

3 Developing Measures to Improve Highway Safety: The Safety Focus Area of the Strategic Highway Research Program 2

Kenneth Campbell and Linda Mason

The safety focus area of the Strategic Highway Research Program 2 has launched studies to understand how drivers interact with and adapt to the vehicle, the traffic environment, the roadway characteristics, the traffic control devices, and environmental conditions. By assessing the collision risk associated with each of these elements and interactions, the studies will support the development of effective countermeasures.

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Civil War hero, lumberman, engineer, inventor, and railroad company president Roy Stone was “the pioneer advocate of good roads in the United States” and the first chief of a federal agency for overseeing road development. A neglected part of his masterful road improvement strategy was nurturing the growth of rural free delivery of mail—which became a compelling argument for better roads.

14 POINT OF VIEW The Most Important Question in Engineering

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The most important question, as identified by the author, applies to everything the engineering profession does—from selecting the problems that deserve attention to the thought processes for solving those problems. But is the question asked often enough today in the rush to undertake bold, complex solutions to pressing problems, although simpler solutions might be as effective at less cost—that is, good enough in practical terms?

17 Building Partnerships for Progress Through Transportation Research: Highlights from TRB’s 2008 Annual Meeting

For five days in January, Washington, D.C., became the capital of transportation research—or at least the connecting hub—with more than 10,500 researchers, practitioners, and administrators representing government, industry, and academia gathering from the United States and abroad to network with peers, share information, and interact at sessions and workshops, committee meetings, commercial exhibits, and many additional events. Here are photographic highlights from the program.



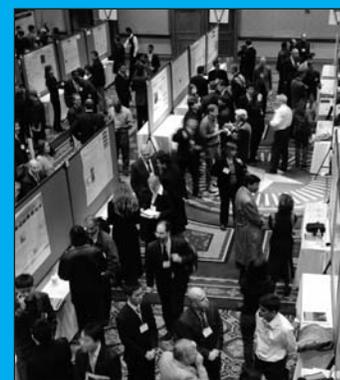
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COVER: Networking with peers is the primary reason for attending the TRB Annual Meeting, according to a 2008 follow-up survey, and the program offered a variety of occasions, settings, and formats—such as Meet-the-Author poster sessions. (Photograph by Cable Risdon.)

TR NEWS

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

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Correction: The photograph of a hybrid snowmobile competing in the Clean Snowmobile Challenge ("Did You Know?" sidebar to the TRB 2007 Field Visit Program article, January–February 2008 TR News, page 18) was provided courtesy of Michigan Technological University.

COMING NEXT ISSUE

A regional metropolitan planning organization's guidelines to promote public health through transportation planning, a description of the new domestic scan program guided by the National Cooperative Highway Research Program and its initial findings, gauging the market reach of transit stations, and other articles are showcased in the May–June 2008 TR News.



Image from a right-of-way visualization tool developed by the Minnesota Department of Transportation; a pilot domestic scan team has examined and evaluated innovative approaches to right-of-way acquisition and utility relocation.

Developing Measures to Improve Highway Safety

The Safety Focus Area of the Strategic Highway Research Program 2



KENNETH CAMPBELL AND LINDA MASON

Campbell is Chief Safety Program Officer, Strategic Highway Research Program 2 (SHRP 2), Transportation Research Board of the National Academies, Washington, D.C., and Mason is Communications Officer, SHRP 2.

Driver behavior often is considered the cause of collisions, but the collision risks inherent in the relationship of a driver's performance to the roadway design and to traffic conditions are unknown. The central goal of the safety focus area of the Strategic Highway Research Program 2 (SHRP 2) is to understand how drivers interact with and adapt to the vehicle, the traffic environment, the roadway characteristics, the traffic control devices, and the environmental conditions. Assessing the collision risk associated with each of these elements and interactions will support the development of effective countermeasures.

Rising Challenges

Highway safety improvements are not keeping pace with increases in travel. The steady declines in the rate of collisions per vehicle-mile-traveled have leveled off in the past decade. While travel has increased, the expansion of highway miles and lanes has slowed down, increasing traffic volume and congestion. The demographics of the driver population are changing—the percentage of older drivers is expected to increase substantially, from an estimated 15 percent in 2010 to approximately 25 percent in 2030. Innovative measures are needed to advance safety under these changing conditions.





Future traffic safety challenges include the following:

- ◆ Continued growth in travel;
- ◆ Changes in vehicle size and design;
- ◆ Demographic changes—especially an increase in older drivers;
- ◆ New vehicle technologies, such as automatic braking systems and adaptive cruise control;
- ◆ Driving behavior, particularly aggressive driving;
- ◆ Increased driver distraction, with more vehicle-based devices;
- ◆ Increased truck travel; and
- ◆ High-speed congestion.

The changing traffic environment complicates and heightens the need for fundamental traffic safety research.

Each 1 percent improvement in highway safety represents the prevention of 400 fatalities and 30,000 injuries and an annual savings of \$2.3 billion.

Crossroad for Prevention

Fundamental research can lead to sizeable reductions in deaths and injuries, despite the growth in travel. Such research improves understanding of the contributing factors in collisions and casualties; this information in turn assists in the development of new or improved countermeasures.

In the early days of injury prevention research, expert investigators looked only at injury-producing collisions and inferred the risk factors. A turning point was the decision by the National Highway Traffic Safety Administration (NHTSA) to take systematic samples of injury

SHRP 2 Research: Asking Why to Learn How

SHRP 2 research aims to reveal the underlying causes of crashes and congestion on the highways. The research will answer fundamental questions about why these events occur and will be the basis for developing and deploying countermeasures and innovations to save lives and to advance the planning, building, and operation of U.S. highways.

SHRP 2 is guided by the policies of the National Research Council, the principal operating agency of the National Academy of Sciences and the National Academy of Engineering; the policies promote robust science and rigorous, independent review, and the program is administered in much the same way as TRB's other research programs. The distinctive characteristics of SHRP 2, however, derive from the nature of the inquiries that it pursues. For example, SHRP 2 projects will

- ◆ Adapt advances in human factors research, organizational theory, environmental science, data management, telecommunications technologies, and other sciences to benefit transportation;
- ◆ Strategically link research across focus areas to leverage technical expertise and establish information networks; and
- ◆ Develop the basis for broad application of innovative technologies and procedures.

The overarching goal for SHRP 2 is to provide transportation agencies with the information necessary to deliver excellent customer service, so that highway users can arrive safely and reliably at their destination on roadways that are long-lasting, that enhance communities, and that are environmentally responsible. The four objectives critical to achieving this goal have become the focus areas for SHRP 2 research: safety, which is described in the accompanying article; renewal; reliability; and capacity.



Highway renewal involves the reconstruction or rehabilitation of deteriorating highway infrastructure to new standards of service. Renewal implies accelerated construction that minimizes the disruption for highway users and surrounding communities and that yields reliable, long-lasting facilities.

Renewal research under SHRP 2 will develop a systematic approach to the selection of the appropriate project scale, designs, materials, and construction techniques for renewal projects. The research also will produce performance standards that optimize construction speed, minimize traffic and community disruption, and maximize the length of service and cost-effectiveness for agencies, highway users, and communities. The goals are captured in the familiar phrase: get in, get out, stay out.



Reliability research under SHRP 2 is targeting travel time variation, which affects the time required to reach a destination and influences how much extra time drivers must allow to arrive within a desired time frame. The research addresses the root causes of unreliable travel times by focusing on highway system operations. Research projects will identify effective operations strategies; improve the means of integrating operations activities into planning, modeling, and decision making; and aid implementation of operations strategies.



Capacity research within SHRP 2 focuses on strategies and tools to integrate environmental, economic, and community requirements systematically into the planning and design of new highway capacity. The core of the program is a framework for collaborative decision making, to solve capacity problems in a context-sensitive manner.

The SHRP 2 website, www.TRB.org/SHRP2, provides details of the full research plans and projects, as well as program activities and events.

and noninjury collisions alike, providing an objective estimate of injury risk—or the probability of injury—in a collision. This change applied the objective methods of risk analysis that had been used effectively in medical and other fields to traffic injury prevention. The advance was essential to the development of the sophisticated occupant protection systems in today's cars.

Collision prevention has reached a similar cross-road. Although driver behavior is widely believed to be responsible for most collisions, the effect of the inter-relationship of driver performance and behavior with the roadway design and traffic conditions on the risk of collisions and casualties has not been explored. Accurate information about the contribution of human, vehicle, roadway, and environmental factors to the risk of collisions will yield the data and insights necessary to develop the needed countermeasures.

Advanced technologies, as envisioned for intelligent transportation systems, also are enabling new research methods that can provide objective, exposure-based risk estimates and detailed information about driving performance and driving errors that could not be measured before. The development of new countermeasures will require a rigorous and detailed understanding of the relationships among the several factors that contribute to collisions and casualties.

Topics in Focus

The SHRP 2 safety program aims at a comprehensive assessment of the interaction of driving behavior and performance with roadway, environmental, vehicular, and human factors, and of the influence of these factors and their interactions on collision risk, especially on lane departure and intersection collisions. Basic questions address the effects of driver, vehicle, roadway, and environmental factors on driving behavior, as well as the relationship of changes in driving behaviors to crash risk under various vehicle, roadway, and environmental conditions.

Although the study can encompass many crash types and situations, attention will focus on crashes that involve lane departures and on crashes at intersections. Candidate factors include the following:

- ◆ **Driving factors:** Driver age and gender, speed, driver errors, inattention, distraction, fatigue, impairment, and perhaps driving characteristics—such as aggressive or nonaggressive driving styles—that may be characterized from measures of driving performance such as speed on curves, deceleration when approaching an intersection, or gap acceptance.

- ◆ **Roadway factors:** Edge-marking, rumble strips, lane width, shoulder type and width, curvature, grade, signage, and sight distance.

- ◆ **Intersection factors:** Intersections with signals versus those with signs, intersection configuration, signal timing, traffic volumes, and sight distance.

- ◆ **Environmental factors:** Conditions of light, weather, and pavement.

- ◆ **Vehicle factors:** Vehicle type (e.g., car, SUV, or van), braking characteristics, handling characteristics, available crash prevention technologies (e.g., cruise control, stability control), and visibility characteristics (e.g., blind zones, headlamp performance).

Specific questions for research address the possible relationship of these factors—independently or in combination—with the risk of road departure or of intersection collision.

Collision Surrogates

A central issue is the evaluation of collision surrogates. A collision surrogate is an event that is almost a collision, such as a near-collision, a traffic conflict, or a critical incident—an event that significantly increases the risk of harm. Producing a stable risk estimate from actual collisions requires combining large amounts of travel by many drivers. The inclusion of collision surrogates can greatly increase the power of field studies, because the surrogates occur much more frequently than crashes and without harm.

The concept of traffic conflicts was introduced in 1968 as a way to identify and classify near-collisions at intersections. The SHRP 2 data collection technologies will support continuous measurement of crash margin measures such as the time to lane departure or the time to collision. These are examples of measures that can be used to develop surrogate risk estimates for specific traffic maneuvers. The development of collision surrogates can allow safety researchers to estimate collision risk without waiting for collisions to occur.



GEN NISHINO/GETTY IMAGES

Improved safety measures call for research encompassing a range of driver factors.

In addition to driver and intersection factors, SHRP 2 safety research will examine roadway, environmental, and vehicle factors in crashes.



ANDY SACKS/GETTY IMAGES

Instrumentation for the SHRP 2 naturalistic driving study will include Doppler radar sensors mounted behind the license plate.

PHOTO: VIRGINIA TECH TRANSPORTATION INSTITUTE



New Research Capabilities

Several projects point toward the future of traffic safety research. The same advanced technology that enables intelligent vehicle safety also enables the nearly continuous collection of a vast array of data, including driver inputs and the vehicle's motion and position in relation to the roadway and other vehicles.

This new capability allows study of the entire driving process, including precollision and collision events, with an accuracy that previously was possible only under laboratory conditions. In particular, objective measures of driver actions in normal driving are now achievable.

Continuous recording capability can provide accu-

rate and detailed exposure data—that is, travel data—as well. The SHRP 2 safety research includes major studies with two data collection methods: a vehicle-based data collection technology and a site-based data collection technology.

Vehicle-Based Instrumentation

The U.S. Department of Transportation (DOT) has been developing portable, vehicle-based data collection packages since the early 1990s. U.S. DOT also has sponsored several small-scale field studies of intelligent vehicle technology, such as adaptive cruise control, with special research vehicles, extensive instrumentation packages, and volunteer drivers to support evaluation of the advanced technology.

The 100-Car Naturalistic Driving Study (see box, below) is a recent NHTSA project to measure driver behavior and performance. The instrumentation package in the volunteer's vehicle provided a continuous video recording of forward and rear views, of the driver's face, and of the instrument panel; in addition, forward- and rearward-looking radar units were concealed in the license plate brackets, and the vehicle was equipped with a machine-vision lane-position monitor, a Global Positioning System (GPS) locator, and connections to the vehicle data network, communications, and data storage. Adapting this instrumenta-

The 100-Car Naturalistic Driving Study

The 100-Car Naturalistic Driving Study tracked the behavior of the drivers of 100 vehicles that were equipped with video and sensor devices for more than one year. During the study time, the vehicles were driven nearly 2 million miles, yielding 42,300 hours of data. The 241 drivers were involved in 82 crashes, 761 near-crashes, and 8,295 critical incidents.

"The huge database developed through this breakthrough study is enormously valuable in helping us to understand—and prevent—motor vehicle crashes," notes Tom Dingus, director of the Virginia Tech Transportation Institute, Blacksburg.

The 100-car study and its follow-on analysis were cosponsored by the National Highway Traffic Safety Administration (NHTSA), the Virginia Transportation Research Council—the research division of the Virginia Department of Transportation (DOT) and a partnership between Virginia DOT and the University of Virginia—and Virginia Tech.

PHOTO: VIRGINIA TECH TRANSPORTATION INSTITUTE



Simultaneous video images from the 100-Car Study recorded (clockwise from top left) the driver's face, the view over the driver's shoulder, the rear view, and the left-side view.

The reports, *The 100-Car Naturalistic Driving Study Phase II: Results of the 100-Car Field Experiment* and *The Impact of Driver Inattention on Near-Crash/Crash Risk: An Analysis of 100-Car Naturalistic Driving Study Data*, are available on NHTSA's website at <http://www-nrd.nhtsa.dot.gov/departments/nrd-13/newDriverDistraction.html>.

tion package to the SHRP 2 research questions requires linking the roadway characteristics to the vehicle data using the GPS locator at each instant.

Site-Based Instrumentation

The site-based data collection approach deploys several overhead video cameras that can be placed at selected sites to record detailed information on the motion and relative position of traffic on a selected road segment or intersection. The site-based approach lends itself to designed experiments. For example, an intersection can be monitored under different traffic conditions, or with different signal phases, or before and after design modifications.

