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This publication is a report of transportation research, education, and outreach activities for the period July 2002 through June 2003 (fiscal year 2003). It covers the Center for Transportation Studies and the special programs housed within it:

- Intelligent Transportation Systems (ITS) Institute
- Minnesota Local Technical Assistance Program (LTAP)
- Transportation and Regional Growth Study

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Director’s Message
One of the most respected national rankings of universities in the academic community has been conducted the last two years by The Center at the University of Florida. In this ranking, the University of Minnesota is the third public university listed, behind the University of California, Berkeley, and the University of Michigan.

Key variables evaluated in the Florida ranking parallel our center’s activities in the field of transportation. In fact, they include all of the performance measures our CTS Executive Committee has developed to monitor our performance. Significant measures include research funding attracted, the number and quality of students, publications in peer-reviewed journals, and level of outreach activities. Our performance, as measured by our Executive Committee, remains at a high level despite the economic downturn and state deficit.

The key to national rankings and to our center’s performance is the quality of the University of Minnesota faculty and research staff with whom we work. This past year we began the new CTS Scholars Program to strengthen our relationships with these leaders. This report lists our CTS faculty scholars and CTS research scholars (see page 32). As you can see, we have a strong multidisciplinary breadth and depth of expertise from which to address transportation challenges and educate the future transportation workforce.

An example of what we can accomplish is shown in the completion of our Transportation and Regional Growth Study. The results of five years of research, summarized in the synthesis report *Market Choices and Fair Pricing*, have attracted attention from policy leaders at the state, local, and national level, as you can read about in this annual report.

While we have developed new ways to work with faculty and staff, we also have strengthened our relationship with transportation students. We are pleased to be a sponsor of ITSO, the Interdisciplinary Transportation Student Organization. These student leaders are doing a great job of bringing students from engineering, policy, planning, and logistics together to focus on current transportation issues and career opportunities.

We continue to foster innovation in transportation by providing two key components: scientific knowledge and human resources. With the help of our scholars and ITSO, we will continue to produce new knowledge and new perspectives, and to connect students to the issues and to the potential contributions they can make to develop our future transportation system.

Robert Johns, Director
Center for Transportation Studies

"We continue to foster innovation in transportation by providing two key components: scientific knowledge and human resources."
CTS total annual revenues
FY2003: $11,399,586

- State: 38%
- Federal: 30%
- University matching funds: 11%
- Miscellaneous: 9%
- Private-sector matching funds: 8%
- Local/Regional: 3%
- Private-sector: 2%
Findings of the research completed under the Transportation and Regional Growth Study were published by CTS in March 2003 in a synthesis report titled *Market Choices and Fair Prices*. Results of the TRG Study have helped frame the debate surrounding transportation and land development in Minnesota and suggested ways to address congestion and sprawl.

The Minnesota Department of Transportation, the Metropolitan Council, and the Minnesota Local Road Research Board (LRRB) sponsored the five-year study, which comprises 16 separate reports designed to offer policymakers sensible choices to address the state’s transportation and land-development issues.

The study has attracted attention from policymakers and the media. Both Twin Cities newspapers, the *Star Tribune* and the *Pioneer Press*, gave it prominent coverage. The national *Urban Transportation Monitor* ran a front-page article about the study. In addition, CTS presented the synthesis to a number of regional transportation leaders.

**Key findings**

The study is the most comprehensive ever done on transportation and regional growth issues in Minnesota. Its key findings are:

- Minnesota’s current state and regional policies have encouraged low-density, spread-out growth.
- While congestion is a sign of growth and vitality, the negative impacts require us to understand its cause.
- Congestion is not the problem, but a symptom of larger transportation and regional growth issues, including a system in which transportation and land-use decisions were made with little reference to each other.
- Neither of the most discussed options—building more roads and traffic lanes, and increasing mass transit—will, by itself, solve our transportation challenges.
- Transit has a limited impact on congestion, but it does effectively serve activity-rich destinations—such as downtown areas and the University of Minnesota.
- Current development patterns have negative environmental impacts, including endangering water resources.
- Minnesota policymakers need to think of the Twin Cities metro area as comprising 19 to 24 counties, not seven.

**Options for further debate**

The study does not offer silver bullet solutions to the state’s transportation challenges. Instead, it offers two options for further debate: “honest pricing” and “more market choices.”

Honest pricing lets the market work, leading to better decisions and more efficient use of resources. Honest pricing exposes potential home buyers, commercial developers, and automobile owners to the true costs of transportation and land development—most of which are currently hidden in state aids to local governments, local property taxes, and motor-vehicle registration taxes.

Gearing policies to accommodate trends already evident in the marketplace is the best way to see faster and more durable results. More market choices means more market-oriented planning and zoning to create destinations that would welcome a mixture of employers, services, and amenities. These would be better served by a combination of improved roads, an expanded bus system, and carefully implanted commuter and light rail lines.

*Market Choices and Fair Prices* (TRG Report No. 17) is available in print from CTS or online in PDF format at: [www.cts.umn.edu/trg](http://www.cts.umn.edu/trg).

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**CTS HIGHLIGHT**

CTS allocated funding for 67 new and continuing research projects totaling approximately $6.3 million. Funding sources included USDOT, Mn/DOT and its Minnesota Guidestar Program, the Minnesota Local Road Research Board, and the University of Minnesota. As part of the CTS research program, the ITS Institute selected eight research projects for funding involving 24 researchers. Total Institute research project funding amounted to $1.2 million.
Putting limits on the speed-versus-safety debate

A new study may help put limits on the debate about the role speed plays in car crashes.

Though it may seem obvious that driving slower is safer, there is a lack of consensus in the public and policy arena about the connection between the speed one chooses to drive and the risk of being involved in a crash.

The issue is further muddied by several recent studies that suggest only a weak connection between driving speed and crash risk.

Civil engineering associate professor Gary A. Davis is hoping his research, sponsored by the U.S. Department of Transportation’s Research and Special Projects Administration (RSPA) through the ITS Institute, will help clarify the issue and inject some facts into the debate.

Avoiding research pitfalls

According to Davis, problems with previous research on the subject have produced misleading results. For example, one commonly used research approach looks for associations between a road’s average speed or speed variance and its crash rate, without looking at the speeds of vehicles actually involved in crashes. Unless carefully done, this approach can produce classic statistical misinterpretations, such as the ecological fallacy and Simpson’s paradox. On the other hand, crash reconstruction techniques do attempt to look at the speeds of vehicles involved in crashes, but haven’t accounted for inevitable measurement errors when estimating the speeds of vehicles. These errors in speed measurement can give rise to inaccuracies in statistical results.

Rather than study broadly aggregated data, Davis and graduate students Sujay Davuluri and Jianping Pei decided to focus on how speed affects crash risk at the individual level. To avoid the measurement-error pitfalls of previous research, the team developed a method for quantifying the uncertainty in estimates made from crash reconstructions, and incorporated this into a case-control study of vehicle speed and crash risk. The “cases” were a sample of vehicles involved in fatal crashes, for which the researchers collected and analyzed data from the Minnesota Department of Transportation and the Minnesota State Patrol.

For each case, “control” speeds were collected on vehicles passing the crash site during conditions similar to those when the crash occurred. Crash reconstruction methods were used to estimate each case vehicle’s speed. Rather than use a straightforward case-control approach, the heterogeneity in the crashes they had to work with required them to develop new methods for extracting information from very small samples.

Taking chances with higher speeds

The findings, Davis reports, show that higher speeds are associated with an increase in crash risk, and in some cases, the researchers could identify speed as a definite causal factor for a crash.

“Speed by itself doesn’t appear to be sufficient to cause a fatal crash,” Davis says. Rather, he adds, speed comes into play when a driver encounters a crash-avoidance situation, resulting either from driver error or by a surprise event outside of his or her control—a pedestrian stepping suddenly into the street, for example. In such a case, speed, while not by itself causing the crash, can make it difficult to avoid a collision.

Davis says he doesn’t expect the research results to dictate policy; instead, he hopes to inform the ongoing debate about the role of speed in determining crash risk. Aside from influencing what speed limits should be, the findings could potentially help law enforcement and traffic engineering agencies decide how much emphasis to put on speed limits and their enforcement. This in turn might lead to a need for automated enforcement methods or for non-enforcement approaches (such as in-vehicle driver feedback) for controlling speed. On another level, the information might spur further debate about the tradeoffs between the benefits of higher speeds (such as shorter travel times) and the costs associated with a potentially increased crash risk.

More information about this research may be found online at: www.its.umn.edu/research/projects/2001032.html.
BRT lane-assist technology expands road capacity

In the 1997 science-fiction film The Fifth Element, the problem of increased roadway demand is solved by creating multiple tiers of moving traffic—in the air—filled with cars capable of flight. Although this film offers a fantasy view of urban transportation for the year 2215, the lesson here is that building more roads to carry more traffic may not be a viable option in the future. Experts acknowledge that in many areas, constructing new roadways or adding lanes to existing ones is no longer feasible or credible as the primary solution to traffic congestion.

One way to get more capacity from existing roads is to allow transit buses to drive on road shoulders, creating, in a sense, a bus rapid-transit, or BRT, system. Metro Transit and Mn/DOT cooperatively operate a BRT-like capability throughout the Twin Cities metro area in which buses operate in high-occupancy vehicle (HOV) lanes and on specially designated road shoulders, albeit at speeds significantly lower than limits posted for the adjacent highway.

Driver-assistive technologies

However, operating a transit bus, typically 9 feet across from mirror to mirror, on shoulders that are usually no more than 10 feet wide, presents serious challenges. For one thing, these narrow lanes require that bus drivers maintain a lateral error of less than one-half foot to avoid collisions. This is difficult under the best of conditions and becomes impossible in bad weather, low visibility, and high traffic congestion. In response, ITS Institute researchers are developing driver-assistive technologies to solve these challenges.

Researchers from the Intelligent Vehicles Laboratory, which is part of the ITS Institute, are adapting lane-keeping and forward collision-avoidance technologies originally developed for snowplows. To aid system development and facilitate testing, the team has outfitted an experimental vehicle—a Metro Transit bus dubbed the “TechnoBus”—with advanced technology. To date, this work has been a partnership of the University of Minnesota, Metro Transit, and the Federal Transit Administration.

The TechnoBus is fitted with a steering actuator, which provides torque feedback to a driver. This feedback system uses a differential global-positioning system (DGPS) and an inertial sensor to determine bus position and orientation. Position of the bus as determined by the DGPS system is compared to the location of the shoulder as provided by a digital lane-level geospatial database, or digital map. Using the error between where the bus is and where it should be, a corrective torque proportional to that error is applied to the steering wheel. This torque is felt by the driver’s hands and helps the driver stay in the lane. When the bus is on a trajectory to leave the lane, the system also vibrates the driver’s seat on the side to which the bus is departing, providing a second feedback path to the driver.

Human factors issues

Because the use of shoulders and other specialized lanes along with lane-assist technology will fundamentally change the environment and role of the bus driver, researchers are also studying related human factors issues and are working to quantify how driver performance and stress are influenced by this change in driving environment. Researchers have already conducted a pilot study in which 12 drivers were trained and tested under three conditions during rush-hour traffic: normal traffic lane without lane-assist technology; shoulder use without lane-assist technology; and shoulder use with lane-assist technology. Preliminary results suggest that the system may be a valuable aid to support bus driving on dedicated shoulders for BRT applications and also indicate that drivers themselves like the system.

The overall findings of this research were used to identify system requirements and recommend next steps. Since no market-ready, turnkey lane-assist systems are currently available, the next step for the research team is to field-test a system that integrates GPS, magnetic guidance, vision, and other available technologies and then test a robust, fail-safe system.

More information about BRT lane-assist systems may be found online at: www.its.umn.edu/research/brt.
Passing up congestion

Since 1994, the Minnesota Department of Transportation and the Metropolitan Council have been working with the Humphrey Institute at the University of Minnesota to find a solution to gridlock on Twin Cities’ highways. These efforts, financed by a series of grants from the Federal Highway Administration, have focused on value pricing as a way to manage rush-hour traffic flow.

