



MID-AMERICA TRANSPORTATION CENTER

Volume 2 Issue 1

IMPROVING SAFETY AND MINIMIZING RISK ASSOCIATED WITH INCREASING MULTI-MODAL FREIGHT MOVEMENTS

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THE UNIVERSITY OF IOWA



MATC Hosts USDOT Research and Innovative Technology Administration Grant Administrators

The Mid-America Transportation Center was pleased to host the US Department of Transportation's Research and Innovative Technology Administration Grant Administrators, Amy Stearns and Lydia Mercado, who visited the

University of Nebraska—Lincoln in August. It was a productive day, filled with presentations by the MATC director, associate directors, and faculty, as well as lab tours, meetings with students, and viewing of crash test results.

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KU Robert Rescot: 2008 MATC Student of the Year

MATC is proud to announce **Robert Rescot** as the 2008 student of the year. Robert is a second-year Ph.D. student in transportation engineering at the University of Kansas (KU). He is originally from the St. Louis, Missouri area, and has previously received a bachelor's degree in civil engineering and a master's degree in transportation engineering from the University of Missouri-Columbia.

Robert is an ambitious student, active in all phases of academic life including teaching, research and service, in addition to working on his Ph.D. course work. With a clear goal in mind of one day becoming a professor, he recognizes

the vital importance of demonstrating during his graduate work the ability to successfully balance research, teaching, and professional service requirements. Robert is currently instructing several lab sections of a land surveying course, and guest lectures periodically in several other transportation courses. He has also taught classes in the usage of the VISSIM microsimulation software as well as the theory and application of microsimulation.



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University of Nebraska Lincoln Jennifer Schmidt: 2008 UNL Student of the Year

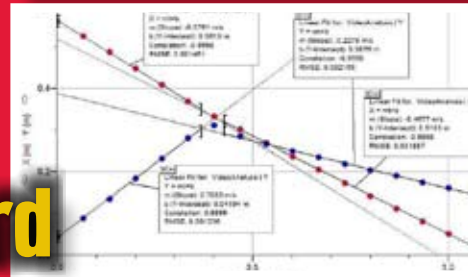
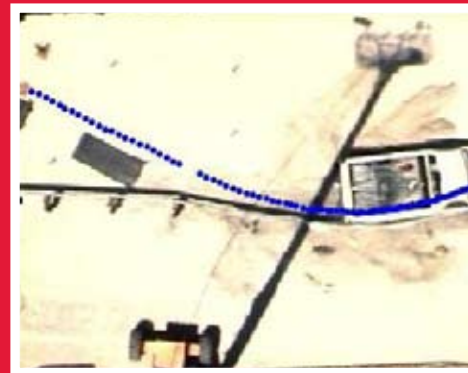
The Mid-America Transportation Center is pleased to announce **Jennifer Schmidt** as UNL's 2008 student of the year.

Jennifer is currently working on her master's degree in civil engineering at the University of Nebraska—Lincoln.

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Top: Jerel Welker and Eugene Kirianov working on developing their lesson plans at the first summer institute.
Right: Jerel Welker on the Indy Race car used at the MwRSF test facility.



Pictured above are diagrams used in Jerel's lesson plan. In his award application he used lesson plan materials developed during the summer institute.

Lincoln Math Teacher Receives Presidential Award

Southwest High School math teacher Jerel Welker develops critical thinkers and problem solvers, not just kids who know about quotients and integrals. That ability to teach students how math relates to their world, is what math department chairman Tom Ahlschwede says makes Welker a great teacher. It is also the quality that helped Welker earn the 2007 Presidential Award for Excellence in Mathematics and Science Teaching, the nation's highest award in those fields.

Excellent teachers like Jerel Welker play a crucial role; not only do they impact students' future interests and careers, but they also benefit the nation by encouraging

innovative thinking in tomorrow's leaders. Ahlschwede confirms that Welker is such a leader, someone who "incorporates technology and the real world and demonstrates how pre-cal[culus] relates to physics, science, and to things you see every day."

Welker's expertise lies in integrating technology into his classroom, and more importantly, fostering an atmosphere of respect and trust in his classrooms, which allows kids to take risks -- to do things differently and to learn in new ways.

Welker received \$10,000 from the National Science Foundation, one of ninety-nine

recipients from across the country who all teach math and/or science to students from the 7th through the 12th grades.