Several intersections, differing only in one or two important characteristics, may be selected for simultaneous study for more direct control of the intervening variables. Information on the signal phase can be recorded. Although information on the individual drivers would not be known, the spectrum of driver performance may be observed more broadly—patterns of steering, acceleration, and deceleration during various maneuvers, as well as their associated distributions, can be derived from the vehicle motions.

This data collection technology also lends itself to surrogate measures of collision risk. Additional development of these systems is needed, however, to



PHOTO: TEXAS TRANSPORTATION INSTITUTE

Installation of a site camera on a roadway in Texas.

improve the coverage and automated processing.

SHRP 2 Safety Projects

The SHRP 2 safety research plan includes two tracks:

- ◆ An extensive field study of driving behavior with volunteer drivers and a sophisticated instrumentation package installed in the volunteers' vehicles; and
- ◆ A video system to record the movements of all vehicles at specific road sites, such as an intersection.

The chart below shows the main anticipated projects and the general flow of work. The number, content, and timing of the contracts are subject to change.

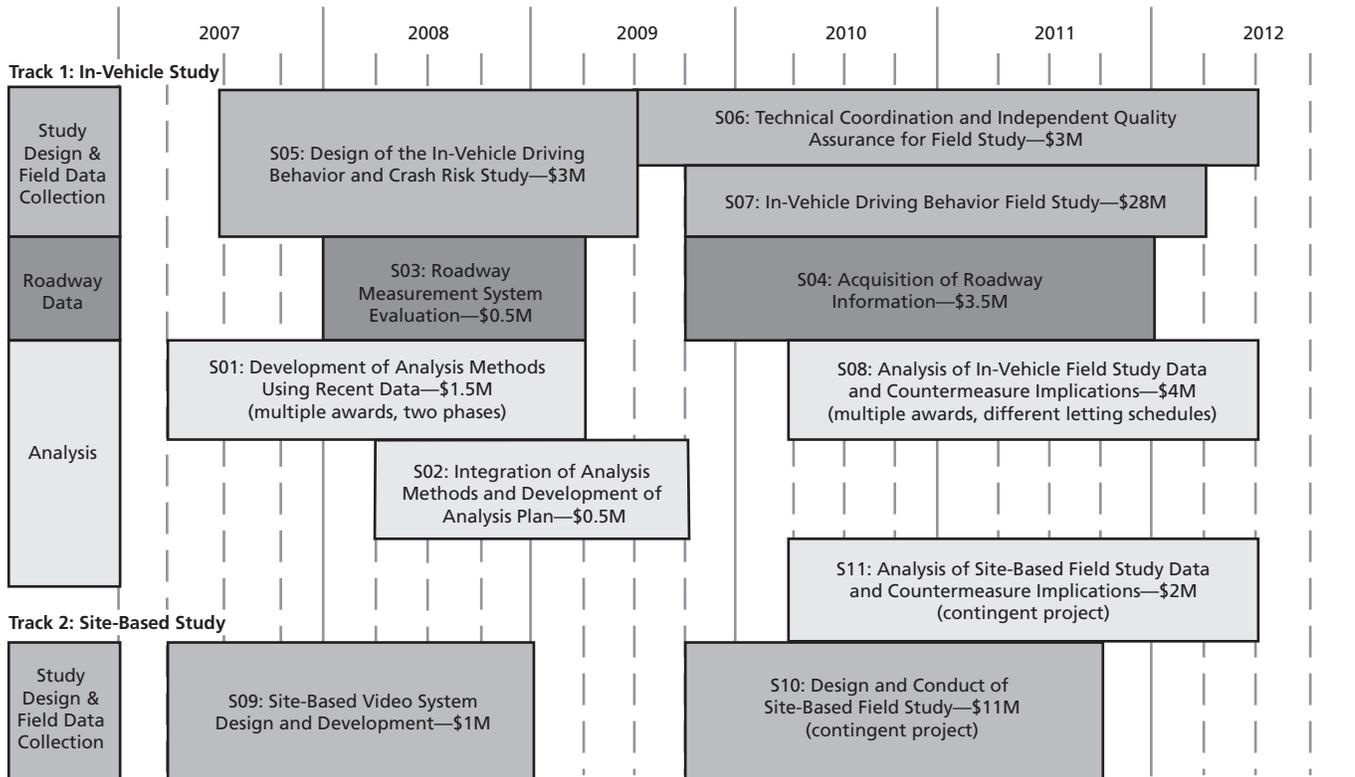


FIGURE 1 SHRP 2 Safety Projects Timeline

The SHRP 2 naturalistic driving research is building on the technologies deployed in Virginia Tech's 100-Car Study, which used a complex of in-vehicle cameras to gather data on crashes.



Vehicle-Based Study

The in-vehicle driving behavior study will be conducted with volunteers who will drive instrumented vehicles for everyday use. An instrumentation package will be developed for installation on many vehicle models. The drivers will use their own vehicles during the study period; removal of the instrumentation package at the end of the study will leave the car in its original condition. The driver and vehicle pool will change at least once a year through the reinstallation of the instrumentation package in a new driver's vehicle.

The study is shown at the top of the chart on page 7, beginning with the study design (Project S05), which leads to data collection in 2009 (Project S07). Project S05 includes the development of a complete data collection system, a field trial of the system, and the management plan for the full study. The project will develop the design for a field study involving about 2,500 instrumented vehicles operated over a period of 2 to 3 years.

Data Collection

The data collection package must accommodate requirements for a variety of analyses of lane departure, intersection crashes, and other questions. The study will be conducted in several geographic areas to accommodate variations in weather, geographical features, and rural, suburban, and urban land use. Data will be archived for analysis as part of the data processing and will be made available to qualified researchers.

The study design includes defining the selection criteria for the study areas, defining the selection plan and testing procedures for drivers and vehicles, producing a complete, functioning data system, designing and conducting a field trial, and developing a management and implementation plan for the full study. Project S06 will provide the technical coordination and independent quality assurance for the field data collection projects.

Another critical need in the in-vehicle study of driving behavior is for detailed roadway data, with greater coverage of the roads used by the volunteer

drivers. These data will support the association of driver behavior with roadway characteristics such as grade, curvature, and posted speed limits. The study design is supported by Projects S03 and S04, which will collect and integrate the roadway data.

Project S03 will conduct a roadway measurement system evaluation, or rodeo. The objective is to evaluate the accuracy of mobile road and pavement inventory data collection systems operated at highway speeds. This evaluation will serve as a prequalification stage for Project S04, Acquisition of Roadway Information. Vendors successfully completing the rodeo will be eligible to bid on Project S04.

Project S04 will collect and acquire the necessary roadway information for the SHRP 2 safety analysis and support the production of a geographic information system database of roadway and roadside characteristics and features for the areas selected for Project S07.

Advancing Analysis

The field studies envisioned under SHRP 2 will produce large data sets. Although data collection technology has advanced rapidly in the past few years, analytic methods have not kept pace. The field data collection projects therefore are supported by a series of projects to develop analytic methods.

The analysis work begins with several projects under S01, Development of Analysis Methods Using Recent Data, already in progress, to develop and demonstrate analytic approaches with available data. Key aspects of the analyses include the application of crash surrogate approaches, such as traffic conflicts, critical incidents, near-collisions, and other surrogate measures; development of exposure-based collision risk measures; and the formulation of analytic methods to quantify the relationship of human factors, driver behavior, and vehicle, roadway, and environmental factors to collision risk.

The results of the S01 projects are integrated in Project S02, which will develop an analysis plan for the field study data collected in Projects S07 and S04. Project S08, Analysis of In-Vehicle Field Study Data and Countermeasure Implications, includes several analysis projects to address a range of research questions using the data collected.

Site-Based Study

The instrumented vehicle study uses video to record the driver's face, the forward view, and the instrument panel. This type of video data is the best source of information about driver factors such as inattention, distraction, and fatigue. The use of volunteer drivers, however, limits the roadway and environmental factors to the driver's choice, instead of a researcher-chosen array. The in-vehicle instrumentation prevents the

TABLE 1 Multiyear Budget for SHRP 2 Safety Research, December 2007

Project	Project Title	Budget	Programmed
S01	Development of Analysis Methods Using Recent Data (multiple awards up to \$300,000 per project)	\$1,500,000	2006
S02	Integration of Analysis Methods and Development of Analysis Plan	\$500,000	2007
S03	Roadway Measurement System Evaluation	\$500,000	2007
S04	Acquisition of Roadway Information	\$3,500,000	2008
S05	Design of the In-Vehicle Driving Behavior and Crash Risk Study	\$3,000,000	2006
S06	Technical Coordination and Independent Quality Assurance for Field Study	\$3,000,000	2008
S07	In-Vehicle Driving Behavior Field Study	\$28,000,000	2008
S08	Analysis of Driving Behavior Field Study Data and Countermeasure Implications (multiple awards)	\$4,000,000	
S09	Site-Based Video System Design and Development	\$1,000,000	2006
S10	Design and Conduct Site-Based Field Study		
S11	Analysis of Site-Based Field Study Data and Countermeasure Implications		
	TOTAL	\$45,000,000	

For additional information, visit the SHRP 2 website, www.TRB.org/SHRP2.

researcher from comparing the experience of many vehicles operating on the same road segment, because only the study vehicles have the instrumentation package. Consequently, the information on surrounding traffic is limited.

The site-based risk study complements the in-vehicle study by examining all of the traffic passing through a given road segment. This approach allows a more direct and systematic comparison of roadway design and operational variables.

The site-based data collection approach uses several video cameras that can be placed overhead at selected sites to record detailed information about the motion and relative positions of the traffic moving through the road segment or intersection. Cameras can be linked to cover an entire intersection or a longer road segment.

The first project in this track, Project S09, Site-Based Video System Design and Development, is under way. The purpose of this initial project is to improve the capabilities of available systems. The safety research plan continues this track with site-based field data collection starting in 2009 under Project S10, Design and Conduct of the Site-Based Field Study.

The field study will support a comprehensive assessment of the individual and interactive collision risk of all vehicles within the field of the video cameras. Driver behavior is reflected in the steering, braking, and throttle control that produce the path of the vehicle.

Project S11 will conduct the analysis of the field data. Continuation of this track beyond Project S09 depends on the availability of funding and on the

outcome of Project S09 in improving the capabilities of site-based video systems.

The safety projects and current budget allocations are listed in the table above. Projects approved by the SHRP 2 Oversight Committee are indicated in the last column, showing the year of approval. The program of research originally recommended by the Safety Technical Coordinating Committee (TCC) totaled \$60 million and included the site-based projects. Removal of Projects S10 and S11, combined with cost reductions in S07, brought the total project cost down to \$45 million. If additional funding does not become available, the Safety TCC may not be able to continue the site-based work beyond the initial project approved for 2006.

Immediate Implications

The plan for the SHRP 2 safety research embraces an unprecedented opportunity to use the latest technology to record detailed information from a large sample of volunteer drivers. The size of the program, combined with the comprehensive coverage of driver, vehicle, roadway, and environment, is necessary to reveal the interrelationship of driver behavior with the traffic and with the roadway environment. Analysis methods will be adapted to take advantage of the scope and detail of the data.

The SHRP 2 research program represents a new paradigm for traffic safety. The findings are expected to have immediate implications for improved countermeasures. Along with the establishment of new data and research methods, these findings will support the next generation of safety countermeasure development.

“Large and Difficult Problems”

The War Hero and the Rural Free Delivery He Made Possible

ROBERT G. CULLEN

The author is Information Resource Manager, American Association of State Highway and Transportation Officials, Washington, D.C. This article is adapted from a presentation at the Winton M. Blount Symposium on Postal History, Washington, D.C., November 2006, and is published with permission of the Smithsonian Institution.

With urban bicyclists venturing out onto rural roads, road improvement became a national issue for the League of American Wheelmen in the 1880s.



PHOTO: LIBRARY OF CONGRESS

Roy Stone is perhaps most widely known today as a Union Army officer who fought bravely at the Battle of Gettysburg (1). His own contemporaries, however, knew and admired him for reasons that went far beyond that momentous Civil War battle.

Stone was a man of great intelligence and ambition, with formidable leadership skills to spare. His range of interests and abilities led him to careers not only in the military but also as a lumberman, engineer, inventor, and railroad company president (1). He also had a vital passion for something that would become his life's crowning achievement. When Stone died in 1905, *The Washington Post* proclaimed him “the pioneer advocate of good roads in the United States” (2).

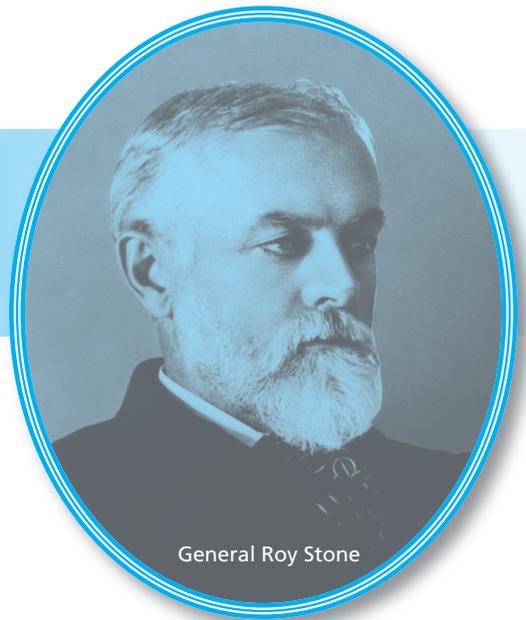
An article about Stone in the *New Haven Register* in 1892 sought to portray many of those endeavors. The article approvingly stated, “Gen. Stone is a well-known inventor and engineer and is never happier than when working at large and difficult problems” (3).

Stone's appetite for “large and difficult problems” manifested itself in his restless fight for better roads throughout the nation. It also enabled him to leave his imprint on a landmark enterprise more traditionally and firmly linked not with roadbuilding history but with postal history—rural free delivery.

Stone and his fellow good-roads advocates helped make that service—which delivers mail for free directly to rural residents nationwide—both possible and successful. This often underappreciated contribution merits a more extensive analysis. No account of the formative years of rural free delivery can be complete without referring to the Good Roads Movement and to the war hero who galvanized and guided the movement throughout the 1890s.

Good Roads Movement

The origins of the Good Roads Movement can be traced to the 1870s. The bicycle had grown in popu-



General Roy Stone

larity, especially among affluent young men in northeastern and midwestern cities. For them, bicycles represented a welcome escape into the tranquility of the countryside, away from the drudgeries of daily city life (1, 4, 5).