“Value pricing” or “congestion pricing” is the use of electronically collected user fees during congested times in order to use highway capacity more efficiently. Drivers who pay the fee can use a special express lane, which allows them to bypass the congestion.

Pilot project

In 2001, a 30-member value-pricing advisory task force, composed of state legislators, mayors, and business, environmental, and transportation association leaders, examined value pricing options in Minnesota and concluded that the state should proceed with a pilot project. Two years later, Gov. Tim Pawlenty signed a law that supported the conversion of existing high-occupancy vehicle (HOV) lanes, also known as car pool lanes, into tolled express lanes, or high-occupancy toll (HOT) lanes, for solo drivers.

The pilot project developed by Mn/DOT will begin in January 2005. Solo drivers on I-394 will be able to pay a fee to drive in the HOV, or “MnPass,” lane. Buses and car pools will continue to use the lane free of charge.

As drivers approach the MnPass lane, they will see signs announcing the user fee, which may vary according to demand or time of day. As they enter the lane, an electronic device on an overhead gantry will read a transponder mounted on their windshield or dashboard. The user fee will be deducted from the transponder, which functions much like a telephone card.

Proponents of MnPass believe that user fees will pay for the initial infrastructure costs. After that, revenue will be used to improve transportation in the I-394 corridor: one half will be spent on public transit; the other half, on road improvements.

California models

Many people are concerned that MnPass will create a “Lexus lane” used only by wealthy drivers. But, according to Lee Munnich, director of the State and Local Policy Program at the Humphrey Institute, research has shown that this hasn’t happened in areas where such lanes are in operation.

“Studies show that in Orange County, California, people of all income levels use the peak-period express lanes on SR-91,” Munnich says. “And in San Diego, four years after the express lanes opened on I-15, 89 percent of the city’s drivers support extending them.”

The benefits of MnPass may extend beyond those who pay to use the lane. It is possible, Munnich adds, that congestion in the other lanes will lessen as some traffic goes to the express lane. On California’s SR-91, for example, average rush-hour speeds in the general lanes doubled.

Transit users may also benefit from improvements paid for by MnPass revenue. In San Diego, improvements financed by user fees led to a 25 percent increase in bus ridership between 1999 and 2001.

Of course, there is a chance MnPass tolls will cause the few car poolers already using the HOV lane on I-394 to stop. But the opposite effect is more likely—that more people will start carpooling. That’s what happened in both Orange County and San Diego, Munnich says, where carpooling increased after the express lanes were opened to solo drivers willing to pay a user fee.

Funding implications

Because the project is expected to pay for itself, Munnich notes that it will probably not be necessary to raise taxes to defray the necessary infrastructure changes. Once the initial cost is paid off, user fees should be able to fund the cost of additional improvements.

In addition, since MnPass is approved by FHWA, the state of Minnesota may avoid costly penalties imposed by the federal government, which financed the original highway construction, for opening the HOV lane to solo drivers.

According to Munnich, value pricing promises to reward people for making less costly choices, such as riding the bus, carpooling, or traveling at less-congested times. The result may mean slower congestion growth and a reduced need for costly road construction. In addition, he says, congestion pricing could help pay for critical transportation improvements.

More information about this research is available online at: www.lrrb.gen.mn.us/pdf/200331.pdf (4.7 MB).
**A shipper panel to measure transportation services**

Marketing and logistics management professor Fred Beier and a research team investigated the feasibility of establishing an ongoing panel made up of consumers of transportation services—i.e., shippers—to regularly evaluate the quality of services they receive from carriers.

In a study sponsored by Mn/DOT and titled “The Feasibility of a Shipper Panel to Measure Transportation Services,” Beier’s team found that a panel could provide shippers and others (including carriers) with standardized metrics and longitudinal data on performance, and might also result in a standard upgrading of the carrier evaluation process itself.

**Geographic differences**

First, the researchers needed to document the current evaluation processes that shippers use. To do so, they held focus groups with, then surveyed, shippers in the metro area and greater Minnesota.

Preliminary results show significant differences between the geographic areas. In greater Minnesota, the primary evaluation standard consists of loyalty to the carrier relationship. Shippers often lack quantitative evaluation metrics and tend to rely more on qualitative methods. Data often does not exist in electronic formats or even as hard copy. Also, shippers are generally reluctant to switch carriers because they have fewer alternatives.

In contrast, metro area shippers use more analytical, quantitative methods and rely less on relationships. Their primary metrics include prices and measured service (such as on-time delivery). Metro firms communicate regularly with their carriers through report cards and by using quantitative feedback.

**Common priorities**

Though the evaluation methods differed between metro and non-metro shippers, evaluation criteria did not. Overall, firms reported that on-time delivery and costs were most important. According to Beier, this is significant because it reduces the number of individual criteria a shipper panel would have to focus on, thereby simplifying the process. A shipper panel would not measure prices, but it would track four or five service characteristics including on-time delivery.

Based on what Beier and his research team have discovered so far, a shipper panel is feasible and may increase the quality of service that carriers provide to their customers or help pinpoint where problems in transport of goods and services may be occurring.

More information about this research may be found online at: [www.lrrb.gen.mn.us/PDF/200304.pdf](http://www.lrrb.gen.mn.us/PDF/200304.pdf) (0.7 mb PDF).
Mapping ‘suburban DNA’ for a new design strategy

Our physical traits are determined by the genetic information encoded in the DNA molecules of our chromosomes. Even if we try, we cannot will ourselves to have a smaller nose, straighter hair, or a taller frame.

In much the same way, University landscape architecture professor Lance Neckar says, suburban development is determined by a well-established legal framework that shapes designs, planning practices, and policies. This “suburban DNA” is also deeply embedded in the culture of the Twin Cities region.

For example, in most suburban communities, the minimum single-family residential lot size is one-third of an acre, which results in low population density. Building codes require that residential and commercial development be separated, which means suburban neighborhoods have no “corner stores” within walking distance.

**Proposed commuter rail corridor**

Neckar took a critical look at this “suburban DNA” in a recent study of the proposed Highway 61/Red Rock Commuter Rail Corridor. The study is part of the larger Transportation and Regional Growth Study, which is a collaboration among CTS, the Center for Urban and Regional Affairs, the Minnesota Department of Transportation, the Metropolitan Council, and the Minnesota Local Road Research Board.

In the Red Rock study, Neckar concentrated on two critical variables that could alter the “genetic code of sprawl”: vehicle-miles traveled (VMT) and water quality and quantity.

“In many communities, a person cannot get a carton of milk without getting into the car,” he explains. “This increase in VMT is related to zoning laws and funding for better roads that lead from single-use residential areas to strip malls in areas zoned for commercial development.”

The second variable, water quality and quantity, is an essential element of growth. “Suburban growth has been based on ground water,” Neckar adds. “We’re drinking water that is hundreds and thousands of years old. We’re drinking it faster than it’s being replenished.”

The Red Rock Commuter Rail Corridor extends from Minneapolis to Hastings, with a principal station in St. Paul. Neckar and his research team focused on projected growth in the Cottage Grove area near the proposed station at Jamaica Avenue and Highway 61.

Development in the area depends on water from the Prairie du Chien aquifer. No effort is being made to conserve this ground water by using rain and snow as sources of drinking water. Instead, storm water is treated as waste. It flows through suburban streets and is eventually piped to distant receiving basins.

**A new design strategy**

Neckar and his team proposed a design strategy that would use streets as “parkways” similar to those in Minneapolis. These parkways feature wide swaths of open land with grass and trees along the street in front of houses. Storm runoff filters through this open land (infiltration) and returns to the ground water.

This design strategy calls for an increase in the density of dwelling units from three to as many as seven per acre. Nodes of commercial and institutional services would be created within walking distance of residents. Some, but not all, nodes would be located in the area of the commuter station.

This design strategy conserves water and reduces VMT by incorporating infiltration approaches into the design of pedestrian-friendly streets. By increasing density and placing residents within walking or biking distance of the station, the design also assures that commuter rail will have enough riders to be sustainable.

Neckar admits that this strategy, though promising, does not follow local planning and zoning regulations. What is needed is more regional integration of urban design and land use. “With a few tweaks to the infrastructure,” he says, “we can accommodate substantial growth, protect our water supply, and serve a sustainable transit system.”

More information about this research may be found online at: [www.cts.umn.edu/trg](http://www.cts.umn.edu/trg).
There’s no fence like a snow fence

Each year, travel on many roads in the Upper Midwest is affected to varying degrees by blowing and drifting snow. Direct consequences often include hazardous driving conditions, degraded road quality, and significant snow removal costs. During one year of unusually high snowfall, the state of Minnesota spent $215 million on snow control. In addition, secondary effects of snow-covered roads can include the compromised safety and prosperity of local businesses and communities. Shipments may be delayed, schools can be closed, and farms are often cut off from emergency services when roads shut down.

Seeking a better way, University of Minnesota researchers joined practitioners from the Minnesota Department of Transportation (Mn/DOT), the Minnesota State Climatology Office, and other agencies to address the issue with a study entitled “Implementation of Climatological Summaries for Blowing Snow Control: Design, Training, and Website Development.” University soil, water, and climate professor Mark Seeley and Dan Gullickson of Mn/DOT’s Office of Environmental Services initiated the project after the snowy winter of 1996–97. The goal was to determine the most effective snowdrift mitigation strategies for any given site, with a focus on the living snow fence approach.

A barrier between road and snow

Living snow fences are designed plantings of trees or shrubs strategically placed a certain distance (usually 150–300 feet) from the roadway. The aim of these fences is to create a barrier between blowing and drifting snow and the road, thereby capturing and storing snow upwind of the road throughout the winter. According to Seeley, living snow fences are a “highly effective method of controlling blowing and drifting snow.”

During the beginning of the project, researchers analyzed snow and wind data using a database with the most comprehensive coverage available; the database contained the climatic history of 370 locations, some dating back to the 1850s. After analyzing the data, the team was able to determine the criteria necessary for the creation of an effective living snow fence. They joined their findings with previous studies in order to develop site-specific methods for the most effective design and deployment of snow fences. Effective design includes choosing a snow fence with an appropriate height and density for the problem area, expanding the fence far enough lengthwise, and placing it an accurate distance from the road.

An interactive Web site

The team launched an interactive Web site that allows users to access data from the snow climatology database and findings from the study. Engineers, road designers, and maintenance staff are able to optimize snow control practices for specific sections of road and gain recommendations for deploying efficient living snow fences. Moreover, any user can learn about the recent successes of living snow fence plantings. For example, in southern Minnesota during the near record-setting winter of 2000–2001, three types of fence (strips of standing corn, twin-row honeysuckle, and single-row honeysuckle with red cedar) performed exceptionally well, storing 50 percent of their theoretical capacity.

The team’s research reaffirmed that living snow fences provide an economically and environmentally beneficial means for rural communities to improve road conditions and driver safety. Financially, they reduce snow removal, equipment, and pavement maintenance costs in addition to preventing economic disruptions caused by road closures. Through reduced wind speed and improved driver visibility, living snow fences also result in fewer accidents and safer travel on our roads during the winter season. CTS honored the University-led team by presenting them with the 2003 CTS Research Partnership Award (see page 26).

More information about this research may be found online at: www.climate.umn.edu/snow_fence/.
Understanding integral abutment bridges

Motorists traveling on Olmsted County Road 104 south of Rochester are probably unaware of anything different about Bridge 55555, which spans the south fork of the Zumbro River. A few drivers, however, may notice that their ride is smooth and lacks the usual bumpity-bump that occurs when a car passes over expansion joints.

That’s because this 217-foot-long bridge is an integral abutment bridge, built without expansion joints in its deck. Bridge 55555 is also the subject of a field study sponsored by the Minnesota Local Road Research Board and led by civil engineering professors Catherine French and Carol Shield.

Expansion joints relieve stress

Most highway bridges are supported by a concrete abutment at each end. Besides providing support for the bridge, the abutments also support or hold back the soil of the embankments on either side of the river or highway spanned by the bridge.

