panels to inform GAO staff on technical issues affecting policy.

COOPERATIVE RESEARCH PROGRAMS NEWS

Safe Performance of Low-Floor Light Rail

The typical design of low-floor light rail vehicles calls for three-section, articulated vehicle body with the center section fixed to a center truck on nonpowered, independently rotating wheels. The leading and trailing sections of the vehicle are each supported by a motored truck at one end and by a nonpowered center truck at the other. The low floor height prevents the use of wheel sets with solid axle connections between the right and left wheels of the center truck.

During acceleration or braking on curves, the center section and truck may rotate excessively, as the two connecting articulations cause a high angle-of-attack and flanging. In addition, the independently rotating wheels of the center truck do not permit self-steering through the curve, which increases the angle-of-attack and flange forces. This leads to increased flange wear, gauge face wear, stick-and-slip noise, and potential for derailment at curves, as well as special track work. The wheel life of the low-floor center truck can be significantly shorter than that of motored trucks.

Research is needed on the performance of the center trucks of low-floor light rail vehicles, to compile the lessons learned and to provide guidance to transit agencies and light-rail vehicle manufacturers on how to mitigate performance problems. Interfleet Technology, Inc., has been awarded a \$249,170, 18-month contract (Transit Cooperative Research Program Project C-16, FY 2004) to identify factors that cause derailments, excessive noise, excessive wheel and rail wear, and reduced ride quality.

The research will provide guidance for light rail systems and in vehicle procurement and track design and will identify mitigation actions related to design specifications for vehicles and track (including curved and special trackwork), the wheel-rail interface, track construction and maintenance tolerances, and the use of turnout

point protection and friction modifiers.

For further information, contact Chris Jenks, TRB (telephone 202-334-3089, e-mail cjenks@nas.edu).

Pavement Texturing Guidelines To Reduce Hydroplaning, Costs

Tining—a means of texturing newly constructed concrete pavements—enhances frictional characteristics in the surface macrotexture to reduce hydroplaning, skidding, and wet-weather crashes. The use of tining has evolved, however, without adequate consideration of the effects on noise generation, long-term durability, smoothness, constructibility, pavement serviceability, and cost-effectiveness.

Other options for texturing concrete pavements may improve performance and yield environmental and economic benefits. Widely accepted guidelines or procedures for identifying and selecting methods of texturing concrete pavements are needed. In addition, the relevant technical, environmental, economic, and safety issues must be addressed.

ERES Consultants, a division of Applied Research Associates of Champaign, Illinois, has been awarded a \$449,994, 30-month contract (National Cooperative Highway Research Program Project 10-67, FY 2004) to recommend appropriate methods for texturing concrete pavements for specific applications in a range of climatic, site, and traffic conditions. The research will include tining and other means of texturing fresh and hardened concrete to enhance surface frictional characteristics and will develop a rational procedure for highway agency personnel to identify and select appropriate texturing methods for concrete pavements.

For further information contact Amir N. Hanna, TRB (telephone 202-334-1892, e-mail ahanna@nas.edu).

Technical Activities Updates

Following are highlights of the activities of 1 of the 11 Groups in TRB's Technical Activities Division and summaries of two recent conferences.

Design and Construction Group: Innovations

Group Chair: Gale Page, Florida Department of Transportation

The standing committees within the Design and Construction Group have posted on the TRB website a catalog of practical papers that will be presented at the 2005 Annual Meeting. Participants can determine which technical session will feature a paper of interest by following a link to the interactive Annual Meeting program. Committees have identified practical papers for the past 7 years.

The Group's Design Section produced two special publications in 2004, in addition to selected volumes of the *Transportation Research Record: The Journal of the Transportation Research Board*. The Geometric Design Committee's Transportation Research E-Circular 067, *Context-Sensitive Design Around the Country: Some Examples*, was published in July and is available on the TRB website (www.TRB.org/publications/circulars/ec067.pdf). The Utilities Committee completed a long-term project with the publication of State-of-the Art Report 9, *Utilities and Roadside Safety* (www.TRB.org/publications/sar/sar_9.pdf).

The Accelerating Innovation in the Highway Industry Task Force has focused on ways to overcome two major barriers to innovation. The task force demonstrated that the accelerating construction technology transfer team (ACTT) concept can mitigate one barrier, stand-pipe organizational culture, through new and creative approaches backed by management. A summary of the workshops that explored the ACTT concept was published as Transportation Research E-Circular 059, *Accelerated Highway Construction, Workshop Series Summary* (www.TRB.org/publications/circulars/ec059.pdf).