The urban bicyclists organized the League of American Wheelmen (LAW) in 1880 to share their enthusiasm. Headquartered in Boston, LAW was more than a social club for avid weekend bicycle riders—it was the primary means for them to address the common challenges experienced when traveling into rural areas (1, 5).

The typical urban bicyclist pedaling into rural America encountered roads that were in horrid condition and often impassable. Many roads were pock-marked with deep ruts from farmers' heavy wagons and often became mudholes after rain or snow. Significantly steep grades worsened these conditions (4, 6).

Frustrated by bumpy rides and by damage to bicycles on journeys through rural areas, members of LAW argued loudly for major improvements to the roads. The reform-minded bicyclists, however, quickly found themselves in an intense and intractable standoff with the residents of rural communities. Urban bicyclists saw roads that required enhancements, but the farmers who lived alongside those same routes saw a home-grown resource that was adequately serving its purpose and that did not need to be upgraded to accommodate outsiders at a high cost to residents (4).

This good-enough attitude reflected the conspicuously local responsibilities of counties and townships for the construction and maintenance of country roads. More often than not, local government entities lacked funds, as well as practical roadbuilding skills (4, 6).

Farmers and other rural residents customarily paid a modest tax for road maintenance and frequently were required by statute to take care of the roads adjacent to their properties. Because they paid for and looked after the roads, rural residents believed they

were entitled to claim local-use ownership (4).

Members of LAW, however, managed to live up to rural perceptions of them as pampered interlopers who wanted other people to foot the bill for their recreational pursuits. By 1890, LAW had earned widespread rural resentment and few—if any—road improvements in the countryside. The organization's members realized that to promote the good-roads agenda effectively, they had to make their message more palatable in the targeted areas.

Strategic Shift

This led to a major strategic shift in how LAW championed the idea of good roads. Instead of relying on an approach that laid both shame and blame on farmers' doorsteps, LAW highlighted the ways that road improvements could benefit the lives and fortunes of rural Americans (4, 8).

LAW members began to emphasize the economic benefits that would accrue to rural communities from better-surfaced, all-weather roads. According to these new arguments, the improvement of rural roads would boost nearby property values and would allow farmers to transport produce more efficiently and to participate in a rapidly evolving international marketplace (4).

Stone became involved with LAW at the time of this strategic shift¹ and may have played a role in originating and adopting it (1). He quickly became the most prominent spokesman for the strategy and the foremost leader of the Good Roads Movement.²

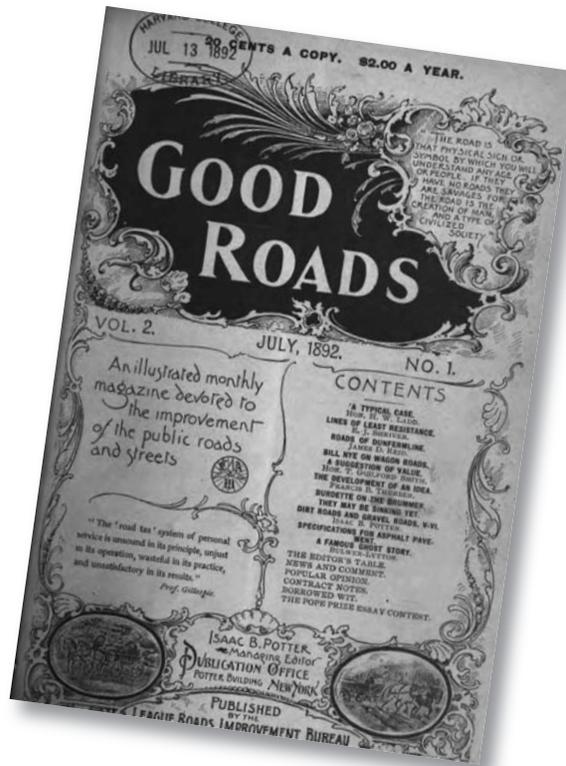
"The importance of this movement cannot be overestimated," Stone told the *New Haven Register* (3). Stone also asserted that the movement's aims could "only be accomplished by organization, reaching every interest concerned and especially the farmer."

In this way, Stone stressed the role of farmers in what he and his good-roads colleagues hoped to accomplish. He and others in the movement regularly combined purposeful outreach with powerful appeals to the farmers' financial interests (4).

This approach became a prominent feature of the Good Roads Movement as the 1890s progressed. Stone

¹ According to Weingroff (1, p. 29), "by 1890, General Stone's interests had shifted from mass transit to roads."

² In contrast to the vast number of LAW members, Stone apparently was not a bicyclist. His interest in good roads arose from the example of high-quality roads in northeastern New York State, where he grew up, and also from the tough-to-travel routes he came across during the Civil War (2). Stone's strong interest in good roads also was encouraged by his railroad career. Many railroad executives saw improved roads as a way of ensuring that farmers could transport goods to railroad stations, increasing freight revenue (2, p. 55; also see Goddard, S. B. *Getting There: The Epic Struggle Between Road and Rail in the American Century*. Basic Books, New York, 1994, pp. 46–47).



Good Roads magazine, launched in 1892, included before-and-after photographs and reports on the beneficial effects of rural road improvements.

and the others vigorously courted rural residents and their organizations, such as the National Grange of the Patrons of Husbandry. In 1892, Stone was instrumental in forming the National League of Good Roads, an advocacy group with a broader base than that of LAW, and actively recruited a large agrarian participation (1, 8, 9).

Stone and other good-roads advocates also relied on the printed word to press their case in the countryside. They prepared and widely distributed pamphlets on a variety of roads issues. In 1892, LAW launched *Good Roads* magazine to harness goodwill and support for the movement's priorities (4, 8).

State and Federal Response

By this time, leaders of the movement were realizing that a more concerted effort had to be made to ease local fiscal responsibility for expertly paved country roads, addressing one of the strongest rural concerns. This led to maiden attempts to reverse longtime precedents against state aid for local road projects. In 1891, New Jersey became the first state to adopt such a bill. Urged by good-roads advocates and in particular by Stone, other states gradually followed New Jersey's legislative lead in helping rural communities fund roadway improvements (4, 10).

Through these means and others, the Good Roads Movement decreased rural intransigence and slowly but surely gained a vast and notably agrarian base of supporters (4). A dramatic consolidation of that gain took place in 1893, when Congress allocated funds in



PHOTO: LIBRARY OF CONGRESS

First Assistant Postmaster Perry S. Heath was a key ally in Stone's efforts to promote rural free delivery and rural road improvement.

the U.S. Department of Agriculture budget for studying and disseminating information on the conditions and management of roads. The funding led to the creation of the first-ever roads agency at the federal level, the Office of Road Inquiry (ORI), on October 3, 1893. Stone was appointed the first chief of ORI, with the title of Special Agent (1, 7).

Transcending the Limitations

Although federal participation in good roads advocacy was welcome, Stone found his new position hamstrung by a paltry budget and by a conservative, cost-conscious Secretary of Agriculture, J. Sterling Morton, who instructed ORI to refrain from directly building roads and from seeking to influence policy for building roads. Stone was told that ORI's role would be confined to technical questions about roads (1, 11).

With characteristic determination, however, Stone sought to transcend as much as possible these administrative limitations and to make the most of whatever role he could play in aiding the cause of good roads from his federal post. He traveled extensively as a lecturer to both potential and active supporters of the Good Roads Movement. In addition, he and his staff produced a prodigious amount of official government documents on such topics as good-roads conventions and related legislative measures (1, 4, 8).

Stone's government role allowed him to consolidate the gains the movement already had made in converting the minds and hearts of many rural residents to its cause (8). As head of ORI, Stone became involved in an initiative by another federal agency that also would have far-reaching implications for good roads, as well as for rural America.

Nurturing the Momentum

The initiative was rural free delivery, introduced and enthusiastically promoted earlier in the decade by Postmaster General John Wanamaker. Congress appropriated funds for rural free delivery just before Wanamaker left office in 1893, but subsequent postmasters general balked at launching the program because it was expensive and impractical.

Finally, in October 1896, Postmaster General William L. Wilson used the funds to introduce a handful of experimental rural delivery routes. Wilson, however, did not actively encourage or notably broaden the experiment, which was compromised because many routes were in areas with roads that were unusually poor or practically nonexistent (6).

When Wilson left office the following March, "the mere skeleton of rural free delivery remained, and that was threatened with dismemberment," incoming First Assistant Postmaster General Perry S. Heath recalled (12). Throughout 1897, Heath and others at the Post

Office Department worked to resuscitate the program and to give it an opportunity to flourish (12). The number of rural free delivery routes increased nearly ninefold from 44 to 383 between early 1897 and late 1899 (13, 14).

Stone sought to nurture the momentum for the growth of rural free delivery because extending the program farther into the countryside could become not only a major triumph but also one of the most compelling arguments yet for better roads.³ Stone's willingness to promote the expansion of rural free delivery was emboldened by a changing of the guard at the Department of Agriculture, as James Wilson succeeded the restrictive Morton as secretary and allowed ORI more leeway in carrying out its mission (1).

General Edmund G. Harrison, who worked at ORI for Stone, discussed the alliance with the Post Office Department in an interview: "The matter of free delivery in rural districts throughout the country is given a great deal of attention at the present time, both at the Post Office Department and in the Department of Agriculture.... [T]o make free delivery a success in rural and country districts...good roads are the most important factor" (15).

Presenting Ideas

Correspondence shows some of the ways that Stone and his staff tried to make rural free delivery an unqualified success. A letter from Stone to Harrison reveals a proposal for rural carriers to be responsible for maintaining the roads along their routes in addition to delivering the mail. Perhaps Stone saw this as a way to enhance the appeal of rural free delivery—requiring postal employees to assist actively in the upkeep of country roads. This letter and others, along with newspaper accounts, show that Stone and Harrison endeavored to showcase the plan with an experimental route in southwestern New Jersey (16, 17).

Postal authorities gave the idea careful consideration but decided against applying it nationwide. As Heath explained in a letter to Stone, "[I]t does not seem to me desirable, while the rural free delivery is in its present stage, to complicate it by adding other duties and a division of responsibility" (16).

Another idea cited in Stone's letter to Harrison turned out to be more successful—delivering rural mail only along "permanent," or paved, roads (16). This proposal ended up in the Post Office Department's official guidelines released in fall 1899—about the time Stone retired from ORI—when Heath and his colleagues were smoothing the transition of rural

³ For examples of the Good Roads Movement's support for rural free delivery before 1897, see Mason, P. P. *The League of American Wheelmen and the Good Roads Movement, 1880–1905*. PhD dissertation. University of Michigan, 1957.

free delivery from a provisional to a regular service. According to the guidelines,

No route, where the roads are good and the country is level, ought to be less than 25 miles in length. Rural free delivery, as a rule, should not be recommended where the roads are bad. A preliminary requirement should be made that mud roads be graveled or macadamized before any recommendation for the establishment of rural free delivery can be made. (18)

These proposals illustrate that Stone's involvement in the program was anything but casual or coincidental. The Post Office Department's adoption of roads guidelines for rural free delivery was an important and seminal development.⁴ The guidelines arguably assured Congressional lawmakers that an ongoing, significantly larger-scale version of rural free delivery would unfold in an orderly and standardized framework, not in an arbitrary, haphazard fashion. The guidelines, however, should not overshadow Stone's preeminent contribution to the program (6).

Pivotal Legacy

Stone's most sweeping and pivotal legacy for rural free delivery occurred in the years leading up to the widespread inauguration of the program. Through his good-roads leadership in the private and public sectors, Stone painstakingly had cultivated the constituency that rural free delivery would serve. He and his fellow good-roads advocates convinced many rural residents to abandon their local-use-only orientation for a more expansive vision of country roads as the means to achieve desired socioeconomic ends. Stone and others sustained this new way of thinking through meaningful collaboration, practical information, lofty exhortations, and legislative advocacy. Without such a comprehensive change in public attitudes, rural free delivery would have been unthinkable as a viable long-term initiative.

The good-roads component of rural free delivery helped the program survive and thrive. The goal of rural free delivery was not only for individuals in the countryside to receive and send mail more conveniently but also for them to gain economic empowerment and social equity in a fast-paced and increasingly industrialized world.

Rural free delivery strengthened the continuing demand for improved roads (10). The program also made the U.S. postal delivery system truly national in

⁴ According to Fuller (6, pp. 42–43), requiring groups of rural residents to petition members of Congress for delivery routes was the most popular and resonant of the guidelines that were implemented.



Rural free delivery along an experimental route in 1896.

scope and character (19). Roy Stone performed a critical role in making this happen, although in ways that are not usually recognized.

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POINT OF VIEW

The Most Important Question in Engineering

RICHARD M. WEED

The author, an Emeritus Member of the TRB Management of Quality Assurance Committee, is a consultant based in Trenton, New Jersey. He retired from the New Jersey Department of Transportation in 2002.

New Jersey DOT contractor applies hot-mix asphalt on Route 1, near Lawrence, N.J.

Early in my engineering career, longer ago than I care to remember, I frequently engaged in lively debates with another engineer whose age then was close to my age now. That I still remember our debates indicates that he made a lasting impression on me. He probably saw me as a brash young fellow whose opinions were not yet tempered by practical experience, and I regarded him as old and set in his ways. As is often the case with differences of opinion, the truth probably lay somewhere between.

One thing I understood then and appreciate even more today is that a question he posed in a paper title—How Good Is Good Enough?—is one of the most profound questions in engineering. The man's name was Ed Abdun-Nur, and his 1962 paper focused on the compressive strength of concrete. As time went on, I realized that this question applies to everything the engineering profession does—from selecting the

problems that deserve our attention to the thought processes by which we attempt to solve those problems.

Today I wonder if we ask this question often enough as we rush to undertake bold, complex solutions to pressing problems when simpler solutions might be as effective at substantially less cost—that is, they might be good enough in practical terms. I have written before about a variation of the KISS rule¹—Keep It Simple but Scientific—that emerged spontaneously as the quality assurance program at the New Jersey Department of Transportation (DOT) was evolving. The rule performed well for us, and the concept couldn't be more straightforward: choose the simplest method possible that makes scientific sense, and switch to something more complex only if there is evidence that the simple method is not working.

Good Approximations

The approach has many scientific precedents. Hooke's Law that stress is directly proportional to strain is known to be imperfect, as are Newton's Laws of Motion at the molecular level; nevertheless, these laws serve us well. Similarly, many opportunities arise in engineering to apply classical mathematical procedures to obtain approximations that may be more than adequate for practical purposes. Such solutions often provide an intuitive feel for the method that can guard against potential misapplications.

In contrast, extremely complex methods may be difficult to comprehend—they may be well understood by only a handful of experts. Unless these methods have undergone thorough and well-documented validation testing, there may be no way to be confident that the results they produce are correct.