Most abutment bridges contain expansion joints in their deck. These joints create the “give” that allows the bridge to expand and contract easily as the temperature changes. The expansion joints help protect the bridge from stress that causes concrete to crack and crumble. This is especially important in Minnesota where as French notes, “Bridges are subjected to the hottest hot and the coldest cold.”

But expansion joints often corrode or become filled with debris such as gravel or sand. When this happens, they “freeze” and can no longer move. The bridge wants to continue to expand and contract, but the frozen joints do not permit this movement. The result is increased stress that can damage the bridge structure.

To work properly, expansion joints must be cleaned out regularly. In addition, bridges with cracked or crumbling concrete caused by stress from frozen joints must be repaired. Maintaining typical jointed bridges is costly in terms of money, equipment, and personnel. During maintenance, bridges must be closed to traffic, which inconveniences motorists, delays shipping, and hampers emergency vehicles.

A new approach without expansion joints

To avoid problems with expansion joints, many states have turned to integral abutment bridges. These bridges contain no expansion joints. Instead, they are designed so that the abutment itself can move in relationship to the soil, or backfill, that it retains. Approach panels at both ends of the bridge accommodate relative movement between the bridge deck and the roadway pavement leading to the bridge.

The interaction of the soil and the abutment is complicated. The result is that the design of integral abutment bridges has been based largely on trial and error.

French and Shield began their investigation of Bridge 55555 while it was under construction in 1995. They installed over 120 instruments to monitor the movement of the abutments with respect to the backfill, the effects of temperature, and other aspects of bridge behavior.

They also developed a computer model of the bridge. To verify the model, they compare its response to simulated traffic loads and seasonal changes with the responses measured experimentally in the field.

Extending the study

French and Shield are now working with their students to extend the results of the study by varying parameters in the computer model. These parameters include soil types, connection details, bridge lengths, and pile types and orientations. The research team will investigate the interaction of these parameters and their effects on bridge behavior.

French and Shield hope that their research will lead to improvements in bridge design. “Our goal is better bridges that will last longer,” French says. “And that will mean reduced maintenance costs for counties and less traffic disruption for the state’s drivers.”
Uncovering the likelihood of surface-initiated cracking

As we all know, construction and maintenance of roads require enormous resources and funds. So even small advances in construction practices often translate into substantial savings. In two related studies, University of Minnesota civil engineering professors Andrew Drescher and Henryk Stolarski analyzed certain factors leading to road deterioration. Specifically, their research focused on surface-initiated cracking along roadways.

Multiple sites in various countries around the world have reported observations of cracks whose depth is shorter than the thickness of the asphalt concrete layer. This seems to indicate crack initiation at the surface, and subsequent “top-down” spreading. In contrast with temperature-induced cracking, which typically runs vertically, surface-initiated cracking extends along the road. The phenomenon of surface-initiated cracking is not well understood and is not accounted for in current design models, which often predict that “bottom-up” cracking should develop instead. Understanding this relatively new phenomenon would likely lead to improvements that would extend the life of the pavement.

The research is based on the idea that tire-road interactions may lead to surface stresses that are high enough to initiate pavement cracking. The team investigated the problem with numerical simulations, using a powerful computer, to analyze the pavement stress that regularly occurs in the pavement-tire contact area for various pavement structures. Based on this analysis, the team conducted three-dimensional calculations to determine the influence of the asphalt-layer thickness and the type of the tire on the intensity of surface stresses and, thus, on the likelihood of cracking. Given the cost involved in road design and maintenance, these findings could potentially lead to significant monetary savings.

More information about this research may be found online at: www.lrrb.gen.mn.us/PDF/200307.pdf (3.98 mb).
Enrollment in the Graduate Certificate Program in Transportation Studies has climbed steadily during the past year, and semi-annual information sessions about the program consistently draw more than a dozen students and professionals, including transportation planners, civil engineers, and public policy consultants.

Seven students received a graduate certificate in transportation studies this academic year: Andrew Johnson, Heather Krause, Peter Langworthy, Nancy Lueke, Nicholas Mackaman, Molly McCartney, and Peter Rafferty.

John Adams (Geography), Gary Davis (Civil Engineering), Kevin Krizek (Humphrey Institute), David Levinson (Civil Engineering), and Gerard McCullough (Applied Economics) served as faculty advisors. Davis replaced McCullough in fall 2003 as certificate director of graduate studies.

CTS and the University of Minnesota Graduate School launched the program in fall 2001 for professionals in transportation-related fields as well as for students seeking a master’s degree in a related discipline. By completing the flexible program requirements, participants acquire advanced knowledge of the complex issues in transportation and gain a significant professional credential.

The certificate program is built around a core set of graduate-level courses in policy, engineering, and supply chains. Participants are required to complete two of these courses, as well as a transportation technology seminar. Participants also must select two or three elective courses from a broad range of offerings in numerous academic departments. Application materials and information about the Graduate Certificate Program in Transportation Studies may be found online at: www.cts.umn.edu/certificate.

**CTS research seminars**

CTS holds hour-long research seminars to provide University faculty and researchers from a variety of disciplines an opportunity to share their findings.

**Fall-semester presentations**

“Bituminous Materials Characterization,” Mihai Marasteanu, Civil Engineering

“Increasing the Value of Public Involvement in Transportation Project Planning,” Gary Barnes, Humphrey Institute of Public Affairs

“Does Land Use Planning Affect Travel? Analyzing Moving Households and Neighborhood Accessibility,” Kevin Krizek, Humphrey Institute of Public Affairs

**Spring-semester presentations**

“Experimental Investigation of the Effect of Vertical Pre-Release Cracks in Prestressed Bridge Girders,” Catherine French, Civil Engineering

“Improving the Design of Roadside Ditches to Decrease Transportation-related Surface Water Pollution,” Jodi Elfering and David Biesboer, Plant Biology

“Groundside Effects of Air Transportation: Three Case Studies,” Julie Cidell, Geography

Mihai Marasteanu, Gary Barnes, Kevin Krizek, Catherine French, Jodi Elfering, David Biesboer, and Julie Cidell
During the 2002–2003 academic year, the Intelligent Transportation Systems Institute continued its multidisciplinary seminar series. These advanced transportation technologies seminars included a diverse set of presentations by local and national researchers addressing different areas of ITS research, such as traffic management and modeling, human factors, sensing, and intelligent vehicles as they relate to road- and transit-based transportation. The seminars are offered for credit and required as a course in the Graduate Certificate Program in Transportation Studies at the University of Minnesota.

**Fall-semester presentations**

“Ramp Meters on Trial,” David Levinson, Civil Engineering

“Is the Sequential Travel Forecasting Paradigm Counterproductive?” David Boyce, Civil and Materials Engineering, University of Illinois at Chicago

“Wireless EMS Services: Opportunities and Challenges to Bringing Safety and Travel Services to Rural Minnesota,” Tom Horan and Frank Douma, Humphrey Institute of Public Affairs


“Simulating Snowplow Scheduling in District One,” Martha Wilson, Industrial Engineering, University of Minnesota—Duluth (videocast from Duluth)

“Dynamics and Control of Tilting Vehicles,” Lee Alexander, Mechanical Engineering

“Mn/DOT ITS Projects,” Farideh Amiri, Mn/DOT Office of Traffic Engineering and Intelligent Transportation Systems

**Spring-semester presentations**

“A Unified Approach to Spatial Outliers with Application to Traffic Data Analysis,” Shashi Shekhar, Computer Science and Engineering

“Advanced Traffic Signal Control and Prioritization,” Thomas Urbanik II, University of Tennessee–Knoxville, Civil and Environmental Engineering

“Vehicle-based Student Competitions at the U of M: History and Educational Impact,” Patrick Starr, Mechanical Engineering

“Comparing Dualmode Transportation Systems with Other Proposed and Existing Systems,” Francis D. Reynolds, dualmode transportation inventor and private consultant

“The ITS Laboratory—Building the Future,” Ted Morris, Center for Transportation Studies

“Traffic Flow Study of the Miller Hill Corridor,” Jiann-Shiou Yang, Electrical and Computer Engineering (Duluth)


**Special presentation**

“Advanced Technology for Homeland Security Applications,” Vassilios Morellas, Honeywell Laboratories’ Automation and Control Systems

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**CTS Richard P. Braun Chair**

As of December 2003, $273,000 of a target $500,000 has been raised by the University’s Institute of Technology to create the CTS Richard P. Braun Chair in transportation engineering. CTS is collaborating with the University’s Department of Civil Engineering to establish the new faculty chair.

Each gift to the fund will be matched twice to reach the goal of $1.5 million needed to permanently endow the chair. CTS will match dollar-for-dollar all private and industry contributions and the Department of Civil Engineering will match contributions through a permanent commitment of annual department funds to support the position.

The chair is a leadership position that will build on the legacy begun by Professor Matthew Huber and will foster innovation in the academic program in transportation engineering for the Department of Civil Engineering. The position will develop new educational programs as well as oversee research and teaching activities in transportation engineering.
Transportation Career Expo

With tightening budgets, openings for entry-level jobs in transportation have become scarce, even for students with internship experience. To help their search, in March 2003, about 75 students, from Minnesota and Wisconsin, and 18 exhibitors came to the Eighth Annual Transportation Career Expo in Minneapolis.

Most attendees had similar intentions: to land a job or, at minimum, gather advice for pursuing a variety of careers in transportation. Employers promoted their organizations through booths, and several company representatives led informational sessions.

Speakers encouraged students to be persistent in their job seeking and reminded them that that the transportation field has a promising future. Cheri Marti of CTS, who led the general session on career preparation, said that transportation is often better insulated against budget cuts because of the crucial role transportation plays in society.

Interdisciplinary Transportation Student Organization

University of Minnesota students pursuing degrees in transportation-related fields, with support from CTS, created the Interdisciplinary Transportation Student Organization, or ITSO (pronounced “it-so”). The group’s main purpose is to connect with transportation professionals through monthly meetings and other events and to learn about careers in transportation.

ITSO has affiliated itself with several professional organizations including the Minnesota Chapter of Women’s Transportation Seminar (WTS Minnesota), the North Central Section of the Institute of Transportation Engineers (NCITE), and the Intelligent Transportation Society of Minnesota (ITS Minnesota).

Membership in ITSO is free. Students interested in becoming involved in this organization may visit the ITSO Web site at www.tc.umn.edu/~itso.
Web modules for high school students

A ramp-meter module designed by the ITS Institute’s K-12 coordinator, Mark Tollefson, has been distributed to all Twin Cities metropolitan-area high schools. Students in many physics, algebra, and statistics classes are using the computer-based curriculum that covers ramp metering theories and intelligent transportation systems concepts. By reaching students with engaging, hands-on activities, the Institute hopes to spark an early interest in transportation.

Tollefson also has designed a “Web quest” curriculum on global positioning systems that is currently at the review stage. Along with listing various Web sites about GPS, the curriculum includes quizzes that check students’ learning progress. The unit can be used in the same courses as the ramp-meter module as well as in earth science and physical science courses.

Tollefson is the science department coordinator, advanced placement physics teacher, and accelerated chemistry teacher with Eastview High School in Apple Valley, Minnesota. He works part-time for the Institute to help develop outreach ideas and activities for teachers, students, and parents.

The ramp meter module is available online at www.its.umn.edu/education/rampmodule/index.html.

National Summer Transportation Institute

The Intelligent Transportation Systems Institute welcomed a group of secondary school students from the Fond du Lac area in July 2002.

ITS Laboratory manager Ted Morris led a tour of his lab’s facilities and talked about current research at the Institute, including computer simulations and traffic control studies. He also highlighted the diversity of potential careers in intelligent transportation systems, including engineering, management, and research.

After lunch at the lab, the group departed for the Mn/DOT Traffic Management Center, where they toured the nerve center of Twin Cities traffic management. The ITS Institute hosts groups of college-bound students each summer as part of the National Summer Transportation Institute, sponsored by the Federal Highway Administration.
CTS awards, scholarships, and employment

CTS presented the Matthew J. Huber Award for Excellence in Transportation Research and Education to two students: Xue Li and Lei Zhang, doctoral candidates in the Department of Civil Engineering. Li’s major is pavement engineering and his advisor is Assistant Professor Mihai Marasteanu. Zhang, who is advised by assistant professor David Levinson, is concentrating in transportation engineering. CTS presents the award to graduate students each year in April at the CTS annual meeting and awards ceremony. The award is named in honor of the late Professor Matthew J. Huber, in recognition of his contribution to the teaching and study of transportation at the University of Minnesota.

