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*CTS Research E-News brings you the latest research project milestones, published reports, and seminar coverage.*

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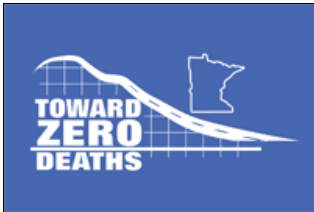
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**Safety****How hot is HEAT? Evaluating Minnesota's speed management program**

In September 2005, Minnesota's Department of Transportation and Department of Public Safety launched the Minnesota Speed Management Program (MSMP), also known as [Highway Enforcement of Aggressive Traffic \(HEAT\)](#). Now University of Minnesota researchers **Kathleen Harder** and **John Bloomfield** have delivered the first comprehensive evaluation of the program's effectiveness in mitigating speeding and reducing crashes on Minnesota highways.

In its goals and implementation, the MSMP reflects the vision of Minnesota's Toward Zero Deaths (TZD) program, which pursues the ambitious goal of eliminating traffic-related fatalities in the state. The "Four E's" of Toward Zero Deaths—education, enforcement, engineering, and emergency services—are key elements of the MSMP's approach to speed management. TZD stakeholders will discuss the program's goals and

implementation at the annual TZD Conference in September—see the [TZD Web site](#) for more information.

Following the repeal of the National Maximum Speed Law in 1995, speed limits on many Minnesota highways were increased. These increases, however, were not accompanied by any new education or enforcement efforts. Subsequent sharp increases in highway fatality rates influenced the development of the MSMP.

Under the MSMP, roughly 850 miles of highway actually had their speed limits increased from 55 mph to 60 mph, reflecting the original design specification of these roadways before the implementation of the nationwide 55 mph speed limit. These speed limit increases were accompanied by increases in the level of enforcement on the affected roadways, with more officers from the State Patrol, county sheriff's offices, and local police departments on patrol to ensure compliance. In addition, a public safety education campaign relying heavily on radio was launched to focus attention on the safety issues surrounding excessive vehicle speeds.

Harder and Bloomfield used data on travel speeds and crash rates from different types of highways across the state to analyze the program's effectiveness at reducing the number of speeding drivers and reducing crashes. They also analyzed driver perceptions based on surveys administered before and after the implementation of the program.

In terms of speed limit compliance, the data showed that enhanced enforcement was generally effective in bringing down the number of speeding drivers. However, certain road types showed a noticeable increase in speeding outside of enhanced enforcement zones; the reasons for this increase are not entirely clear.

Rates of fatal and serious-injury crashes also appeared to fall statewide in response to the program, but the researchers note that complete statistical evaluation of these data is difficult because of the relatively small number of incidents.

The Minnesota Speed Management Program appears to have accomplished the goal of making Minnesota's roads safer and bringing the state

closer to a future without traffic deaths. In addition, the researchers conclude that by reducing the economic costs to society of injuries and fatalities—estimated to be more than \$3 million for a single serious crash—the program has almost certainly paid for itself.

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## Researchers aim to better understand rural road safety

New work being done to better understand rural road safety was a hot topic at this year's CTS Transportation Research Conference. **Alec More**, a research assistant at the [Center for Excellence in Rural Safety \(CERS\)](#), is working with CERS director **Lee Munnich** on a national study to identify best practices in rural transportation safety. Though the research is in its early stages, More said some key themes are beginning to emerge.

In a more localized study, CERS research assistant **Tyler Patterson** presented his findings for rural road safety in Minnesota. Of all roadway fatalities in Minnesota, about 70 percent occur on rural roadways—bringing attention to the need for better understanding of rural roadway safety. Patterson explained that young male drivers are a special concern, because they cause 71 percent of fatal crashes, based on research done in an east-central Minnesota study of Chisago, Isanti, Mille Lacs, Kanabec, and Pine counties.

One of those themes is a lack of understanding of how to report on rural safety issues. "Many states are unsure about reporting requirements," he said. "States are looking for guidance." The researchers hope to establish a new standard in communication between states about rural safety by collecting information that has never been gathered previously. This is especially important because more fatalities occur on rural roads each year than on urban ones.

