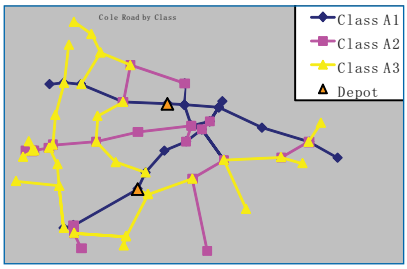
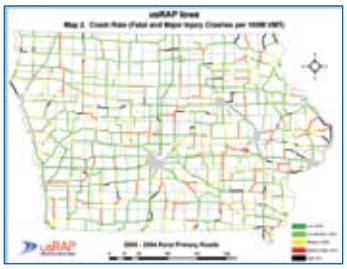
MTC

MIDWEST TRANSPORTATION CONSORTIUM

2009 Annual Report





IOWA STATE UNIVERSITY

Institute for Transportation

About the MTC

The mission of the University Transportation Centers (UTC) program is to advance U.S. technology and expertise in the many disciplines comprising transportation through the mechanisms of education, research, and technology transfer at university-based centers of excellence. The Midwest Transportation Consortium (MTC) is a Tier 1 University Transportation Center that includes Iowa State University, the University of Iowa, and the University of Northern Iowa. Iowa State University, through its Center for Transportation Research and Education (CTRE), is the MTC's lead institution.

2008–2009 Annual Report

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A U.S. DOT University Transportation Center Tier 1 Program

Report for Year 2 (October 2008–September 2009)

December 2, 2009

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ACKNOWLEDGMENTS

We would like to thank the US Department of Transportation's Research and Innovative Technology Administration for funding the Midwest Transportation Consortium. We would also like to thank the Iowa DOT and Iowa Highway Research Board for their support. We would also like to extend a note of appreciation to our advisory board:

- Tom Welch, State Transportation Safety Engineer, Iowa DOT (chair)
- Tom Granda, Team Leader, Human Centered Systems Laboratories, Turner-Fairbank Highway Research Center, Federal Highway Administration (FHWA) (member)
- J. Peter Kissinger, President and CEO, AAA Foundation for Traffic Safety (member)
- Barry D. Stephens, Senior Vice President Engineering, Energy Absorption Systems, Inc. (member)
- Jerry Roche, Transportation Engineer, Iowa Division Office of the FHWA (ex-officio member)

SECTION A: ANNUAL REPORT

MTC AT A GLANCE

In October 2008 the Midwest Transportation Consortium (MTC) began its second of three years as a Tier I University Transportation Center (UTC). Its theme, "Transportation Safety through Improvements in Management Information Systems," reflects the strong emphasis on safety in the current federal transportation policy bill (SAFETEA-LU).

The MTC is composed of Iowa's three Regent universities: Iowa State University (ISU) (lead organization), The University of Iowa (UIowa), and the University of Northern Iowa (UNI). Located in a largely rural region, the MTC generally focuses on intercity/rural traffic safety for motor vehicles. All three universities have conducted and are conducting traffic safety research, each within a specific niche:

- ISU—Crash statistics and analysis to support safety in the design and operations of roadways
- UIowa—Human factors to improve safety
- UNI—Geographic information systems and statistical tools to conduct safety analysis

The complementary nature of the consortium member universities' traffic safety–related specialties, and their physical proximity to each other and to the Iowa Department of Transportation (Iowa DOT), the center's major funding match partner, facilitate efficient and productive partnerships.

Regarding research, for example, MTC Director Shauna Hallmark at ISU is collaborating with faculty members at UIowa on two safety-related projects sponsored by the Strategic Highway Safety Program (SHRP 2). One project is developing methods to utilize naturalistic driving study data to address lane departure crashes, and the other is prioritizing safety research topics for SHRP 2's planned large-scale naturalistic driving study.

The three universities are broadening students' educational experiences by integrating courses and student activities. For example, ISU students have taken safety-related courses at UIowa, and vice versa. The three universities alternately host and broadcast weekly seminars each spring semester. Director Shauna Hallmark is an adjunct faculty member with UIowa's Department of Civil Engineering and serves on committees for graduate students at UIowa.

We continue to strengthen partnerships beyond the consortium member universities. The UIowa is also a member of the Mid-America Transportation Center (MATC) consortium, led by The University of Nebraska-Lincoln. MTC's associate director at UIowa, Dr. Linda Boyle, serves on both MTC and MATC's advisory boards and acts as liaison between them. In addition, ISU and the University of Wisconsin-Madison's Midwest Regional UTC host the Mid-Continent Transportation Symposium in alternate years; in August 2009, it was ISU's turn to plan and lead this important Midwest event, along with the Iowa DOT.

Another way the MTC collaborates with other organizations is through our advisory committee, which includes several highly knowledgeable and nationally prominent safety experts:

- Tom Welch, State Transportation Safety Engineer, Iowa DOT (chair)
- Tom Granda, Team Leader, Human Centered Systems Laboratories, Turner-Fairbank Highway Research Center, Federal Highway Administration (FHWA) (member)
- J. Peter Kissinger, President and CEO, AAA Foundation for Traffic Safety (member)
- Barry D. Stephens, Senior Vice President Engineering, Energy Absorption Systems, Inc. (member)
- Jerry Roche, Transportation Engineer, Iowa Division Office of the FHWA (ex-officio member)

MTC Director Shauna Hallmark and Associate Directors Linda Boyle of UIowa and Tim Strauss of UNI serve as ex-officio members of the advisory board.

At the end of year 2, the Tier 1 MTC and its staff have awarded six competitive research projects, supported more than 20 graduate students for at least one semester, hosted 14 speakers for the spring 2009 semester weekly seminar, co-hosted a regional transportation research symposium with 400 attendees and participated in several other workshops and training events, presented three FHWA/NHI webinars, presented dozens of research papers, and published several refereed journal articles. It has also completed several projects initiated under an earlier, regional UTC grant. The rest of this report provides details.

DIRECTOR'S MESSAGE: CHANGE, CHALLENGE, RE-CHARGING

The second year of MTC's Tier 1 UTC grant was punctuated by the recurring illness of its director, Dr. Tom Maze, and, in June 2009, his passing; see a brief tribute on the following. Dr. Maze was one of those uniquely gifted people who can never be replaced, and his presence and contributions to the transportation and education communities in Iowa and around the nation, including the UTC, are missed beyond telling. As he often quipped, however, change is the only constant, and the MTC is responding to this unhappy change by taking stock of major challenges and re-charging the activities that carry Dr. Maze's unmistakable mark of excellence.

I was appointed interim director and then director of the MTC. To carry on the level of activity previously led by Dr. Maze, we have reorganized MTC staff responsibilities. Under this new structure, described in the next section of this report, the director and co-directors at the consortium member universities, along with primary staff at ISU, work as a leadership team overseeing major MTC initiatives. Several faculty and professional staff at ISU who had previously played tangential roles are now more integrally involved in the day to day management of MTC initiatives.

We are re-energizing, discovering exciting opportunities and generating stimulating ideas that we have begun to implement during the final months of this second year of the Tier 1 grant.

A primary new initiative instituted during Year 2, for example, has been the development of an intense mentoring program for MTC students as described in this report. We're excited about enhancing students' academic experiences while maximizing their preparation for future professional responsibilities. We have also increased our support for and involvement with InTrans's unique workforce development activity, the online magazine *Go!* We are very deliberately seeking opportunities to support and participate in other organizations' technology transfer activities like the Iowa DOT's annual Traffic Safety Forum and its November 2009 Human Factors Workshop.

It is an honor to follow in Dr. Maze's footsteps, carrying on the work he began and building new opportunities and initiatives. I am beginning to appreciate the intense, intrinsic rewards of this hard work and to understand Dr. Maze's unflappable dedication to the MTC. And I think he would heartily approve of where we're going.

Shauna Hallmark
MTC Director

Tribute to Tom Maze

In memory of Dr. Maze

A scholarship is being established in Dr. Maze's name. To contribute, send a check payable to Treasurer, ISU (with the memo "Maze Scholarship Fund") to the following address:

Chris Knight
CCEE Department
394 Town
Iowa State University
Ames, IA 50011

More information

See a timeline of Dr. Maze's career, plus memories and reflections from his friends and peers, online, www.intrans.iastate.edu/news/2009/tommaze.html.

Dr. Tom Maze began his engineering career at ISU, earning a B.S. in civil engineering here in 1975. He returned to ISU in 1988 as an associate professor of civil engineering (transportation), with a master's degree from the University of California, Berkeley (1977) and a PhD in civil engineering from Michigan State (1982), and several years at the University of Oklahoma in Norman as assistant professor and as director of the Oklahoma Highway and Transportation Engineering Center.

In 1990 Dr. Maze became ISU's co-director of the Midwest Transportation Center (MTC), the first UTC program for region 7. From the beginning, Dr. Maze was a visionary program builder who took full advantage of opportunities provided through the UTC program. Until he died in June 2009, he directed a UTC program at ISU for all but five years (when the region 7 grant was led by Nebraska). He was a charter member of the Consortium of University Transportation Centers.

Dr. Maze instituted and grew the Iowa Transportation Center (ITC) at ISU (later the Center for Transportation Research and Education, and now the Institute for Transportation) as an umbrella organization for the MTC and for local, regional, and eventually national and international activities. Together with excellent faculty and staff that he attracted to the program, Dr. Maze built ISU's reputation for excellence in transportation-related research, outreach, and education.

Dr. Maze was a top-notch educator. Through the MTC, he developed a progressive, graduate-level academic enrichment and learning community program at ISU called Transportation Scholars. He was an innovator in streamlining quick-response research. In 1996, he helped forge an efficient research management agreement between ISU and the Iowa DOT that is the envy of many states. In addition to working with students and conducting research, he took a keen interest in nurturing new faculty members and helping them develop successful careers. And he was intensely involved in enhancing transportation technology transfer through professional training and outreach activities. One of his legacies at ISU is the Mid-Continent Transportation Research Symposium, a regional conference he initiated in 1996 in partnership with the Iowa DOT.

Through ongoing activities like the symposium, as well as the extensive body of work he leaves behind and the many former students who are today's transportation professionals, Dr. Maze's accomplishments will continue to have an impact across Iowa, the country, and beyond for a very long time.

ORGANIZATIONAL STRUCTURE AND KEY PERSONNEL

The MTC is housed in ISU's Institute for Transportation (InTrans), previously known as the Center for Transportation Research and Education. All MTC personnel at ISU are InTrans staff on partial appointment to the MTC.

The illness and death of long-time MTC director Dr. Tom Maze during Year 2 of the Tier 1 grant resulted in the appointment of a new director, Dr. Shauna Hallmark, and the realignment of some staff responsibilities. The MTC's organizational structure is illustrated in Figure A-1, followed by brief descriptions of key personnel and their roles.

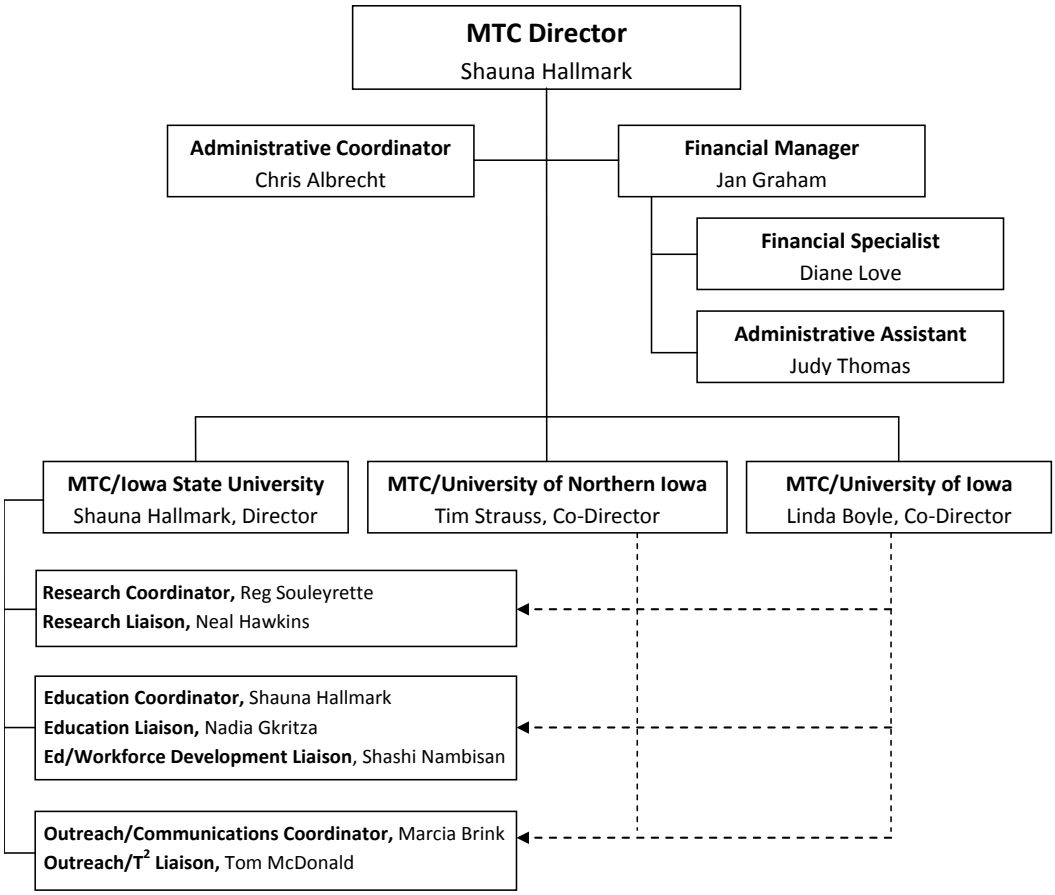


Figure A-1. MTC personnel organizational chart

Dr. Shauna Hallmark is the **MTC director** and principal investigator for the MTC's Tier 1 grant. She is also the MTC's **education coordinator**. In these roles, she is responsible for MTC's overall research, outreach, and educational activities and expenditures and directly leads its educational and student recruitment programming. She is also an associate professor of civil, construction, and environmental engineering at ISU, with a specialization in transportation engineering, and as transportation engineer at InTrans is principal investigator or co-principal investigator on a large portfolio of projects.

Dr. Linda Boyle and **Dr. Tim Strauss** are **co-directors** of MTC**,** responsible for administering MTC activities at UIowa and UNI, respectively. Dr. Boyle is associate professor of mechanical and industrial engineering at UIowa. Dr. Strauss is associate professor of geography at UNI.