Zhang also received the Milton Pikarsky Award—Science and Technology during the Transportation Research Board’s 82nd Annual Meeting in Washington, D.C. in January 2003. In Zhang’s thesis, Developing Efficient and Equitable Freeway Ramp Control Strategies, measures of efficiency and equity for ramp meters are defined and applied to data collected in the Twin Cities ramp metering shut-off experiment of fall 2000.

Also at the TRB annual meeting in January 2003, graduate research assistant Robert F. K. Martin received the ITS Institute’s 2002 Outstanding Student of the Year Award. Martin’s work is focused on the detection, tracking, and classification of vehicles using computer vision techniques.

Dan Herber, a joint-degree student in law and a graduate program in urban and regional planning, was named a 2003 Eno Transportation Foundation Fellow. The award included a five-day visit to Washington, D.C. where he and 19 other fellows met with top policymakers and transportation leaders to discuss the reauthorization of transportation funding legislation. The Eno Foundation, created in 1921 by William Phelps Eno, a pioneer in the transportation field, is a private organization dedicated to improving all modes of transportation. Transportation graduate students are nominated by their professors, with a limit of one nominee from each campus. Professor Kevin Krizek and CTS supported Herber’s nomination.

In May 2003, Nancy Lueke, a graduate student at the University of Minnesota’s Humphrey Institute, won the graduate scholarship award from the Minnesota chapter of Women’s Transportation Seminar.

In addition, CTS continued to work with faculty to offer graduate assistantships and undergraduate scholarships to help increase the number of transportation students, and to provide expense reimbursement scholarships for student attendance at the annual TRB and ITS America conferences. CTS also continued to help match University of Minnesota students with possible job opportunities in transportation-related organizations through its newsletter and Web site. And the Center’s student interns assisted in the research, education, and outreach areas as well as provided office support.
Minnesota Local Technical Assistance Program

Housed within CTS, Minnesota LTAP is part of a network of 58 centers nationwide funded by the Federal Highway Administration’s Local Technical Assistance Program, better known as LTAP. Funds for Minnesota LTAP are also provided by the Minnesota Local Road Research Board (LRRB) and Mn/DOT.

Minnesota LTAP offers a statewide workshop program and partners with other organizations to cosponsor events. LTAP offered the following workshops in FY2003:

- Gravel Road Maintenance and Design
- Bridge Maintenance
- Context-Sensitive Design Workshop for Local Governments
- Design, Construction, and Maintenance of Stormwater Basins and Erosion Control
- Asphalt Pavement Maintenance and Preservation
- Reducing Risk and Liability
- Design and Maintenance Considerations for Erosion Control on Local Roads
- Advanced Automotive Training in Electricity
- Hydraulic Testing and Troubleshooting
- MMUTCD Training
- Motor Grader Operator Training

Minnesota LTAP cosponsored the following events:

- Eighth Annual Transportation Career Expo
- Seven Annual Minnesota Pavement Conference
- Spring and Fall State Maintenance Expos
- Context-Sensitive Design (Mn/DOT) workshop
- APWA “Click, Listen, and Learn” online courses
- Work Zone Traffic Control and Road Marking workshop
- Traffic Engineering Fundamentals workshop

LTAP and CTAP (see page 20) workshops included 118 total sessions in more than 42 statewide locations. These sessions reached more than 8,611 city, county, state, and other transportation personnel.

In a new effort, Minnesota LTAP, in cooperation with Mn/DOT, developed and delivered training using the Minnesota Manual on Uniform Traffic Control Devices (MMUTCD). This one-day class was offered at 10 sites across the state, attracting a record 362 attendees. Minnesota LTAP also delivered two new mechanic training workshops in the fields of advanced automotive training in electricity and hydraulic testing and troubleshooting.

In addition, Minnesota LTAP, the Minnesota Department of Transportation Office of State Aid, the Minnesota LRRB, and FHWA designed and distributed a CD-ROM version of the previously released Asphalt Maintenance Field Guide. This version was distributed to all LTAP centers and FHWA resource centers.

A resource card containing key Web sites, as well as contact information for the Minnesota LTAP and Mn/DOT Library staff, is available from Minnesota LTAP or online at: www.mnltap.umn.edu/publications.

More information about Minnesota LTAP is available online at: www.mnltap.umn.edu.

www.mnltap.umn.edu

Minnesota LTAP launched an easy-to-navigate Web site (www.mnltap.umn.edu), with buttons and “rollovers” that take you directly to workshop, news articles, information, and much more. Included are the pages for the Roads Scholar Program and CTAP. The site also features a new LTAP logo and a new graphic look. Contact Minnesota LTAP with comments at: mnltap@umn.edu.

CTS HIGHLIGHT

CTS planned and delivered 118 total LTAP and CTAP program sessions in more than 42 statewide locations, reaching more than 8,611 city, county, state, and other transportation personnel.

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Minnesota LTAP partners with Mn/DOT, the Minnesota Local Road Research Board (LRRB), the Minnesota Public Works Association, and the Minnesota Street Superintendents Association to hold annual spring and fall maintenance research expos. These events allow transportation professionals, especially those in the maintenance area, to exchange ideas and information; learn about new technologies, practices, and materials; and improve communications within the workplace. Also included are half-day outdoor equipment demonstrations and indoor equipment displays of exhibitors’ technology.

Expo attendance has nearly doubled in recent years. The fall 2002 expo, held October 3-4 in St. Cloud, attracted approximately 2,000 attendees from state, county, city, and township governments. The snowplow “rodeo” competition and other fall expo events generated extensive news coverage and drew the attention of TV stations from the Twin Cities, Greater Minnesota, and the Cable News Network. The spring expo drew more than 800 attendees April 24-25, 2003, also in St. Cloud.

Minnesota LTAP launched a new certificate program, the LTAP Roads Scholar Program, designed for local and state agency maintenance personnel who are committed to learning new skills and expanding their knowledge in the latest road and bridge innovations and best practices. The program combines Minnesota LTAP’s many training options into a structured curriculum of half-day and one-day training sessions.

Participants must earn eight credits to complete the program: three credits from required LTAP workshops and five elective credits from a combination of LTAP workshops, maintenance expos, and Circuit Training and Assistance (CTAP) workshops. There is no enrollment fee, and students have five years to complete the certificate. Graduates will be recognized through various means, such as a press release to their local newspapers and coverage in the Minnesota LTAP newsletter and on the Web site.

More information about the LTAP Roads Scholar Program may be found online at: [www.mnltap.umn.edu](http://www.mnltap.umn.edu).

CTAP, the Circuit Training and Assistance Program, is a mobile outreach effort providing training, technical assistance, and technology transfer to city, county, state, and related personnel. Workshops may be scheduled for a range of topics upon request.

CTAP instructor Kathy Schaefer, a former maintenance supervisor with Mn/DOI, made statewide training tours focused on snow and ice control, and asphalt pavement maintenance, as well as offering several short courses. In all, more than 4,100 employees from cities, townships, counties, and the state participated in CTAP training sessions. In addition, Schaefer gave a presentation on erosion control at the county engineers’ association annual conference in January 2003 and at the 2003 spring maintenance expo.

CTAP is sponsored by Minnesota LTAP, Mn/DOT’s Maintenance Research and Operations Office, and the Minnesota Local Road Research Board. More information about CTAP may be found online at: [www.mnltap.umn.edu](http://www.mnltap.umn.edu).
AirTAP

AirTAP—the Airport Technical Assistance Program—is a statewide assistance program for aviation personnel that offers practical instruction by knowledgeable, experienced trainers and also provides a range of helpful information, materials, and resources. AirTAP is administered by CTS in partnership with Mn/DOT Aeronautics and the Minnesota Council of Airports, or MCOA.

In cooperation with Mn/DOT and MCOA, Minnesota AirTAP designed and delivered two workshops, Wildlife Control Seminar and Asphalt, Concrete, and Turf Maintenance Preservation, to address maintenance challenges facing local airports in Minnesota. AirTAP also partnered with Mn/DOT, MCOA, and Minnesota LTAP to present a one-day workshop, Disadvantaged Business Enterprise (DBE) Program and Labor Wage Compliance, to update airport personnel involved with airport funding and construction compliance.

The program continued publication of Briefings, a quarterly one-page insert for the MCOA newsletter, and continued to publish highlights of its workshops and training sessions. Specifically, Minnesota AirTAP developed and distributed four reports based on AirTAP programs: Airfield Pavement Maintenance, Project Funding and Development, Snow and Ice Control, and Wildlife Control Seminar Highlights.

In addition, AirTAP published Flying High: A Marketing Toolkit for Minnesota Airports. This toolkit was designed in response to airport personnel requesting easy-to-implement ideas that help build support for airport operations and demonstrate the value of airports to the community. The toolkit was distributed to more than 1,500 airport personnel.

Electronic versions of all AirTAP publications may be downloaded from the Web site (www.airtap.umn.edu), along with other useful information, materials, and resources.
CTS celebrated 15 years at the University of Minnesota during its fall luncheon where speakers reviewed CTS accomplishments, acknowledged CTS supporters, and addressed future goals.
CTS 15th anniversary

CTS celebrated its first 15 years at a special luncheon in November 2002, remembering growth milestones, recognizing CTS partners, volunteers, and staff, and looking toward the future.

CTS director Robert Johns, associate director Laurie McGinnis, and assistant director Cheri Marti led the festivities, which included staff, supporters, advisors, and committee and council members from the past and present. MIT civil and environmental engineering systems professor Joseph M. Sussman delivered a luncheon presentation titled “Transportation in the 21st Century: A Systems View.” (For more about Sussman’s speech, see page 27.)

Marti moderated a “roving microphone” retrospective of major CTS milestones interspersed with recollections by nine industry leaders and contributors to the Center’s history. During the discussion, she explained that the idea of a transportation center at the University was first conceived by three faculty members in the Department of Civil Engineering—Panos Michalopoulos, Yorgos Stephanedes, and Ray Sterling.

Dick Braun, the founding director of CTS, wrapped up the memories describing his move from the Mn/DOT commissioner’s office to a tiny space in the civil engineering building, where the program was first housed. With counsel from various people, he came to see what kind of center was needed—a platform with a neutral outlook, not part of one department, that would bring together stakeholders. “Under Bob Johns, it’s developed into something far beyond what I first perceived,” he concluded, “and I applaud the staff for their efforts.”

McGinnis took a few moments to acknowledge the organizations and volunteers whose support has been vital to CTS. She thanked the sponsors, in particular Mn/DOT, for their ongoing support, and the hundreds of volunteers who have contributed to CTS by serving on the CTS Executive Committee, Board of Advisors, program steering committees, and councils. Finally, she thanked all current and former staff.

Johns closed the celebration with a look toward the future, where he sees CTS serving two main functions: to help create knowledge through its support of faculty-led research, and to help educate and train future transportation professionals. CTS, he added, will also anticipate new issues and continuously remake itself in order to adapt to the changing policy and funding environment.
Regional and national transportation officials, policymakers, and professionals joined U.S. Rep. James L. Oberstar March 16–17, 2003, to discuss improving intermodal connections among passenger and freight carriers. It was the second meeting of the forum named after Oberstar and hosted by CTS.

Oberstar headlined the event, which featured Associate Deputy Secretary of Transportation Jeffrey Shane and Lt. Gov. Carol Molnau. CTS director Robert Johns served as master of ceremonies.

“Intermodalism is more than just a ‘buzzword’ or the flavor of the day among transportation policymakers,” Oberstar said, kicking off the forum by laying out a broad vision for the nation’s transportation system. “We need to think in intermodal terms as we engage in long-range planning for our transportation infrastructures.”