The only teacher selected from Nebraska, Welker also represents Lincoln. After teaching at Lincoln High School for many years, he has been teaching at Southwest since 2004.



Robert Rescot accepting the MATC UTC student of the year award at the CUTC awards banquet on January 10, 2009.

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Robert Rescot: 2008 MATC Student of the Year

Mr. Rescot is an active peer in the research community. He is currently the team leader on a MATC-funded project focused on the evaluation of an intermodal rail-truck freight facility. To that end, he manages a team of undergraduate and graduate students, maintains crucial

business relationships with partner agencies, and regularly collaborates with the faculty. Robert's research interests include highway and work-zone operations, traffic flow theory, highway safety, simulation modeling, and roundabouts. His record of service to the discipline and to his colleagues is also impressive. He is a friend of several TRB committees, an active paper reviewer, and currently serves as the president of the Institute of Transportation Engineers' KU student chapter. Outside of his field, Robert is active with his church and serves on a regional committee of the Boy Scouts of America.

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Jennifer Schmidt: 2008 UNL Student of the Year

She is a graduate research assistant at Midwest Roadside Safety Facility and her research focuses on the safety performance of work-zone traffic control devices with new safety standards. She received her bachelor's degree in civil engineering from the University of Nebraska-Lincoln.

In the summer of 2007, Jennifer expanded her educational horizons on a study abroad trip to Brazil, where she took an engineering class. Jennifer plans to pursue a career in the structural design of buildings. Her academic honors include earning a University Regents' scholarship, and graduating from the Honors Program. Jennifer has served as secretary of Chi Epsilon and continues her service to the profession as a member of the American Society of Civil Engineers.

Letter from the Director



Dr. Laurence Rilett

I am pleased to present the 2nd issue of the Mid-America Transportation Center newsletter. As you will see in the accompanying articles we have been busy implementing our various research, education, and technology transfer programs. In August we had a successful visit by USDOT Research and Innovative Technology Administration (RITA) grant administrators Amy Stearns and

Lydia Mercado. We also had our first full Advisory Board Meeting where we received excellent input and advice on our programs.

I would like to take this opportunity to welcome to our MATC Advisory Board Mr. John Craig, Director of the Nebraska Department of Roads and Mr. Dick Reiser, Executive Vice President and General Council of Werner Enterprises. Our Advisory Board will benefit from the excellent advice John and Dick are sure to provide, and I look forward to working with them in the coming years.

During FY 2009, MATC funded sixteen new research projects, which are described briefly in this newsletter starting on page 8. All of the projects are related to the theme of MATC: "improving safety and minimizing

risk associated with increasing multi-modal freight movement on the U.S. surface transportation system." Similar to the FY 2008 projects, this year's MATC research program includes significant participation from researchers at major universities in all four states of Region VII, including the University of Nebraska, Kansas State University, University of Kansas, University of Iowa, and the Missouri University of Science and Technology (formerly University of Missouri-Rolla).

To implement the education component of our mission, MATC hosted another successful summer institute for middle and high school teachers and students in July and August. We are proud of the fact that one of our previous Summer Institute participants, Mr. Jerel Welker, was recently honored with a Presidential Award for Excellence in Mathematics and Science Teaching. Speaking of award winners, I extend a personal congratulations to Robert Rescott, a Ph.D. student from the University of Kansas, who was the 2008 MATC student of the year. Robert was a unanimous choice of the selection committee and he did an excellent job of representing MATC at the CUTC meeting in January of this year.

I am very enthusiastic about all our transportation research initiatives and look forward to the coming years as we continue to build one of the pre-eminent UTC's in the country. As always, I welcome your feedback and suggestions. Thank you for your interest and continued support.

Sincerely,
Larry

Visit to India Builds Relationships, Creates Partnerships for MATC

Led by Chancellor Harvey Perlman, an invited group of UNL representatives traveled to India in February to expand opportunities for collaboration with university and research organizations and to initiate and strengthen personal ties with educators and officials.

As part of this trip agreements and partnerships were built that will expand the opportunities for UNL's faculty and students and enhance the university's international reputation. International agreements reached during this visit include: a joint doctoral program and collaborative research in engineering, both with Anna University in Chennai; an academic partnership with India's Ministry of Food Processing Industries; and an agreement with the International Crops Research Institute for the Semi-Arid Tropics.