Note: In September 2009, Dr. Boyle left The UIowa. Her previous cohort in the MTC program, ***Dr. Paul Hanley****, is now MTC's* ***co-director*** *for UIowa. Dr. Hanley is the director of transportation policy research at UIowa's Transportation Policy Center and associate professor of urban and regional planning.*

Mr. Chris Albrecht is the MTC's **administrative coordinator**. He administers MTC's annual research solicitation, tracks performance measures to meet UTC reporting requirements, helps recruit students and tracks their activities, oversees logistics of the MTC's spring seminar series, and handles several other administrative tasks. He is a transportation research specialist at InTrans.

Dr. Reginald Souleyrette is the MTC's **research coordinator**. As such, he oversees the MTC's annual solicitation for research proposals and subsequent project awards. He also leads ISU's efforts in usRAP, a major national and international outreach activity partially supported by MTC (see page 49). He is professor of civil, construction, and environmental engineering at ISU and associate director of InTrans, leading the institute's research and outreach initiatives in geospatial safety information systems.

Ms. Marcia Brink serves as MTC's **outreach coordinator**. She is responsible for disseminating MTC-related information via its website and other media and for editing, publishing, and distributing electronic and paper MTC-funded research reports and technical summaries. She also serves as managing editor of *Go!*, an online student recruitment tool (see page 43). She is the communications manager at InTrans.

Dr. Nadia Gkritza serves as **education liaison** for the MTC to ISU's Department of Civil, Construction, and Environmental Engineering. She is the director of ISU's interdisciplinary transportation degree program, an associate professor of civil engineering, and a transportation engineer serving as principal investigator on several InTrans projects.

Dr. Shashi Nambisan serves as MTC's **workforce development liaison**. In this role, he is planning a workshop for spring 2010 that combines elements of previous career fairs sponsored by MTC with lessons learned from other workforce development activities around the country. He also promotes federal and state partnerships with *Go!*, the online student recruitment tool. He is the director of InTrans and a professor of civil, construction, and environmental engineering at ISU.

Mr. Neal Hawkins serves as MTC's **research liaison** to the Iowa DOT's traffic safety engineer. As such, he organizes annual research focus groups to elicit and prioritize potential safety-related research projects for Iowa DOT funding. Mr. Hawkins is associate director for traffic operations at InTrans and an adjunct faculty member in ISU's Department of Civil, Construction, and Environmental Engineering.

Mr. Tom McDonald serves as MTC's **outreach liaison**. He seeks opportunities for MTC to partner with various InTrans programs and with other organizations in conducting mutually appropriate outreach/ technology transfer/training activities. At InTrans, he is Iowa's safety circuit rider, providing transportation safety-related training to local street and road agencies.

Ms. Jan Graham is the MTC's **financial manager**, overseeing budgets and expenditures for various MTC projects and activities. She has served in this capacity since 1992 when ISU was building its first UTC region 7 grant program. She is also the assistant to InTrans director Shashi Nambisan.

Ms. Diane Love is the MTC's **financial specialist**, processing bills and salaries for students, staff, and faculty. She is also account specialist for InTrans.

Ms. Judy Thomas is the MTC's **administrative assistant**, coordinating MTC-sponsored project accounts with Iowa State's Office of Contracts and Grants. At InTrans she is the director's program coordinator.

As detailed in this report, this new staffing structure is resulting in some ambitious initiatives to focus and strengthen its research program, significantly enhance academic programming and professional development activities for MTC students, and support unique outreach and technology transfer activities.

RESEARCH

To support the UTC's mission of advancing traffic safety–related technology and expertise through research, the MTC funds research projects in two ways, which are described below:

1) Projects selected through MTC's competitive proposal process (MTC sponsored projects)
2) Projects for which MTC provides some level of support, such as partial funding of a student, or has a partnering relationship (MTC match projects)

MTC Sponsored Projects

During Year 2 (2008–2009) of the Tier 1 grant, the MTC awarded three competitive projects:

- "Asset Management and Safety: Roadway Lighting, Signing, and Pavement Marking Tools"
- "Use of Crash Surrogate Measures to Assess the Impact of Systematic Improvements and Other Countermeasures on Rural Roadway Safety"
- "Behavior Study of Merge Practices of Drivers in Work Zone Closures"

Details about these three projects are provided in the "Research Project Status Report" (Section B) of this annual report. These projects were selected through a two-month competitive process:

Pre-proposals

In October 2008, a request for pre-proposals was sent to appropriate researchers at each of the consortium universities (ISU, UNI, UIowa) and appropriate faculty at other universities within region 7. Proposers/ principal investigators responded with one-page descriptions of potential research problems. Details about sources of match funds, staffing, etc., are not required at this initial stage in the process.

Three pre-proposals were peer-reviewed by MTC personnel to determine if they met the following requirements:

- The topic was related to MTC's theme, "Transportation Safety through Improvements in Management Information Systems."
- The topic had sufficient merit.
- The proposed research could be accomplished.

Full proposals

All three pre-proposals met the above requirements. The proposers/ principal investigators were then asked to develop full proposals with a detailed problem statement, proposed methodology/tasks, staffing details, deliverable(s), schedule, level of MTC funding requested, and a written statement specifying the estimated amount and source of non-federal match funds. Although not required, proposals are expected to include graduate student assistants when appropriate.

Each proposal was evaluated by transportation practitioners with expertise related to the specific proposal topic. For example, proposed projects relating safety to the geometric design of highways may be reviewed by geometric designers and safety engineers at state departments of transportation (DOTs) surrounding Iowa. The proposals were evaluated according to the following criteria:

- Clarity and completeness
- Relevance of research objectives and potential level of the project's impact
- Tasks and methods that will be used to achieve the research objectives
- Qualifications of the project team
- Interdisciplinary and collaborative nature of the project
- Cost to the MTC and sources and extent of matching funds

Award requirements

Finally, proposers of the three selected projects were asked to provide itemized budgets. Budgets must detail expenses by category, including but not limited to salaries and wages, fringe benefits, travel, supplies, equipment, telecommunication charges, and university indirect charges, and must clearly outline funding sources. At least half of total project costs must be provided by non-federal matching funds, with the exception of the following federal programs that are eligible to provide matching funds:

- Technology Deployment Program (section 503 of U.S. Code)
- Local Technical Assistance Program (Section 504b)
- State Planning and Research Program (Section 505)

Successful proposers were also required to set up an active technical advisory committee. If necessary, the MTC appoints members to a project's advisory committee. The goals of the advisory committees are to meet at least once during the course of the project (teleconferences are acceptable), preferably at the beginning to provide suggestions about methodology, etc., and to review and provide input to deliverables like research reports before they will be accepted by MTC.

All MTC sponsored project activities and budgets are monitored by the director, administrative coordinator, and financial manager. Researchers are expected to provide quarterly progress reports.

MTC Match Projects

During Year 2 of the Tier 1 grant, the MTC also provided financial support to several other sponsored projects related to the MTC's safety theme. Decisions to provide such match funds are made on a case-by-case basis by the MTC director in consultation with the MTC's research coordinator and administrative coordinator. The most common type of match funding is partial support of a graduate student assistant.

Summary of all MTC-Funded Research

Following are brief summaries of all research projects that received MTC funding during the past several years. Many received funding during Year 2 (2008–2009) of the Tier 1 UTC grant.

MTC Sponsored Projects — Ongoing

Asset Management and Safety: A Performance Perspective

Match Funds

Iowa DOT,
Iowa Highway Research Board

MTC PI

Omar Smadi, ISU

Need & Objectives

The primary research objective is to develop a relationship between operational asset performance (roadway lighting, signage, pavement marking, and pavement condition expressed in roughness and rutting) on safety performance. As a secondary objective, the research team will investigate the feasibility of developing a methodology to prioritize safety improvements based on a benefit cost analysis in relationship to individual assets condition (investing in signs vs. marking or lighting).

Behavior Study of Merge Practices of Drivers in Work Zone Closures

Match Funds

Smart Work Zone Deployment Initiative

MTC PI

Shauna Hallmark, ISU

Need & Objectives

The purpose of this project is to determine which driver behaviors result in the greatest reduction of capacity with an impact on safety. The objectives of this project are to identify the driver behaviors that are the most detrimental to work zone traffic flow/safety, document the frequency of such behaviors, determine the impact on capacity reduction, develop strategies to modify to aberrant driver behavior, and identify behaviors that have a direct negative impact on safety.

Match Funds

Iowa DOT,
Iowa Highway
Research Board

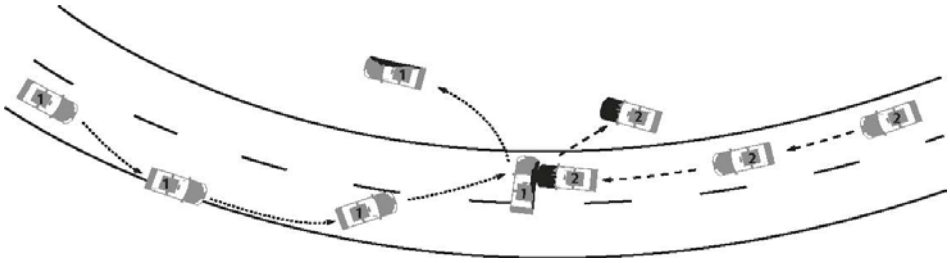
MTC PI

Shauna Hallmark, ISU

Use of Crash Surrogate Measures to Assess the Impact of Systematic Improvements and Other Countermeasures on Rural Roadway Safety

Need & Objectives

The goal of this research is to provide better information about the effectiveness of rural roadway safety countermeasures with a focus on lane departures. The project has three major emphasis areas: summarize known information about rural lane departure safety countermeasures, evaluate effectiveness of edge line rumble stripes in reducing lane deviations, and evaluate the effectiveness of horizontal curve treatments in reducing lane deviations.



Match Funds

Iowa DOT

MTC PI

Shauna Hallmark, ISU

MTC Student

Nicole Oneyear, ISU

Low Cost Strategies to Reduce Speed and Crashes on Curves

Need & Objectives

The main goal of this research is to evaluate the effectiveness of dynamic speed feedback signs and other low-cost strategies to reduce speeds and crashes on curves.

Anticipated Benefits

Research results will provide traffic safety and county engineers and other professionals with additional tools to more effectively manage speeds and decrease crashes on horizontal curves on rural roadways

Match Funds

Iowa Highway
Research Board

MTC PI

Omar Smadi, ISU

Pavement Markings and Safety

Need & Objectives

Using Iowa DOT data under nighttime conditions, this research effort is focused on achieving the following objectives:

1. Capitalize on current research efforts and develop a systematic method to compare pavement marking and crash data for a given roadway segment.
2. Investigate the impact that varying levels of pavement marking retroreflectivity have on crash performance.

Anticipated Benefits

Agencies can use these findings to develop strategies for determining the level of investment needed in pavement markings.

Match Funds

Iowa DOT

MTC PI

Reg Souleyrette, ISU

Management of Rural Expressways for Improved Safety and Operational Performance

Need & Objectives

Rural expressways are intended to provide many of the mobility and safety benefits of a freeway at far lower cost. The objectives of this research include developing a database and process for identifying problem locations on expressways, developing a "toolbox" to account for safety when designing expressway corridors, helping develop guidelines for varying access controls on rural expressway corridors, and developing guidelines for Intergovernmental Corridor Management Agreements.

Anticipated Benefits

This project will provide input to the task force and will result in changes in the design and operation of Iowa's expressway system.

Match Funds

California Department of Transportation, University of Missouri–Columbia

MTC PI

Sam Kiger, University of Missouri–Columbia

Bridge Vulnerability Assessment and Mitigation Against Explosions

Need & Objectives

Following September 11, 2001, the FHWA and the American Association of State Highway and Transportation Officials (AASHTO) assembled a Blue-Ribbon Panel of experts to develop strategies and provide guidance to improve the safety and security of bridge and tunnel infrastructure.

Anticipated Benefits

The goals of this project are to develop procedures to assist professionals and bridge owners identify critical bridges and to develop procedures to assess their vulnerability to explosions.

Match Funds

University of Iowa

MTC PI

Linda Boyle, University of Iowa

Assessing the Spatial and Temporal Differences in Midwestern Crashes Relative to National Data: Implications for Public Policy Decisions

Need & Objectives

Crash data at the national level use the General Estimate System, whereas the state-level crash data are generally comprehensive. The goal of this research is to determine if temporal and spatial effects observed in the national data can be generalized to differences unique to Iowa and regions encompassed by the MTC.

Anticipated Benefits

The findings of this study will help identify where gaps in the crash data exists and how better policies can be tailored to the geographical differences unique to the Midwest. By isolating each of these effects, future policy decisions can be better aligned with the root cause of severe motor vehicle injuries.

Match Funds

University of Missouri–Columbia

MTC PI

Charles Nemmers, University of Missouri–Columbia

Phase I completed July 2008, Phase II in progress

Effectiveness of Safety Corridor Programs in Region 7 States

Need & Objectives

Safety corridor programs aim to improve particularly unsafe roadway segments within a state. The objectives of this research are to synthesize 13 safety corridor programs across the United States and identify the characteristics common to successful programs and recommend ways for FHWA Region 7 states (Missouri, Nebraska, Kansas, and Iowa) to establish successful safety corridor programs and select pilot corridors.

Findings to Date

- Corridors are relatively homogenous throughout.
- Multidisciplinary safety improvement efforts combine engineering, education, and enforcement (3E) measures. Some states also consult emergency medical services (4E approach).
- Only 3 to 12 safety corridors per state are active at one time.

Match Funds

Iowa DOT

MTC PI

Neal Hawkins, ISU

Iowa Pavement Marking and Sign Management System

Need & Objectives

The MTC portion of this project (described below) will focus on tool development, data integration (GIS/GPS) and an implementation plan that allows the DOT to integrate these tools into daily operations. The objective of this research is to develop a sign and pavement marking management system that improves the quality of signs and pavement markings on the roadway network and improves the ability to budget for these key assets.

Anticipated Benefits

This work will help the DOT with the development of their pavement marking and sign management systems and provide a tool to do asset-related scenario planning regarding funding needs, life cycle, quality, and material selection.