In his keynote address during the portion of the forum open to the public, Shane cited the critical role freight transportation has played in making the U.S. economy one of the most efficient in the world. But he stressed the need for improving intermodal links for passenger travel and providing consumers with more travel choices.

After Shane’s keynote remarks, a mixed panel of freight and passenger transportation executives swapped ideas and fielded questions from an audience of more than 200. Oberstar and moderator Robert Johns were joined by Peter Bell, chair of the Metropolitan Council of the Twin Cities; William Berry, intermodal vice president of Canadian National Railway Company; Donald Schneider, chairman of Schneider National, Inc.; Gerry Brown, president of Cargo Marine and Terminal, Inc.; and Paul Skoutelas, CEO of the Port Authority of Allegheny County.

A detailed report summarizing the second James L. Oberstar Forum for Transportation Policy and Technology is available online at: www.cts.umn.edu/oberstarforum.

(From left) Jeffrey Shane, Carol Molnau, James Oberstar, and Robert Johns

(From left) Robert Johns, Donald Schneider, Peter Bell, William Berry, Gerry Brown, Paul Skoutelas, and James Oberstar
CEO Leadership Forum

CTS hosted a three-day DOT leadership forum to foster in-depth discussion of and develop action plans for addressing how each DOT carries out leadership strategies, delivers programs, and operates its transportation systems. The event, which took place May 4–6, 2003, was sponsored by the American Association of State Highway and Transportation Officials (AASHTO), the Transportation Research Board (TRB), and the Federal Highway Administration (FHWA), with funding provided by the National Cooperative Highway Research Program (NCHRP).

CTS director Robert Johns, Lt. Gov. and Mn/DOT commissioner Carol Molnau, and AASHTO president James Codell kicked off the first day of the forum, which included presentations built around three forum topics—strategic leadership, program delivery, and system operations—and set the stage for more focused interaction later in the forum.

Opening presentations were made by John Brandl, a professor at the Hubert H. Humphrey Institute of Public Affairs, Steve Lockwood, vice president with Parsons Brinkerhoff, and Tom Warne, president of Tom Warne and Associates. Other participants included Codell, John Horsley, executive director of AASHTO, Robert Skinner Jr., TRB executive director, and Frederick “Bud” Wright, FHWA executive director.

Forum invitees also took part in a series of unique conversation circle discussions designed to address each of the three forum topics. The event culminated with a large-group brainstorming session followed by small work-group sessions geared to finalize action plans to carry out the initiatives and ideas generated throughout the forum. The group came up with 21 specific action plans, which the sponsoring organizations, through an NCHRP panel, prioritized for future implementation.

A report summarizing the three-day workshop is available online at quality.transportation.org.

2003 Annual Transportation Research Conference

In April 2003, CTS held the Fourteenth Annual Transportation Research Conference in St. Paul. Throughout the event, security concerns since September 11 consistently emerged as a top priority along with congestion and funding reauthorization. Highlights include:

- A “State and Regional Transportation Policy Update” by Lt. Gov. Carol Molnau, Minnesota transportation commissioner, and Peter Bell, chair of the Metropolitan Council.

Molnau and Bell, two of the Pawlenty administration’s top transportation leaders, said the governor’s goal is moving people and goods as efficiently as possible. Each shared their visions for the future of transportation in Minnesota. Molnau said their plan couples a clear commitment to building critical road and bridge projects with innovative financing tools to deliver progress to Minnesota drivers. In addition to singling out congestion as the number one lifestyle issue in the seven-county metro area, Bell also set forth a number of goals for the council.

- A luncheon presentation titled “Leveraging Technology to Reshape Transportation Planning,” by Michael Shiffer of the Chicago Transit Authority. (For more about Shiffer’s presentation, see page 27.)

- Nearly two dozen concurrent sessions, including topics such as value pricing, environmental streamlining, human-powered transportation, data gathering, safety and security, transportation access for the disadvantaged, transportation asset management, and the I-35W access project.

- A half-day workshop on bridge design and rapid replacement, featuring Minnesota and national experts.

Complete coverage of the 2003 Transportation Research Conference may be found online at: www.cts.umn.edu/news/report/2003/06/.
CTS annual meeting and awards luncheon

As the featured speaker at the CTS annual meeting and awards luncheon in April 2003, U.S. Rep. Martin O. Sabo addressed the funding and logistical challenges of responding to the threat of terrorism. Sabo recently left the House Transportation Appropriations Subcommittee to become the ranking member of the new Homeland Security Subcommittee.

CTS also presented the following awards at the meeting. The ceremony is an opportunity for CTS to recognize significant contributions to the field of transportation.

- **William K. Smith Distinguished Service Award**: Gary Eikaas, vice president of Dedicated Logistics Inc. and the inaugural winner of the award last year, presented the 2003 award to Ron Lifson, vice president/general manager of LDI Fibres, Inc.
- **Distinguished Public Leadership Award**: CTS Executive Committee member Fred Corrigan, executive vice president of the Minnesota Transportation Alliance, presented the award to Colleen Landkamer, a Blue Earth County commissioner and former policy fellow at the Humphrey Institute.
- **Richard P. Braun Distinguished Service Award**: Richard P. Braun, founding director of CTS, presented the award to Robert Benke, former Mn/DOT research services director.
- **Ray L. Lappegaard Distinguished Service Award**: CTS director Robert Johns announced Pete Fausch, principal engineer for SRF Consulting Group, Inc., as this year’s recipient.

- **CTS Research Partnership Award**: The project recipient was “Implementation of Climatological Summaries for Blowing Snow Control: Design, Training, and Website Development.” In the project, University researchers joined practitioners from several agencies to develop snowdrift mitigation strategies in order to save lives, money, and time. (For more about the project, see page 9.) Project partners included:
  - Mark Seeley, Amy Baker, and Dave Ruschy (University of Minnesota’s Department of Soil, Water, and Climate)
  - Martha Shulski (Alaska Climate Research Center, formerly with the Department of Soil, Water, and Climate)
  - Dan Gullickson, Lou Barrett, Ed Fleege, Elizabeth Hobbs, and Jim Klessig (Mn/DOT)
  - John Doan (Minnesota Department of Finance, formerly with Mn/DOT)
  - Paul Flynn (U.S. Department of Agriculture Natural Resources Conservation Service)
  - Lee Klossner (University of Minnesota’s Southwest Research and Outreach Center at Lamberton, Minnesota)
  - Kenny Blumenfield (University of Minnesota Department of Geography)
  - Pete Boulay, Greg Spoden, and Jim Zandlo (Minnesota Department of Natural Resources State Climatology Office)

Research Partnership Award winners: (front row, left to right) Elizabeth Hobbs, Amy Baker, Jim Klessig, Dan Gullickson, Lou Barrett, Laurie McGinnis. (Back, left to right) John Doan, Dave Ruschy, Mark Seeley, Pete Boulay, Kenny Blumenfield, Paul Flynn, Ed Fleege, and Jim Zandlo
CTS luncheon presentations

The Center’s luncheon presentations provide a setting for transportation professionals, faculty, and students to interact as they listen to presentations of national issues. The spring luncheon is held in conjunction with the annual CTS transportation research conference.

At the spring luncheon in April 2003, Michael Shiffer told the assembled researchers and practitioners, “Wonderful plans fail without communication.” As vice president of planning and development for the Chicago Transit Authority, Shiffer is responsible for making sure the nation’s second-largest transit operator is not left behind by shifting land-use patterns or changing customer behavior. His presentation shared some of the ways his agency is using technology to meet the needs of today while preparing for the future. At the core of an effort he led to reorganize and consolidate CTA’s technological resources was the idea of an “information infrastructure” to support decision-making. But as Shiffer pointed out, it’s the communication—not the technology itself—that makes plans succeed or fail.

At the CTS winter luncheon in February 2003, Hiroshi Tsuda offered his personal perspective on the challenges faced by engineers and designers working with intelligent transportation systems (ITS) technologies. Tsuda, a researcher from Nissan Technical Center North America, used examples from his work developing in-vehicle navigation systems. Tsuda’s presentation touched on some classic problems in interface design, as well as complex implementation issues that are becoming increasingly important as ITS technologies enter the mainstream. As ITS applications become common, Tsuda said, researchers and engineers must pay attention to both the needs of the driver and the large-scale effects of implementing new technologies—a lesson he has learned through experience.

During the CTS 15th anniversary celebration in November 2002, MIT civil and environmental engineering systems professor Joseph M. Sussman delivered a fall luncheon presentation titled “Transportation in the 21st Century: A Systems View.” Sussman observed that transportation is facing significant transitions in the interconnected areas of technology, systems, and institutions. In response to such challenges, Sussman expressed the need for a “T-shaped professional” who has not only an in-depth knowledge within a transportation specialty, but also a breadth of knowledge in transportation fundamentals.

Freight and Logistics Symposium

Economic concerns, post-September 11 security measures, congestion, infrastructure innovations, public- and private-sector responsibilities, and the development of an regional air cargo facility were just some of the many topics examined by freight and logistics professionals, researchers, and policymakers at the Sixth Annual Freight and Logistics Symposium, hosted by CTS in December 2002.

The event’s main sessions included a keynote address by Wilbur Smith Associates vice president Arno Hart, a panel discussion about Minnesota’s global connections, and a public policy perspective from Congressman Mark Kennedy. Other highlights included a presentation on building exclusive truck lanes by Naresh Amatya, a senior planner with the Southern California Association of Governments, and an update on the Minneapolis-St. Paul international air cargo study by Mn/DOT’s Cecil Selness.

Kennedy touched on a wide range of transportation-related topics, from a fundamental public responsibility for building roads to the demands of increasing globalization. “We need to make sure we have the capacity to move goods and services around this state and the country, and internationally,” he said. Hart’s presentation, titled “Hang Ten: Riding the Wave of Transportation Integration,” discussed how freight transportation has evolved from a business dependent on inventory to one relying on operations.

“Transportation information is the catalyst for change,” Hart observed, citing the necessity for agility, for moving and responding quickly. “Logistics is becoming a strategic weapon for economic development.”

CTS sponsored the symposium in cooperation with the CTS Logistics Task Force, Mn/DOT, the Minnesota Freight Advisory Committee, the Council of Logistics Management, and the Metropolitan Council.

A summary report detailing the entire event is available online at: www.cts.umn.edu/publications/proceedings/.
Congressional and legislative staff visits

Members of the Minnesota House Transportation Policy Committee and the Transportation Finance Committee visited CTS in March 2003 for a first-hand look at transportation research in progress at the University. The TechnoBus, demonstrating the latest in high-tech navigational equipment, transported the legislators to and from the University, with a demonstration on the intercampus busway. The group also toured the HumanFIRST Program’s facilities, which include a driving simulator that allows researchers to test driver response to various situations. Visiting transportation committee members included policy committee chair Ron Erhardt, finance committee chair Bill Kuisle, and Bernie Lieder, Peter Nelson, Frank Hornstein, Bruce Anderson, Alice Hausman, Nora Slawik, Chris DeLaForest, Mike Beard, Connie Ruth, and Andy Westerberg. Committee staff Margaret Amundson and Mark Meffert also attended.

U.S. Rep. John Kline received a briefing on a variety of CTS programs during a site visit in December 2002. After an overview from CTS director Robert Johns, Kline heard an update by ITS Institute director Max Donath about research being performed in the Institute’s Intelligent Vehicles (IV) Laboratory. Kline then viewed a demonstration at the HumanFIRST lab. U.S. Rep. Martin Sabo received a similar tour and briefing following his remarks at the CTS annual meeting and awards luncheon in April 2003.

In November 2002, CTS hosted a congressional staff day attended by Dick Larson (Congressman Gil Gutknecht’s office), Katie Delmore (Congresswoman Betty McCollum’s office), Louis Moore (Congressman Martin Sabo’s office), Mark Matuska (Congressman Mark Kennedy’s office), and Deven Nelson (Congressman James Oberstar’s office). In addition to various presentations, the group received tours and demonstrations at the HumanFIRST Program, the IV Lab and the Technobus intelligent vehicle, and the ITS Institute Lab.