What seems to be missing today is a conscious effort to seek out the simple solutions first, instead of immediately embarking on long-term and costly research studies. As a former research engineer, I fully appreciate the value of understanding natural phenomena. The research community should strive for this understanding, but experience has demonstrated

¹ See, for example, A Brief History of Highway Quality Assurance, *TR News*, November–December 2005, pp. 30–32.



PHOTO: NEW JERSEY DOT

that well-thought-out, empirical solutions also can be effective. Considerable simplicity often can be gained at the expense of only a minor loss of precision. Perhaps the ideal approach is for both efforts to proceed simultaneously, allowing the simple methods to provide short-term solutions with immediate payback, while researchers investigate whether better solutions are obtainable.

Case for Simplicity

Persuasive arguments in engineering must be technical—that is the nature of the discipline; therefore the best way to illustrate these principles is with a practical example. Figure 1 shows an example from my field, the engineering applications of statistical analysis. Realistic boundary conditions are used with an appropriate mathematical form to develop a practical performance model to predict the expected service life (EXPLIF) of pavement as a function of as-constructed quality.

The upper and lower boundary conditions in Figure 1 suggest that a reverse S-shape is suited for this application. The acceptable quality level (AQL) and the rejectable quality level (RQL)—both important in analyzing the risks associated with statistical acceptance procedures—provide convenient determining points for specifying the model more precisely. The general exponential equation shown in the figure is appropriate for a single quality characteristic, but similar multidimensional models can be developed for any reasonable number of quality characteristics.

This approach could not be simpler at either the conceptual level or the application level, and models such as these can be extremely useful for the statistical specifications designed to accept construction by pay adjustment. After a single-characteristic or a multiple-characteristic performance model has been developed to predict expected life from the quality received, the next step is to translate that level of expected life into an appropriate amount of pay adjustment. This can have far-reaching financial and legal consequences for both the transportation agency and the construction industry; therefore this step must be valid, accurate, and defensible.

Life-Cycle Cost Analysis

Because one purpose of the pay schedule is to withhold sufficient payment at the time of construction to recover the anticipated future costs that result from substandard work, life-cycle cost analysis is ideally suited for this determination. The method properly accounts for the different costs spread out over time that can be related to construction outcomes that are under the contractor's supervision and control. This same method also can justify bonus clauses that award

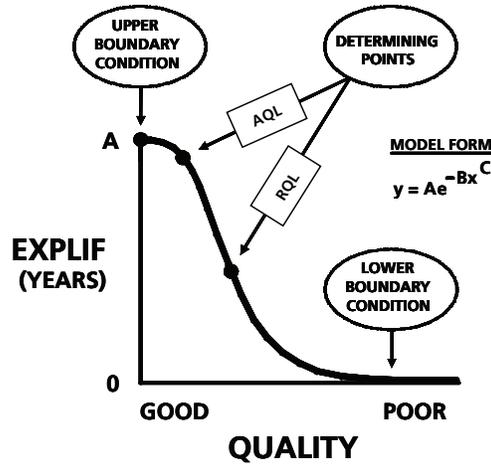


FIGURE 1 Diagram of performance-modeling technique. (EXPLIF = expected service life; AQL = acceptable quality level; RQL = rejectable quality level.)

small increases in payment for an extension of expected life that is attributable to work of superior quality.

For example, New Jersey DOT has developed such a procedure for the acceptance of hot-mix asphalt pavement. A key component of the underlying analysis is the recognition that a marginally deficient section of roadway—one that is not outright rejectable—will not be repaired at the time of construction to restore its intended design life; instead, that section will be expected to fail prematurely at the time predicted by the performance model. The additional expense of resurfacing this pavement at an earlier date justifies the pay reduction assessed to the contractor. Conversely, if the performance model predicts an extension of service life, an appropriate level of bonus payment is awarded.



PHOTO: TWINING LABORATORIES OF SOUTHERN CALIFORNIA, INC., WWW.TWININGLABS.COM

Quality inspector performs asphalt concrete compaction testing.

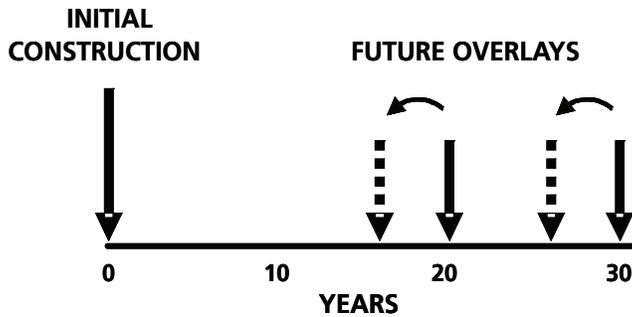


FIGURE 2 Diagram showing consequences of premature failure.

Importance of Thorough Analyses

Engineers have used life-cycle cost analysis for many years, and its application is well understood. But unless care is taken, certain important components of the analysis may be neglected. For example, a significant contributing factor that easily might be overlooked is the effect of premature failure on all future overlays. Figure 2 depicts the major activities that should be accounted for in new construction with a design life of 20 years—although this same approach could be applied just as well to a typical resurfacing, which has a shorter design life.

Quality inspector performs asphalt concrete mix sample quartering for laboratory testing.



PHOTO: TRAINING LABORATORIES OF SOUTHERN CALIFORNIA, INC.; WWW.TRAININGLABS.COM

In the Figure 2 example, deficient initial construction has led to premature failure at about 16 years, so that the overlay that would have been expected in the 20th year now must be applied 4 years earlier. Yet if the 20th-year overlay must be moved up to year 16, and the typical overlay lasts 10 years, then the 30th-year overlay must be moved up to year 26, and so on. Failing to account for the economic impact of having to reschedule successive future overlays can underestimate the cost of premature failure substantially and, as a result, can produce construction specifications that do not adequately protect the agency's interests.

Fortunately, this turns out to be a relatively simple mathematical problem, and a single reference has been provided that contains additional references detailing both the development of the performance models and the derivation of the life-cycle cost equation (1). Any analysis that overlooks a critical component—such as the economic impact of successive future overlays, in this example—cannot be regarded as “good enough.”

Guiding Philosophy

Engineers face diverse challenges that often require striking a balance between theory and practicality. For extremely sophisticated applications—the space program, for example—the choice must be to go with complex solutions and the latest technology. But in the highway field, the data and the technology are sometimes empirical, and the opportunity frequently arises to make intelligent use of methods that stress practicality over complexity.

In some cases, the data to justify an extremely sophisticated model or complex solution are not available. In these cases, it makes perfect sense to use simplified models, such as those shown in Figures 1 and 2. The numbers are hypothetical, but if it were possible, getting an answer that is 90 percent as effective with a methodology that is 10 percent as complicated would be considered a bargain in many situations. Asking the question, “How good is good enough?” expresses a penchant for practicality that will almost always prove beneficial in the practice of engineering.

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

Building Partnerships for Progress Through Transportation Research

1 Paul Brubaker (*center*), Research and Innovative Technology Administration (RITA), fields a question during the spotlight session, Dialogue with the U.S. DOT: Reforming Federal Transportation Policies and Programs, surrounded by (*left to right*) Brian McLaughlin, National Highway Traffic Safety Administration; Krista Edwards, Pipeline and Hazardous Materials Safety Administration; Collister (Terry) Johnson, Jr., St. Lawrence Seaway Development Corporation; and Tyler Duvall, U.S. Department of Transportation (DOT).

Approximately 10,500 transportation researchers, practitioners, and administrators representing government, industry, and academia from the United States and abroad gathered in Washington, D.C., January 13–17, 2008, to participate in the 87th Annual Meeting of the Transportation Research Board. The five-day program offered attendees a variety of opportunities for networking with peers, information sharing, and interaction through more than 3,000 presentations in more than 567 sessions; 86 specialty workshops; 436 meetings of committees, subcommittees, and task forces; and many additional events. Featured for the first time were commercial exhibitors, with more than 170 booths in the



expanded exhibit halls showcasing transportation-related products and services alongside displays by TRB sponsors.

The meeting's spotlight theme, Partnerships for Progress in Transportation, was featured in sessions that crossed all modes and disciplines. Details and highlights appear on the following pages.

2 A special delegation of Iraqi transportation officials, led by Construction and Housing Minister Bayan Dezei (*seventh from right*), visited the TRB Annual Meeting, welcomed by former U.S. Secretary of Transportation Norman Y. Mineta (*fourth from left*); 2008 TRB Executive Committee Chair Debra L. Miller (*fifth from right*), Secretary of Kansas DOT; and Joseph S. Toole (*right*), Federal Highway Administration (FHWA).



Annual Meeting photographs by Cable Risdon Photography

TRB 2008 ANNUAL MEETING HIGHLIGHTS

INTERSECTIONS

1 Georgia Tech students (*left to right*) Yolanda Oliver-Commey, Dorothy Morillos, and Jin Xu consult the 284-page Annual Meeting program.



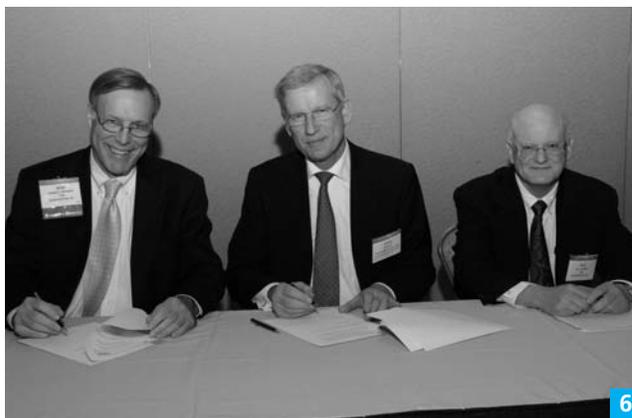
2 The 87th Annual Meeting included expanded exhibit halls that featured more than 170 commercial companies and TRB sponsors.



3 Katherine Turnbull (*right*), Texas Transportation Institute (TTI), assists Annual Meeting first-timer Rebekah Gayley, University of Delaware, during the Welcome Session.



4 Basic Research and Emerging Technologies Related to Concrete Committee Chair Mohammad S. Khan (*left*), Professional Service Industries, Inc., briefs young and new attendees on committee activities.



5 Incoming Technical Activities Council (TAC) Chair Robert Johns (*right*), University of Minnesota, and Cynthia Burbank, PB, participate in discussion during the TAC meeting, Sunday, January 13.

6 TRB Executive Director Robert E. Skinner, Jr. (*left*); Joris Al, Director of the Rijkswaterstaat, the national transportation agency of the Netherlands; and Strategic Highway Research Program (SHRP) 2 Director Neil Hawks (*right*), sign an agreement for senior-level loan staff to assist SHRP 2 for one year.



8 From opening Sunday through closing on Wednesday, the exhibit hall was an active forum for professional networking and information gathering.

7 Robert E. Skinner, Jr., TRB; Ann L. Koby (*left*), Women's Transportation Seminar (WTS); and Miranda Carter, Chair, TRB Women's Issues in Transportation Committee, display the signed TRB-WTS memorandum of understanding.



SPOTLIGHT SESSIONS

1 Patricia Van Gorp, Beacon Associates International, speaks on critical aspects, foundations, and best practices in a session on Context-Sensitive Solutions and Managing Effective Public Involvement.

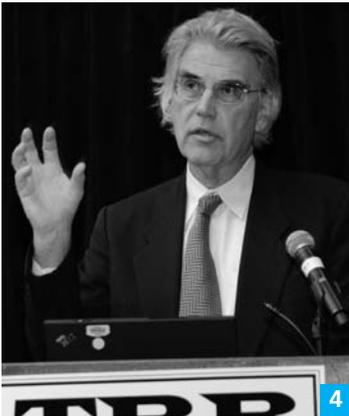
2 Dan Doctoroff, former Deputy Mayor of the City of New York, gave the keynote presentation at Session 141, Cutting Carbs in the Transportation Sector: International Efforts to Address Global Climate Change.

3 Lewis Fulton, International Energy Agency, Paris, briefs the Session 141 audience on international energy issues.

4 Michael Gallis, Michael Gallis & Associates, emphasizes a point during the session on Looking at the Past and Planning for the Future: U.S. Transportation Infrastructure Crisis.

5 Speakers for Strategic Highway Safety Plans: Status Report included (left to right) Jeff Lindley, FHWA; Lowell Porter, Washington Traffic Safety Commission; Rosemarie Anderson, Delaware Valley Regional Planning Commission; and Leanna Depue, Missouri DOT.

6 Panelists J. Richard Capka (center), FHWA, and Sherry E. Little, Federal Transit Administration (FTA), look on as Robert Sturgell, Federal Aviation Administration (FAA), responds to a question during the Dialogue with the U.S. DOT: Reforming Federal Transportation Policies and Programs.



7 Jeffrey N. Shane, U.S. DOT, directs the active discussion during the Dialogue with the U.S. DOT.

8 FTA Administrator James S. Simpson moderates the session on Transit Investment and Congestion Pricing: Roundtable of Transit Role in Congestion Management.

9 Khani Sahebjam, Minnesota DOT, participates in a panel on the Interstate 35W Bridge Project: Design-Build in an Emergency.



TRB 2008 ANNUAL MEETING HIGHLIGHTS

SESSIONS AND WORKSHOPS

1 Planning committee for the Human Factors in Transportation Workshops.



2 Thomas Sheridan, Volpe National Transportation Systems Center, presents the Human Factors in Transportation Workshops keynote address.



3 Michael Culmo, CME Associates, Inc., offers the latest news on Connection Details for Prefabricated Bridge Elements and Systems.



4 Emil Frankel (left), Bipartisan Policy Center, considers a response from Tyler Duvall, U.S. DOT, during the workshop, Emerging Debate About New Systems for Transportation Finance.

1 (*Human Factors in Transportation Workshops Planning Committee, front row, left to right:*) Jerry Wachtel, The Verizon Group, Inc.; Michael Perel, National Highway Traffic Safety Administration; Neal Lerner, Westat; Suzanne E. Lee, Virginia Polytechnic Institute and State University (Virginia Tech) Transportation Institute; Gregory W. Davis, Turner–Fairbank Highway Research Center, FHWA; Alex Landsburg, Computer Sciences Corporation; (*back row, left to right*) Daniel V. McGehee, Human Factors and Vehicle Safety Public Policy Center, University of Iowa; Fred R. Hanscom, Transportation Research Corporation; Helmut T. Zwahlen, Ohio University; Group Chair Thomas Raslear, Federal Railroad Administration; Christopher Monk, George Mason University; Richard Pain, TRB.



5 Deborah Freund, Federal Motor Carrier Safety Administration (FMCSA), contributes to a workshop discussion of strategies for involving stakeholders in evaluation throughout the research and development cycle.



6 Consultant Donald R. Trilling speaks on the development of TRB Special Report 218, *Transportation in an Aging Society*, during a two-part session marking the 20th anniversary of the report.