Match Funds

Iowa DOT

MTC PI

Reg Souleyrette, ISU

Development of a Comprehensive Framework for Managing Decisions Regarding Highway Bypasses

Need & Objectives

Highway bypasses allow through traffic to travel around communities with minimal time delays; however, there is little research on the safety impacts. The objectives of this research include identifying the circumstances in which highway bypasses are likely and unlikely to have significant impacts on communities and local economies, identifying how communities can address these impacts, and identifying the net safety impacts of completed bypass projects.

Match Funds

Iowa DOT

MTC PI

Reg Souleyrette, ISU

Roadway Alignments as Assets: Evaluating Alternatives for Valuing Major Highway Corridor Rights of Way

Need & Objectives

There are approximately 625 billion square feet of public road rights-of-way with a potential valuation of about $3.5 trillion, or $70 billion in an average-sized state. The objective of this project is to explore alternative means of valuing right-of-way, including book/original value, current market value, replacement value, and valuation based upon the benefits that the right-of-way provides to motorists.

Anticipated Benefits

This research could help access management coordinators explain the problem with adding more direct access commercial driveways to a highway corridor to local officials, businesspersons, and developers.

MTC Sponsored Projects — Recently Completed

Match Funds

Iowa State University

MTC PI

Jennifer Shane, ISU

MTC Student

Daniel Enz, ISU

Completed

October 2009

Construction Project Administration and Management for Mitigating Work Zone Crashes and Fatalities: An Integrated Risk Management Model

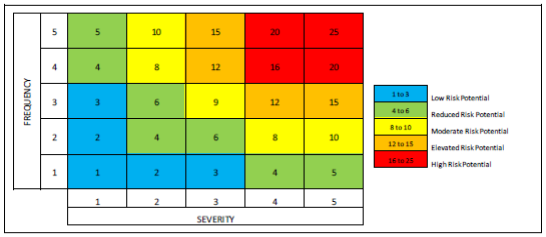
Need & Objectives

Two groups are generally impacted by work zone accidents: the project workers on site and the traveling public. The objective of this research was to explore strategies for mitigating work zone fatalities and accidents before construction starts through project administration and management.

Findings & Conclusions

Hazards were scored based on their risk potential. High-risk potential hazards included driver/operator unfamiliarity and seasonal road use in June and September. However, not all hazards are easily quantifiable by the use of database analysis. More research needs to be conducted qualitatively to assess hazards that possess a degree of uncertainty.

Products & Benefits



The end result of this research is the creation of an integrated risk management model, which will provide a formal step-by-step process used to identify, assess, and respond to risks during all stages of the project life-cycle. Some benefits of an integrated risk management program are to save lives, decrease injuries, reduce property damage, moderate risk of liability, lower insurance premiums for contractors, reduce costs associated with claims/litigation, and decrease project delays.

Match Funds

Iowa DOT, Minnesota Department of Transportation

MTC PI

Shauna Hallmark, ISU

MTC Students

This project funded two students for data collection

Completed

November 2008

Toolbox to Assess Tradeoffs between Safety, Operations, and Air Quality for Intersection and Access Management Strategies

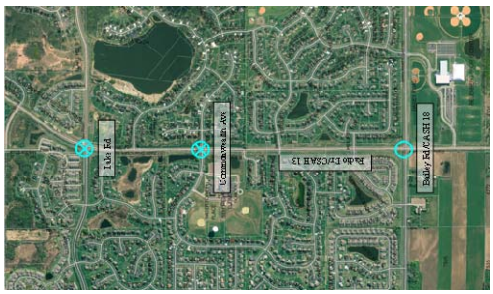
Need & Objectives

Significant transportation agency resources are allocated to meet maintenance, operations, safety, and air quality goals. The objective of this research was to develop analytical tools to evaluate common capital projects that meet agency goals in one area (operations, safety, air quality, and maintenance) but that also have a significant impact on the others.

Findings & Conclusions

Seven improvements were examined in the categories of traffic flow, safety, and fuel consumption. The following briefly summarizes a couple of the improvements.

- Roundabouts allow for higher capacity and fewer delays, typically reduce overall crash rates, and reduce emissions during peak periods.
- Left-turn lane removal increases capacity, reduces crashes, and decreases fuel consumption through less delays.



Products & Benefits

A decision support tool could help agencies maximize the benefits of each improvement project and allocate resources effectively.

Match Funds

Iowa DOT

MTC PI

Tim Strauss, UNI

MTC Students

Jeffrey Lentz, UNI and Anna Pestereva, UNI

Completed

April 2009

Spatial Scale of Clustering of Motor Vehicle Crash Types and Appropriate Countermeasures

Need & Objectives

Crashes occur for a variety of reasons and can be attributed to human, environmental, and vehicular factors. The objectives of this research were to analyze the characteristics and spatial distributions of several types of motor vehicle crashes to evaluate the degree and scale of their spatial clustering and to explore the implications of clustering for developing and selecting appropriate countermeasures.

Findings & Conclusions

- Crashes related to signal running were found to cluster the most, while fatal crashes tended to be the most dispersed.
- For many individual crash types, different patterns and processes and potentially different countermeasures seem to appear at different scales of analysis. This fact highlights the importance of scale considerations in problem identification and countermeasure formulation.

Products & Benefits

Crash clustering information could help improve transportation safety by helping safety engineers select countermeasures that are closely linked to crash causes and the spatial extent of identified problem locations.

Integration of Asset Management Systems with Load and Resistance Factor Design

Match Funds

University of Missouri–Columbia

MTC PI

J. Erik Loehr, University of Missouri–Columbia

Completed

November 2008

Need & Objectives

General procedures for designing earth slopes using Load and Resistance Factor Design (LRFD) techniques were developed with the objective of incorporating soil parameter bias and correlation to recalibrate the resistance factors curves of the LRFD design charts in order to produce more consistent levels of safety.

Findings & Conclusions

The following conclusions were drawn from this project:

1. Resistance factor curves were able to be recalibrated by including correlation magnitudes between strength parameters cohesion and friction angle.
2. Resistance factor curves showed that low resistance factor values are not sensitive to soil parameter uncertainty or variability.
3. The inclusion of parameter bias allowed recalibration of the resistance factor curves that produce less conservative slope designs.

Evaluation Framework for the Creation and Analysis of Integrated Spatially-Referenced Driver-Crash Databases

MTC PI

Tim Strauss, UNI

MTC Students

Mathew Noble, UNI
And Lucas Geadelmann, UNI

Completed

April 2009

Need & Objectives

This project was designed to evaluate the potential benefits and limitations of integrating transportation safety-related databases in a spatially-referenced geographic information systems (GIS) environment. The focus was on the analysis of crash records and driver records.

Findings & Conclusions

Various integrated transportation safety databases, using both spatial and non-spatial data, are possible. For non-spatial data, driver characteristics in relation to driver tendency to be involved in crashes and crash injury/crash-citation linkages were analyzed. Spatially referenced data could be used to link crash location and driver address to analyze crashing involving residents of a specific county.

Products & Benefits

The integration of spatially referenced data can help improve transportation safety analysis by displaying spatial patterns; improving information about crash types, frequencies, and locations; and exploring causal relationships in crash patterns.

Match Funds

Iowa DOT,
Iowa Highway
Research Board

MTC PI

Tom Maze, ISU

MTC Student

Christian Sax, ISU

Completed

November 2008

Clear Zone: A Synthesis of Practice and an Evaluation of the Benefits of Meeting the 10 ft. Clear Zone Goal on Urban Streets

Need & Objectives

Fixed objects can present hazards to drivers when the objects are located too close to the roadway, but they can also provide a protective barrier for pedestrians. The primary objective of this research was to increase the level of knowledge regarding the benefits and drawbacks associated with the urban roadway clear zone width goal of 10 ft.

Findings & Conclusions

- According to a cost savings analysis, the greatest benefits accrued when the setback distance was increased to 3 ft. and to 5 ft. from the curb.
- A consistent fixed object offset helps reduce the number of fixed object crashes.
- There is no significant relationship between the fixed object density (the amount of fixed objects along a roadway segment) and the number of fixed object crashes.

Products & Benefits

This research suggests that urban communities may find little benefit in rigidly adhering to the Iowa DOT's 10 ft. setback recommendation. There is very little benefit to increasing the fixed object setback to more than 5 ft. from the curb.

Match Funds

Iowa DOT

PI

Omar Smadi, ISU

MTC Student

Basak Aldemir-Bektas, ISU

Completed

September 2008

Iowa DOT Asset Management Using Pontis: Data Integration, Performance, and Decision Support Tools

Need & Objectives

The Iowa DOT currently owns and maintains over 4,000 bridges and culverts on the state highway system. The objectives of this research were to develop, implement, and operate an integrated bridge asset management system (Pontis) for the state of Iowa.

Products & Benefits

This system will enable the Iowa DOT to make objective, cost-effective, and timely decisions regarding bridge maintenance, rehabilitation, and replacement.

MTC Match Projects

Match Funds

Iowa DOT, City of Ames

PI

Konstantina Gkritza, ISU

MTC Student

Teng Wang

A Transportation Safety Planning Tool for the City of Ames

Need & Objectives

Transportation planning software helps evaluate safety investment alternatives for specific corridor segments, but it cannot be applied for screening a network to identify and rank sites for safety improvements or be used by metropolitan planning authorities to assess safety impacts of future changes in population and school density. Therefore, there is need for a systematic process and framework to explicitly consider road safety issues and establish future safety performance targets at the city level. The objectives of this research include developing safety performance functions and making recommendations to the City of Ames regarding the use of the developed screening and safety planning tools.

Anticipated Benefits

A transportation safety planning tool can provide decision support for planners in Ames to establish future safety goals and performance targets for the city and could provide guidance to other communities in Iowa.

Match Funds

Iowa DOT

PI

Konstantina Gkritza, ISU

MTC Student

Wei Zhang

Evaluation of Iowa's Drivers Improvement Program

Need & Objectives

Iowa's Driver Improvement Program targets drivers who have been convicted of three or more countable moving violations within a 12-month period or who have been convicted of a speeding violation of 25 to 29 miles over the posted speed limit. Under this program, such drivers may be required to attend driver improvement school and successfully complete, at the person's expense, a program approved by the Iowa DOT in lieu of driver's license suspension. The objectives of this research are to determine the effectiveness of the program versus the resource/cost allocation and the infrastructure it requires and to make recommendations to the Motor Vehicle Division regarding the effectiveness and potential changes for the program.

Findings & Conclusions

Iowa offers certain driving improvement programs, such as driver improvement school and suspending driving privilege for habitual violators, serious violations, and countable moving violations. However, there is still room for improvement. Iowa could implement online and home-study courses, which are low-cost but effective.

Products & Benefits

Having an effective Driver Improvement Program can help promote safety for all road users, especially for those who abuse the road and who are hazards to themselves and others.

Development of Analytical Tools to Evaluate Road Departure Crashes / SHRP2 SO1

Match Funds

National Academy of Sciences

PI

Shauna Hallmark, ISU

MTC Students

Abhisek Mugdal and Yu-Yi Hsu

Need & Objectives

The goal of this research is to map the sequence of events leading to road departure incidents and crashes and to quantify how roadway, environmental, vehicle, and human factors influence whether an incident occurs in the first place and how those factors affect subsequent events and final outcomes. To accomplish this, analytical tools will be created to develop exposure-based risk measures using surrogate crash measures with driver, vehicle, roadway, and environmental as characteristics for the response variables.

Evaluation of Rumble Stripes on Low-Volume Rural Roads in Iowa

Match Funds

Iowa DOT

PI

Shauna Hallmark, ISU

MTC Student

Bradley Grefe, ISU

Phase I completed July 2009
Phase II in progress (completion estimated 2011)

Need & Objectives

Edge "rumble stripes," which are a combination of conventional rumble strips with a painted edge line placed on the surface of the milled area, may be an effective, relatively low-cost method that to reduce the number of ROR crashes on lower-volume paved rural roads without paved shoulders. The objectives of this research are to install and evaluate the performance of edgeline rumble stripes at several test locations in Iowa.

Findings to Date

In Phase I, the following were found:

- In general, the wear of paint markings in the rumble stripes' grooves was similar to the wear on regular surfaces. The rumble stripes did not appear to improve the longevity of the painted edge line.
- Design of the milling machine should be modified to allow for use on horizontal curves and to ensure predictable alignment and mill depth.

Anticipated Benefits

The true benefits of edge line rumble strips (reduction in ROR crashes) cannot be determined until a crash analysis is completed. Preliminary results indicate that local agencies could install narrow-width rumble stripes as feasible and relatively low-cost mitigation for lower-volume paved rural road sections with a history of or potential for lane departure crashes. This project includes a long-term assessment of pavement marking performance, preliminary crash assessments, and an evaluation of lane keeping.

Effectiveness of Special Deer Management Hunts on Deer-Vehicle Crashes

Match Funds

Iowa DOT

PI

Nadia Gkrtiza, ISU

MTC Student

Michael Baird

Need & Objectives

In Iowa, one measure to control the deer population is annual deer hunts. However, the effectiveness in reducing deer-vehicle crash rates where these hunts have been implemented is not known. The main objective of this study is to investigate the effectiveness of localized deer herd management plans in reducing the frequency of deer-vehicle crashes.

Findings to Date

Deer density is a more significant predictor of the frequency of deer-vehicle crashes in urban deer management zones compared to deer herd size. Further, the frequency of deer-vehicle crashes was higher in zones with a higher percentage of residential and commercial acreage, which confirms the adverse safety impacts of human migration into deer habitat. Overall, the frequency of deer-vehicle injuries increased over the study period in the three urban deer management areas, which may be attributed to an increase in the vehicle miles traveled and a higher deer population.

Anticipated Benefits

- Based on this research, widening the left shoulder in the absence of a median barrier may lead to less deer-vehicle injuries.
- Understanding the relationship between the deer management hunts and the frequency of deer-vehicle crashes can help keep the deer population at a sustainable level, while maximizing safety.

Match Funds

Iowa DOT, IGTSB

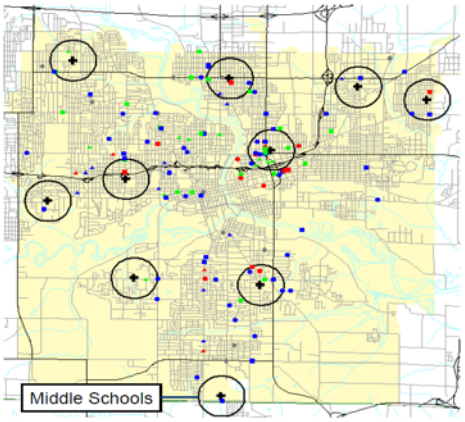
PI

Reg Souleyrette, ISU

MTC Students

Mehmet Caputcu and Dan Cook

Iowa Traffic Safety Data Service (ITSDS)



Need & Objectives

ITSDS provides agencies with the most readily available crash data analysis resources in Iowa. It was created to fill the gap between what safety data users can gather for themselves and what they can obtain from experts. ITSDS uses the latest in geographic information systems technology developed by the Iowa DOT.