MATC Director and Distinguished Professor, Dr. Laurence Rilett, was invited to accompany Chancellor Harvey Perlman, Vice Chancellor of Research Prem Paul, Dean of the College of Engineering David Allen, and Associate Dean of the College of Engineering Namas Chandra, during the Chennai portion of the trip. During his visit to India Rilett gave presentations at the Indian Institute of Technology- Madras (IITM) and the Indian Institute of Technology-Bombay (IITB). He serves as an external member on the committee of a Ph.D. student at IITB, Sushant Sharma, and this provided an opportunity for sharing information on

common research interests with faculty and students.

Some of the groundwork for promising future collaborations between India and UNL developed from Rilett's ongoing professional ties between himself and Dr. Lelitha Devi Vanajakshi, one of his former Ph.D. students who is now an assistant professor at IITM. Rilett and Vanajakshi have submitted a joint grant proposal to the Indo-U.S. Forum related to holding a workshop between American and Indian transportation professionals in the area of Intelligent Transportation Systems (ITS). They are also in the process of submitting a joint research proposal related to ITS.

Bringing everyone closer on a personal level was a very important strategy on this trip. As a result of this trip Anna University sent a team of administrators and faculty to UNL in March to further explore collaborations. During their visit the Anna University faculty toured the traffic systems and structures laboratories at UNL, and attended presentations given by Dr. Libby Jones and Dr. Atorod Azizzinami. Transportation faculty and students from Anna University will be visiting UNL this summer as part of this exchange initiative as well.

Overall the successful trip demonstrated that today's educational challenges have global dimensions, and that international partnerships are built on personal contacts. It is a distinct honor for the University of Nebraska-Lincoln and the Mid-America Transportation Center to be able to foster these important relationships with our colleagues in India, the largest democracy in the world.





Dr. Rilett addresses the MATC Advisory Board on the current state of the center.



UNL Professor, Dr. Andy Nowak discusses his MATC research project with Ms. Lydia Mercado.



MATC Advisory Board and Associate Directors. Top row, L-R: Ty Westergaard, Ray Moore, Musaque Hossain, Dick McReynolds, Dave Connell, Larry Rilett, Mark Stiles, and Tom Molinazzi. Bottom row, L-R: Dean Sicking, Andy Nowak, Bob VanderClute, E. Dean Carison, Paul Hanley, Moe Jamshidi, David Sehart, and Dan Murray.

First Annual MATC Advisory Board Meeting

The first meeting of the MATC Advisory Board was held this fall at the University of Nebraska-Lincoln Wick Alumni Center. The meeting started off with a presentation by Dr. Larry Rilett on the State of MATC and a review of the theme and strategic plan. MATC consortium partners then presented overviews of the research, education, and technology transfer activities in progress at each of their campuses. The research underway is exciting. Please turn to the Research Projects section of the newsletter for details.

Dr. Prem Paul, Vice Chancellor for Research and Economic Development at UNL addressed the advisory board and associate directors to thank them for their support and welcome them to the University of Nebraska. An advisory board member round table discussion was held on issues facing the freight industry related to trucking, railway, waterways, logistics, etc. MATC and its advisory board considered ways they could address these issues through collaborative research projects.

The afternoon session included discussions of issues currently or potentially facing the DOTs, and then turned to focus on the topic of how to strengthen the relationships between transportation professionals within the private and public sectors. Several action items that were developed to be researched and put into place over the next year. The day ended with a live crash test and tour of the Mid-west Roadside Safety Facility.

We are very thankful to all our board members for their excellent support and continued collaborative efforts to improve freight transportation in Region VII.

Dr. Yong-Rak Kim poses with his graduate students in the UNL Materials Lab after presenting to USDOT Administrators.



Crash test results on cable guard rail.



Dr. Dean Sicking presents results of crash test to MATC Advisory Board members during a tour of the MwRSF testing facility.



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Successful USDOT-RITA Site Visit to MATC!

Dr. Larry Rilett, director of MATC, along with several MATC consortium partners summarized the accomplishments of the past year and provided overviews of the research, technology transfer initiatives, human resources, diversity initiatives and program goals that were planned and/or taking place at each of their campuses.