7 Rollin Hotchkiss, Brigham Young University, speaks at a workshop on fish passage at culverts.



8 Megan L. Smirti, University of California, Berkeley, moderates discussion during Pangs of New York: Reducing Delays at Kennedy, LaGuardia, and Newark Airports.



9 Christopher Flanigan, FMCSA, responds to a question about the agency's analysis, research, and technology programs.





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7 Will Kempton, California DOT, delivers the opening remarks at a session on the Highway Trust Fund.

8 A. Keith Turner, Colorado School of Mines, engages audience members on Rock Fall Evaluation and Control.



8

SESSIONS AND WORKSHOPS

(continued)

1 Michael F. Monteleone, Louis Berger Group, explains conclusions from a simulation of pedestrian traffic at the World Trade Center memorial.

2 Robert E. Skinner, Jr. (left); New Public Transportation Systems and Technologies Committee Chair Susan Shaheen, University of California, Berkeley (center, right); and Planning and Environment Group Chair Marcy Schwartz, CH2M Hill (right), present a TRB Communications Competition award to Caroline Rodier, Pacbell Mineta Transportation Institute, for Transit Training for Older Travelers.

3 Poster sessions allowed attendees to have informal but intensive, face-to-face discussions with authors.

4 Henry G. (Gerry) Schwartz, Jr., formerly of Sverdrup-Jacobs Civil, Inc., presents the conclusions and recommendations from the new policy study from TRB and the NRC Division on Earth and Life Studies on the potential impacts of global climate change on U.S. transportation.

5 Words of Wisdom: Lessons Learned from Former CEOs of State Departments of Transportation included (left to right) speakers J. Bryan Nicol, Indiana DOT; Bradley Mallory, Michael Baker Corporation; moderator Mara Campbell, Missouri DOT; and Gordon Proctor, Ohio DOT.

6 John E. Putnam, Kaplan Kirsch & Rockwell LLP, moderates Shifting into Neutral? Assessing Carbon Offset Programs for Transportation.

TRB 2008 ANNUAL MEETING HIGHLIGHTS

SESSIONS AND WORKSHOPS

(continued)

1 An award for best poster on bituminous materials was presented to Trenton M. Clark (*left*), Virginia DOT, and Kevin McGhee, Virginia Transportation Research Council, by Bituminous Materials Section Chair James S. Moulthrop (*right*), Fugro Consultants.



2 Brian P. Kennedy, Short Elliott Hendrickson, Inc., explains findings of a study on Integrating Innovative Uses of Digital Video and Interactive Visualization Tools.



3 Jill Hough, North Dakota State University, details an ecological modeling approach to examining travel behavior of elderly women in rural and small urban areas of North Dakota.

4 Bicycle Transportation Committee Chair Jennifer Dill (*left*), Portland State University, and Pedestrians and Cycles Section Chair Ann M. Hershfang, America Walks, network at the Feet First Caucus.



5 Heikki Luomala, Tampere University of Technology, presents findings from a study on the effects of seasonal frost on pavement stiffness in Finland.

6 (*Left to right*) Ian Hodgson, European Commission; Robert Larson, U.S. Environmental Protection Agency; Al Jessel, Chevron Global Downstream; Dan Sperling, University of California, Davis; and Alex Farrell, University of California, Berkeley, participate in a panel on proposed standards and regulations for low-carbon and renewable fuel.



7 Maritime and Intermodal Forum participants (*left to right*) Joedy Cambridge, TRB; Pete Swan, Pennsylvania State University; Mary Brooks, Dalhousie University; Paul Bingham, Global Insight, Inc.; Harold Cervany, Tioga Group; Mike Belzer, Wayne State University; Larry Bray, Tennessee Valley Authority; Jeanne Beckett, Port of Tacoma; Bob Doll, TRANSYS Associates; Thomas Wakeman, Stevens Institute of Technology; Jon Meyer, CSX Transportation; Thera Black, Thurston Regional Planning Council; and Elaine King, TRB.



1



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COMMITTEE MEETINGS

1 International Activities Committee Chair Jorge Prozzi (*left*), University of Texas, Austin, and Alejandra Medina, Virginia Tech, present a certificate of appreciation to Maryvonne Plessis-Fraissard (*right*), The World Bank.

2 Vehicle User Characteristics Committee Chair Leo Tasca (*left*), Ontario Ministry of Transport, considers a statement by John Campbell, Battelle Memorial Institute, during committee proceedings.



3



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3 The Native American Transportation Issues Committee reviews research and practice related to transportation on or near tribal lands and communities and affecting tribal historical and cultural properties.

4 Design Section Chair Elizabeth Hilton, Texas DOT, hears reports on committee activities and plans for the year.



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5 Surface Transportation Weather Task Force Chair Wilfrid A. Nixon, University of Iowa, presents the meeting agenda; the group officially became a TRB standing committee in March.



7

6 Outgoing Chair of the Emerging Technology for Design and Construction Committee Richard G. Griffin (*left*), Colorado DOT, receives a certificate of appreciation from Section Chair Steven D. DeWitt, North Carolina Turnpike Authority.



8

8 Members of the Local and Regional Rail Freight Transport Committee took a creative approach to Annual Meeting transportation and housing by hiring a private passenger car, which traveled from New York to Washington, D.C., attached to an Amtrak train.

9 The private passenger car parked at Union Station during the Annual Meeting, before making the return trip to New York.



9

7 Edward Beimborn, University of Wisconsin, Milwaukee, participates in discussion during the organizational meeting of the Energy–Climate Change Task Force.

TRB 2008 ANNUAL MEETING HIGHLIGHTS

EXHIBITS

1 The Lambda Tech International booth offers information on the latest in Global Positioning System technology with data collection, display, and processing systems.



1

2 A meeting attendee receives instruction before trying out the National Advanced Driving Simulator provided by the University of Iowa.



2

3 Caroline Donohoe assists a participant with a train simulator showcased at the Research and Innovative Technology Administration's Volpe National Transportation Center booth.



3

4 The Cardinal Systems, LLC, booth features an interactive demonstration of the latest in photogrammetric and virtual reality mapping software for the transportation industry.



4

CHAIRMAN'S LUNCHEON AND AWARDS

5 Shirley DeLibero, DeLibero Transportation Strategies, received the Sharon D. Banks Award for Innovative Leadership in Transportation. Cited were her ability to lead, motivate, empower, and mentor people at all levels of the public transportation industry.



5

6 Alan E. Pisarski was presented the W. N. Carey, Jr., Distinguished Service Award in recognition of 30 years of leadership on a variety of committees, panels, and task forces across the spectrum of TRB, particularly in data-related issues.



6

7 Former TRB Cooperative Research Programs Director Robert J. Reilly was honored with the Roy W. Crum Distinguished Service Award for outstanding leadership in transportation research management.



8

8 Robert Land, Senior Vice President for Government Affairs, JetBlue Airways, was the featured speaker at the Chairman's Luncheon, addressing a capacity audience.



7

9 Executive Committee Chair Linda S. Watson, LYNX-Central Florida Regional Transportation Authority, introduces visiting dignitaries during the Chairman's Luncheon.



9



DISTINGUISHED LECTURE AND AWARDS FOR OUTSTANDING PAPERS

1 Matthew W. Witzcak, Arizona State University, delivers the Thomas B. Deen Distinguished Lecture, focusing on pavement performance research implementation.

2 Technical Activities Council Chair Neil J. Pedersen (*far left*), Maryland State Highway Administration, and TRB Executive Committee Chair Linda S. Watson (*far right*) present the Charley V. Wootan Award for best paper in policy and organization to Abolfazl Mohammadian (*left*) and Yongping Zhang, University of Illinois, Chicago.



3 Also receiving a Charley V. Wootan Award for best paper in policy and organization are (*left to right*) Michael L. Pack, Phillip Weisberg, and Sujal Bista, University of Maryland, College Park.

4 Coauthors (*left to right*) Rachel B. Copperman and Chandra R. Bhat, University of Texas, Austin, and Jessica Y. Guo, University of Wisconsin, Madison, share in the Pyke Johnson Award for outstanding paper in transportation systems planning and administration.



6 D. Grant Mickle Award recipients (*left to right*) Conrad L. Dudek, Texas A&M University; Brooke R. Ullman, TTI; and Steven D. Schrock, University of Kansas, share in the D. Grant Mickle Award for outstanding paper in the operation and maintenance of transportation facilities.



The Fred Burggraf Award recognizes outstanding papers by young researchers:

7 In planning and development, Abolfazl Mohammadian (*left*) and Taha H. Rashidi, University of Illinois, Chicago; and

8 In design and construction, Stacy G. Williams, University of Arkansas, Fayetteville.



Executive Committee Gains New Officers, Members

Debra L. (Deb) Miller, Secretary of the Kansas Department of Transportation (DOT), is the 2008 Chair of the TRB Executive Committee, succeeding Linda S. Watson. Vice Chair for 2008 is Adib K. Kanafani, Edward G. and John R. Cahill Professor of Civil Engineering at the University of California, Berkeley (UCB).

Miller took the reins at Kansas DOT in 2003 after four years with HNTB, a nationwide firm of architects, engineers, and planners, where she provided strategic planning and public communication assistance to state DOTs and municipalities. From 1986 to 1997, she was Director of the Division of Planning and Development at Kansas DOT.

Miller was a member of the National Research Council (NRC) committee that produced the 1996 TRB policy study report, *Paying Our Way: Estimating Marginal Social Costs of Freight Transportation*.

She chaired the National Cooperative Highway Research Program Project Panel on Commuting in America III and is active on several other TRB committees. She is a graduate of Kansas State University.



Miller

Kanafani joined the UCB faculty in 1970 and has taught and conducted research on transportation systems, transportation engineering, airport planning and design, and air transport economics. He has made major contributions to air transport demand analysis, airport capacity analysis methods, and airline network analysis. In 1997 he founded and codirected the National Center of Excellence in Aviation Operations Research at UCB. He was director of the university's Institute of Transportation Studies from 1983 to 1998 and subsequently chaired the Department of Civil and Environmental Engineering.

Kanafani was elected to the National Academy of

Long-Term Committee Leaders Achieve Emeritus Status

TRB awarded emeritus membership to 16 individuals at the 2008 Annual Meeting, honoring significant, long-term contributions and outstanding service on technical activities committees. The honorees and their committees are listed below.

Vivek D. Bhise
Simulation and Measurement of Vehicle and Operator Performance Committee

John P. Broomfield
Corrosion Committee

Nicolaas F. Coetzee
Full-Scale and Accelerated Testing Committee

Robert B. Dial
Transportation Network Modeling Committee

John W. Eberhard
Safe Mobility of Older Persons Committee

Wolfgang S. Homburger
Transit Capacity and Quality of Service Committee

Lynne H. Irwin
Strength and Deformation Characteristics of Pavement Sections Committee

Gihon Jordan
Pedestrians Committee



Pedestrians Committee Chair Ronald G. Van Houten (*left*), Western Michigan University, presents an Emeritus Membership certificate to Gihon Jordan, consultant.

Herbert S. Levinson
Transit Capacity and Quality of Service Committee

Hani S. Mahmassani
Transportation Network Modeling Committee

Lance A. Neumann
Transportation Programming, Planning, and Systems Evaluation Committee

Leland D. Smithson
Winter Maintenance Committee

Peter R. Stopher
Travel Survey Methods Committee

John H. Suhrbier
Transportation and Air Quality Committee

Vukan R. Vuchic
Intermodal Transfer Facilities Committee; Light Rail Transit Committee

Philip L. Winters
Transportation Demand Management Committee

Engineering in 2002. He has received many awards, including the James Laurie Prize of the American Society of Civil Engineers in 2000. He has been active on TRB committees since the mid-1970s. Kanafani earned master's and doctoral degrees from UCB and a bachelor's degree in engineering from the American University of Beirut.

Watson, who is CEO of LYNX—Central Florida Regional Transportation Authority, will continue to serve on the Executive Committee through 2010 and is a member of the Subcommittee for NRC Oversight.

Newly appointed to the Executive Committee are William A. V. Clark, Professor of Geography, University of California at Los Angeles; David S. Ekern, Commissioner, Virginia DOT; Jeffrey W. Hamiel, Executive Director, the Metropolitan Airports Commission, Minneapolis—St. Paul, Minnesota; Edward A. (Ned) Helme, President and founder, Center for Clean Air Policy, Washington, D.C.; Will Kempton, Director, California DOT; Susan Martinovich, Director, Nevada DOT; and Neil J. Pedersen, Administrator, Maryland DOT State Highway Administration.

EXECUTIVE COMMITTEE

1 Chair Linda S. Watson guides the Executive Committee through its agenda.

2 Debra L. Miller succeeded Watson as Chair on January 17.

3 Adib Kanafani, University of California, Berkeley, was named Executive Committee Vice Chair for 2008.

4 Robert E. Skinner, Jr., reports on the operating status and recent achievements of TRB and the prospects for the coming year.

5 Members of the congressionally established National Surface Transportation Policy and Revenue Study Commission made a special presentation to the TRB Executive Committee, offering insights and answering questions (*left to right*): Tom Skancke, Steve Heminger, Vice Chair Jack Schenendorf, Frank Busalacchi, Rick Geddes, and Paul Weyrich. Frank McArdle (*not pictured*) also participated in the briefing.

The Executive Committee policy session on public-private partnerships and social equity featured four guest speakers:

6 Jeffrey Buxbaum, Cambridge Systematics;

7 Past Executive Committee Chair Martin Wachs, RAND Corporation;

8 Peter J. Rickershauser, BNSF Railway Company; and

9 Robert Poole, Jr., Reason Foundation.



TRB 2008 ANNUAL MEETING HIGHLIGHTS

EXECUTIVE COMMITTEE

(continued)

1 Sandra Rosenbloom, University of Arizona, who served as rapporteur for the policy session, presents a summary of the discussion and possible directions for TRB.

2 John C. Horsley, American Association of State Highway and Transportation Officials, offers insights into legislative activity on Capitol Hill.

3 C. Michael Walton, University of Texas, comments on the report of the Subcommittee for NRC Oversight, which he chairs.

New members participating in the Executive Committee discussions included

4 Susan Martinovich, Nevada DOT;

5 LeRoy Gishi, Bureau of Indian Affairs;

6 William A. V. Clark, University of California, Los Angeles; and

7 Edward A. (Ned) Helme (left), Center for Clean Air Policy, with Michael Trentacoste, FHWA.

Also among the many contributors to the meetings were

8 John D. Bowe (left), API Limited, and Angela Gittens, HNTB Corporation;

9 Joseph H. Boardman, Federal Railroad Administration; and

10 Nicholas J. Garber, University of Virginia.

11 TRB Technical Activities Director Mark Norman (left), with Meetings Director Linda Karson, reviews innovations implemented to expand and improve the Annual Meeting program, exhibits, facilities, and operations in 2008.