In the preliminary stages of the study, the CERS researchers surveyed states to determine the key causes of accidents on rural roadways. Ultimately, speed combined with drinking and driving proved to be one of the most prominent concerns. In addition, lack of funding, education, and enforcement also contribute.

While both More's and Patterson's research are still in early stages, their work will help determine best practices for improving safety on rural roads.

Additional coverage of the 2007 CTS Transportation Research Conference, including expanded coverage of this session, appears in the [June 2007 CTS Report newsletter](#).

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## Transit, Bicycling, & Walking

### Research examines route choice by bicyclists



When road repairs or construction make it necessary to disrupt or reroute traffic, transportation agencies are usually careful to plan for the effects on motorists. The effects of such disruptions on bicyclists are less well understood. As cycling continues to grow in popularity for urban commuting, University of Minnesota researchers **Francis Harvey** and **Kevin Krizek** are developing techniques to more accurately evaluate how facility disruptions affect cyclists.

Harvey and Krizek equipped bicycle commuters from South Minneapolis with Global Positioning System-based data gathering systems, in order to create fine-grained logs of their normal commuting behavior. The participants also maintained logs of their trips, including information on their feelings of safety, comfort, and confidence throughout the experiment. During the first week, participants rode their usual routes. In the second week, the researchers changed the cyclists' routes—simulating route disruptions caused by road work. In the final week of the experiment, the cyclists were allowed to choose which route to follow.

Focus group discussions with the participants helped the researchers gather qualitative data about the attitudes and preferences of cyclists. Such data can be invaluable to planners who need to understand the subjective experiences of users when designing transportation facilities.

According to the researchers, the experiment successfully showed the suitability of small GPS-based devices to measure the spatial behavior of cyclists, and produced several interesting results. In terms of route selection, cyclists often picked routes that were not the shortest possible, in response to safety and comfort issues. Safety proved to be the key determinant of bicycle speed, with cyclists riding faster when they felt safer. Other factors, such as windy days and variations in traffic volumes, also appeared significant.

[Commuter Bicyclist Behavior and Facility Disruption](#) (Mn/DOT 2007-15) is available from the CTS Web site.

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## National Transit News

### TCRP research publications available online

The federal Transit Cooperative Research Program (TCRP), administered by the Transportation Research Board, provides practical transit research to address technical and operational issues. TCRP emphasizes putting research results into the hands of organizations and individuals that can use them to solve problems.

Recent TCRP publications include:

- ◆ [Mobile Data Terminals](#) (TCRP Synthesis 70)

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## Intelligent Transportation Systems

### ITS Institute launches redesigned Web site

The [Intelligent Transportation Systems Institute](#) this month launched its redesigned Web site. Among the improvements to the site are a reorganization of research project information that makes finding information on research projects faster and easier, improvements to the overall site navigation system, and a new graphic design.



"Because intelligent transportation systems research moves fast, the Web is a key communications tool for us," said ITS Institute director **Max Donath**. "These improvements really enhance our ability to reach a worldwide audience of researchers and transportation professionals."

Outreach staff members from the Center for Transportation Studies, led by library and information services manager **Arlene Mathison**, web coordinator **Charlie Grussing-Neitzel**, and graphic designer **Cadie Wright**, developed the new site.

## Ramp metering: researchers continue to refine Twin Cities system



Call it the relentless pursuit of perfection: University of Minnesota researchers continue to develop improvements to the ramp metering algorithm that regulates traffic on the Twin Cities freeway system. In the third phase of their ongoing research, civil engineering researchers **Panos Michalopoulos**, **Henry Liu**, **John Hourdos**, and **Xinkai Wu** focus on improving the control logic and queue size estimation of the Stratified Zone Metering (SZM) algorithm.

Implemented in 2002, the SZM algorithm replaced a previous ramp metering system that had succeeded in increasing vehicle throughput on metropolitan freeways at the cost of long delays for vehicles waiting to enter the freeways during peak traffic periods. Widespread public dissatisfaction with the original algorithm led to an experimental ramp meter shutoff and the development of SZM, which attempts to reduce wait times. Faced with increasing travel demand levels and high expectations from commuters, however, traffic engineers are keen to

improve SZM.