The task force now is focusing attention on a second barrier, the difficulty of advancing and adopting emerging technology within a large organization. The task force sponsored the workshop, *Controlling Project Cost Estimates: Managing the Risks*, earlier this year.

In September, the committees on Engineering Geology and on the Exploration and Classification of Earth Materials conducted a symposium, *Geotechnical Methods Revisited*, immediately preceding the 55th Highway Geology Symposium in Kansas City, Missouri. The primary goal was to share common methods in geotechnical investigation with young professionals entering the work force.

Special Conferences

Users Discuss Travel Survey Data

On November 1–2, TRB convened a diverse group of data users to discuss the National Household Travel Survey (NHTS) and potential improvements to the next survey. The conference covered safety, environment, congestion, land use, intermodal travel, and travel by special populations, such as the elderly and school-age children. In attendance were 140 professionals from federal, state, and local governments, as well as researchers, academics, and practitioners in the areas of travel behavior, travel and air quality forecasting, environmental policy, and survey methods. The conference objectives were to

- ◆ Discuss results of NHTS-based investigations of critical areas

for transportation policy,

- ◆ Learn innovative applications of the data to understand and estimate travel behavior,
- ◆ Discuss the design of future national household travel surveys,
- ◆ Identify emerging trends and data needs, and
- ◆ Discover data sources that complement the NHTS data to provide a more complete picture of travel behavior in the United States.

At the conference, Deputy Assistant Secretary for Transportation Policy George Schoener explained that the next survey would return to separate questionnaires for daily travel and for long-distance travel. The Federal Highway Administration will conduct the daily travel survey and the Bureau of Transportation Statistics will concentrate on long-distance patterns.

The papers presented and discussed at conference sessions and interactive workshops illustrated the wide range of uses of the NHTS both in transportation and in other areas. The papers and summary comments are posted at www.TRB.org/Conferences/NHTS. A Transportation Research E-Circular will be published in early 2005.



Participants at the NHTS Conference in the National Academies' Keck Center, Washington, D.C.

Best Practices Exchanged for Safety-Conscious Planning

Since May 2000, the Safety-Conscious Planning Working Group (SCPWG) has designed strategies, programs, and products to facilitate implementation of the safety in transportation planning requirement under the Transportation Equity Act for the 21st Century. SCPWG is an ad hoc, unfunded public-private partnership interested in promoting safety-conscious transportation planning. The annual Leadership Conference brings together planning and safety professionals who created models to address safety in planning. TRB hosted the 2004 conference in Washington, D.C., August 31–September 1, to stimulate

- ◆ Networking and information sharing,
- ◆ Technology transfer, and
- ◆ State and regional input to the SCPWG Action Plan.

Sixty-five persons from state departments of transportation, metropolitan planning organizations, regional councils, local jurisdictions, and federal agencies met to exchange ideas and experiences and to learn about techniques and tools available for incorporating safety considerations into the planning process.

Workshops Educate Media on Terrorist Attack Response

Effectively informing the public during a terrorist attack is the goal of a series of 10 workshops being held across the country by the National Academies in 2004 and 2005. The focus of the workshops includes the impacts on transportation following a terrorist attack.

At each workshop, experts in science, health, and engineering from the National Academies provide local journalists, state and local public information officers, and emergency managers with frank, objective information about the impact of weapons of mass destruction. The project, *News and Terrorism: Communicating in a Crisis*, is being organized with assistance from the Department of Homeland Security and the Radio–Television News Directors Foundation.

“These workshops play a key role in the Department’s efforts to provide journalists and state and local public information officials with the tools and contacts needed to report complicated, but life-saving information in the event of a terrorist attack,” said Homeland Security Secretary Tom Ridge.

Workshops took place in Chicago, Kansas City, Portland, Philadelphia, and Miami in 2004 and are planned for Austin, Atlanta, Denver, Boston, and San Francisco in 2005. Each workshop features an interactive tabletop terrorist attack scenario tailored to the city, to determine how to convey vital information to the public about a potentially catastrophic attack.

Transportation plays a key role in the scenarios, affecting where the weapons may be placed and how the public, media, and local officials react in the aftermath of the attack. In several of the scenarios, terrorist attacks occur on or near public transit, trucks, or trains. In each scenario, traffic reporters must explain how they would relay news of traffic congestion in the aftermath of an attack.