Estimating Maintenance Costs for Mixed High-Speed Passenger and Freight Rail Corridors

A New Tool for Rail Planners

ALLAN M. ZAREMBSKI AND JOHN F. CIKOTA, JR.

Zarembski is President, Zeta-Tech Associates, Inc., Cherry Hill, New Jersey; and Cikota is Senior Transportation Analyst, Federal Railroad Administration, Washington, D.C.

An increasingly attractive strategy for introducing high-speed passenger rail service begins by examining the freight corridors between well-populated cities. The corridors should offer the potential for improved passenger rail service that could be time-competitive with airplane and automobile for door-to-door trips in the range of 100 to 500 miles. The next task is to determine the upgrading necessary for the corridors to accommodate high-speed passenger operations in addition to the current freight traffic.

State agencies and other transportation planners investigating these options often need estimates of maintenance-of-way costs for the proposed high-speed rail routes. For example, the Mid-West Regional Railway Initiative (MWRRI), a consortium of states, recently wanted to examine projected maintenance-of-

way costs for several proposed high-speed rail corridors in the Midwest, including Chicago to Detroit, Chicago to St. Louis, and Chicago–Milwaukee–St. Paul.

Problem

Future high-speed rail operations most likely will make use of track shared with freight trains. Because the experience in these corridors has been with freight-only traffic, transportation planners must determine the increase in the maintenance-of-way costs from the introduction of high-speed passenger traffic. These added costs reflect the increased track class and the tighter track requirements for the higher speeds of the passenger trains, as well as costs associated with the dynamic impacts of the higher-speed passenger trains and the increased traffic density, with correspondingly reduced opportunities for maintenance.



Because most railroad tracks in North America are privately owned, access agreements must be negotiated with the private owners. These agreements must specify how costs, such as for maintenance-of-way, are to be shared, or alternatively what access charges must be paid.

Solution

A recent Federal Railroad Administration (FRA) study looked at the maintenance-of-way costs associated with upgrading freight corridors for higher-speed operation—specifically the ongoing infrastructure maintenance costs for meeting varying traffic, track, and operating conditions. These ongoing or steady-state right-of-way maintenance costs included such cyclic capital costs as rail replacement, tie renewals, surfacing, ballast replacement, and the like, which are normally capitalized for accounting, as well as the maintenance costs for such tasks as inspections, spot repairs, and routine maintenance. Capital upgrade costs were excluded.

Costs were generated for three operating scenarios, covering a range of tonnage and traffic mix:

- ◆ Predominantly freight;
- ◆ Mixed traffic; and
- ◆ Predominantly passenger.

The costs were converted to total costs per track mile and included

- ◆ Maintenance-of-way operating expenses;
- ◆ Cyclic capital expenditures for track;
- ◆ Bridge and building costs (maintenance and capital); and
- ◆ Communications and signals costs (maintenance and capital).

Cost Models

To determine a range of right-of-way maintenance costs that included both the maintenance and the cyclic capital costs, two models were used:

- ◆ A model that calculates the level of work required to maintain a defined segment of track or territory, to estimate the noncapital track-maintenance expenditures for specific track segments and territories; and
- ◆ A model that calculates the cyclic capital costs from the standard service-lives and costs for track components, to estimate the future or steady-state spending required to replace components that wear out.

Minimum and maximum costs were developed for

Track Maintenance Cost Factors: Sample Case

Track Maintenance Cost Factors: Sample Case		Cost Per Track Mile (\$1,000)				Cost Per Passenger Train Mile (\$)			
		<i>Total Tonnage (MGT)</i>				<i>Total Tonnage (MGT)</i>			
		Ratio of Passenger to Freight Trains	FRA Track Class	5 or fewer	5–15	15–30	30 or more	5 or fewer	5–15
2 passenger: 1 freight	4	26.6	31.0	42.0	60.8	1.97	0.77	0.52	0.45
	5	29.2	34.4	46.8	68.8	3.41	1.39	0.96	0.89
	6	33.0	39.3	53.8	80.3	5.50	2.29	1.60	1.52
10 passenger: 1 freight	4	29.4	38.1	54.7	***	2.49	1.08	0.96	***
	5	31.5	41.5	59.9	***	2.95	1.32	1.20	***
	6	35.8	48.3	70.6	***	3.90	1.82	1.69	***
40 passenger: 1 freight	4	31.9	47.2	***	***	3.13	1.55	***	***
	5	34.4	52.1	***	***	3.48	1.77	***	***
	6	37.5	58.1	***	***	3.91	2.04	***	***

MGT = million gross tons

*** Elements of the matrix that represent unrealistic combinations of tonnage and high-speed passenger trains were intentionally omitted, including predominantly passenger operations with tonnage levels above 15 MGT and equal passenger-freight operations with tonnage levels above 30 MGT.

NOTE: maximum passenger speed is as follows: FRA Class 4, 80 mph; FRA Class 5, 90 mph; FRA Class 6, 110 mph.

each cell in the cost matrices. The minimum costs represented the typical Class I freight railroad practice, in which passenger trains operate on a freight railroad right-of-way; the maximum costs reflected maintenance practices on high-speed railroad track, such as Amtrak's Northeast Corridor.

The resulting costs were then calibrated to costs independently developed in a bottom-up cost study on two track segments in the Midwest:

- ◆ Buffington Harbor to Ft. Wayne, Indiana; and
- ◆ Watertown to Madison, Wisconsin.

The first segment would add high-speed passenger trains to a line with five freight trains per day, about 15 million gross tons (MGT) of traffic annually, and an operating speed of 40 mph. The second segment would add high-speed passenger trains to a line with two freight trains per day, less than 5 MGT, and an operating speed of 25 mph. Costs included activities to keep the railroad in safe condition for operations.

Allocating Costs

The resulting total costs per track mile were allocated between passenger and freight trains, allowing for the calculation of a cost per passenger train mile. An engineering-based cost allocation model divided the track maintenance costs among the different traffic types, including freight and passenger trains.

The model applies engineering damage equations to calculate the portion of track damage—or component life consumption—from each defined type of traffic operating on a specific track segment. The calculated relative damage is then used to allocate the track maintenance costs in an auditable and accountable way. The result is a set of cost matrices presenting total cost per track mile and cost per passenger train mile.

The table on page 30 presents the results of a sample analysis for three different mixes of passenger and freight trains—low, medium, and high percentage of passenger trains—and four different densities of total traffic. The results are presented for three different FRA track classes with maximum passenger train operating speeds: FRA Class 4 at 80 mph, FRA Class 5 at 90 mph, and FRA Class 6 at 110 mph. The total maintenance-of-way cost per track mile is presented, as well as the cost per passenger train mile—the commonly used measures for determining costs and access charges. The final methodology and tables were presented in an FRA technical monograph that will serve as a handbook for planners of new high-speed rail operations (1).

Benefits

The Rail Planner's Handbook will assist planners of high-speed rail service in estimating the costs of the

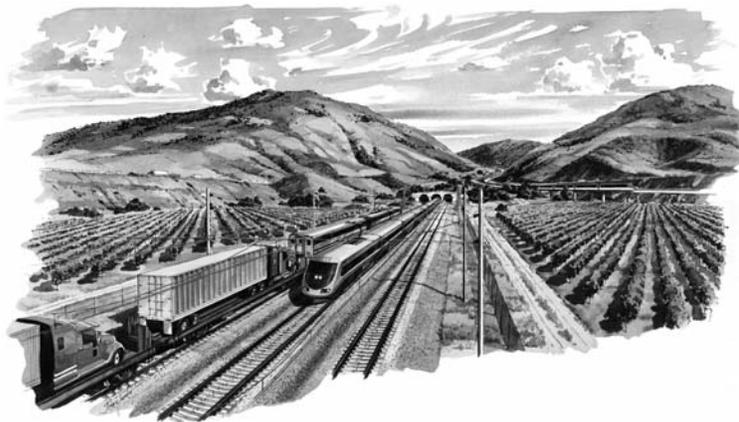


Illustration: J. Craig Thorne. Commissioned by Cooper Consulting Co., Kirkland, Wash., for The Schiller Institute, Los Angeles, Calif.

right-of-way maintenance associated with the operation of high-speed passenger trains. The results are provided as matrices that allow planners to select the appropriate maintenance or capital cost for any segment of a proposed high-speed passenger railroad.

The handbook has been used to estimate future maintenance-of-way costs for several proposed rail corridors and for parts of the MWRRI consortium plan, which are investigating high-speed passenger operations on freight lines. The handbook is expected to become an indispensable aid in the planning of high-speed rail service throughout the United States.

In practice, the operation of publicly funded passenger trains on private freight railroads will require the negotiation of access charges, and the negotiated charges probably will not be the same as the costs shown in the matrices. The cost matrices, however, indicate the expected total spending that will be required on a steady-state basis and provide an example allocation of the costs.

For more information, contact Allan M. Zarembski, Zeta-Tech Associates, Inc., 900 Kings Highway North, Cherry Hill, NJ 08034; telephone 856-779-7795; e-mail Zarembski@zetatech.com.

Reference

1. *Technical Monograph: Estimating Maintenance Costs for Mixed High-Speed Passenger and Freight Rail Corridors*. Federal Railroad Administration, U.S. Department of Transportation, Washington, D.C., 2004.

EDITOR'S NOTE: Appreciation is expressed to Amir N. Hanna, 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, Keck 488, 500 Fifth Street, NW, Washington, DC 20001 (telephone 202-334-2952, e-mail gjayaprakash@nas.edu).

Artist's rendering of high-speed rail on a freight corridor in California.

Emmanuel S. (Bruce) Horowitz

TranSystems Corporation

Veteran rail transportation economist Bruce Horowitz specializes in passenger rail economic feasibility; evaluation of non-Federal Railroad Administration– (FRA-) compliant equipment in shared-use environments; passenger-rail cost allocation; and airport–rail access system economics.

Horowitz began his career as a student at the University of California (UC), Berkeley, where he contributed to research on the economics of the struggling Southern Pacific Peninsula Commute Service—the predecessor to today’s fast-growth and successful CalTrain. In 1975, while completing his studies at UC Berkeley, he joined the San Francisco Office of DeLeuw–Cather Engineers as a project economist for the Port Authority of Allegheny County (Pittsburgh, Pennsylvania) South Hills Corridor Alternatives Study.



“[L]egitimate and well-documented [study] recommendations frequently take many years to be actualized.”

“I look back on my early work with pride,” Horowitz comments. “For the South Hills Corridor Alternatives Study, I created an economic model for benefit–cost and cost-effectiveness that included external social and financial factors, leading to a reevaluation of and recommendation against the experimental Skybus in favor of conventional light rail.”

In 1977, after working as a consultant for Amtrak on the original Northeast Corridor Improvement Project, Horowitz joined Amtrak, where he provided economic and operations analysis guidance for nearly 18 years. He created quantifiable performance measures for the business planning process and identified ways to expand service and amenities at equal or lower cost when Amtrak’s funding and economic performance were under increasing scrutiny.

For Horowitz, a highlight of his career was his role as principal investigator for the *Chicago Hub Study*—a forward-thinking document that recommended incremental frequency and speed increases for the three major short-distance rail corridor routes originating in Chicago. Through significant state funding and involvement, the recommendations are currently being implemented and are achieving the forecasted improvement in rider-

ship and reduction in unit cost. Citing the study as an example, Horowitz advises young transportation researchers not to be impatient, “because legitimate and well-documented recommendations frequently take many years to be actualized.”

Other economic studies in which Horowitz participated while at Amtrak include an evaluation of an airline code-share operation of Amtrak trains from Philadelphia International Airport to Atlantic City; studies that justified substantial expansion of through-train service from New York City to Springfield, Massachusetts; and an extensive analysis of the long-term financial security risk of excessive debt financing for the acquisition of new rolling stock.

During the mid-1980s, Horowitz left Amtrak to work as an independent consultant. He developed a base of knowledge in the regulation and application of lighter-weight, non-FRA-compliant diesel multiple unit (DMU) equipment in shared-track environments. Working with CANAC–Canadian National Railway, he designed the safety case and operational plan for Ottawa, Ontario—OC Transpo’s new DMU service.

In 2007, Horowitz joined TranSystems, where he is assisting the expansion of the company’s rail and passenger transit capabilities by establishing a new mid-Atlantic passenger rail practice in Alexandria, Virginia. He also contributes to rail planning and alternatives analysis studies and serves as coprincipal investigator for the National Cooperative Highway Research Program Project 8-64, Developing a Guidebook for Improved Principles, Processes, and Methods for Shared-Use Passenger–Freight Corridors.

Horowitz is active in many professional transportation, planning, and economic associations. He has served on the steering committee of the Federal Railroad Administration–Federal Transit Administration–Intelligent Transportation Systems Shared-Use Working Group, which is led by the American Public Transportation Association (APTA). He is a member of APTA’s Intercity and High-Speed Rail committee; a past member of the High-Speed Ground Transportation Association; and a member of the Eta Kappa Nu Electrical Engineering Honor Society and the Phi Beta Kappa Society.

In 1985, Horowitz joined the TRB Intercity Rail Passenger Systems Committee, which he later chaired. He has chaired and is an emeritus member of the Commuter Rail Transportation Committee and he has served in the Public Transportation Group. Horowitz has attended TRB Annual Meetings since 1983.

A native of suburban Boston, he began his studies at the Massachusetts Institute of Technology in the late 1960s, and after a brief hiatus, he completed his education at UC Berkeley, earning a bachelor’s degree in transportation economics in 1975. He has guest-lectured on passenger train economics at the University of Maryland and is an honorary faculty member of the U.S. Army Transportation School at Ft. Eustis, Virginia.

Susan Hanson Clark University

“The subject of people’s access to opportunity first began to interest me in the early 1970s, during my dissertation research on the travel and activity patterns of urban residents,” remarks Susan Hanson, an urban geographer and research professor at Clark University, Worcester, Massachusetts. “Questions of access require recognizing that individuals are parts of households and that households are embedded in the urban fabric; household context and urban spatial context are paramount in understanding that there is a relationship between transportation and access to opportunity.”

A research professor at Clark University’s school of geography since 1981, Hanson recently served as the Jan and Larry Landry University Professor and as a director of the school of geography.

“Transportation issues are central to contemporary urban life and are often well suited for examination by persons with multidisciplinary backgrounds.”



Before joining Clark, she taught at the State University of New York, Buffalo, and at Middlebury College, Middlebury, Vermont.

“If you look into the educational background of transportation professionals, many of them came to transportation from the field of geography. Many geographers and students of geography are drawn to the field of transportation,” Hanson notes. “Transportation issues are central to contemporary urban life and are often well suited for examination by persons with multidisciplinary backgrounds.”