Products & Benefits

The service provides free crash data analyses and mapping services for anyone who needs to examine crash data to make decisions about funding, improving roads, implementing enforcement, writing reports, designing presentations, or increasing traffic safety awareness.

Match Funds

National Academy of Sciences, University of Iowa

PI

Shauna Hallmark, ISU

Integration of Analysis Methods and Development of Analysis Plan / SHRP2 SO2

Need & Objectives

ISU is a subcontractor to the University of Iowa. ISU researchers will review products of the current SHRP 2 safety projects and assist with identifying analytic approaches to address intersection research questions.

Match Funds

National Cooperative Highway Research Program

PI

Shauna Hallmark, ISU

Update of "Roundabouts: An Informational Guide"

Need & Objectives

CTRE is a subcontractor on this project and is responsible for reviewing current roundabout design guides used in the United States and internationally and doing a literature review. CTRE will also conduct focus groups of U.S. planners, designers, and operators of roundabouts and other interested parties to identify concerns with the FHWA Guide.

Match Funds

Iowa DOT

PI

Shauna Hallmark, ISU

Evaluation of Electronic Speed Limit Signs for United Community Consolidated School

Need & Objectives

The objective of this project is to evaluate the effectiveness of an electronic speed sign at the United Community Consolidated School in reducing speeds near the school. The school is located on a 4 –lane expressway and the school and Iowa DOT had expressed concerns about the interaction of high speeds and high volume of turning movements at the school.

Anticipated Benefits

The evaluation will provide information about the effectiveness of different types of signing in the unique situation where schools are located along expressways.

Match Funds

Iowa DOT

PI

Neal Hawkins, ISU

Improving Transportation for Large Scale Events Within the State of Iowa

Need & Objectives

This project will focus on improving travel safety and efficiency to and from Iowa's largest traffic generating events including the Iowa State Fair, college football games in Iowa City and Ames, high school sports tournaments at the Wells Fargo Events Center in Des Moines, and racing at the Iowa Speedway in Newton.

Match Funds

Iowa Energy Center

PI

Shauna Hallmark, ISU

MTC Student

Abhisek Mugdal

Hybrid Electric School Bus Deployment and Evaluation

Need & Objectives

In recent years, several studies have been released detailing the negative public health impacts of vehicle emissions on young children and even demonstrating the amount of pollutants present in and around vehicles such as school buses. One such study indicated that the pollutant levels inside buses are actually higher than outside the buses. The objectives of this project are to evaluate technology deployed in Iowa, compare the actual emissions characteristics of the hybrid buses to standard diesel buses for Iowa buses, and evaluate the cost effectiveness of the hybrid electric school buses.

Anticipated Benefits

The deployment of hybrid electric school buses in Iowa has the potential to produce significant impacts on the air quality, petroleum usage, and economic strength of the state while providing substantial health benefits to Iowans.

Match Funds

Smart Work Zone Deployment Initiative

PI

Zachary Hans, ISU

Work Zone Forecasting Service

Need & Objectives

The objective of this project is to promote and facilitate analysis and evaluation of the impacts of road construction activities in Smart Work Zone Deployment Initiative (SWZDI) states.

Anticipated Benefits

The service may provide assistance in technical matters regarding application of software commonly used to investigate the impacts of construction activities as well as develop models to estimate queue length, delay, travel behavior, and cost associated with specific road construction activities and traffic control.

Match Funds

Iowa DOT

PI

Reg Souleyrette, ISU

MTC Student

Mehmet Caputcu

Safety Analysis of Low Volume Rural Roads in Iowa

Need & Objectives

Objectives of this project include identifying common site characteristics that may impact safety performance and creating a system-level generalized linear model for secondary, low-volume road crashes that will attempt to isolate crash, drive, and/or roadway variables that are the best predictors of low-volume road crashes.

Match Funds

Iowa DOT

PI

Omar Smadi, ISU

Pontis Implementation and Operation

Need & Objectives

The objective of this project is to provide support to the Iowa Department of Transportation to implement and operate AASHTO's PONTIS bridge management software.

Match Funds

Iowa DOT,
Smart Work Zone Deployment Initiative

PI

Shauna Hallmark, ISU

MTC Students

Eric Fitzsimmons and Nicole Oneyear

Completed

January 2009

Synthesis of Traffic Calming Techniques in Work Zones

Need & Objectives

The speed of a vehicle traveling through a work zone is determined by the driver's judgment of the environment. A posted speed limit in a work zone is determined in much the same way as a posted regulatory speed limit on a road in that a traffic study, traffic control plan, and engineering judgment must be used to determine an appropriate speed at which the driver feels safe and is not tempted drive at an unsafe speed through the work zone. The objective of the research was to summarize the effectiveness of different traffic calming treatments for reducing speeds in work zones.

Findings & Conclusions

Several work zone treatments were determined to be effective for slowing down vehicles. Advance warning signs, variable speed limits, changeable/variable message signs, speed feedback, and drone radar were effective for slowing down speeding vehicles by a minimum of 3 mph. Automated flagging was another technique that was found to work as well as flaggers but without putting flagger lives at risk.

Products & Benefits
Understanding which techniques slow drivers in work zones will help agencies choose what methods to employ. Also, finding effective techniques can help prevent accident and fatalities in work zones.

Evaluation of 70 MPH Speed Limit

Match Funds
Iowa DOT

PI
Reg Souleyrette, ISU

MTC Student
Dan Cook

Completed
January 2009

Need & Objectives
On July 1, 2005, the State of Iowa implemented a 70 mph speed limit on most rural Interstates. The objective of the research project was to evaluate the effect the new speed limit has had on speeds, traffic volumes, and highway safety in the state.

Findings & Conclusions
For the six months immediately after Iowa raised the rural Interstate speed limit to 70 mph, an increase in serious crashes was observed, but longer term trends were not found to be statistically significant. Volume on the interstates increased by 5%, but the number of vehicles exceeding the speed limit by 10 mph decreased from 20% to 8%. Fatal crashes increased from the 2.5 years before the implementation, but comparing the data 14 years of before data, the number of serious crashes per year actually decreased.

Modern Roundabout Guidance for the Iowa DOT

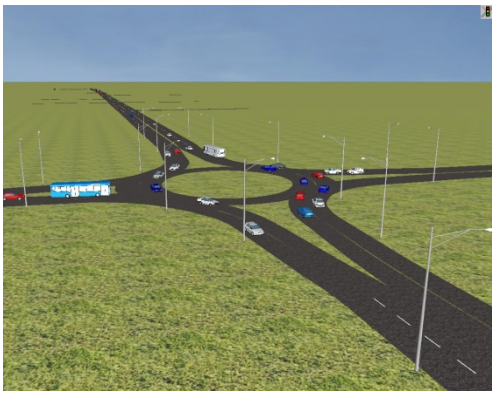
Match Funds
Iowa DOT

PI
Shauna Hallmark, ISU

Completed
November 2008

Need & Objectives
This technical memorandum provides preliminary planning-level guidance to engineers, technicians, planners, and policymakers considering a modern roundabout at an existing or proposed intersection in Iowa.

Findings & Conclusions
There are certain locations that would greatly benefit from roundabouts; however, there are many misconceptions about roundabouts. It is important to educate the public about how roundabouts can be beneficial and also educate them in how to properly navigate roundabouts.



Anticipated Benefits
This information provides basic guidance for agencies who are considering implementing a roundabout.

Match Funds

US DOT / Volpe National Transportation Systems Center

PI

Shauna Hallmark, ISU

MTC Student

Yu-Yi Hsu

Completed
January 2009

Investigating Factors Contributing to Large Truck Lane Departure Crashes Using LTCCS Database

Need & Objectives

Investigate the factors that contribute to large truck lane departure crashes using data from the Federal Motor Carrier Safety Association's Large Truck Crash Causation Study (LTCCS) Database.

Findings & Conclusions

Large truck drivers responsible in single-vehicle lane departure crashes were primarily driving too fast for the curve or turn. Driving too fast for conditions and inadequate surveillance were the two most common causes of large truck drivers responsible in multi-vehicle lane departure crashes.

Products & Benefits

By understanding the factors that contribute to large truck lane departures, transportation agencies can determine specific countermeasures to mitigate large truck lane departure events.

Match Funds

Iowa DOT

PI

Neal Hawkins, ISU

Completed
May 2009

Improving Safety for Slow Moving Vehicles on Iowa's High Speed Rural Roadways

Findings & Conclusions

SMV safety on Iowa's high speed roadways should be based on an understanding of crash performance and input from these special groups. A practical approach should include the following:

- A systematic approach to identifying specific safety problems
- Close coordination with the community
- Identification of solutions
- Local involvement in the process

EDUCATION

To support the UTC's mission of advancing traffic safety–related technology and expertise through education, the MTC focuses a significant share of its resources and energy on strategic educational activities. These activities can be categorized in either of two ways, developing human capital and workforce development.

The MTC especially emphasizes preparing professionals whose careers will support the MTC's theme, "Transportation Safety through Improvements in Management Information Systems."

Developing Human Capital

Developing human capital involves optimizing students' academic preparation for professional careers in transportation. Toward this end, the MTC funds graduate student research assistantships plus a variety of educational, research, and professional enrichment activities for undergraduate and graduate students. Participating MTC students are studying in a variety of transportation-related disciplines. Iowa State University students, for example, come from civil, construction, and environmental engineering; the interdisciplinary transportation degree program; community and regional planning; statistics; and English/technical communications.

During the 2008–2009 reporting period, six MTC-sponsored students completed their master's degrees at ISU, while one student finished a PhD. Three MTC-sponsored students completed master's degrees from UNI during the reporting period; seven MTC students graduated with master's degrees and one with a PhD from UIowa.

Student research assistantships

The majority of MTC funding is devoted to graduate student assistantships. It is worth noting that this funding advances both the MTC's educational mission and its research mission but is reported strictly as educational funding.

Qualifying students receive assistantships to work on safety-related projects (either MTC sponsored projects or MTC match projects). These students receive salary funding for up to one-half of a 20-hour/ week assistantship plus one-fourth tuition for MS students and one-half tuition for PhD students per semester. Master's degree candidates may receive funding for up to two years and doctoral candidates for four years. At least half of every MTC graduate student's support must be provided by internal or external match funds, generally non-federal.

In addition to successfully conducting their research, students receiving MTC assistantships are expected to participate in the following activities:

- Spring semester transportation seminar series
- Fall semester MTC Scholar Conference (at which they must present at least one paper for the research paper contest)
- Stewardship initiative
- Beginning summer 2009, a monthly mentoring program

These four required activities (***** below) and other, optional, student activities are described in the following paragraphs:

Educational and professional development activities

The MTC organizes educational and technology transfer events and provides student funding for conference attendance, student meetings, and other professional development activities. Any interested student may participate.

***Transportation 691: Seminar in Transportation.** Each spring semester, the MTC sponsors a weekly transportation seminar and hosts speakers from around the country. See Figure A-2. The seminar provides students with a broad picture of regional, national, and international transportation issues with a focus on transportation safety. Students and faculty at former region 7 UTC consortium member universities, the University of Missouri-Columbia and University of Missouri-St. Louis, also participated this year, even though they are no longer members of the consortium. In addition, researchers and professional staff from Iowa DOT and FHWA, Iowa Division, regularly attend the seminar series. In spring 2009, 14 presentations were made. See Table A-1.

Figure A-2. Tim Neuman of CH2MHill is greeted by Mary Stahlhut, Iowa DOT

Table A-1. Spring 2009 MTC Seminar Series Speakers

Date	Speaker	Topic
January 23	Jason Sims Kansas City Scout	Intelligent Transportation Systems and Safety
January 30	Elizabeth Westlake UIowa	Iowa's Teen Driving Project
February 6	Shauna Hallmark ISU	Naturalistic Driver Safety Evaluation
February 13	Nadia Gkritza ISU	Economic Development Effects of Highway Investment
February 20	Mara Campbell Missouri DOT	MoDOT's Tracker Performance Measurement Tool
February 27	James Noble University of Missouri	Amtrak's St. Louis to Kansas City Rail Capacity Solution
March 6	John Woodrooffe University of Michigan	Heavy Vehicle Safety
March 13	Stuart Anderson Iowa DOT	Economics and Transportation Funding
March 27	Tim Neuman CH2MHill	Origins and Uses of the NCHRP 500 Series
April 3	Brian Kinsey Lambert Intl. Airport	Branding of Lambert Intl. Airport as a Cargo Hub
April 10	Keith Knapp University of Minnesota	Rural Safety Projects
April 17	Fred Mannering Purdue University	Risk Compensation and Effectiveness of Vehicle Safety Features
April 24	Mick Noce Unyson Logistics	Software Solutions for Managing Multiple Modes
May 1	Howard Preston CH2MHill	Investment in Safety Improvements

*__Transportation Scholars Conference.__ During the fall semester, the MTC conducts a conference during which students present original papers. Student papers and presentations are evaluated by a panel of judges. In fall 2008 Bobbie Seppelt of UIowa was the winner, and Josh Hochstein of ISU was runner-up.

The five presenters/presentations were as follow:

- Modeling Human-Automation Interaction: Evaluating Driver Response to Adaptive Cruise Control Failures - Bobbie Seppelt, UIowa
- The J-Turn Intersection: Design Guidance and Safety Experience - Josh Hochstein, ISU
- Clear Zone: A Synthesis of Practice and an Evaluation of the Benefits of Meeting the Ten-Foot Clear Zone Goal on Urban Streets - Christian Sax, ISU
- Correlation Between History of Traffic Violations and Trauma Recidivism in a Level 1 Trauma Center - Vivien Yin, UIowa
- The Perception of Driver Distraction among Teenage Drivers - Elizabeth Westlake, UIowa

Student of the Year. Each year one student is selected as MTC Student of the Year based on his or her overall record in terms of research, presentations, publications, student activities, and course grades. In fall 2008, Christian Sax was selected because, as Dr. Tom Maze noted, his performance had been consistently impressive across the board. The prize was a fully paid trip to the Transportation Research Board (TRB) annual meeting in Washington, D.C., in January 2009, where Christian was presented a plaque. Christian graduated in December 2008 with a master's degree in civil engineering and is currently working as a consultant in the Dallas metropolitan area.