In May 2003, about 75 attendees of the 2003 ITS America national conference, held in Minneapolis, also took part in tours and demonstrations at the HumanFIRST Program, the IV Lab and the Technobus intelligent vehicle, and the ITS Institute Lab.
Minnesota Pavement Conference

Though participants at the Seventh Annual Minnesota Pavement Conference heard updates on the usual suspects—such as bituminous treatments and concrete quality improvement—a new emphasis was on contracting, specifically, how to define and administer warranty contracts and avoid fraud and litigation.

Moderated by Pat Hughes, director of Mn/DOT’s Office of Materials and Road Research, the February 2003 conference featured speakers from the local, state, and federal levels. A special highlight was the presentation of the Annual Pavement Conference Award, renamed in honor of the 2002 recipient, Gerry Rohrbach. Doug Differt, Mn/DOT deputy commissioner, presented the 2003 Gerry Rohrbach Distinguished Service Award to Erland Lukanen. Differt praised Lukanen as a leader in the pavement industry since the late 1960s, first with the Minnesota Highway Department and then with consultants Braun Intertec and ERES.

Three of the plenary session speakers then touched on contracting-related issues. John D’Angelo, asphalt materials engineer with the Federal Highway Administration, presented the findings of an FHWA International Scanning Tour that investigated European experiences with transportation finance. The roundtable series was intended to stimulate open discussion among transportation leaders about a wide variety of transportation viewpoints.

The first event, in February, featured Jeff Squires, a senior policy advisor to Sen. James Jeffords of Vermont, the ranking minority member of the Senate’s Environment and Public Works Committee. Squires spoke about the need for finding other sources of financing transportation projects due to an expected decrease in gas-tax revenues, and gave some examples of how other metropolitan areas are addressing transportation financing and congestion issues.

In March, the breakfast roundtable featured Bob Poole, a researcher from the Reason Public Policy Institute who, along with his colleague Ken Orski, authored a recently released study of HOT (high-occupancy toll) networks. Poole highlighted the positive financing and congestion impacts of HOT networks and detailed the benefits they could provide for metropolitan areas around the U.S. warranties. Mark Peters, senior special agent with the USDOT Office of Inspector General, discussed contractor fraud statistics and trends. Legal matters were also the focus for Tom Vasaly, assistant attorney general with the state of Minnesota.

Mn/DOT, Minnesota LTAP, and the Department of Civil Engineering sponsored the conference. Planning committee members from the University were civil engineering researcher Gene Skok, Jim Grothaus of CTS, and Lori Graven and Teresa Washington of the College of Continuing Education.

The pavement conference was sandwiched between the Third Annual Mn/ROAD Conference on February 19 and the 51st Annual Geotechnical Engineering Conference on February 21. University presenters at the Mn/ROAD conference were: civil engineering assistant professor Mihai Marasteanu, “Advanced Asphalt Binder Testing”; plant biology research assistant Jodi Elfering, “Improving the Design of Roadside Ditches”; mechanical engineering professor and ITS Institute director Max Donath, “ITS Participation at Mn/ROAD”; soil, water, and climate professor Satish Gupta, “Moisture Retention Characteristics of Unbound Materials”; and civil engineering assistant professor Bojan Guzina, “Base/Subgrade Characterization Devices.”

Transportation finance roundtables

In April, University of Minnesota researchers Barry Ryan of the Department of Applied Economics and Gary Barnes of the Humphrey Institute’s State and Local Policy Program presented some of the work related to transportation finance that they did as part of the CTS Transportation and Regional Growth Study. Ryan described how different types of highways and streets in Minnesota are paid for, and Barnes discussed his research on travel behavior.

Finally, in June, U.S. Rep. Mark Kennedy, a member of the House Transportation and Infrastructure Committee, presented highlights of his Freeing Alternatives for Speedy Transportation (FAST) Act, which he co-authored in April. In addition, Marthand Nookala, director of Mn/DOT’s Operations, Safety, and Technology Division, explained specifics of a new Minnesota law that allows the express lanes on I-394 to be tolled. A roundtable discussion, moderated by former state senator Carol Flynn, featured Alan Steger of the FHWA, Sen. Ann Rest, author of the state senate legislation, Sen. Dick Day, Natalio Diaz of the Metropolitan Council, and Mn/DOT’s Doug Differt.
Toward Zero Deaths Program

TZD, or the Toward Zero Deaths Program, is an interagency partnership led by the Minnesota Department of Public Safety and Mn/DOT, in cooperation with the State Patrol, the Federal Highway Administration, Minnesota county engineers, and CTS.

The goal of the program is to raise awareness of traffic safety issues statewide and to develop tools that can be used to reduce the number of deaths and injuries resulting from traffic accidents in Minnesota.

On behalf of the Toward Zero Deaths team, CTS coordinated the development of a TZD toolkit and a new Web site (www.tzd.state.mn.us) to better organize coalition efforts and more effectively reduce traffic fatalities and injuries. Coalitions can customize the toolkit to address the specific problems they are facing. The new Web site also contains information about how groups can organize to identify traffic safety problems in their communities and participate in finding solutions to those problems.

Statewide, the Toward Zero Deaths program is examining new technologies to help address safety concerns. These include finding short-term, lower cost alternatives to traditional engineering solutions, which can be too expensive or take too long to complete.

More information about TZD may be found online at: www.tzd.state.mn.us.

Midwest Transportation Knowledge Network

CTS is one of the members of the Midwest Transportation Knowledge Network (MTKN), an 10-state network of transportation libraries in the Midwest. It was founded in December 2001 through the efforts of the National Transportation Library, Midwest transportation libraries (both at state DOTs and universities) and numerous concerned professionals in the region.

One major goal of the MTKN is to create a single point of access for the bibliographic catalog records of all member libraries, with cooperative lending of these resources among members. This resource will help managers, engineers, and planners to find and apply the most recent, credible, validated technical information related to their current projects. Desktop access to this database will be available in March 2004. The MTKN has also partnered with the National Transportation Library and the National Highway Institute to develop online training to educate customers on topics such as finding transportation information on the Internet and using transportation information databases.

If you would like further information about the Midwest Transportation Knowledge Network, please see www.mtkn.org, or contact Jerry Baldwin, Mn/DOT Library director and MTKN Executive Committee chair, 651-297-4532, jerry.baldwin@dot.state.mn.us, or Arlene Mathison, CTS librarian, 612-624-3646, amathison@cts.umn.edu.

CTS Library

The CTS library can provide assistance in obtaining CTS publications and research, as well as transportation-related research and publications from other organizations. Please call 612-624-3646 or e-mail library@cts.umn.edu.
CTS continues to develop its Web site as a mechanism for distributing information to a broader audience. This year, the Center saw the number of visitors grow from 49,339 to 163,447, more than tripling its audience.
By bringing together University scholars, CTS serves as a catalyst for helping the University explore new approaches for strengthening transportation knowledge and human resources.
CTS has established a new program to strengthen its relationships with University faculty and researchers. The CTS Faculty and Research Scholars Program brings faculty and staff together to develop transportation research and education opportunities.

CTS has worked closely with University faculty and sponsors to create innovations in transportation through the development of scientific knowledge and an educated labor pool. The new scholars program further leverages the skills of CTS staff in providing the initiative and linkages needed to advance transportation research and education. Scholars will have a role in shaping and prioritizing new research directions and in enhancing CTS educational programs such as the graduate certificate in transportation studies.

Under the CTS Faculty and Research Scholars Program, scholars have joint appointments at CTS as well as in their own departments. The program establishes an ongoing forum for faculty and researchers to meet with CTS staff to provide feedback, discuss interdisciplinary research opportunities, develop new education initiatives, and discuss ways to improve expertise in response to external demands. The program also addresses how to provide support and guidance to new faculty.

The scholars (listed below) were selected because of the transportation focus in their research and education activities, their ongoing involvement with CTS, and their successful relationships with transportation research sponsors. Their two-year appointments may be renewed or rotated to other candidates.

Learn more online about CTS Faculty and Research Scholars at: www.cts.um.edu/scholars
Ph.D. from the University of California, Berkeley (1971); M.S. and B.S. degrees in agricultural economics from the University of Illinois

John Hourdakis
Research Fellow, Civil Engineering

Education and Background: Doctorate focusing on transportation studies currently in progress; M.S. in civil engineering from the University of Minnesota; and undergraduate civil engineering degree from the University of Patras, Greece

Lev Khazanovich
Associate Professor, Civil Engineering

Research Expertise: Aspects of concrete pavement research, design, and evaluation, including performance prediction, modeling, non-destructive testing, and finite element modeling

Education and Background: Ph.D. from the University of Illinois (1994); B.S. from the Leningrad Institute of Civil Engineering, Russia (1983); and research at the ERES Division of Applied Research Associates, Inc.

David Kittelson
Frank B. Rowley Distinguished Professor of Mechanical Engineering

Research Expertise: Formation of pollutants and contaminants, particle and nanoparticle emissions from diesel engines, performance of alternative fuels

Education and Background: Ph.D. in chemical engineering from the University of Cambridge, England (1972); M.S. and undergraduate degrees from the University of Minnesota

Kevin Krizek
Assistant Professor, Humphrey Institute of Public Affairs

Research Expertise: Transportation, urban, and land-use planning; travel behavior analysis, including cycling, walking, and transit factors

Education and Background: Ph.D. in urban design and planning and M.S.C.E. degree from the University of Washington, Seattle; and master’s degree in planning from the University of North Carolina

Taeck Kwon
Professor, Electrical and Computer Engineering Director, UMD Transportation Data Research Laboratory

Research Expertise: ITS applications, large-scale data management, digital signal processing, sensor networking, road/weather information systems, pavement condition reporting

Education and Background: Doctorate in computer science from the University of Minnesota, M.S. and B.S. degrees in computer science from King Fahd University of Petroleum and Minerals, Saudi Arabia

Michael Manser
Research Associate, HumanFIRST Program

Research Expertise: Role of human perception, cognition, and behavior in typical driving environments; intersection-approach behavior, driver distraction, driver training, driving simulation systems

Education and Background: Ph.D. in cognitive psychology from the University of Minnesota with a cognate in human factors and ergonomics

Mihai Marasteau
Assistant Professor, Civil Engineering

Research Expertise: Characterization, modeling, and experimental testing of bituminous paving materials; low-temperature behavior of asphalt binders and mixtures

Education and Background: Ph.D. and M.S. degrees in civil engineering from Pennsylvania State University and engineering diploma from the Civil Engineering Institute of Bucharest, Romania

Kevin Krizek
Assistant Professor, Humphrey Institute of Public Affairs

Research Expertise: Pavement research, evaluation, and management; structural design

Education and Background: B.S. in civil engineering from the University of Minnesota (1974), position at Minnesota Department of Transportation for 18 years, and consultant for 23 years

Barbara Lukermann
Senior Fellow, Humphrey Institute of Public Affairs

Research Expertise: Land development; neighborhood planning; links between land use, housing, and transportation policy

Education and Background: Bachelor’s degree in geography from Cambridge University, UK; M.A. in geography from the University of Minnesota; principal post in a consulting firm for 15 years

Michael Manser
Research Associate, HumanFIRST Program

Research Expertise: Role of human perception, cognition, and behavior in typical driving environments; intersection-approach behavior, driver distraction, driver training, driving simulation systems

Education and Background: Ph.D. in cognitive psychology from the University of Minnesota with a cognate in human factors and ergonomics

Mihai Marasteau
Assistant Professor, Civil Engineering

Research Expertise: Characterization, modeling, and experimental testing of bituminous paving materials; low-temperature behavior of asphalt binders and mixtures

Education and Background: Ph.D. and M.S. degrees in civil engineering from Pennsylvania State University and engineering diploma from the Civil Engineering Institute of Bucharest, Romania

Alfred A. Marcus
Professor, Strategic Management and Organization, Carlson School of Management

Research Expertise: Transportation logistics and business management, environmental regulation

Education and Background: Ph.D. from Harvard University (1977); M.A. and B.A. degrees from the University of Chicago (1973, 1971); and research consultant at the National Academy of Sciences, Washington, D.C. (1975–76)