In addition, experts from the National Academies provide straightforward information on weapons of mass destruction, including a series of fact sheets, produced by the Division on Earth and Life Studies, on biological, chemical, nuclear, and radiological terrorist threats, along with lists of experts who can provide reliable information quickly in a time of crisis. The fact sheets are available at the National Academy of Engineering (NAE) website, www.nae.edu/NAE/pubundcom.nsf/weblinks/CGOZ-642P3W?OpenDocument.

“We hope these workshops will help all involved develop strategies for dealing with unprecedented terrorist events and create an instant pool of trusted experts to be called up,” said NAE President William Wulf. “The media are often blamed for sensationalizing. But armed with accurate information, presented well, these overlooked first responders can serve to calm the public, promote rational reactions, and save lives.”



Homeland Security Secretary Tom Ridge responds to questions during the National Academies workshop held in Philadelphia.

For more information, email Randy Atkins, Senior Media Relations Officer for the National Academy of Engineering, at atkins@nae.edu or go to www.nae.edu/nae/pubundcom.nsf/weblinks/MKEZ-538P3X?OpenDocument.

Website Focuses on Rural Transportation

The National Association of Counties (NACo) and the National Association of Development Organizations (NADO) have launched a new web-based resource tool for rural transportation stakeholders, including local elected officials and regional development professionals. The website, www.ruraltransportation.org, is dedicated to sharing best practices, providing forums for peer learning, highlighting local initiatives, and identifying useful and informative resources related to rural transportation.

The site presents state models of rural planning and programming; recent studies on planning, transit, air quality, rail, aviation, and safety; resources on the deployment of intelligent transportation systems; links to congressional committees, federal agencies and resources, state agencies, national organizations, and university transportation research centers; and calendar listings on upcoming meetings and events.

Made possible through a grant from the U.S. Department of Transportation, the website aims to improve the level of coordination among federal, state, and local officials, to ensure that the rural multimodal system meets the needs of local residents and businesses.



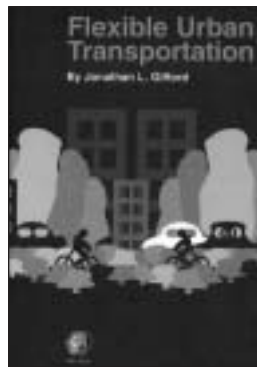
Marine Cargo Operations: A Guide to Stowage
Third Edition. Robert Meurn and Charles Sauerbier.
Cornell Maritime Press. Centreville, Maryland: 2004;
512 pp.; \$50; 0-80733-550-2.

Drawing largely on the authors' experience, the book presents the principles of cargo operations and describes stowage techniques and applications. The emphasis of the third edition is on containerization and the proper and safe carriage of cargo. The new edition reviews information and provides questions and answers for candidates preparing for the U.S. Merchant Marine license examination.

Flexible Urban Transportation

Jonathan Gifford. Elsevier Science Ltd. 2003; 260 pp.;
\$85 hardcover; 0-08-044053-3.

George Mason University Professor Jonathan Gifford assesses U.S. highway and transit policy, which has focused on planning, designing, and constructing the Interstate highway system over the last half-century. A member of TRB committees on research and education, and on social, economic, and cultural issues, as well as of NCHRP project panels on transportation investment and operations, Gifford suggests that regulations and procedures that govern transportation choices—for protecting communities, fostering environmental stewardship, and supporting a dynamic and productive economy—are severely outdated, and the interests vested in the current policy are blocking reform. The book evaluates American transportation planning and proposals for an adaptive transportation decision-making process.



***Review of the U.S. Army Corps of Engineers
Restructured Upper Mississippi River–Illinois
Waterway Feasibility Study***

National Research Council. Washington, D.C.: 2004;
67 pp.; \$12 paperback; 0-309-09133-0.

The book reviews the progress made by the U.S. Army Corps of Engineers in broadening a study of the Upper Mississippi River–Illinois Waterway system to improve navigation, including a multibillion-dollar proposal to double the length of up to 12 locks on the river.

Although the National Research Council (NRC) committee applauded the Corps' efforts to give greater consideration to ecological restoration, the report finds that the economic justification for expanding locks has not yet been demonstrated—the models used by the Corps to predict the demand for barge transportation were flawed. NRC also notes that the study did not pay sufficient attention to inexpensive, nonstructural navigation improvements that could ease barge traffic. TRB assisted the Water Science and Technology Board and their NRC unit in this assessment.