Hanson’s research has focused on the relationship between travel and urban spatial structure, as well as on gender and economy, access to employment, local labor markets, and sustainability. A highlight of her career is *Gender, Work, and Space*, a book in which Hanson and coauthor Geraldine Pratt present research on gender and urban labor markets—specifically, the effects of spatial and temporal access to employment in shaping gender divisions within the labor market.

“My work with Geraldine Pratt examined how a potential worker’s interactions within the household, the neighborhood, and the larger community, as well as his or her employer’s perceptions and actions, helped to shape the location and type of work a person was doing,” recalls Hanson. “My current work on

gender and entrepreneurship is an extension of my earlier work, but with a focus on self-employment rather than on the wage-and-salaried workforce. Issues of access are important to people interested in entrepreneurship, as many people are attempting to reduce their commutes and live more locally-focused lives.”

Hanson has participated in and is a member of many professional organizations. As a Peace Corps Volunteer from 1964 to 1966, she served as a teacher at a secondary school in western Kenya. She served as a chairman and member of the Niagara Frontier Transportation Committee’s Bicycle Subcommittee in the 1970s, and has served on the United Way of Worcester’s Community Indicators Task Force and on the Worcester Consortium Task Force on Downtown Revitalization. She has been active in the Association of American Geographers (AAG), and served as AAG president from 1990 to 1991.

Hanson’s involvement in TRB began in 1982 when she served on the Transportation Demand Forecasting Committee. She has served on many National Research Council and TRB study committees, including the Committee on Urban Transportation Congestion Pricing; the Committee on Physical Activity, Health, Transportation, and Land Use—which she chaired; and the Committee for the Study on the Relationships Among Development Patterns, Vehicle Miles Traveled, and Energy. She recently served two terms on the TRB Executive Committee and the Executive Committee’s Subcommittee for National Research Council Oversight.

“TRB is uniquely positioned to help solve many of the energy, environmental, and security-related problems facing the contemporary world,” Hanson comments. “All of these problems require interdisciplinary and multidisciplinary research and TRB is a superb forum for researchers who want to interact and work with others from different disciplinary backgrounds. No one can be involved in TRB without encountering someone from a different corner of the transportation field—someone who will challenge you to think differently about a problem.”

Hanson earned a bachelor’s degree in geography from Middlebury College in 1964 and a doctorate in geography from Northwestern University in 1973. She was awarded Lifetime Achievement Honors by the Association of American Geographers in 2003, as well as the Van Cleef Medal from the American Geographical Society for her work in urban geography in 1999. She was elected to the National Academy of Sciences in 2000, and is a fellow of the American Academy of Arts and Sciences, the Center for Advanced Studies in the Behavioral Sciences, and the American Association for the Advancement of Science.

TRB Meetings 2008

June

- 2–4 25th International Bridge Conference*
Pittsburgh, Pennsylvania
- 4–6 Aviation Group Midyear Meetings
Washington, D.C.
- 15–19 2nd Freeway and Tollway Operations Conference*
Ft. Lauderdale, Florida
- 15–20 TRB Summer Conference: Joint Summer Meeting and 33rd Annual Ports, Waterways, Freight, and International Trade Conference
Baltimore, Maryland
- 16–18 6th RILEM International Conference on Cracking in Pavements*
Chicago, Illinois
- 16–19 4th National Conference on Surface Transportation Weather
Indianapolis, Indiana
- 17–19 7th International Symposium on Snow Removal and Ice Control Technology
Indianapolis, Indiana
- 22–24 Innovations in Travel Demand Forecasting 2008
Portland, Oregon
- 23–28 7th International Conference on Managing Pavements and Other Roadway Assets*
Calgary, Alberta, Canada

July

- 6–9 47th Annual Workshop on Transportation Law
San Diego, California
James McDaniel
- 7–10 Southern African Transport Conference*
Pretoria, South Africa
Martine Micozzi
- 8–10 The Greenshields Fundamental Diagram: 75 Years Later (*by invitation*)
Woods Hole, Massachusetts
Richard Cunard
- 13–16 8th National Conference on Access Management*
Baltimore, Maryland
- 13–17 4th International Conference on Bridge Maintenance, Safety, and Management*
Seoul, Korea
- 20–23 Committee on Transportation-Related Noise and Vibration
Key West, Florida
- 21–22 Bus Rapid Transit Workshop
Cleveland, Ohio
Peter Shaw
- 27–30 6th National Seismic Conference on Bridges and Highways*
Charleston, South Carolina
- 28–29 Young Driver Subcommittee Midyear Meeting and Workshop
Woods Hole, Massachusetts
Richard Pain

August

- 6–8 North American Travel Monitoring Conference and Exposition (NATMEC 2008)
Washington, D.C.
- 11–16 6th International Conference on Case Histories in Geotechnical Engineering*
Washington, D.C.
- 17–21 9th International Conference on Concrete Pavements*
San Francisco, California

September

- 3–5 Best Practices in Meeting SAFETEA-LU Requirements in the Statewide Transportation Planning Process
Atlanta, Georgia
Kimberly Fisher
- 8–11 International Conference on Construction Management*
Orlando, Florida
Frederick Hejl
- 10–12 Conduct of Research and Technology Transfer Committees Midyear Meeting
Woods Hole, Massachusetts
Mark Norman
- 17–19 11th National Conference on Transportation Planning for Small and Medium-Sized Communities: Tools of the Trade
Portland, Oregon

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

*TRB is cosponsor of the meeting.

Academy Inducts Four TRB Engineers

Among the 65 new members and 9 foreign associates elected to the National Academy of Engineering (NAE) in 2008 are TRB volunteers Anthony E. Fiorato, CTL Group; W. Allen Marr, GeoComp Corporation; Robert F. Sawyer, University of California, Berkeley; and Kumares C. Sinha, Purdue University.

Fiorato is a past member of the Task Force on Highway Research in Industry, and a liaison representative to the National Cooperative Highway Research Program Panel 18-05, Relationship of Portland Cement Characteristics to Concrete Durability. Marr is a member of the Tunnels and Underground Structures Committee and a past member of the Soils and Rock Instrumentation Committee.

Sawyer served on the National Research Council-appointed Committee for the Evaluation of the Congestion Mitigation and Air Quality Improvement

Program, which produced TRB Special Report 264. A National Associate of the National Academies, Sinha is an emeritus member of the TRB International Activities Committee and the Transportation Programming, Planning, and Systems Evaluation Committee, and is a member of the Bridge Management Committee and the Transportation Research Record Publication Board.

Election to NAE is among the highest professional distinctions accorded to an engineer. Membership honors outstanding contributions to engineering research, practice, or education, including significant contributions to engineering literature, the pioneering of new and developing fields of technology, making major advances in traditional fields of engineering, or developing or implementing innovative approaches to engineering education.



FOSTERING EXCHANGE—

On April 4, 2008, TRB Executive Director Robert E. Skinner, Jr. (*right*), and Chang-se Kim, President, Korea Institute of Construction and Transportation Technology Evaluation and Planning (KICTEP), signed a memorandum of understanding to initiate and maintain a regular exchange of information between the Strategic Highway Research Program 2 and KICTEP regarding projects of mutual interest in construction and transportation research.

COOPERATIVE RESEARCH PROGRAMS NEWS

Highway Capacity Manual Update

Since publication of the *Highway Capacity Manual* in 2000, advances have been made in microscopic traffic simulation, operations analysis, and the management and control of traffic facilities. For capital and operations decision makers, better tools are needed for evaluating context-sensitive solutions, travel-time reliability, and over-capacity conditions.

To update the *Highway Capacity Manual*, NCHRP has funded 8 projects totaling \$4.5 million in 6 years. The Strategic Highway Research Program 2 is developing new tools for the *Highway Capacity Manual* that will require a production research project for com-

piling the necessary information.

Kittelson & Associates has been awarded a \$1 million, four-year contract (NCHRP 3-92) to develop an updated *Highway Capacity Manual* that meets the needs of planning and design engineers for 2010. The manual will provide a comprehensive set of methodologies for quantifying congestion and facility performance, as well as an integrated systems analysis approach for sizing facilities and for determining geometric design parameters.

For more information, contact B. Ray Derr, TRB, 202-334-3231, rderr@nas.edu.



Continuous Flow Intersections Ease Gridlock

Working with the Louisiana Department of Transportation and Development (DOTD), the engineering firm ABMB has implemented a continuous flow intersection (CFI) design to ease gridlock. Open since 2006, a two-leg CFI in Baton Rouge, Louisiana, allows left-turning vehicles to cross lanes of oncoming traffic several hundred feet before reaching the main intersection, using a series of carefully timed traffic signals. Routing the left-turning

traffic ahead of the intersection allows extended time for signal phases, increases intersection capacity, and reduces congestion.

A Louisiana DOTD study of CFI technology at the intersection of Airline Highway and Sherwood Forest Boulevard in Baton Rouge found that

- ◆ Intersection congestion was reduced by as much as 40 percent during rush hour;
- ◆ Approximately 10 percent more traffic passed through an intersection; and
- ◆ The number of crashes was reduced by 27 percent.

Other CFI applications include a prototype built at Dowling College, Long Island, New York, and a full-scale project in Maryland at the intersection of Routes 228 and 210, 15 miles south of Washington, D.C. New CFIs are in the design and construction phases in Utah, Ohio, and Mississippi, and additional projects are under consideration in Arkansas, Maryland, and Texas.

For more information, visit www.abmb.com/cfi.html.

Study Report Details Crash–Congestion Costs

The American Automobile Association has released a study report, *Crashes vs. Congestion: What's the Cost to Society*, which compares the societal and economic impacts of motor vehicle crashes and traffic congestion. The study, conducted by Cambridge Systematics, Inc., raises awareness of the importance of transportation investments and provides policy makers, departments of transportation, and the public with information on the extent of the traffic safety problem.

Data indicate that the annual societal costs of motor vehicle crashes are nearly two-and-one-half times the cost of congestion—approximately \$164.2 billion for crashes and \$67.6 billion for congestion. The study report makes recommendations for tackling the problem of cultural complacency with regard to traffic safety; key recommendations address

- ◆ The need for leadership and commitment at the federal, state, and local levels to make safety a priority in transportation planning and to focus planning and resources on safety improvements;
- ◆ Development of effective methods to increase public awareness and understanding of the societal impacts of auto crashes, the need for effective countermeasures, and the role of motorist behavior in safety; and
- ◆ Prioritization of increased funding for testing and systematic evaluation of safety interventions.

The report presents cost calculations for crashes in metropolitan areas covered by the annual Texas Transportation Institute's *Urban Mobility Report*, and shows that crash costs exceeded congestion costs in each metropolitan area studied. The \$164.2 billion cost for crashes equates to an annual per-person cost of \$1,051; \$430 per person is the rate for congestion. Crash costs rise to more than seven times congestion costs in small urban areas of less than 500,000 residents.

A TIGHT FIT—Two Japanese-built container cranes pass under the Vincent Thomas Bridge at the Port of Los Angeles, en route to TraPac terminal, December 14, 2007. The two \$7 million cranes stand 285 feet in height, weigh more than 300 tons each, and will assist TraPac by more than doubling the terminal's container volume from 900,000 twenty foot equivalent units (TEUs) to approximately 2.4 million TEUs in the next 30 years. The delivery of the cranes was timed to occur when the tide was lowest, to ensure clearance from the bridge.



AASHTO Practitioner's Handbook: Using the SAFETEA-LU Environmental Review Process

American Association of State Highway and Transportation Officials (AASHTO), 2008; 24 pp.; AASHTO member, \$10; nonmember, \$12; 1-56051-407-7.



The environmental review process for transportation projects was established by Congress for all highway and transportation projects that require approval by the U.S. Department of Transportation. This handbook aids transportation practitioners respon-

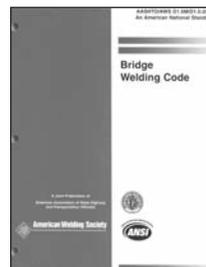
sible for ensuring compliance in the agency review process—including preparation of environmental impact statements—and covers such topics as initiating an environmental review process; inviting participating agencies; establishing a coordination plan; setting comment deadlines; providing for agency and public involvement in determining project purpose and need; determining methodologies for the analysis of alternatives; resolving issues of concern; developing

detailed preferred alternatives; reporting permit decision delays; and more.

AASHTO-AWS Bridge Welding Code

AASHTO, 2008; 410 pp.; AASHTO members, \$264; nonmembers, \$317; 0-87171-075-8.

Created by a joint American Welding Society-AASHTO committee and developed in response to industry demand for a single document to provide management, engineers, foremen, and welders with cost-effective methods of bridge fabrication, the revised 2008 bridge welding code covers best practices and general provisions for routine bridge-welding applications. Included are additions and updates to usage; handling and storage requirements for consumables; performance test specifications; filler-metal variables; inspection personnel qualifications; HPS-485W and HPS-50W high-performance steel grades; and more.



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

TRB PUBLICATIONS

A Guide for Reducing Collisions Involving Young Drivers

NCHRP Report 500, Volume 19

Provided are strategies for reducing collisions involving young drivers, as well as information for safety practitioners on implementing programs to reduce injuries and fatalities on highways.

2007; 88 pp.; TRB affiliates, \$33.75; nonaffiliates, \$45. Subscriber category: *safety and human performance (IVB)*.

Best Practices to Enhance the Transportation-Land Use Connection in the Rural United States

NCHRP Report 582

Guidance is presented on how best to integrate land use and transportation in rural communities. Also provided is information on programs and investment strategies that support community development, livability, and adequate transportation capacity.

2007; 95 pp.; TRB affiliates, \$33.75; nonaffiliates, \$45. Subscriber Category: *planning and administration (IA)*.

Technologies for Improving Safety Data

NCHRP Synthesis 367

This synthesis covers new technologies for the acquisition, processing, and management of crash, roadway inventory, and traffic operations data. Summarized are current state-of-the-practice and state-of-the-art technologies for the efficient and effective

collection and maintenance of data for highway safety analysis.

2007; 102 pp.; TRB affiliates, \$33.75; nonaffiliates, \$45. Subscriber categories: *planning and administration (IA)*; *safety and human performance (IVB)*.

Cone Penetration Testing

NCHRP Synthesis 368

Cone penetrometer equipment options are reviewed, along with field testing procedures; cone penetration test (CPT) data presentation and geostatigraphic profiling; CPT evaluation of soil engineering parameters and properties; CPT for deep foundations, pilings, shallow foundations, and embankments; and CPT use in ground modifications and difficult ground conditions.