During the afternoon, discussion focused on MATC business operations and the status of reporting requirements for the center. Amy Stearns and Lydia Mercado shared their expertise and positive response regarding MATC's activities and progress to date.

The day concluded with tours of the lab facilities used for MATC research projects, including the mobile intelligent transportation systems van and lab, the structures lab, the materials lab, and the radio frequency identification lab. Stearns and Mercado were able to interact with the faculty and students who were doing the research in each of the labs. A brief tour of the MATC offices was followed by a bus tour to the Midwest Roadside Safety Facility, where graduate students displayed the results and discussed the barrier research conducted during the previous day's crash test.

Mr. Rodrigo Franca, IMSE Logistics Graduate Student discusses MATC-RFID research with Ms. Lydia Mercado.



Mr. CJ Hsu, CIVET Transportation Graduate Student presents MATC-ITS research to US DOT Grant Administrators.

NTC Mobile ITS Van set up for tour in front of the UNL Wick Alumni Center.



UNION PACIFIC RAILROAD HARRIMAN DISPATCHING CENTER

Transportation Students Tour Union Pacific

As part of the Missouri Valley ITE meeting on September 24, 2008, MATC graduate and undergraduate students were given a tour of the Union Pacific Harriman Dispatching Center in Omaha, Nebraska by Steve Barkley, vice president of center and of Network Operations with Union Pacific.

The Harriman Dispatching Center (HDC) was recently remodeled with state-of-the-art technology, including biometric security on the doors, ergonomic lighting, and cutting-edge sound control with an acoustic cloud throughout the HDC. The first train was dispatched from the newly remodeled center in February of 2008.

Equipped with today's advanced technology and software, the dispatch center coordinates up to 2,000 freight and metro trains simultaneously on over 25,000 miles of track. Network surveillance feeds

real-time data into various maps and graphs displayed on the walls of the dispatch center and utilized by the dispatchers. This state-of-the-art system allows Union Pacific to increase its rail network velocity, improve car cycle times, and save fuel, among many other benefits. The new system also integrates mainline and terminal planning in order to improve utilization of locomotives, cars, terminals, and crews.



The HDC also has implemented a sophisticated weather monitoring system that utilizes GIS data to constantly determine the weather conditions on every mile of track. This information is critical in order to mitigate any possible weather interference (tornadoes, hurricanes, etc.), which could create congestion, or even damage tracks or trains. It also allows dispatchers to keep track of every train on every track every minute of every day, so that goods and people are moved quickly, safely, and efficiently through the rail system.

Valuable ITS Training Workshop on Systems Engineering



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OKLAHOMA TRANSPORTATION CENTER



ITS Heartland hosted its first systems engineering workshop this fall at the Oklahoma Department of Transportation in Oklahoma City. With thirty-five ITS professionals in attendance, discussion topics included information on the federal requirements for systems engineering as documented in Rule 940.11. The benefits and organizational implications of applying systems engineering in traditional project development and implementation processes were evaluated, while training and technical resources were made available to help further the understanding of systems engineering and its application. The workshop used the new guide, "FHWA Systems Engineering for Intelligent Transportation Systems: An Introduction for Transportation Professionals," as a primary reference to introduce systems engineering.

The presenters were Cliff Heise, who is the eastern region vice president of Iteris, Inc., and Mac Lister, an ITS specialist at the FHWA Resource Center.

Mr. Heise, who is responsible for programs at the federal, state, and local levels, and manages a team of systems, software, and transportation engineers, has over twenty-four years of project management experience in the areas of systems and software engineering throughout all phases of program development.

Mac Lister provides training, outreach, and technical support for the National ITS architecture and systems engineering programs. He is also the team leader for the FHWA's National Field Support team for Regional Architecture implementation and a member of the FHWA Operations Council's architecture and systems engineering working group, as well as the field co-chair of the Planning for Operations Working Group and a member of the 511 Deployment Coalition Working Group. Mr. Lister has over thirty-five years of experience in the field of information systems.

The workshop was a joint effort between the ITS Heartland Chapter, ITS America, the Oklahoma Department of Transportation, the Mid-America Transportation Center, and the Oklahoma Transportation Center. A special thanks to Alan Stevenson and the Oklahoma DOT for hosting the workshop and to Matt Volz of Telvent Farradyne, Inc. for his coordination with ITS America.