***Running on Empty: Transport, Social Exclusion,
and Environmental Justice***

Edited by Karen Lucas. International Specialized Book Services. Portland, Oregon: 2004; 306 pp.; \$69.95 hardcover; 1-86134-570-4; \$32.50 paperback; 1-86134-569-0.

Papers in this collection examine the links between transportation, poverty, and social exclusion by comparing policy and practice in the United States and the United Kingdom. Case studies by U.S. and U.K. practitioners demonstrate that a focus on short-term planning, oversimplification of the problem, competing funding priorities, and legislative and institutional barriers all affect the successful delivery of services. Several contributors are active in TRB, including Karen Lucas (Social and Economic Factors of Transportation Committee), Kelly Clifton (Traveler Behavior and Values Committee), Lori Kennedy (Task Force of Design-Build, and Planning and Environment Group), Robert Cervero (Committee on Physical Activity, Health, Transportation, and Land Use), Anne Morris (Task Force on Environmental Justice in Transportation and Task Force on Context-Sensitive Design and Solutions), and Marc Brenman (Task Force on Environmental Justice in Transportation).



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

TRB PUBLICATIONS

Construction 2003

Transportation Research Record 1861

This five-part volume considers portland cement concrete pavements, bituminous pavements, quality assurance, bridges and structures, and construction management. Papers examine the use of ride quality index for construction quality control and acceptance specifications, application of infrared imaging and ground-penetrating radar to detect segregation in hot-mix asphalt overlays, and context-sensitive construction in Kentucky.

2003; 160 pp.; TRB affiliates, \$36; nonaffiliates, \$48. Subscriber category: materials and construction (IIIB).

Traffic Control Devices, Visibility, and Rail-Highway Grade Crossings 2004

Transportation Research Record 1862

Centerline rumble strips are evaluated in two papers, one studying the effect on lateral vehicle placement and speed and the other analyzing crash and driver behavior. Accompanying papers provide assessments and modeling of road visibility under fog; present findings on the design, luminance, conspicuousness, and retroreflectivity of traffic, warning, and regulatory signs; and offer explanations of intrusion detection technologies and a collision frequency and consequence model for rail grade crossings.

2004; 135 pp.; TRB affiliates, \$36; nonaffiliates, \$48. Subscriber category: highway operations, capacity, and traffic control (IVA).

Railroads: High-Speed Passenger Rail, Railway Bridges, and Track Design and Maintenance

Transportation Research Record 1863

This volume contains case studies of high-speed rail and maglev systems in Europe and Asia; research into the development and implementation of a continuous vertical track-support testing technique; information requirements for railroad enterprise asset management; objective track quality indices; and railroad accident rates for use in transportation risk analysis.

2004; 98 pp.; TRB affiliates, \$32.25; nonaffiliates, \$43. Subscriber category: rail (VII).

Bonded Repair and Retrofit of Concrete Structures Using FRP Composites: Recommended Construction Specifications and Process Control Manual

NCHRP Report 514

This report presents the findings from a research project to develop recommendations for construction specifications for bonded fiber-reinforced polymer repair and retrofit of concrete structures. The

project also produced a construction process control manual, which is included.

2004; 102 pp.; TRB affiliates, \$15.75; nonaffiliates, \$21. Subscriber category: bridges, other structures, and hydraulics and hydrology (IIC).

Portable Scour Monitoring Equipment

NCHRP Report 515

This volume presents the findings of research to develop portable scour monitoring equipment for measuring the streambed elevations at bridge foundations during flood conditions. The report offers specific fabrication and operation guidance for a portable scour monitoring device.

2004; 93 pp.; TRB affiliates, \$15.75; nonaffiliates, \$21. Subscriber categories: bridges, other structures, and hydraulics and hydrology (IIC); soils, geology, and foundations (IIIA); maintenance (IIIC).

Pier and Contraction Scour in Cohesive Soils

NCHRP Report 516

The findings on bridge scour in cohesive soils are reviewed in this report, which recommends a method for predicting the extent of complex pier and contraction scour.

2004; 120 pp.; TRB affiliates, \$16.50; nonaffiliates, \$22. Subscriber categories: highway and facility design (IIA); bridges, other structures, and hydraulics and hydrology (IIC); soils, geology and foundations (IIIA); materials and construction (IIIB).