The TRAMLAB system, developed by Michalopoulos and Hourdos, offers powerful capabilities for microscopic traffic simulation—in which every virtual vehicle moves independently. The research team used this simulation system to test the current SZM against an improved version using models of two urban freeway test sites, under a variety of demand scenarios.

One area in which the research made particular progress is queue size estimation. Inaccurate estimates of the number of vehicles waiting to enter the freeway can result in poor performance, with queues growing too long or too many vehicles entering the freeway. The new algorithm classifies ramp meters according to the observed errors in the vehicle detectors around them, and applies different queuing rules depending on the error classification.

*Employment of the Traffic Management Lab for the Evaluation and Improvement of Stratified Metering Algorithm—Phase III* (Mn/DOT 2007-13) is available from the CTS Web site.

## Transportation Infrastructure

### The economics of bridge deck replacement



Workers replace a concrete bridge deck

During the 1970s, the use of low-slump concrete overlays on highway bridge decks gained popularity in Minnesota. Both existing bridges and newly constructed bridges benefited from the additional durability provided by the low-slump concrete. Today, many of these bridge decks are approaching the end of their projected service lives. To mitigate the high costs of wholesale replacement of all such bridge decks, civil engineering researchers set out to develop a better understanding of how these decks deteriorate over time.

Researchers **Arturo Schultz** of the civil engineering department, **Steven Olson** of the Multi-Axial Subassemblage Testing (MAST) Laboratory, and graduate student **Justin Zimmerman** performed an economic analysis of bridges with low-slump overlays. The study population of bridges included 492 bridges from across the state, constructed or rehabilitated with low-slump overlays between 1974 and 1981. The study was sponsored by the Minnesota Department of Transportation.

Maintaining aging bridges is an expensive and necessary task for transportation agencies. Developing a detailed understanding of the maintenance and replacement requirements of "populations" of bridges that share construction characteristics is one way to promote efficient management practices.

As a foundation for their economic analysis, the researchers calculated deterioration curves for each bridge in the study based on inspection data from the Federal Highway Administration's National Bridge Inventory. This information was then combined with cost data gathered from the Minnesota Department of Transportation to produce a present-value cost analysis—a type of analysis often used in the business world to evaluate the costs of acquiring and maintaining capital assets.

The results of the economic analysis showed that some variables associated with bridge construction had little effect on the economics of maintaining bridges, while others had considerable impact. The study population of bridges fell largely into three sub-populations having different deterioration rates. In addition, observed differences in inspection data between bridges in different management districts underscores the importance of applying uniform inspection criteria. Overall, the results indicate that maintaining bridges through repair is generally more economical than replacing the entire deck.

The researchers note that the techniques used in this study could easily be applied to new data, and that as more bridges are repaired or rehabilitated, it will become possible to verify and expand on the findings of the current research.

*Determining Economic Strategies for Repair and Replacement of Low-Slump Overlays of Bridge Decks* (Mn/DOT 2007-14) is available from the CTS Web site.

## Upcoming Events

Here are selected events related to transportation research. Visit the CTS Web site, [www.cts.umn.edu/events](http://www.cts.umn.edu/events), for more comprehensive event information. You may also subscribe to e-mail event announcements using our [subscription form](#).

**July 9, 2007**

**Review & Tour of MnROAD**, Albertville, MN. (484 KB PDF)

**August 16–17, 2007**

**Mid-Continent Transportation Symposium**, Iowa State University, Ames, Iowa. Sponsored by the Center for Transportation Research and Education (CTRE).

**August 23–24, 2007**

**2007 Access to Destinations Conference**, University of Minnesota.

**September 17–18, 2007**

**2007 Toward Zero Deaths Conference**, Duluth Entertainment Convention Center, Duluth, Minnesota. Contact Shirley Mueffelman at 612-624-4754 or [conferences2@cce.umn.edu](mailto:conferences2@cce.umn.edu)

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