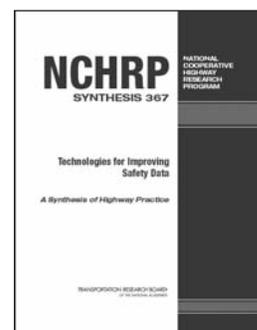
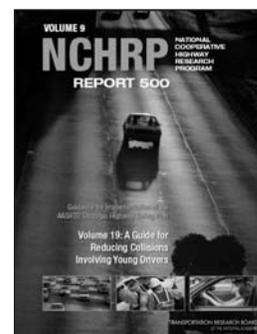
2007; 117 pp.; TRB affiliates, \$35.25; nonaffiliates, \$47. Subscriber category: *soils, geology, and foundations (IIIA)*.

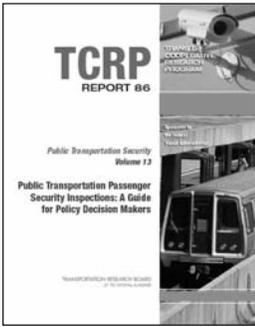
Animal-Vehicle Collision Data Collection

NCHRP Synthesis 370

Examined are data from animal-vehicle collision accident reports, as well as from animal carcass counts in the United States and Canada.

2007; 107 pp.; TRB affiliates, \$35.25; nonaffiliates, \$47. Subscriber categories: *highway operations, capacity, and traffic control (IVA)*; *safety and human performance (IVB)*.





Public Transportation Security, Volume 13: Public Transportation Passenger Security Inspections: A Guide for Policy Decision Makers

TCRP Report 86, Volume 13
Guidance is provided for public transportation agencies on implementing passenger-security inspection programs.

2007; 67 pp.; TRB affiliates, \$30.75; nonaffiliates, \$41. Subscriber categories: *planning and administration (IA); transportation law (IC); public transit (VI); security (X)*.



Transit-Oriented Development: Traveler Response to Transportation System Changes

TCRP Report 95, Chapter 17
The transportation-related impacts of a transit-oriented development land use strategy are examined. Other issues include regional context, land use mix, and primary transit modes.

2007; 135 pp.; TRB affiliates, \$36.75; nonaffiliates, \$49. Subscriber categories: *planning and administration (IA); highway operations capacity, and traffic control (IVA); public transit (VI)*.



Fixed-Route Transit Ridership Forecasting and Service Planning Methods

TCRP Synthesis 66
This synthesis contains findings on the state-of-the-practice in fixed-route transit ridership forecasting and service planning. Identified are forecasting methodologies, resource requirements, data inputs, and organizational issues. Also presented is information on the impacts of service changes and on transit agency assessments of self-implemented improvement programs.

2006; 50 pp.; TRB affiliates, \$23.25; nonaffiliates, \$31. Subscriber category: *public transit (VI)*.



Safety Management Systems for Airports: Overview

ACRP Report 1, Volume 1
The airport safety management system (SMS) is described, and a systems approach to safety management and its benefits to the safety and business aspects of airports are explained. Also described are the four components of an SMS: safety policy, safety risk management, safety assurance, and safety promotion.

2007; 30 pp.; TRB affiliates, \$24; nonaffiliates, \$32. Subscriber category: *aviation (V)*.

Airport Aviation Activity Forecasting

ACRP Synthesis 2
Current practices and methods of forecasting airport activity in the United States are examined. The synthesis addresses ways that airport forecasts are used and identifies common aviation metrics, aviation data sources, issues in data collection and preparation, and

special data issues at nontowered airports. The text also covers the evaluation of forecasts, including assessments of forecast uncertainty and accuracy, issues of optimism bias, and options for resolving differences when several forecasts are available.

2007; 32 pp.; TRB affiliates, \$33; nonaffiliates, \$44. Subscriber categories: *planning and administration (IA); aviation (V)*.

Commercial Motor Vehicle Carrier Safety Management Certification

CTBSSP Synthesis 12
The latest information on commercial motor vehicle safety certification, self-evaluation, benchmarking, and best practices programs is assembled in this synthesis; major common elements and protocols are identified; and evidence for the crash-reduction effectiveness of programs is critically assessed.

2007; 52 pp.; TRB affiliates, \$33.75; nonaffiliates, \$45. Subscriber categories: *operations and safety (IV); freight transportation (VIII)*.

Traffic Signals Systems and Regional Systems Management 2006

Transportation Research Record 1978
Research topics in this volume include a loop detector–bicycle interaction model to aid in loop detector design; an investigation of noncoordinated movements of coordinated semiactuated traffic signals; an evaluation of in-service, detection–control systems at five isolated, high-speed intersections in Texas; a program for solving a system’s optimal dynamic traffic assignment and signal optimization; a comparison of traffic signal control transition methods for different levels of congestion; a procedure to collect arterial road travel time data using test vehicles equipped with Global Positioning Systems; and more.

2006; 208 pp.; TRB affiliates, \$45; nonaffiliates, \$60. Subscriber category: *highway operations, capacity, and traffic control (IVA)*.

Concrete Materials 2006

Transportation Research Record 1979
Papers address such topics as the effects of a two-stage mixing process on fresh and hardened characteristics of cement concrete; the use of fly ash to mitigate alkali–silica reaction in recycled aggregate concrete; an evaluation and comparison of the mechanical properties of self-consolidating, normal, and high-performance concrete; the effects of grounded ends, bonded caps, and unbonded pads on high-strength concrete; efforts to improve the durability of concrete in Virginia; and more.

2006; 101 pp.; TRB affiliates, \$36; nonaffiliates, \$48. Subscriber category: *materials and construction (IIIB)*.

Driver Behavior, Older Drivers, Simulation, User Information Systems, and Visualization
Transportation Research Record 1980

Selected papers include an examination of the effects of rainfall on freeway operations; outcomes of rewarding safe driving in the Netherlands; the effects of flare use by disabled motor vehicle operators on speed, lane distribution, and roadway edge separation of passing motor vehicles; the impact of adaptive cruise control and driver alertness modalities on driver performance; an evaluation of novice-teen and experienced-adult driver eyegance behavior; cell phone use and driver performance on urban arterial and local roadways; and more.

2006; 142 pp.; TRB affiliates, \$39; nonaffiliates, \$52. Subscriber category: safety and human performance (IVB).

Planning and Analysis 2006

Transportation Research Record 1981

Included in this volume is the 2005 Charley V. Wootan Award-winning paper that describes the training needs of metropolitan planning organization participants in Florida. Also presented are a summary of recommendations from a peer review of the Federal Highway Administration Travel Model Improvement Program; the results of a state-sponsored assessment of the Transportation Planning Rule in Oregon; public consensus-building efforts to generate strategies and alternatives for air quality, noise, traffic-safety, and congestion problems in communities affected by the I-710 corridor project in Los Angeles; genetic algorithm variants for optimizing transportation project selection and scheduling with resource constraints; and more.

2006; 178 pp.; TRB affiliates, \$43.50; nonaffiliates, \$58. Subscriber category: planning and administration (IA).

Pedestrians and Bicycles 2006

Transportation Research Record 1982

Papers include a comparison of pedestrian walking speeds as presented in the Federal Highway Administration's *Manual on Uniform Traffic Control Devices for Streets and Highways* and a 2005 National Cooperative Highway Research Program-Transit Cooperative Research Program study; recommended pedestrian walking speeds for intersections based on characteristics of the pedestrian population; using path networks to aid pedestrian-oriented, urban environment planning; the development of a Florida Department of Transportation level-of-service model for urban arterials with sidewalks; pedestrian flow on sidewalks and pedestrian level-of-service estimates in Waikiki, Hawaii; and more.

2006; 209 pp.; TRB affiliates, \$45; nonaffiliates, \$60. Subscriber category: safety and human performance (IVB).

Energy and Environmental Concerns 2006; Including 2006 Thomas B. Deen Distinguished Lecture

Transportation Research Record 1983

Part 1 contains the 2006 Thomas B. Deen Distinguished Lecture by Abba Lichtenstein on political and financial obstacles involved with preservation of historic transportation structures. Part 2: Energy and Environmental Concerns contains research on integrating information technology with Florida's efficient transportation decision-making process; evaluating natural dispersion of highway storm-water runoff in rural areas; road surface retexturing in Ohio to reduce pavement-tire noise; vertical equity in transportation finance and policy; fuel consumption of idling commercial trucks; and more.

2006; 182 pp.; TRB affiliates, \$43.50; nonaffiliates, \$58. Subscriber category: energy and environment (IB).

Highway Facility Design 2006

Transportation Research Record 1984

Part 1: Roadside Safety Design contains research on improved portable, lightweight concrete safety barrier design in Italy; information, tools, and procedures to develop guidance on the use of traffic barriers in work and construction zones; and more. Part 2: Landscape and Environmental Design and Context-Sensitive Design and Solutions includes papers on physical characteristics of greenways and natural paths in Spain; and teaching context-sensitive design to undergraduate engineering students. Part 3: Hydrology, Hydraulics, and Water Quality covers the development of a protocol for selecting hydraulic and hydrologic software and includes an evaluation of storm-water treatment strategies. Part 4: Utilities includes information about a computer-based procedure for assisting and enhancing the permit-granting process, as well as a description of a tool for facilitating knowledge sharing and interoperability in infrastructure renewal projects.

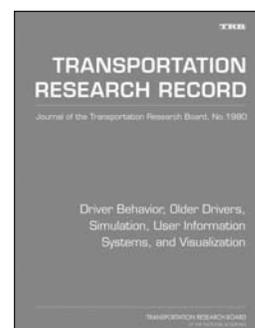
2006; 167 pp.; TRB affiliates, \$41.25; nonaffiliates, \$55. Subscriber category: highway and facility design (IIA).

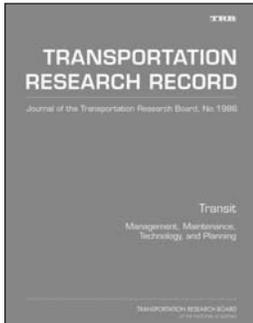
Traveler Behavior and Values 2006

Transportation Research Record 1985

Research topics include an analysis of the effects of presentation order in stated-transport-mode-choice experiments; research on the modeling of stated and revealed route choice in Lexington, Kentucky; a study on the use of transport modes and multimodal travel behavior in Germany; the impact of life-changing events on car ownership and travel behavior; a demand-modeling framework for microsimulations of large-scale traffic demand; understanding and predicting travel behavior with cognitive mapping; and more.

2006; 272 pp.; TRB affiliates, \$50.25; nonaffiliates, \$67. Subscriber category: planning and administration (IA).





Transit: Management, Maintenance, Technology, and Planning

Transportation Research Record 1986

Part 1: Management and Maintenance includes research on an asset management framework for a rail transit environment in London, England; a methodology for revenue allocation in urban public transport systems with integrated fare systems and multiple operators; and an economic model to increase level of service and ridership for public bus transportation in Israel. Part 2: Technology contains papers on the innovation processes of U.S. transit agencies; institutional factors affecting public transportation operators' adoption of interoperable smart card systems for regional and multioperator fare collection systems; new public transportation technologies to sustain European cities; and more. Part 3: Planning presents studies on estimating increased ridership on metro and bus–minibus systems in Istanbul, Turkey; transit ridership variation in U.S. metropolitan areas from 1990 to 2000; a regional express bus system plan for the San Francisco, California, Bay Area; and more.

2006; 210 pp.; TRB affiliates, \$45; nonaffiliates, \$60. Subscriber category: public transit (VI).

Air Quality 2006

Transportation Research Record 1987

Included in this volume is the 2006 Pyke Johnson Award–winning paper on measuring and modeling emissions from low-emissions vehicles that meet U.S. Environmental Protection Agency and California Air Resources Board requirements. Other papers report research on such topics as emissions from new and in-use transit buses in Mexico City, Mexico; ultrafine particle emissions for conventional diesel and hybrid electric diesel transit buses; a model for measuring air quality near roadway intersections; a road-pollution and -alert system for roads at risk of exceeding thresholds of acceptable air quality; and more.

2006; 170 pp.; TRB affiliates, \$41.25; nonaffiliates, \$55. Subscriber category: planning and administration (IA).

Highway Capacity and Quality of Service 2006

Transportation Research Record 1988

How road users perceive trip quality on rural freeways; traffic operations on two-lane highways in Germany; a method for estimating and predicting travel speed on urban arterial streets for planning applications; the correlations between roadway saturation flow rate and area population, number of lanes on a roadway, and roadway speed limits; and a framework to develop formulas for estimating the capacity of freeway bottlenecks are among the research topics presented in this volume.

2006; 146 pp.; TRB affiliates, \$41.25; nonaffiliates,

\$55. Subscriber category: highway operations, capacity, and traffic control (IVA).

Low-Volume Roads 2007

Transportation Research Record 1989

Low-Volume Roads 2007 comprises 81 papers in two volumes. Volume 1 contains 8 parts and the 2007 Eldon J. Yoder award-winning paper on a precast modified beam-in-slab bridge system for low-volume roads. Other papers include a study of a multicriterion decision analysis tool and a timber transportation model that were used to determine standards for minimizing environmental and economic costs for low-volume, forest roads; cost-effective, alternative road construction methods to ensure long-term sustainability of low-volume roads in Saskatchewan, Canada; a privatized maintenance program for the federal road network of Malaysia; and more. Volume 2 contains 6 parts and presents research on alternative stabilization methods for sulfate-rich soils in southern Arlington, Texas; results of laboratory and field research on soil stabilization using fluid bed combustion fly ash; research to calculate the variability of geotextile index tests for use in estimating material variability for reliability-based engineering; and more.

2007; 702 pp.; TRB affiliates, \$71.25; nonaffiliates, \$95. Subscriber categories: planning and administration (IA); energy and environment (IB); pavement design, management, and performance (IIB); bridges, other structures, and hydraulics and hydrology (IIC); materials, construction, and maintenance (III).

Pavement Management; Monitoring, Evaluation, and Data Storage; and Accelerated Testing

Transportation Research Record 1990

Divided into three parts, this volume gathers research on topics that include a gray-system theory for predicting long-term pavement smoothness and performance; a damage model for analyzing stabilized soil layers below airfield runway surfaces that have been subjected to repetitive aircraft loadings; the effects of a data quality assurance process on pavement management; safety performance of private-sector contractors for road maintenance and management in New Zealand; network-level falling weight deflectometer data from the Virginia Interstate system; and more.

2007; 161 pp.; TRB affiliates, \$43.50; nonaffiliates, \$58. Subscriber category: pavement design, management, and performance (IIB).

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TR NEWS

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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, typed pages). Authors also should provide appropriate and professionally drawn line drawings, charts, or tables, and glossy, black-and-white, high-quality photographs with corresponding captions. Prospective authors are encouraged to submit a summary or outline of a proposed article for preliminary review.

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

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

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

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

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

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

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

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

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

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

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