Osama Masoud
Research Associate, Computer Science and Engineering

Research Expertise: Vision-based computerized data collection and monitoring of traffic and pedestrians, algorithms for vehicle classification

Education and Background: Ph.D. in computer science from the University of Minnesota, M.S. and B.S. degrees in computer science from King Fahd University of Petroleum and Minerals, Saudi Arabia

Gerard McCullough
Associate Professor, Applied Economics

Research Expertise: Industrial organization and transportation economics

Education and Background: Ph.D. from the Massachusetts Institute of Technology (1993), A.B. from
Wisconsin, and undergraduate M.A.L.A. from the University of Graduate School of Design, Education and Background: Twin Cities Professor, Landscape Architecture Lance Neckar Association of State Development research division of the National University (1967), and chair of in economics from Georgetown of Minnesota, bachelor’s degree in transportation’s role in the community Education and Background: Post-graduate work in economics and computer science at the University of Minnesota, bachelor’s degree in economics from Georgetown University (1967), and chair of research division of the National Association of State Development Agencies (1986–1990) Lee Munnich Director, State and Local Policy Program, Humphrey Institute of Public Affairs Research Expertise: Transportation financing, impact of telecommunications technology on business and transportation, transportation’s role in the community Education and Background: Post-graduate work in economics and computer science at the University of Minnesota, bachelor’s degree in economics from Georgetown University (1967), and chair of research division of the National Association of State Development Agencies (1986–1990)

Lance Neckar Professor, Landscape Architecture Research Expertise: Subdivision design approaches that can reduce or stabilize the number of vehicle miles traveled by residents, light rail transit and bus transportation in the Twin Cities Education and Background: M.L.A. from Harvard University’s Graduate School of Design, M.A.L.A. from the University of Wisconsin, and undergraduate degrees in history and German

Steven A. Olson Research Associate, Civil Engineering Research Expertise: Bridge engineering, design, and rehabilitation; load capacity analysis; structural inspection Education and Background: Ph.D., M.S., and bachelor’s degrees in civil engineering from the University of Minnesota and former manager of engineering design for the National Steel Bridge Alliance


Barry Ryan Research Fellow, Applied Economics Research Expertise: Transportation financing alternatives, strategies for addressing congestion and urban sprawl, future development pattern of the Twin Cities area Education and Background: M.S. in public finance and B.S. in agricultural marketing from the Department of Applied Economics at the University of Minnesota

Thomas M. Scott Director, Center for Urban and Regional Affairs (CURA) Research Expertise: Local government, change and development in urban politics and government Education and Background: Ph.D. in political science, currently a faculty member in the Department of Political Science

Craig Shankwitz Director, Intelligent Vehicles Program, ITS Institute Research Expertise: Man-machine interaction, vehicle-driver interfaces, sensors, human in the loop control systems, non-linear vehicle dynamic problems Education and Background: Ph.D. in electrical engineering with an emphasis in the area of control theory from the University of Minnesota (1992) and formerly responsible for the motion control of the National Advanced Driving Simulator (NADS) at the University of Iowa

Shashi Shekhar Professor, Computer Science and Engineering Research Expertise: Geographic information systems (GIS) and spatial databases, assessment of roadmap accuracy, high-performance methods for querying and visualizing traffic data, data storage methods Education and Background: Ph.D. and M.S. degrees in computer science and M.S. degree in business administration from the University of California, Berkeley; B. Tech degree in computer science from the Indian Institute of Technology, Kanpur; technical advisor to United Nations Development Program (UNDP) and Environmental Systems Research Institute (ESRI)

Carol Shield Associate Professor, Civil Engineering Research Expertise: Mechanical behavior of plate, beam, and wire-rope structures; composite materials; bridge repair; seismic simulation Education and Background: Ph.D. in theoretical and applied mechanics from the University of Illinois at Urbana-Champaign (1991), master’s degree in mechanical engineering from Rensselaer Polytechnic Institute (1986), bachelor’s degrees in mathematics and engineering from Swarthmore College (1984), and former research engineer at the United Technologies Research Center (1984–1991)

Barbara VanDrasek Research Associate, Geography Research Expertise: Transportation and regional growth, urban geography, patterns of land development Education and Background: Ph.D., master’s, and bachelor’s degrees in geography from the University of Minnesota, grant-funded work for the Minnesota Department of Transportation

Mary Vogel Senior Research Fellow, Landscape Architecture Research Expertise: Community design and transit, community design and personal safety, large regional systems Education and Background: M.Arch. degree from the University of Minnesota

Nicholas Ward Director, HumanFIRST Program, ITS Institute Research Expertise: Human-centered approach to traffic safety improvement, systems design to support driver cognitive functioning and driver distraction and impairment Education and Background: Ph.D. in human factors psychology from Queen’s University, Canada; eight years conducting human factors research in transportation safety and ITS at the University of Leeds

Bruce Wilson Professor, Biosystems and Agricultural Engineering Research Expertise: Erosion control, surface water runoff pollutant mitigation Education and Background: Ph.D. in agricultural engineering from the University of Kentucky (1984), M.S. degree from the University of Minnesota, and former faculty member at Oklahoma State University

Thomas M. Scott Director, Center for Urban and Regional Affairs (CURA) Research Expertise: Local government, change and development in urban politics and government Education and Background: Ph.D. in political science, currently a faculty member in the Department of Political Science
Research reports published in FY 2003

**Economy research**


Anderson, D. and McCullough, G. The Distribution of Transportation Costs in the Twin Cities Region. CTS 03-03.


Johnson, C. Market Choices and Fair Prices: Research Suggests Surprising Answers to Regional Growth Dilemmas (TRG Synthesis). CTS 03-02.*


Rose, D. Power Plant Siting Decisions and Transport Implications. CTS 03-09.

Ward, E. A Systems Thinking Perspective on the Transportation and Regional Growth Study. CTS 03-05.*

*Economy/Environment research

**Infrastructure research**


Seavey, K. Inspection of Timber Bridges. Mn/DOT 2002-34.


Stolarski, H. The Effect of Transverse Stiffner Beams on Shear Transfer. Mn/DOT 2003-12.


Wilson, B. The Impact of Roughness Elements on Reducing the Shear Stress Acting on Soil Particles. Mn/DOT 2002-22.

**Environment research**


Neckar, L., Station Urban Design Issues in Red Rock Commuter Rail. CTS 03-07.


Tix, D., Hebberger, J., Vaughan, E., Charvat, I. The Effects of Fire versus Mowing on Prairie Plant Communities. Mn/DOT 2003-20

Vogel, M. St. Paul Central Corridor Study: Pierce Butler Industrial Redevelopment Parkway. CTS 03-08.


**Safety and traffic flow research**

Donath, M. A GPS-Based Head Up Display System for Driving Under Low Visibility Conditions. Mn/DOT 2003-03.
CTS Executive Committee

Chair: Richard T. Murphy Jr.
President, Murphy Warehouse Company

Tom Chaffin
Vice President, Traffic Control Division, 3M

Douglas Differt
Mn/DOT Deputy Commissioner

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District #3 Member, Metropolitan Council

Colleen Landkamer
Blue Earth County Commissioner

Richard Thomas
Government Relations Director, Ames Construction

John Anderson
Associate Dean, Carlson School of Management

Fred Corrigan
Executive Vice President, Minnesota Transportation Alliance

Ron Erhardt
Minnesota House of Representatives

Keith Langseth
Minnesota State Senator

Tom Chaffin
Vice President, Traffic Control Division, 3M

Fred Corrigan
Executive Vice President, Minnesota Transportation Alliance

Ron Erhardt
Minnesota House of Representatives

Keith Langseth
Minnesota State Senator

Terri Barreiro
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Blue Earth County Commissioner

Richard Thomas
Government Relations Director, Ames Construction

Anne Beers
Chief of Minnesota State Patrol, Department of Public Safety

Steve Crouch
Associate Dean, IT Administration, University of Minnesota

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Professor, Humphrey Institute of Public Affairs, University of Minnesota

Donn Wiski
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John Hausladen
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Al Steger
Minneapolis Division Administrator, Federal Highway Administration

Charleen Zimmer
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Gerry Brown, Cargo Carriers Inc.

Carol Bultan, Minnesota Safety Council Inc.

Lyndon Carlson, Minnesota House of Representatives

Ed Cohoon
Jim Denn, Former Mn/DOT Commissioner

Natalio Diaz, Metropolitan Council

Gary Elkaas, Dedicated Logistics, Inc.

Peter Fausch, SRF Consulting Group, Inc.

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Bill Goins, Federal Express

John Gulliver, Department of Civil Engineering, University of Minnesota

Davis Helberg, Seaway Port Authority

Dave Holt, Minnesota Asphalt Paving Association

Curt Johnson, Citistates

Pat Kumar, IT Administration, University of Minnesota

Ronald Lison, LD1 Fibres Inc.

Barbara Lukermann, Center for Urban and Regional Affairs, University of Minnesota

Vincent Magnuson, University of Minnesota Duluth

Jim Newland

Elliot Perovich, Anoka County

John Rodeberg, City of Hutchinson

Bob Sands, Edwards and Kelsey

G. Edward Schuh, Humphrey Institute of Public Affairs, University of Minnesota

Thomas Scott, Center for Urban and Regional Affairs, University of Minnesota

Mike Setzer, Metro Transit

Michael Sheehan, Olmsted County

Chuck Siggerud, SEH

Mark Snyder, Concrete Paving Association of Minnesota

Jim Solem

Elwyn Tinklenberg, The Tinklenberg Group

Sandra Vargas, Hemepin County

Douglas Weiszhaar, WSB & Associates Inc.

Phil Wheeler, Rochester/Olmsted Planning

Note: Listings in these appendices are current as of December 2003.
CTS Councils and Advisory Committees

CTS Councils and Advisory Committees

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Bernard Arsenneau, Mn/DOT
George Cochran, Mn/DOT (ret.)
Jody Hauer, Office of Legislative Auditor
Connie Kozlak, Metropolitan Council
Gary Thompson, Mn/DOT

**Transportation and the Economy Council**
Chair: Jody Hauer, Office of Legislative Auditor
John Adams, Geography, University of Minnesota
Stephen Alderson, HNTB
Rabindra Bains, Mn/DOT
Gary Barnes, Humphrey Institute of Public Affairs, University of Minnesota
Robert Benke, Community Resource Partnership Inc.
Mark Berndt, Wilbur Smith Associates
David Braslau, David Braslau Associates
Ken Buckeye, Mn/DOT
Dave Christianson, Metropolitan Council
William Craig, Center for Urban and Regional Affairs, University of Minnesota
Norman Foster, Minnesota Department of Finance
Jerry Fruin, Applied Economics, University of Minnesota
Robert Gale, Mn/DOT
William Gardner, Mn/DOT
Kate Garwood, Anoka County Highway Department
Donald V. Harper, Carlson School of Management, University of Minnesota (ret.)
David Levinson, Civil Engineering, University of Minnesota
Carol Lovro, Association of Minnesota Counties
Jerry Nagel, Northern Great Plains Inc.
Betsy Parker, Mn/DOT
Perry Plank (ret.)
Raymond Rought, Mn/DOT
Charles Sanft, Mn/DOT
Eric Willette, League of Minnesota Cities

**Transportation Safety and Traffic Flow Council**
Chair: Gary Thompson, Mn/DOT
Bernard Arsenneau, Mn/DOT

Mike Asleson, Minnesota State Patrol
Dharam Bobra, Hennepin County
David Burns, 3M
Gary Davis, Civil Engineering, University of Minnesota
Max Donath, ITS Institute
Rob Ege, Mn/DOT
Dave Kopacz, FHWA
Eil Kwon, Mn/DOT
Richard Larson, Mille Lacs County
James McCarthy, Federal Highway Administration
Panos Michalopoulos, Civil Engineering, University of Minnesota
Durga Panda, Image Sensing Systems, Inc.
Nikos Papanikolopoulos, Computer Science and Engineering
Howard Preston, CH2M Hill
Steve Ruegg, PB Consult Inc.
Robert Sands, Edwards and Kelsey
Brian Scott, SRF
Shashi Shekhar, Computer Science and Engineering, University of Minnesota
Al Smith, Minnesota State Patrol
Kathryn Swanson, Minnesota Department of Public Safety/Traffic
Linda Taylor, Mn/DOT
Michael Wade, Kinesiology, University of Minnesota
Nic Ward, HumanFIRST Program, University of Minnesota