Significant Findings from Full-Scale Accelerated Pavement Testing

NCHRP Synthesis 325

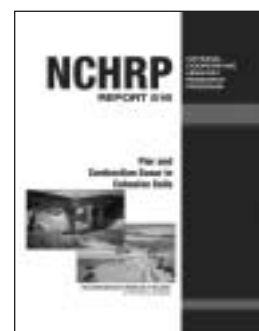
This synthesis summarizes findings of full-scale accelerated pavement tests, performed in the laboratory and in the field, that simulate the effects of long-term, in-service loading conditions in a compressed time period. The synthesis provides an overview of accelerated pavement testing applications and reviews ancillary tests, including airfield pavement research, environmental effects, and future directions and strategies.

2004; 201 pp.; TRB affiliates, \$17.25; nonaffiliates, \$23. Subscriber categories: pavement design, management, and performance (IIB); materials and construction (IIIB).

Strategic Planning and Decision Making in State Departments of Transportation

NCHRP Synthesis 326

State transportation agencies' strategic management practices are examined in this report, including tac-



TRB PUBLICATIONS (continued)



tical planning, resource allocation, performance management and measurement, and the development of a strategic agenda. The text also synthesizes approaches to link strategic planning with other decision making.

2004; 62 pp.; TRB affiliates, \$12; nonaffiliates, \$16. Subscriber category: *planning and administration (IA)*.

State Product Evaluation Programs

NCHRP Synthesis 328

State transportation agency programs to evaluate new products and technologies that affect highways and transportation practices and operations are reviewed in this synthesis.

2004; 35 pp.; TRB affiliates, \$11.25; nonaffiliates, \$15. Subscriber categories: *highway and facility design (IIA)*; *materials and construction (IIIB)*; *maintenance (IIIC)*.

Track-Related Research, Volume 3—Exothermic Welding of Heavy Electrical Cables to Rail: Applicability of AREMA Track Recommended Practices for Transit Agencies

TCRP Report 71, Volume 3

This volume contains the results of research on exothermic welding of heavy electrical cables to rail and on applicability of AREMA track recommended practices for transit agencies. Current practices and possible improvements to methods of connecting heavy electrical cables to rail, and transit practices and components not addressed by AREMA, are covered.

2004; 10 pp.; TRB affiliates, \$13.50; nonaffiliates, \$18. Subscriber categories: *public transit (VIA)*; *rail (VII)*.

Traveler Response to Transportation System Changes

TCRP Report 95

The TCRP Report 95 series comprehensively documents various transportation system changes, policy actions, and alternative land use and site development design approaches. This third edition covers 18 topic areas—9 are new—each to be published as a stand-alone chapter.

◆ Chapter 3: Park-and-Ride/Pool

Chapter 3 focuses on park-and-ride and park-and-pool facilities that support high-occupancy vehicle lanes; busways; bus rapid transit and other express bus services; and light rail transit, commuter rail, and heavy rail transit facilities and services.

92 pp.; TRB affiliates, \$15; nonaffiliates, \$20.

◆ Chapter 10: Bus Routing and Coverage

This chapter focuses on traveler response to alterations in conventional bus transit routing. Included are routing changes at both the individual route and system levels, new bus systems and system closures, bus system expansion and retrenchment, increases and decreases in geographic coverage, and routing and coverage changes made in conjunction with fare changes.

74 pp.; TRB affiliates, \$15; nonaffiliates, \$20.

2004; Subscriber categories: *planning and administration (IA)*; *highway operations, capacity, and traffic control (IVA)*; *public transit (VI)*.

Use of Rear-Facing Position for Common Wheelchairs on Transit Buses

TCRP Synthesis 50

To enact provisions of the Americans with Disabilities Act of 1990, guidelines were issued for the securement of wheelchairs on board transit buses. This synthesis surveys current practice in securing wheelchairs in a rear-facing position on buses.

2003; 42 pp.; TRB affiliates, \$10.50; nonaffiliates, \$14. Subscriber category: *public transit (VI)*.

Transit Advertising Sales Agreements

TCRP Synthesis 51

This report synthesizes transit agency practices in advertising sales, contracting, and display. Information is provided on advertising sales policies, advertising rate cards, contracts with advertising sales companies, revenue from rates charged, requests for proposals, and nontraditional forms of advertising.

2004; 99 pp.; TRB affiliates, \$13.50; nonaffiliates, \$18. Subscriber category: *public transit (VI)*.