***Stewardship initiative.** At the beginning of the fall 2009 semester, a set of stewardship guidelines was developed for students receiving financial support through the MTC, and reporting requirements were implemented.

***Student mentoring program.** In the summer of 2009, in response to student suggestions, the MTC began a student mentoring program. The program consists of monthly meetings to discuss topics of relevance to graduate students. The first meeting was held in September 2009. Twelve students attended the session, during which general information was provided for student research assistants.

Attendance at TRB. A total of 12 students received partial funding from MTC to attend the 2009 annual meeting of the Transportation Research Board in Washington, D.C. Students attended sessions, poster events, and committee meetings. Each student prepares a one page report when they return from TRB documenting the activities that they participated in.

Mid-Continent Transportation Research Symposium. In August 2009, approximately 15 MTC students attended the biennial ISU/Iowa DOT/MTC–sponsored symposium. Most of the students acted as room monitors, and nine students made presentations about their research projects.

Summary of MTC student activities

During Year 2 of the Tier 1 grant, six ISU students completed master's degrees and one student finished a doctoral degree. Three UNI students completed master's degrees. At UIowa, seven students completed master's degrees and one finished her PhD. All graduates are now working as transportation professionals. Details about specific student activities are listed below:

"MTC's annual Transportation Scholars Seminar is an important learning experience for future transportation engineers and helps us develop a professional consciousness."

Basak Aldemir-Bektas

BS, 2002, Civil Engineering, Middle East Technical University (METU), Ankara, Turkey
MS, 2006, Industrial Engineering, METU, Ankara, Turkey
PhD, expected May 2010, Transportation Engineering, ISU, Ames, IA

MTC-supported projects

PONTIS Implementation and Operation

Awards (Year 2)

International Road Federation Executive Leadership Fellowship, January 2009

Memberships

ISU Transportation Student Association (vice president, Engineering Council representative)
TRB AHD35 Bridge Management Committee (communications coordinator)

"The MTC has offered me the opportunity to attend conferences such as the TRB Annual Meeting to meet other researchers and see the results of various research ideas. This has exposed me to ideas that cannot be learned in the classroom."

Michael Baird

BS, 2009, Civil Engineering, ISU, Ames, IA
MS, expected 2010, Civil Engineering (Transportation), ISU, Ames, IA

MTC-supported projects

Effectiveness of Special Deer Management Hunts on Deer-Vehicle Crashes

Awards (Year 2)

Dwight D. Eisenhower Transportation Fellowship, 2009–2010
Csyani Memorial Fellowship, Spring 2009

Memberships

ISU Transportation Student Association (recruitment chair, president, treasurer)

Presentations (Year 2)

"Effectiveness of Localized Deer Management in Reducing Deer-Vehicle Crash Rates in Iowa—Some New Evidence," Mid-Continent Transportation Symposium 2009, August 20–21, 2009, Ames, IA

Shan Bao

PhD, 2009, Industrial Engineering, UIowa, Iowa City, IA

MTC-supported projects

Older Drivers at Rural Intersections
Currently a post-doc at the University of Michigan Transportation Research Institute

Curtis Brooks

MS, Civil and Environmental Engineering, UIowa, Iowa City, IA
Currently working for the US Army Corps of Engineers

"I attended two TRB annual meetings … it was a learning experience for me that probably would not have been possible without the MTC support."

Mehmet Caputcu

BS, 2005, Civil Engineering with Transportation concentration, Yildiz Technical University, Istanbul, Turkey
MPA, 2007, Drake University, Des Moines, IA (2007)
MS, August 2009, Civil Engineering (Transportation), ISU, Ames, IA

MTC-supported projects

Iowa Traffic Safety Data Service
Safety Analysis of Low Volume Rural Roads in Iowa

Memberships

ISU Transportation Student Association (2007–2008)

"I thoroughly enjoyed my experience at TRB annual meeting in January 2009, which was funded partly through MTC."

Dan Cook

BS, 2009, Civil Engineering, ISU, Ames, IA
MS, expected 2010, Civil Engineering (Transportation), ISU, Ames, IA

MTC-supported projects

Iowa Traffic Safety Data Service
Evaluation of 70 MPH Speed Limit

Memberships

ISU Transportation Student Association (recruitment chair, co-social chair, vice president)

David Dickie

MS, Industrial Engineering, UIowa, Iowa City, IA

MTC-supported projects

Adaptive Behavior of Drivers using Adaptive Cruise Control

Ben Dow

MS, CAD-Research Engineering, UIowa, Iowa City, IA

MTC-supported projects

Early Adopters of Adaptive Cruise Control

"MTC has been a valuable asset to me for completing research and having funding available to present my research at regional and national conferences."

Huishan Duan

BS, 2009, Civil Engineering, ISU, Ames, IA
MS, expected 2011, Transportation Engineering, ISU, Ames, IA

MTC-supported projects

Evaluation of Rumble Stripes on Low Volume Roads in Iowa Assessing Use of Crash Conflict Surrogate Measures to Address and Mitigate Lane Departure Crashes

Memberships

ISU Transportation Student Association

Daniel Enz

BS, 1995, Civil Engineering, University of Wisconsin–Platteville, Platteville, WI
MS, 1998, Civil Engineering, University of Minnesota–Twin Cities, Minneapolis, MN
PhD, 2009, Civil Engineering, ISU, Ames, IA
Currently teaching at the University of Wisconsin–Platteville

MTC-supported projects

Construction Project Administration and Management for Mitigating Work Zone Crashes and Fatalities: An Integrated Risk Management Model
Evaluation of the 24th Street Bridge, Interstate 80/29, Council Bluffs, Iowa

"The MTC program has been a valuable asset to me for completing research and having funding available to present my research at regional and national conferences."

Eric Fitzsimmons

BS, 2005, Civil Engineering, ISU, Ames, IA
MS, 2007, Civil Engineering, ISU, Ames, IA
PhD, expected 2011, Civil Engineering, ISU, Ames, IA

MTC-supported projects

Assessing Use of Crash Conflict Surrogate Measures to Address and Mitigate Lane Departure Crashes
Lane Departure Safety Countermeasures: Strategic Action Plan for the Iowa Department of Transportation
Warrants for Roundabouts
Synthesis of Traffic Calming Techniques in Work Zones

Awards (Year 2)

Dwight D. Eisenhower Fellow, 2008–present

Memberships

ISU Transportation Student Association (social chair)
TRB Student Affiliate

Presentations (Year 2)

"Update on Iowa's 2009 Roadway Departure Strategic Action Plan and Synthesis of Neighboring State Practices to Address Roadway Departure Crashes," Mid-Continent Transportation Symposium, August 20–21, 2009, Ames, IA

"Not only did the MTC help fund my education, but the transportation research skills I learned in graduate school helped me find a job in a very tough economy."

Lucas Geadelmann

BS, 2006, Food Industries and Marketing, University of Minnesota, Twin Cities, Twin Cities, MN
MA, 2009, Geography, UNI, Cedar Falls, IA

MTC-supported projects

Evaluation Framework for the Creation and Analysis of Integrated Spatially-referenced Driver-Crash Databases

Mahtab Ghazizadeh

MS, 2009, Industrial Engineering, UIowa, Iowa City, IA
PhD, Business, UIowa, Iowa City, IA

MTC-supported projects

Crash Data across Four Midwestern States

"As a scholar outside the transportation field, being an MTC scholar has opened up an exciting new area to me as I research and write about transportation related topics for the magazine."

Katie Greenwood

BA, 2008, English, Mount Mercy College, Cedar Rapids, IA
BA, 2008, Art, Mount Mercy College, Cedar Rapids, IA
MA, expected May 2010, English Literature, ISU, Ames, IA

MTC-supported projects

Go! Magazine

Bradley Grefe

BS, 2008, Community & Regional Planning, ISU, Ames, IA
MS, expected 2010, Transportation (Planning), ISU, Ames, IA

MTC-supported projects

Phase II Minnesota Truck Parking Study
Evaluation of Rumble Stripes on Low-Volume Rural Roads in Iowa

Memberships

ISU Transportation Student Association (secretary)
Graduate Community & Regional Planning Club

"The MTC seminar series is valuable for learning more about current and diverse research projects going on in the Midwest. MTC Scholar designation will certainly enhance my future employment opportunities!"

Joshua Hochstein

BS, 2001, Civil Engineering, University of Nebraska, Lincoln, Nebraska
MS, 2009, Civil Engineering (Transportation), ISU, Ames, IA
PhD, expected August 2010, Civil Engineering (Transportation), ISU, Ames, IA

MTC-supported projects

Synthesis of Procedures to Forecast and Monitor Work Zone Safety and Mobility Impacts
NCHRP 15-30: Median Intersection Design for Rural High-Speed Divided Highways
Management of Rural Expressways for Improved Safety and Operational Performance

Awards (Year 2)

Csanyi Fellowship, Spring 2009

Memberships

ISU Transportation Student Association (secretary) (Fall 2005–Spring 2008)

TRB Task Force on Highway Safety Workforce Development Member

Presentations (Year 2)

"The J-Turn Intersection: Design Guidance & Safety Experience", Session #484—Contemporary Geometric Design Issues: Intersections, Driveways, and Cable Barriers, 88th Annual Meeting of TRB, January 13, 2009, Washington, DC

Nicole Hollopeter

MS, Industrial Engineering, UIowa, Iowa City, IA

MTC-supported projects

Driver Behavior using Motion-Based Simulator

Yu-Yi Hsu*

BS, 1999, Statistics, National Central University, Jhongli City, Taoyuan County, Taiwan

PhD, expected 20xx, Statistics, ISU, Ames, IA

MTC-supported projects

Investigating Factors Contributing to Large Truck Lane Departure Crashes Using the Federal Motor Carrier Safety Administration's Large Truck Crash Causation Study (LTCCS) Database

Development of Analytical Tools to Evaluate Road Departure Crashes Using Naturalistic Driving Study Data

*Student statistics consultant

Justin Jorgensen

MS, Urban and Regional Planning, UIowa, Iowa City, IA

Currently working as a transportation planner for the County of Person, NC

Benjamin Kober

MS, Urban and Regional Planning, UIowa, Iowa City, IA

"MTC funding allowed me to attend conferences in Boston and Iowa City and work on the project 'Spatial Scale of Clustering of Motor Vehicle Crash Types and Appropriate Counter-measures,' which helped broaden my education."

Jeffrey Lentz

BS, 2007, Geography: Geographic Information Systems, University of Wisconsin, LaCrosse, LaCrosse, WI
MA, 2009, Geography, UNI, Cedar Falls, IA

MTC-supported projects

The Spatial Scale of Clustering of Motor Vehicle Crash Types and Appropriate Countermeasures

Suyun Ma

MS, Urban and Regional Planning, UIowa, Iowa City, IA

"MTC has provided us a personal medium to support our education, build our career, and connect us to similar researchers."

Abhisek Mugdal

B. Tech., 2007, Civil Engineering, Indian Institute of Technology, Delhi, India
MS, 2009, Civil Engineering (Transportation), ISU, Ames, IA
PhD, expected 2011, Civil Engineering (Transportation), ISU, Ames, IA

MTC-supported projects

Development of Analytical Tools to Evaluate Road Departure Crashes Using Naturalistic Driving Study Data

Memberships

ISU Transportation Student Association

Presentations (Year 2)

"Comparative Study of Costs Incurred by Transportation Users and Charges Compensated," Mid-Continent Transportation Symposium, August 20–21, 2009, Ames, IA
"Comparison of On□Road Biodiesel Emissions in Transit Buses," Mid-Continent Transportation Symposium, August 20–21, 2009, Ames, IA
"Developing Low-Power Systems for Automated Traffic Monitoring," Mid-Continent Transportation Symposium, August 20–21, 2009, Ames, IA
"Identifying Thresholds for Run-Off-Road Events," Mid-Continent Transportation Symposium, August 20–21, 2009, Ames, IA
"Neural Networks Modeling of Biodiesel Emissions from Transit Buses," Mid-Continent Transportation Symposium, August 20–21, 2009, Ames, IA

David Neyens

MS, 2006, Industrial Engineering, UIowa, Iowa City, IA
PhD, Industrial Engineering, UIowa, Iowa City, IA

MTC-supported projects

Drivers with Traumatic Brain Injury—Simulation Study

Mathew Noble

BA, 2004, Public Administration, UNI, Cedar Falls, IA
BA, 2004, Political Science, UNI, Cedar Falls, IA
Master's in Public Policy [MPP], 2009, UNI, Cedar Falls, IA

MTC-supported projects

Evaluation Framework for the Creation and Analysis of Integrated Spatially-referenced Driver-Crash Databases
Historical Legislative Analysis: National Maximum Speed Law (Master's Paper)

Nicole Oneyear

BS, 2009, Civil Engineering, ISU, Ames, IA
MS, expected 2011, Civil Engineering, ISU, Ames, IA

MTC-supported projects

Synthesis of Traffic Calming Techniques in Work Zones
Evaluation of Electronic Speed Limit Signs for United Community Consolidated School
Low-Cost Strategies to Reduce Speed and Crashes on Curves

Memberships

ISU Transportation Student Association

John Parker

MS, Urban and Regional Planning, UIowa, Iowa City, IA

Anna Pestereva

BA, 2007, Geography, St. Petersburg State University, St. Petersburg, Russia
MA, expected 2009, Geography, UNI, Cedar Falls, IA

MTC-supported projects
The Spatial Scale of Clustering of Motor Vehicle Crash Types and Appropriate Countermeasures

Ryan Pettit

MS, 2008, Transportation, ISU, Ames, IA
Currently working in the Chicago area

"Last year, I attended the MTC seminar at InTrans, which I found really helpful in order to become familiar with various transportation topics from different areas."