**Transportation Infrastructure Council**
Chair: George Cochran, Mn/DOT (ret.)
Ron Bray, WSB & Associates
Robert Dexter, Civil Engineering, University of Minnesota
Dan Dorgan, Mn/DOT
Andrew Drescher, Civil Engineering, University of Minnesota
Glenn Engstrom, Mn/DOT
Donald Flemming, URS/BRW Inc.
Alan Forsberg, Blue Earth County
Catherine French, Civil Engineering, University of Minnesota
Theodore Galambos, Civil Engineering, University of Minnesota
Jim Grube, Hennepin County
Bojan Guzina, Civil Engineering, University of Minnesota
Jerome Hajjar, Civil Engineering, University of Minnesota
Patrick Hughes, Mn/DOT
Joe Labuz, Civil Engineering, University of Minnesota

Sue Lodahl, Mn/DOT
Mihai Marasteanu, Civil Engineering, University of Minnesota
Mike Marti, SRF Consulting
Joe Meade, Mn/DOT
Linda Pieper, Things With a Twist, Inc.
Robin Schroeder, FHWA
Arturo Schultz, Civil Engineering, University of Minnesota
Keith Shannon, Mn/DOT
Michael Sheehan, Olmsted County
Carol Shield, Civil Engineering, University of Minnesota
Gene Skok, Civil Engineering, University of Minnesota
Mark Snyder, Concrete Paving Association of Minnesota
Vaughan Voller, Civil Engineering, University of Minnesota
Richard Wolters, Minnesota Asphalt Pavement Association

**Transportation and the Environment Council**
Chair: Connie Kozlak, Metropolitan Council
John S. Adams, Geography, University of Minnesota
Darryl Anderson, Mn/DOT
David Biesboer, Plant Biology, University of Minnesota
John Carmody, Architecture and Landscape Architecture, University of Minnesota
Dick Elasky, Mn/DOT
John Gulliver, Civil Engineering, University of Minnesota
Chris Hiniker, SEH
David Kittelson, Mechanical Engineering, University of Minnesota
Kevin Krizek, Humphrey Institute of Public Affairs, University of Minnesota
Susan Moe, Federal Highway Administration
Steve Morris, Ramsey County Regional Railroad Authority
Lance Neckar, Landscape Architecture, University of Minnesota
Ann Perry, Resource Strategies Corporation
Peter Raynor, Environmental Health and Safety, University of Minnesota
Peggy Reichert, Mn/DOT
Robert Sykes, Landscape Architecture, University of Minnesota
Mary Vogel, Landscape Architecture, University of Minnesota

* Completed term as chair in 2003
APPENDIX B

CTS Councils and Advisory Committees

Education/Outreach Council
Chair: Ann Johnson, Professional Engineering Services, Ltd.
Jerry Baldwin, Mn/DOT
James Benshoof, Benshoof and Associates
Trisha Collopy, Civil Engineering, University of Minnesota
Dave Daubert, Search Engineering, Inc.
Gary Davis, Civil Engineering, University of Minnesota
Jan Ekern, Mn/DOT
John Gulliver, Civil Engineering, University of Minnesota
Maria Hagen, City of St. Louis Park
Mike Marti, SRF Consulting
Sandy McCully, Mn/DOT
Clark Moe, Mn/DOT
Catherine Ploetz, College of Continuing Education, University of Minnesota
Emeric Pratt, Mn/DOT
Micky Ruiz, Mn/DOT (ret.)
Daniel Wegman, Koch Materials Company

ITS Institute Board
Chair: Robert Johns, CTS
Mike Asleson, Minnesota State Patrol
Ron Boenau, Federal Transit Administration
Rebecca Brewster, American Transportation Research Institute
Ted Davis, IT Administration, University of Minnesota
Randy Halvorson, Mn/DOT
Mark Hoisser, DARTS
Dave Johnson, Mn/DOT
Anthony Kane, AASHTO
Vince Magnuson, University of Minnesota Duluth
Marthand Nookala, Mn/DOT
Richard Rovang, Metro Transit
Rich Sanders, Polk County
Al Steger, Federal Highway Administration
Anthony Strauss, University of Minnesota
Kathryn Swanson, Minnesota Department of Public Safety
Don Theisen, Washington County
Toni Wilbur, Federal Highway Administration
Bob Winter, Mn/DOT

Minnesota LTAP Steering Committee
Chair: Julie Skallman, Mn/DOT
Tom Colbert, City of Eagan
Philip Forst, Federal Highway Administration
Dave Frick, Minnesota Association of Townships
Doug Grindall, Koochiching County
Greg Isakson, Goodhue County
Robert Johns, CTS
Dave Johnson, Mn/DOT
Sue Lodahl, Mn/DOT
Shelly Pederson, City of Bloomington
John Rodeberg, City of Hutchinson
Mike Sheehan, Olmsted County
Tom Struve, City of Eagan

AirTAP Steering Committee
Chair: Peter Buchen, Mn/DOT
Dave Beaver, Owatonna Municipal Airport
Glenn Burke, South St. Paul Airport
Kurt Claussen, Rochester International Airport
Jack Eberlein, Metropolitan Airports Commission
Mark Kallhoff, Canby Airport
Laurie McGinnis, CTS
Nancy Nistler, FAA
John Puckropp, GenAvCon
Brian Ryks, Duluth International Airport
Bill Towle, St. Cloud Municipal Airport
Duane Wething, Detroit Lakes Airport

Transportation and Regional Growth Study
Program Management Team
Gina Baas, CTS
Shannon Beaudin-Klein, Mn/DOT
Kenneth Buckeye, Mn/DOT
Eli Cooper, Metropolitan Council
Natalio Diaz, Metropolitan Council
Al Forsberg, Minnesota Local Road Research Board
Randy Halvorson, Mn/DOT
Tim Henkel, Mn/DOT
Robert Johns, CTS
Curtis Johnson, Citistates Group
Dave Johnson, Mn/DOT

James Klessig, Mn/DOT
Connie Kozlak, Metropolitan Council
Adeel Lari, Mn/DOT
Cecil Selness, Mn/DOT
Tom Scott, Center for Urban and Regional Affairs, University of Minnesota
Jim Solem, Center for Urban and Regional Affairs, University of Minnesota
Dick Stehr, Mn/DOT

Research Committee
John Adams, Geography, University of Minnesota
Gina Baas, CTS
Gary Barnes, Humphrey Institute of Public Affairs, University of Minnesota
Gary Davis, Civil Engineering, University of Minnesota
Robert Johns, CTS
Barbara Lukermann, Humphrey Institute of Public Affairs, University of Minnesota
Gerard McCullough, Applied Economics, University of Minnesota
Lance Neckar, Landscape Architecture, University of Minnesota
Barry Ryan, Applied Economics, University of Minnesota
Tom Scott, Center for Urban and Regional Affairs, University of Minnesota
Tom Stinson, Applied Economics, University of Minnesota
Carol Swenson, Design Center for the American Urban Landscape, University of Minnesota

Note: Listings in these appendices are current as of December 2003.
Affiliated researchers and departments

Aerospace Engineering and Mechanics
Gary Balas
William Garrard
Daniel D. Joseph
Tom Lundgren
Yiyuan Zhao

Agronomy and Plant Genetics
Nancy Ehlke

Applied Economics
Jerry Fruin*
William Gartner
Gerard McCullough*
Barry Ryan*
Tom Stinson
Steven Taff
Douglas Tiffany

Biostystems and Agricultural Engineering
John Nieber
Bruce Wilson*

Chemical Engineering and Material Sciences
Frank Bates
Chris Macosko
William Smyrl

Civil Engineering
Randal Barnes
Paul Bergson
Gary A. Davis*
Robert Deter
Andrew Drescher*
Cathy French*
Ted Galambos
John Gulliver
Bojan Suzina
Jerome Hajjar*
Miki Hondzo
JohnHourdakis*
Lev Khazanovich*
Joseph Labuz
David Levinson*
Mihai Marasteanu*
Panos Michalopoulos*
Steven A. Olson*
Arturo Schutz
Carol Shield*
Gene Skok
Karl Smith
Henok Stolarski
Vaughn Voller

Computer Science and Engineering
Daniel Boley
Maria L. Gini
Mats Heimdahl
Ravi Janardan
Joseph Konstan
Osama Masoud*
Nikolaos Papanikolopoulos*
Haesun Park
Shashi Shekhawat
Jim Slagle
Jaideep Sivaswamy

Design Center for American Urban Landscape
Ann Forsyth
Carol Swenson

Ecology, Evolution and Behavior
Edward Cushing

Electrical and Computer Engineering
Mohamed-Slim Alouni
Vladimir Cherkassky
Emad Ebbini
Bapiraju Vinnakota

Geography
John Adams*
Richard Skaggs
Barbara VanDraak*

Horticulture Science
Susan Galatowitsch
Mary Meyer

Humphrey Institute of Public Affairs
Sandrine Archibald
Gary Barnes*
Richard Boland
Gary DeCramer
Frank Douma*
Kenneth Keller
Kevin Krizek*
Barbara Lukermann*
Lee Munnich*
Barbara Rohde
G. Edward Schuh

Institute of Child Development
Herbert Pick
Albert Yonas

Kinesiology
Mary Jo Kane
Thomas Smith
Michael Wade

Landscape Architecture
John Bloomfield*
John Cardy
Kathleen Harder*
Roger Martin
Lance Neckar*
James Pettinari
Robert Sykes
Mary Vogel*

Law School
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William Durfee
Peter Easterveld
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David Kittelson*
Jason Langer
Perry Li
Michael Manser*
Virgil Marple
Bryan Newstrom
Curt Olson
Rajesh Rayamani
Michael Rakauskas
Craig Shankwitz*
Patrick Starr
Walter Trach Jr.
Nic Ward*

Pavement Research Institute
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David Bixboer*
Iris Charvat

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Paul Bloom
William Breiter
Peter Graham
Satish Gupta
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Mark Seeley
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Dong Wang
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Jeff Marr
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Thomas Scott*

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Carolyn Crouch
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Jim Skurla

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Martha Wilson
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Lawrence Zanko

Sociology-Anthropology (UMD)
Susan Mulhound

* denotes CTS Faculty and Research Scholars. (For more information, see page 32.)
## CTS staff directory

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### CTS student interns

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Regan Cunningham</td>
<td>Brad Martin</td>
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<tr>
<td>Shannon Fiecke</td>
<td>Michelle Mennicke</td>
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<tr>
<td>Katie Gerbensky</td>
<td>Tonya Nepend</td>
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<tr>
<td>Melissa Griffin</td>
<td>Tue Nguyen</td>
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<tr>
<td>Jay Groven</td>
<td>Carynn Roehrick</td>
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<tr>
<td>Sam Kuchinka</td>
<td>Harry Rostovtsiev</td>
</tr>
<tr>
<td>Juan Le</td>
<td>Tim Sather</td>
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<tr>
<td>Dustin Lundebrake</td>
<td>Abby Schwartz</td>
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<tr>
<td>Kari Seppanen</td>
<td>Brendon Slatterback</td>
</tr>
<tr>
<td>Jonathon Sydow</td>
<td>Terri Weitz</td>
</tr>
<tr>
<td>Alyssa Wilcox</td>
<td>Kyle Wood</td>
</tr>
</tbody>
</table>

### CTS research assistants

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<thead>
<tr>
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<tbody>
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<td></td>
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<tr>
<td>Sangho Kim</td>
<td></td>
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<tr>
<td>Mahesh Subramony</td>
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</table>

### College of Continuing Education staff partners

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| Sarah Hosfield        | Student Support Services Assistant                 | 612-626-4535  | shosfield@cce.umn.edu      |

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