Transit Operator Health and Wellness Programs

TCRP Synthesis 52

Transit operators' health and wellness, including stress, back- and neck-related injuries, obesity, and alcohol and other drug-related problems, can affect their safety, service, attendance, turnover rate, and workers' compensation. This study investigates the impact of these health and wellness issues on operators' productivity. Information is provided on prevention and implementation strategies and on resources that transit agencies use in addressing operator health and wellness.

2004; 80 pp.; TRB affiliates, \$12.75; nonaffiliates, \$17. Subscriber category: *public transit (VI)*.

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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, Publications Office, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001, telephone 202-334-2972 or email jawan@nas.edu. 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 or higher versions. Original artwork must be submitted. Glossy, high-quality black-and-white photographs, color photographs, and slides are acceptable. Digital continuous-tone images must be submitted as TIF or JPG files and must be at least 3 in. by 5 in. with a resolution of 300 dpi or greater. Any graphs, tables, and line art submitted on disk must be created in Adobe Illustrator or Corel Draw. A caption must be supplied for each graphic element submitted. 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.

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Addressing Customers' Needs

Every day, the transportation community is at work to enhance the value of the transportation system for an increasingly diverse array of customers. Organizations are engaging customers proactively to identify what consumers want and need from the transportation system. TRB has developed and published extensive information on ways to engage and involve customers in transportation decision making— assembling a bookshelf of resources and guides for transportation professionals, decision makers, and members of the general public. Recent TRB publications of interest include the following:

Security-Related Customer Communications and Training for Public Transportation Providers

TCRP Report 86, Vol. 5, ISBN 0-309-06760-X, CD-ROM (2004), \$40

Transportation in an Aging Society: A Decade of Experience

Conference Proceedings 27, ISBN 0-309-07745-1, 325 pages, 8.5 x 11, paperback (2004), \$59

Transit Capacity and Quality of Service Manual, 2nd Edition

TCRP Report 100, ISBN 0-309-08776-7, 572 pages, 8.5 x 11, paperback (2003), \$45

Transit Information and Promotion: Traveler Response to Transportation System Changes

TCRP Report 95, Chapter 11, ISBN 0-309-08763-5, 71 pages, 8.5 x 11, paperback (2003), \$20

The Marine Transportation System and the Federal Role: Measuring Performance, Targeting Improvement

Special Report 279, ISBN 0-309-04952-6, 180 pages, 6 x 9, paperback (2003), \$24

Using Customer Needs to Drive Transportation Decisions

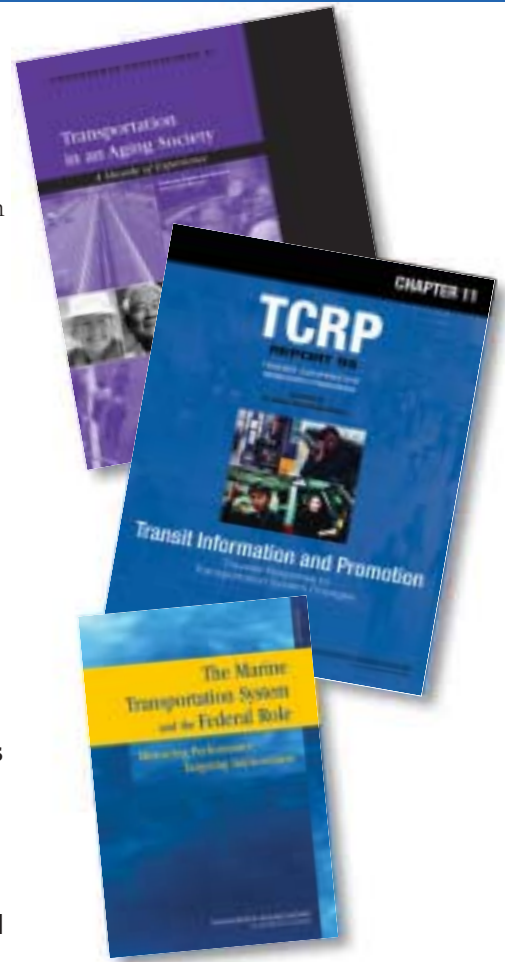
NCHRP Report 487, ISBN 0-309-06803-7, 105 pages, 8.5 x 11, paperback (2003), \$18

Measuring Personal Travel and Goods Movement

Special Report 277, ISBN 0-309-08599-3, 133 pages, 6 x 9, paperback (2003), \$24

The Relative Risks of School Travel: A National Perspective and Guidance for Local Community Risk Assessment

Special Report 269, ISBN 0-309-07728-1, 170 pages, 6 x 9, paperback (2002), \$22



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