Catherine Rentziou

BS, 2008, Civil Engineering, National Technical University of Athens, Athens, Greece
MS, expected May 2010, Civil Engineering, ISU, Ames, IA

Christian Sax

MS, 2008, Civil Engineering, ISU, Ames, IA
Currently working for a private consulting firm in Dallas, Texas

Bobbie Seppelt

PhD, expected 2009, Industrial Engineering, UIowa, Iowa City, IA

Jielin Sun

MS, Urban and Regional Planning, UIowa, Iowa City, IA
Currently in the PhD program for Civil Engineering at the University of California at Irvine

Evan Vencil

BS, 2009, Civil Engineering, ISU, Ames, IA
MS, expected 2010, Transportation Engineering, ISU, Ames, IA

MTC-supported projects
Evaluation of Safety Edge Benefits in Iowa

Memberships
ISU Transportation Student Association

"I'm really enjoying working on the MTC-supported project."

Teng Wang

BS, 2009, Civil Engineering, ISU, Ames, Iowa
MS, expected 2010, Transportation Engineering, ISU, Ames, IA

MTC-supported projects
A Transportation Safety Planning Tool for the City of Ames

Memberships
ISU Transportation Student Association (recruitment chair)

Presentations
The 8th National Conference on Transportation Asset Management, October 19-21, 2009, Portland, Oregon

"MTC is a great opportunity for students studying transportation within the state of Iowa."

Elizabeth Westlake

BSE, 2007, Industrial Engineering, UIowa, Iowa City, IA
MS, 2009, Industrial Engineering, UIowa, Iowa City, IA
MS, expected 2010, Urban and Regional Planning, UIowa, Iowa City, IA
PhD, expected 20xx, Civil Engineering, UIowa, Iowa City, IA

MTC-supported projects
Teenage Driver Distraction
Evaluation of a Mileage-Based Road User Charge (funded by Congress)

Awards (Year 2)
2nd place at Traffic and Safety Conference for "Teenage Driver Distraction" poster

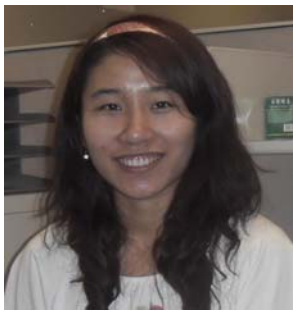
Presentations (Year 2)
"Teenage Driver Distraction Poster," Traffic and Safety Conference, November 2009, West Des Moines, Iowa
"Teenage Driver Distraction," Transportation Webinar, January 2009

Lora Yekshatyan

UIowa, Iowa City, IA

MTC-supported projects

Mitigating Driver Distraction



"I really enjoy working on the project and the MTC meetings. Also, I would like to thank the MTC for helping me in my education."

Wei Zhang

BS, 2008, Civil Engineering, Beijing University of Technology, Beijing, China
MS, expected 2010, Civil Engineering, ISU, Ames, IA

MTC-supported projects

Evaluation of Iowa's Drivers Improvement Program

Memberships

ISU Transportation Student Association (social chair)

Presentations

"Effectiveness of Driver Improvement Programs," Mid-Continent Transportation Symposium, August 20–21, 2009, Ames, IA

Workforce Development

The MTC works with a variety of partners to develop the transportation workforce of tomorrow. In addition to our focus on educating the students at our partner universities, MTC has worked diligently to develop interest among pre-college students in transportation-related careers. Over the years, MTC's primary partners have been the Iowa DOT and the FHWA, but several private associations work with the MTC on these activities as well. During Year 2 of the UTC Tier 1 grant, MTC's main workforce development activities were as follows:

Workforce Development Summit

During the 2008-2009 reporting period, MTC staff led by InTrans Director Shashi Nambisan, have been working to develop a workforce development event to be held in the spring of 2010. This event will combine elements from previous career fair activities sponsored by MTC as well as lessons learned from similar activities around the country over the past few years. MTC staff continues to monitor progress from these other events and plan the Iowa event.

Road Less Traveled

Every year the Program for Women in Science and Engineering at ISU sponsors a one-day conference—the Road Less Traveled—to expose girls in grades six through twelve to career paths in science, technology, engineering, and math (STEM). About 2,500 girls participate each year. MTC Director Shauna Hallmark has been asked to lead a career track in civil engineering at the October 2009 event. As Year 2 ends, she and graduate student Nicole Oneyear are preparing materials.

Go! Magazine

Figure A-3. Katie Fuller, student winner, short fiction, *Go!* writing contest 2008–2009

MTC is a major sponsor of *Go!*, an online magazine produced by InTrans that introduces teens and young adults to the variety of careers available in transportation and related educational paths. During Year 2 the MTC funded one-half of a graduate assistantship for one student writer/editor, Katie Greenwood, and provided additional support for miscellaneous activities like *Go!* staff presentations at high school career fairs. Accomplishments during Year 2 included the following:

- A translator was contracted to translate future issues into Spanish, beginning with the October 2009 issue.
- Six issues of *Go!* were published, featuring the following themes:
  - 21st century roads
  - Advancements in fuels
  - Transportation's unsung heroes
  - Navigation
  - Traffic engineering
  - Winning short stories and essays
- The 2009 reader survey revealed that three quarters of all subscribers are finding the magazine very interesting. Almost 90 percent or respondents have either e-mailed a *Go!* article or recommended *Go!* to someone they know. Both student and adult subscribers asked for more interactive and multimedia activities. Adult subscribers suggested a stronger emphasis on technology.
- *Go!* sponsored a writing contest and, with the help of a grant from ISU's Professional and Scientific Council, offered $3,000 in cash prizes and gift cards. See Figure A-3. Two categories—short story and nonfiction—were offered, both in two age divisions: student (age 16 and up, high school or college) and adult. Of the 50 total submissions from the United States and India, 30 were nonfiction and 20 were fiction; 27 were from adults, and 23 were from high school and college students. All winning entries are published in the June 2009 issue of *Go!*, www.go-explore-trans.org.

TECHNOLOGY TRANSFER

To support UTC's mission of advancing traffic safety–related technology and expertise through technology transfer and outreach activities, the MTC supports and/or conducts several levels of formal and informal activities.

Newsletter and Website

Two issues of the *MTC Bulletin* covering major MTC activities and accomplished were printed and distributed during Year 2. They can be seen online, www.intrans.iastate.edu/mtc/archive. htm#2009. In summer 2009, MTC staff began reviewing the website and developing plans for a major update and reorganization in order to better showcase MTC products and services.

Project Advisory Committees

Every MTC sponsored project (competitively selected) must have an advisory committee. Practitioners who participate in these committees learn about the project and the MTC, and often become champions in implementing project results.

Research Reports and Technology Transfer Summaries

One Tier 1 research project was completed in 2009, and its report has been published and is online: *Construction Project Administration and Management for Mitigating Work Zone Accidents and Fatalities: An Integrated Risk Management Model*. Principal investigators were Jennifer Shane and Kelly Strong at ISU. Additional details are provided in the research section of this report.

Conferences Hosted

Together with ISU, the Iowa Department of Transportation, and others, the MTC co-sponsored the Mid-Continent Transportation Symposium held in August 2009 at ISU. The biennial symposium provides a Midwestern venue for formally presenting research updates in a TRB-like track format. This year's record attendance included nearly 400 practitioners, agency personnel, and researchers.

Fifteen MTC students attended the symposium, most of them serving as room monitors. Nine of them made presentations about their research projects and/or made poster presentations.

Traffic Safety Workshop

In August 2009, the Iowa DOT sponsored a two-day workshop held at the Institute of Transportation/MTC. The event featured Dr. Ezra Hauer, a renowned traffic safety expert from University of Toronto, who discussed a series of topics on traffic safety:

- Safety Performance Functions, Crash Causation, Countermeasures, and Crash Modification Functions
- An Overview of Safety Evaluation
- Can Multivariate Regression Modeling Lead to Cause-Effect Inferences?
- A Review of Speed and Safety
- Evidence-based safety: The other side of the coin
- The Road Ahead

About 50 professionals and faculty from the Iowa DOT, ISU, and FHWA participated on site each day, and several states—Minnesota, Missouri, South Dakota, and Illinois—participated by video conference. Approximately 10 MTC students and several MTC researchers participated. See Figure A-4.

Figure A-4. Dr. Hauer at traffic safety workshop

Webinars

During Year 2, MTC Director Shauna Hallmark was asked to present results of research projects sponsored all or in part by the MTC at three FHWA/NHI webinar events:

- S. Hallmark and T. McDonald, D. Veneziano, and J. Graham. "Safety Impacts of Pavement Edge Drop-off." FHWA NHI Innovations Web Conference on the Safety Edge. May 2009.
- S. Hallmark, N. Oneyear, E. Fitzsimmons, N. Hawkins, and T. Maze. "Synthesis of Traffic Calming Techniques in Work Zones." FHWA NHI Innovations Web Conference on Managing Speeds in Work Zones. Sept 2009.
- S. Hallmark and N. Hawkins. "Traffic Calming on Main Roads Through Rural Communities." FHWA's Office of Safety's Quarterly Focus State Web Conference on Roadway Departure, Intersections, And Speed Management. February 2009.

Presentations at Conferences/Workshops

During Year 2, several MTC staff and students at ISU presented research sponsored by or related to MTC's theme:

- Baird, M., and K. Gkritza. "Effectiveness of Localized Deer Management in Reducing Dee-Vehicle Crash Rates in Iowa – Some New Evidence." Mid-Continent Transportation Research Symposium. Ames, Iowa. August 2009.
- Fitzsimmons, E., S. Nambisan, and S. Hallmark. "Update on Iowa's 2009 Roadway Departure Strategic Action Plan and Synthesis of Neighboring States Practices to Address Roadway Departure Crashes." Mid-Continent Transportation Research Symposium. Ames, Iowa. August 2009.
- Hallmark, S., A. Carriquiry, Y. Hsu, L. Boyle, R. Souleyrette, N. Hawkins, T. McDonald, O. Smadi, and A. Mudgal. "Evaluating Lane Departure Crashes Using Naturalistic Driving Study Data." Strategic Highway Research Program 2, Fourth Safety Symposium. July 2009.
- Hallmark, S., and R. Souleyrette. "Benefits of SHRP 2 Data and Other Safety Data From a Research Perspective." Annual meeting of the Transportation Research Board. Washington D.C. January 2009.
- Hallmark, S., T. Maze, L. Boyle, R. Souleyrette, N. Hawkins, T. McDonald, O. Smadi, and A. Carriquiry. "Evaluating Lane Departure Crashes Using Naturalistic Driving Study Data—Status Report." Annual meeting of the Transportation Research Board. Washington D.C. January 2009.

- Hans, Z. “Development of a Statewide Horizontal Curve Database for Crash Analysis” – August 2009 Mid-Continent Transportation Research Symposium Conference
- Hans, Z. “Iowa Traffic Safety Data Service.” 2008 Blueprint Conference (FHWA, MODOT) – Kansas City, MO.
- Hans, Z. “Use and Abuse of Crash Data in Roadway Access Management.” 2008 Workshop at the National Access Management Conference.
- Hans, Z. “Using Data to Analyze Iowa’s 5% High Crash Risk Roads.” 2008 Midwest/Iowa Highway Safety Data Summit. Dubuque, Iowa.
- Hochstein, J. "The J-Turn Intersection: Design Guidance & Safety Experience." 2009 Annual Meeting of the Transportation Research Board. January 2009.
- McDonald, T. “Road Safety Audits.” American Traffic Safety Services Association Convention. San Jose, CA. February 2009.
- McDonald, T. “Road Safety Audits.” Southeast Road Safety Audit Forum. Orlando, FL. September 2009.
- McDonald, T. “Safety Corridors.” American Society of Civil Engineers Conference. Ames, Iowa. November 2008.
- McDonald, T. “Safety Corridors.” Iowa Traffic and Safety Forum. Hosted by the Iowa DOT in West Des Moines. October 2008.
- McGehee, D., L. Boyle, J. Lee, D. Neyens, S. Hallmark, and N. Ward. “S02 Project: Integration of Analysis Methods and Development of Analysis Plans.” Strategic Highway Research Program 2, Fourth Safety Symposium. July 2009.
- Smadi, O., and K. Gkritza. “Asset Management and Risk: A Practical Approach.” 2009 Mid-Continent Transportation Research Symposium. August 20009. Ames, Iowa.
- Souleyrette, R. “Collaborative Development of a Research Road Map for Geospatial Information Technologies in Transportation,” Annual Meeting of the Transportation Research Board. Washington D.C., January 2009.
- Souleyrette, R. “Research Road Maps: What they are and what they should do.” Collaborative Development of a Research Road Map for Geospatial Information Technologies in Transportation Workshop, Transportation Research Board. Washington D.C., January 2009.
- Souleyrette, R. “Spatial information systems and transportation safety: road assessment programs,” Transportation Management and Policy (TMP) Colloquium. University of Wisconsin, Madison, WI. April 2009.
- Souleyrette, R., and Z. Hans, T. Jantscher and R. Larkin. “Horizontal Curve Identification Methodologies.” Mid-Continent Transportation Research Symposium. Ames, Iowa. August 2009.

- Souleyrette, R., and S. Hallmark. "Integrating Behavioral, Crash and Inventory Data: Benefits from a Research Perspective." Annual meeting of the Transportation Research Board. Washington D.C. January 2009.

Other Publications (Conference Proceedings or Journal Papers)

All MTC presentations made at the Mid-Continent Transportation Research Symposium, listed above, were published in an online proceedings, www.intrans.iastate.edu/pubs/midcon2009/ index.htm.

Refereed journal papers published during Year 2 of the Tier 1 grant included the following:

- Gkritza, K. Modeling Motorcycle Helmet Use in Iowa: Evidence from Six Roadside Observational Studies. Accident Analysis and Prevention. Volume 41 (3). pp. 479-484. 2009.
- Hallmark, S., D. Veneziano, S. Falb, M. Pawlovich, and D.Witt. "Evaluation of Iowa's Graduated Driver's Licensing Program. Accident Analysis and Prevention. Vol. 40. 2008. pp. 1401-1405.
- Hallmark, S., N. Hawkins, E. Fitzsimmons, J. Resler, D. Plazak, T. Welch, and E. Petersen. "Use of Physical Devices for Traffic Calming Along Major Roads thru Small Rural Communities in Iowa." Journal of the Transportation Research Record 2078. 2008. pp. 100-107.

Selected Outreach Activities

A new emphasis in Year 2 was to actively seek opportunities to provide technology transfer and other outreach services. Following are three examples:

Mapping Services for U.S. Road Assessment Program

Raising public awareness about traffic safety is one of the primary objectives of the usRAP pilot program, initiated in 2004 by the AAA Foundation for Traffic Safety (AAAFTS). The program assesses crash risk on U.S. roads and provides the risk information to the public and to state and county highway agencies in accessible formats.

Midwest Research Institute (MRI) in Kansas City, Missouri, is the lead organization. MRI acts as liaison to participating highway agencies, develops program methodologies, collects crash data and other road safety-related data from state agencies, and addresses related organizational issues.

The MTC is a technical partner to MRI in usRAP. ISU's role focuses on mapping crash and other safety data from the pilot states in various formats, using data integration, geospatial analysis, and MRI-developed rating systems. See Figure A-5.

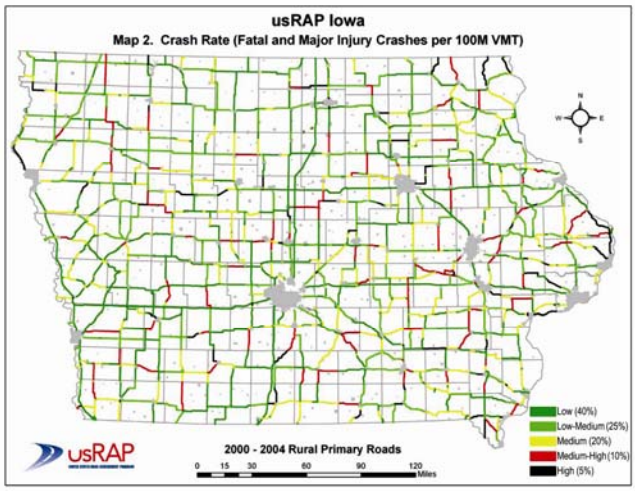


Figure A-5. Example of Risk Map 2 using state-specific risk categories

When state or local-jurisdiction crash data are not available or adequate for creating risk maps, MTC students trained as usRAP technicians use video logs to populate a database of roadway design and traffic control features, then use a computer program to correlate the features with crash risk and assign ratings to various road segments. Agencies can use the resulting ratings maps to develop safety improvement programs. So far, ISU has developed rating maps for selected highways in two states. In addition, MTC students have been instrumental in creating star ratings maps for countries in Latin America through the International Road Assessment Program (iRAP).

Eight states—Florida, Illinois, Iowa, Kentucky, Michigan, New Jersey, New Mexico, and Utah—are participating in the pilot program. More information about the project can be found on the usRAP website, www.usrap.us/home/.

Northeast Iowa Food and Fitness Initiative

Chris Albrecht, MTC administrative coordinator, has worked with the Northeast Iowa Food and Fitness Initiative (NIFFI) to help guide the group toward a shared vision of the built environment that encompasses this seven-county area. The NIFFI, as part of its approach to improving the wellness of residents in the area, has asked Chris to facilitate discussion of the safety aspects of walking and biking infrastructure in and between the region's local communities.

In addition to providing advice and guidance to the NIFFI team, Chris was asked to participate in a site visit and workshop along with national walking and biking expert Mark Fenton, from Boston in September 2009.

Heartland Highway Corridor Management Agreement

Since the departure of David Plazak as MTC's educational director in 2008, Chris Albrecht has assumed the role of resource for access management-related research. In addition to serving in an advisory role to Iowa DOT personnel, Chris has continued to provide access management expertise to stakeholders along southeast Iowa's Heartland Highway Corridor.

Specifically, during the 2008–2009 reporting year, he has produced educational materials, given informational presentations, and guided to production of a corridor management agreement among the many jurisdictions involved along this corridor.

FUNDING SOURCES AND EXPENDITURES

Sources

As illustrated in Figure A-6, the UTCP has funded 40 percent of the MTC's Tier 1 expenditures to date, and the following match partners have funded 60 percent of expenditures to date:

- 34 percent institutional
- 8 percent Iowa DOT
- 9 percent private industry (Midwest Research Institute and AAAFTS support of usRAP activities)
- 9 percent FHWA (included cooperative agreement with FHWA, "Evaluation of Speed Activated Displays on Curves," and registration fees and sponsorship for Mid-Continent Transportation Research Symposium, August 2009)

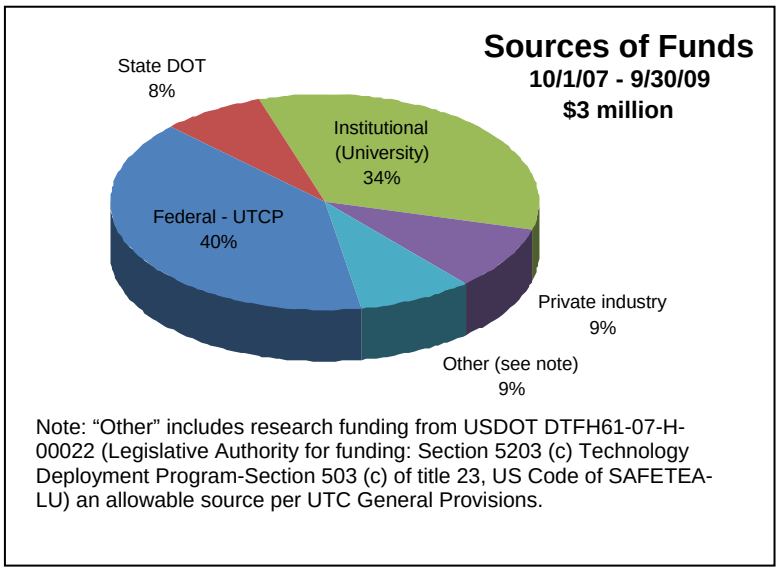


Figure A-6. MTC Tier 1 Funding Sources

Expenditures

The three universities that comprise the MTC have expended approximately $3 million dollars in federal and match funding since the start of the Tier 1 program, with more than 60 percent expended during the second year.

The expenditures originated at the partner universities as follows:

- 80 percent at ISU, the lead university (only 70 percent of the UTCP funds were expended at ISU, indicating that a greater portion of matching funds originated at ISU)
- 15 percent at UIowa
- 5 percent at UNI

Nearly half of all expenditures to date were spent on the educational component of the program at the three universities. However, since all MTC-supported students are expected to participate in research and work on projects, approximately a third of the educational expenditures could also be considered to be part of the research component. As shown in Figure A-7, the general breakdown of expenditures among the MTC's three major activities is as follows:

- 49 percent—direct educational support for students including
  - stipends, fringe benefits, tuition, registrations and professional development, travel and student events
  - faculty and staff coordinating the educational program, mentoring and advising students
  - hosting the spring semester seminar (distance learning) (internet bridge, speaker support, luncheon meetings with visiting speakers and professionals)
  - partial support of *Go!* online magazine
- 22 percent—MTC sponsored research and MTC match projects
- 22 percent—technology transfer/outreach, including all MTC newsletters and other publications, web development and maintenance, project reporting, conference and webinar sponsorship and participation, etc., in addition to the usRAP outreach activity
- 7 percent—computer support, event coordination, and departmental administration

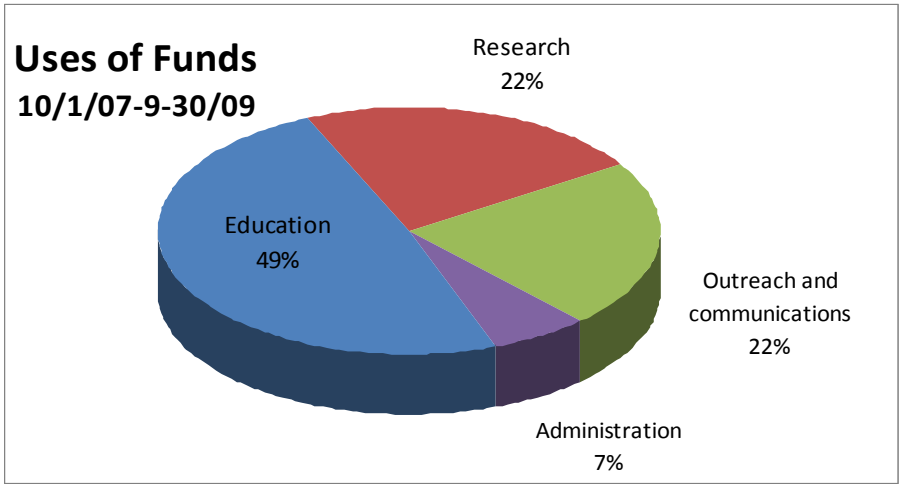


Figure A-7. MTC Tier 1 Expenditures

SECTION B: RESEARCH PROJECT STATUS REPORT

The MTC is now in its second year as a Tier I center. Each year MTC conducts a competitive research program. Requests for pre-proposals for Year 2 were made during late 2008. Pre-proposals were submitted by eligible researchers in UTC Region 7. Three pre-proposals were selected and proposers were invited to submit a full proposal. All three were received by February of 2009 and all were selected by MTC. Proposers were notified in March 2009. However, due to health issues for Tom Maze, the original MTC director, the research projects awarded for Year 2 were not finalized until fall of 2009. As a result, the projects are in the beginning stages. The competitive research projects awarded for Year 2 of Tier 1 are as follow:

1. *Asset Management and Safety: A Performance Perspective*—Omar Smadi and Neal Hawkins, Iowa State University
2. *Behavior Study of Merge Practices of Drivers in Work Zone Closures* – originally awarded to Tom Maze. Current PI—Shauna Hallmark, Iowa State University
3. *Use of Crash Surrogate Measures to Assess the Impact of Systematic Improvements and Other Countermeasures on Rural Roadway Safety*—Shauna Hallmark, Shashi Nambisan, and Tom McDonald, Iowa State University

The three projects competitively awarded in year 1, 2008, have seen significant progress, with one completed during this reporting period. These 2008 projects are as follow:

4. *Pavement Marking and Safety*—Omar Smadi, ISU
5. *Evaluation of Dynamic Speed Feedback Signs and Low Cost Strategies to Reduce Speed and Crashes on Curves*—Shauna Hallmark, Omar Smadi, and Neal Hawkins, ISU
6. *Construction Project Administration and Management for Mitigating Work Zone Crashes and Fatalities: An Integrated Risk Management Model* - Jennifer Shane, ISU—**Completed in October 2009**

The status of each of the six projects is described in the following sections.

Title: **Asset Management and Safety: A Performance Perspective**
Awarded: Spring 2009 but project was not finalized until October 2009
Status report: since this project was recently finalized, only a description of the project is provided.

The primary research objective is to develop a relationship between operational asset performance (roadway lighting, signage, pavement marking, and pavement condition expressed in roughness and rutting) on safety performance. The research will draw on the safety experience of past and ongoing projects and develop a methodology to assess the impact of operational asset performance (condition) on safety performance (crashes). As a secondary objective, the research team will investigate the feasibility of developing a methodology to prioritize safety improvements based on a benefit cost analysis in relationship to individual assets condition (investing in signs vs. marking or lighting).

Title: Behavior Study of Merge Practices of Drivers in Work Zone Closures
Awarded: Spring 2009 but project was not finalized until October 2009
Status report: since this project was recently finalized, only a description of the project is provided.

Lane capacity at work zone lane closures is related to speed and density, and not a fixed value. Although flow is generally measured in aggregate numbers, passenger car equivalents per hour, there is a tremendous range of individual behavior that can affect these aggregate numbers. As flow through the work zone is reduced, the relatively traffic safety of the work zone is also reduced. Work zone queues are commonly hampered by rear-end collisions and sideswipe crashes. However, because crash data do not record the presence of a work zone upstream of the work zone (work zone status is only recorded within the work zone itself), the number of crashes resulting from queues, traffic flow shock waves, and sudden lane changes is unknown. Improved work zone flow will improve safety and work zone flow rates, and are dependent on the behavior of individual drivers. Hence, by reinforcing and enforcing positive lane closure merging behavior can both improve safety and improve the capacity of work zones.

The purpose of this project is to determine which driver behaviors result in the greatest reduction of capacity with an impact on safety. It is believed that such aggressive behaviors as forcing late mergers, tailgating, queue jumping in the closed lane or on the shoulder, and other aggressive behaviors have the greatest impact on maximum flow rates. Other behaviors that create excessive headways or slow speeds can also reduce taper maximum flow.

The objectives of this project are to:

- Identify the driver behaviors which are the most detrimental to work zone traffic flow/safety;
- Document the frequency of such behaviors;
- Determine the impact on capacity reduction;
- Develop strategies to modify to aberrant driver behavior; and
- Identify behaviors that have a direct negative impact on safety.

Title: **Use of Crash Surrogate Measures to Assess the Impact of Systematic Improvements and Other Countermeasures on Rural Roadway Safety**
Awarded: Spring 2009 but project was not finalized until October 2009
Status report: Although the project was not finalized until October 2009, some initial work as reported below was conducted based on the matching funds.

Lane departure is a serious safety concern yet the relationship between factors that influence whether a vehicle departs the roadway in the first place, and the series of actions and events that determine the outcome are complex and not well understood. Understanding why lane departures occur is limited by insufficient crash data and the amount of information that is provided in a crash report. One technique that has been used to overcome the problems of insufficient crash data and limited information about crash events is crash surrogate analysis. A crash surrogate is an event where a crash nearly happened (near-crash) or a situation where had things been slightly different; a crash would have occurred but did not.

In addition to providing a measure of crash risk, crash surrogates can also be used to examine safety situations at a different level of detail and from a different perspective than is possible with traditional crash data. Clearly, drivers are more likely to be involved in multiple non-crash incidents than they are crashes. These incidents are therefore indicators of potential crashes and can provide valuable information about why crashes occur and the potential for future crash involvement given a particular situation. In other cases, incidents may indicate where some roadway, environmental, or human factor may have made a positive contribution toward crash avoidance.

The goal of this research is to provide better information about the effectiveness of rural roadway safety countermeasures with a focus on lane departures. This project was matched by funding from the Iowa Department of Transportation and the Iowa Highway Research Board. The project has three major emphasis areas.

1. Summarize known information about rural lane departure safety countermeasures: This involves a literature review, input from the team expertise in this area, and working with the Iowa DOT to obtain information about state of the practice and state of the art lane departure countermeasures. A comprehensive literature review has been conducted for the following lane departure countermeasures:

- Shoulder and centerline rumble strips
- Edgeline rumble stripes
- Paved shoulders
- Use of the "safety edge"
- Horizontal curve treatments
- Median cable barrier

Results are currently being documented into an updated version of the Iowa DOTs Road Departure Action Plan. The document is approximately 75% complete.

2. Evaluate effectiveness of edgelines rumble stripes in reducing lane deviations: A demonstration project was conducted to evaluate the effectiveness of "rumble stripes" in reducing run-off-road crashes. Edgeline rumble stripes are typically used on sections where no paved shoulder exists. Five pilot study sites were selected for installing the edge line rumble stripes. See Figures B-1 and B-2. Ultimately a crash analysis will be conducted. Three interim measures were used to evaluate the effectiveness of the treatment. This included an assessment of pavement marking wear, feedback from user groups, and changes in vehicle lane keeping (lateral position).

Figure B-1. Close-up of the milling process (courtesy of Bob Sperry, InTrans)

Figure B-2. Rumble stripe installation on F-29 (courtesy of Bob Sperry, InTrans)

Vehicle lateral position is a surrogate measure that has been used to evaluate the effectiveness of rumble strips.

Lateral position data were collected using pneumatic road tubes set up in a "Z" configuration, as shown in Figure B-3.

Using the time stamp of when each tire strikes a particular road tube and geometric relationships, the distance that the vehicle is from the edge of the roadway (O_x) can be determined. Road tubes were set up on several of the test study sites. Lane position was collected before and after installation of the rumble stripes.

Data have been reduced for P-53 and results indicate that before installation of the rumble stripes, the average lateral distance from the edge of the roadway was 3.09 feet. After installation, the average lateral displacement was 3.64 feet. The percentage of vehicles within 1 foot of the pavement edge decreased from 2% before to 0% after installation. All differences were statistically significant. Data for the rest of the pilot study locations will be analyzed as well.

Figure B-3. Road tube layout to measure lane positioning in the field

3. Evaluate the effectiveness of horizontal curve treatments in reducing lane deviations: This portion of the project will evaluate lane keeping behavior for several different low cost treatments on horizontal curves. This will be accomplished using two different methods. Change in lane position will be evaluated using the road tube configuration described above for edgeline rumble stripes. Vehicle trajectories through the curve will be captured using a video data collection set-up. Change in vehicle behavior through the curve will be measured before and after installation of the curve treatments.

Title: Pavement Marking and Safety
Awarded: Spring 2008
Status report: Every spring and fall since 2004, the Iowa DOT has sampled pavement marking retroreflectivity levels for all DOT roadways and has recorded its summer pavement marking painting activities. This information has provided a detailed record of pavement marking conditions that is unsurpassed nationwide. This research project utilizes the Iowa DOT's pavement marking database and detailed crash record system to analyze the relationship between pavement marking retroreflectivity levels and crash rates.

InTrans and MTC researchers conducted a preliminary investigation into this issue by analyzing three years of pavement marking, crash, and traffic data on all state primary roads. This analysis found that examining roadways with low retroreflectivity values reveals a statistically significant relationship between marking condition and safety. However, this relationship is small, and it was determined that it should be tested further. This project, partly funded by the Iowa Highway Research Board, builds upon these preliminary research efforts. Using Iowa DOT data under nighttime conditions, this research effort is accomplishing the following:

- Investigate the impact that varying levels of pavement marking retroreflectivity have on crash performance
- Use these findings to develop strategies that agencies can use to determine the level of investment needed for pavement markings

To date, all pavement marking and crash data has been collected data. Researchers are in the process of finalizing the analysis of the data. The projected completion of the research is late 2009.

Title: Low-cost Strategies to Reduce Speed and Crashes on Curves
Awarded: Spring 2008
Status report: This project evaluates the effectiveness of dynamic speed feedback signs and other low-cost strategies for reducing speeds and crash rates on curves. Crash rates on horizontal curves are often higher than crash rates on tangent sections and are often a result of speed. One task of the project is to evaluate two different dynamic speed feedback signs on curves in six states. The project is also evaluating low-cost curve treatments in Iowa, where 12% of fatal crashes and 15% of major injury crashes occur on curves.

Dynamic speed feedback signs have been installed in five states (Iowa, Oregon, Washington, Arizona, and Florida). Two types of signs are being used. One is a typical speed feedback sign and the other display the appropriate curve sign (shown below). Both are activated when drivers are traveling at a certain threshold over the posted or curve advisory speed. Four signs will also be installed in Texas. All signs are located on 2-lane paved county or US highways. Speed limits for all test locations is 50 mph or higher.

Speed data are collected before installation of the speed feedback signs and then a 1-mon, 1-year, and 2-years after installation. Data are collected approximately ½ mile upstream (which serves as a control site), at the curve PC near the sign, and in the center of the curve. Site status and installation dates are shown in Table B-1. Initial results indicate that the signs overall are very effective in reducing speed.

A subsequent task will be to evaluate change in crashes after the signs have been installed for two years. Control sites were selected in each state which will be included in the crash analysis.

Table B-1. Site Status

State	Signs Installed	Sites Per State		Speed data collected
		Test	Control	
Texas	Waiting for final purchasing with Texas DOT	4	4	
Oregon	2 installed in Nov '09, waiting for delivery of 2 more signs	4	5	Before
Arizona	Sep 17, '08	2	3	Before, 1-mo, 1 yr
Washington	Jul 15, '08	2	3	Before, 1-mo, 1 yr
Iowa	2 on Nov 7 '08 Apr 7 & 23, '09	4	4	Before, 1-mo, 1 yr
Florida	Dec '08	3	4	Before, 1-mo
Ohio	June 2, 09	3	4	Before, 1-mo

A second component of the project is to evaluate low cost strategies to reduce speed and crashes on curves. All of the evaluations will be conducted in Iowa. Six high crash curves were selected in addition to the four Iowa locations where dynamic speed feedback signs were installed. Three treatments were selected based on a review of available literature and the team's expertise. Speed data will be collected before, at 1-month, 6-month, 1-year, 18-months, and 2-years after installation of the treatments. The treatments are shown Figure B-5.

The team is in the process of collecting before speed data and installing the treatments.

Figure B-4. Two types of dynamic speed feedback signs

Full Post Chevron (adding reflectorized strip to post) --- chevron is already in place, reflector strip is added to post (image source: TTI)

Larger Chevrons (image source: Iowa DOT)

Advance curve markings (Image source: FHWA)

Figure B-5. Low cost curve treatments

Title: Construction Project Administration and Management for Mitigating Work Zone Crashes and Fatalities: An Integrated Risk Management Model
Awarded: Spring 2008
Status report: This project is complete. A brief summary of the project is provided below.

On average there are 900 fatalities per year in roadway work zones in the United States. In Iowa, there are an average 6.5 deaths per year and an average total of 366 total work zone crashes per year. Typical initiatives to reduce these numbers are usually physical in nature and are put in place at the actual work zone during construction. These measures include increased fines for moving traffic violations, introducing transverse rumble strips, reduced spacing for channelizing devices, enhanced flagger station setups, reduced work zone speed limits, and variable message signs.

However, physical traffic calming measures have not always proven to be effective when not followed up by enforcement. Enforcement places a significant burden on law officials, and positioning law enforcement officers and vehicles within the work zone can create hazards for both enforcement officers and highway workers. It may be more effective and efficient to use innovative contracting and project administration to address work zone safety in the planning, design, and preconstruction phases of the project. The goal of this research was to develop a method with which to mitigate work zone crashes and fatalities. This was accomplished through the creation of a formal risk management model that can be utilized during the construction management and administration of highway projects for all stages of the project life-cycle.

This effort ultimately resulted in the development of an integrated risk management model. This research consequently focused on the standard risk management model for the 1) identification, 2) assessment, and 3) response (treatment) of hazards that may increase either the frequency or severity of a vehicle crash in a work zone. In the final research report, the research results are presented by the three components of the standard risk management model. The first phase of this research was the identification of risks, the second phase was the assessment of risks, and the third phase was the identification of possible mitigation strategies. The tasks of the first and third phases were accomplished through the use of a comprehensive literature review, content analysis of papers and articles, a focus group discussion, and Internet surveys for identifying work zone hazards and mitigation strategies. The tasks of the second phase were accomplished through the analysis of work zone crash database information and the development of a unique tool that allows for a qualitative assessment of hazards using quantitative data.

The final project report can be accessed at:
http://www.intrans.iastate.edu/research/detail.cfm?projectID=1216322435

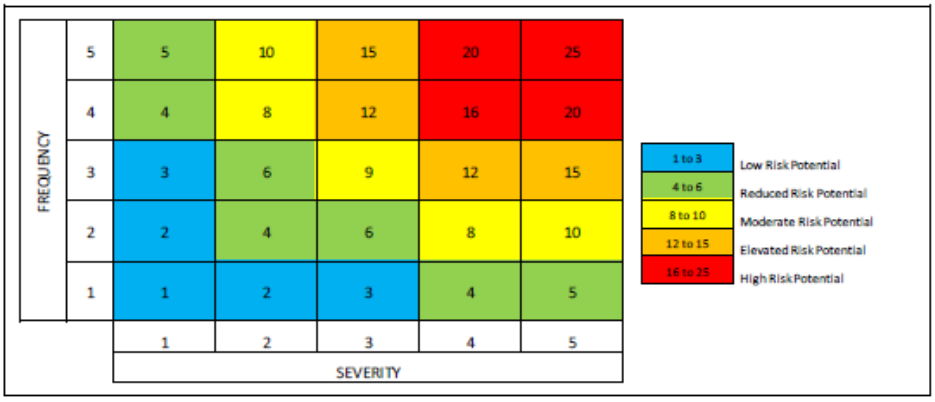


Figure B-6. Risk assessment matrix

SECTION C: PERFORMANCE INDICATORS REPORT

The following information has been reported for the 2008-2009 grant year as noted in the University Transportation Centers Reporting Requirements, dated March 2006.

Research Selection

This section details performance measures for MTC research program.

1. **Number of transportation research projects selected for funding using your UTC grant funding:**

   To date, six (6) research projects have been awarded by the MTC under the current Tier 1 grant. Three (3) research projects were selected for funding under the 2008-2009 grant year, the second year as Tier I University Transportation Center. These projects are listed below.

Year 2 Project (2008-2009)	Principal Investigator, University
Asset Management and Safety: A Performance Perspective	Omar Smadi, ISU
Behavior Study of Merge Practices of Drivers in Work Zone Closures	Shauna Hallmark, ISU
Use of Crash Surrogate Measures to Assess the Impact of Systematic Improvements and Other Countermeasures on Rural Roadway Safety	Shauna Hallmark, ISU

   These projects are in addition to the three (3) projects chosen in 2007-2008. One of these projects, *Construction Project Administration and Management for Mitigating Work Zone Accidents and Fatalities*, has been completed. The 2007-2008 projects are listed below.

Year 1 Project (2007-2008)	Principal Investigator, University
Low Cost Strategies to Reduce Speed and Crashes on Curves	Shauna Hallmark, ISU
Construction Project Administration and Management for Mitigating Work Zone Accidents and Fatalities - **Completed**	Jennifer Shane, ISU
Pavement Markings and Safety	Omar Smadi, ISU

1a. Number of those projects that you consider to be basic research, advanced research, and applied research:

Basic Research: 1
Advanced Research: 5
Applied Research: 6

2. Total budgeted costs for the project reported in Question 1 above:

The combined budgeted costs for the six (6) research projects listed above is $1,191,301, which includes the matching funds. The MTC research funds makes up $376,128 of this total. The project budgets are listed below.

Project Title	Budget
Asset Management and Safety: A Performance Perspective	$250,000
Behavior Study of Merge Practices of Drivers in Work Zone Closures	$60,000
Use of Crash Surrogate Measures to Assess the Impact of Systematic Improvements and Other Countermeasures on Rural Roadway Safety	$259,399
Low Cost Strategies to Reduce Speed and Crashes on Curves	$450,000
Construction Project Administration and Management for Mitigating Work Zone Accidents and Fatalities	$75,789
Pavement Markings and Safety	$96,113

Research Performance

This section details performance of the MTC research program for 2008-2009.

3. Number of reports issued that resulted from transportation research projects funded by the UTC grant:

One (1) final report was issued from the 2007-2008 research program. This report was for *Construction Project Administration and Management for Mitigating Work Zone Accidents and Fatalities*. Two projects remain in progress from that funding year, while three new projects for 2008-2009 are just underway.

4. **Number of transportation research papers presented at academic/professional meetings that resulted from projects funded by the UTC grant:**

   A total of five (5) MTC-funded research papers have been presented at academic and/or professional meetings to date. Presentations were made at the Transportation Research Board Annual Meeting, IMSA Arizona, IRM North Carolina, and the Mid-Continent Symposium. In addition, various informal presentations on these projects have been made to different groups concerning the status and future direction of research.

Education

This section details performance of the MTC education efforts for 2008-2009.

5. **Cumulative number of transportation-related courses that have been added since the beginning of the grant to the number of courses you reported in Baseline Measure 1 in your UTC Strategic Plan.**

   Undergraduate: 0
   Graduate: 2

   A new graduate course in public transit operations and planning was created at the UIowa in the spring of 2009. This is in addition to the new graduate course in transportation data analysis that was created at ISU during the previous reporting period.

6. **Number of students participating in transportation research projects. Count individual students.**

   Undergraduate: 0
   Graduate: 38

   Amongst the three universities, 38 graduate students, both master's and doctoral levels, have worked on MTC-sponsored research during the past year.

Human Resources

This section details performance of the MTC human resources for 2008-2009.

7. **Cumulative number of transportation-related advanced degree programs that have been added since the beginning of the grant to the number of degree programs you reported in your UTC Strategic Plan.**

   Master's Level: 0
   Doctoral Level: 0

8. **Number of students enrolled in transportation-related advanced degree programs (the baseline programs and any added since the beginning of the grant).**

   Master's Level: 96
   Doctoral Level: 13

9. **Number of students who received degrees through the baseline and any added transportation-related advanced degree programs.**

   Master's Level: 53
   Doctoral Level: 2

Technology Transfer

This section details performance of the MTC technology transfer activities for 2008-2009.

10. **Number of transportation seminars, symposia, distance learning classes, etc. conducted by your UTC for transportation professionals.**

    Thirty-five (35) technology transfer or outreach events have been sponsored all or in part by the MTC during the first two years of the Tier 1 UTC grant. These events included a variety of safety-related webinars, conferences, and workshops. In just this past reporting period, twenty events conducted.

11. <u>Number of transportation professionals participating in those events.</u>

Approximately 900 public and private-sector professionals attended MTC-supported events during the 2008-2009 reporting period. This is in addition to approximately 655 the previous reporting period.