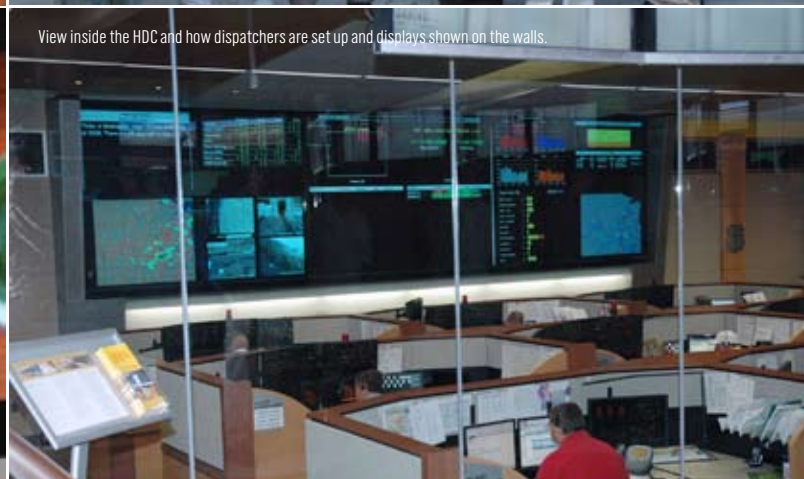
MOVITE conference attendees view the UP introduction video in the enclosed viewing area within the HDC.



UNI graduate and undergraduate students pose with Mr. Steve Barkley and Dr. Larry Rilatt in front of the UP HDC.



Dynamic map of UP routes color coded by level of capacity.



View inside the HDC and how dispatchers are set up and displays shown on the walls.





Mara Campbell



Richard McReynolds



Moe Jamshidi



Sandra Larson



MATC Funded Research Projects Fiscal Year 2009

University of Nebraska Projects



Assessing the Crash Risk for Trucks on Onset Yellow

PI: Dr. Anuj Sharma, Assistant Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: This project will assess the crash risk for trucks at the onset of a yellow signal in isolated high speed intersections. Red light running (RLR) and rear-end crashes are most typical of isolated high speed intersections. A decision to continue through the yellow light can lead to a severe right angle crash, and a decision to stop at the onset of yellow can lead to a serious rear-end crash. This research will evaluate the crash risks of different types of trucks in varied situations of yellow onset.



BENEFITS: The biggest benefit from the project would be the enhanced safety of truck movements. A chart for the dilemma hazard function for trucks on the onset of yellow will be developed. This will help the practitioners to leverage developments in sensor technology to provide adaptive and case-sensitive design for safe and efficient operation of signals at high-speed intersections.

Computational Design Tool for Bridge Hydrodynamic Loading in Inundated Flows of Midwest Rivers

PI: Dr. Junke Guo, Assistant Professor, Civil Engineering, University of Nebraska–Lincoln

Co-PI: Dr. David Admiraal, Associate Professor, Civil Engineering, University of Nebraska–Lincoln; Dr. Tian Zhang, Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: The 1993 and 2008 Midwest floods showed that with weather pattern changes, the period between returning extreme floods may be shortening. These changes threaten existing bridges over rivers. This study transfers the recent supercomputer simulation technology of inundated bridge hydrodynamics from laboratory scales to practical design scales.

BENEFITS: The results of the study will provide bridge engineers with an innovative tool to estimate hydrodynamic loads accurately when bridge decks are inundated during extreme floods.

Design of High-tension Cable Post Bases

PI: Dr. John Rohde, Associate Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: Most DOTs aim at minimal maintenance requirements and low repair costs of median cable systems. Foundations with sleeves to facilitate the replacement of posts seem to be a good solution. Unfortunately, these systems currently have high capitol costs and, in many instances, poor performance. This project will develop high-tension cable median post base designs for a variety of soil and weather conditions.

BENEFITS: The result of this study will be a rational design methodology based on in situ soil conditions for cable post foundations in high tension cable systems. This design method will rationally compare construction and maintenance costs to minimize the life cycle costs of the post/sleeve system. This will allow various transportation agencies to look critically at existing foundation designs in terms of anticipated life cycle performance and associated costs.

Development of Advanced Finite Element Material Models for Cable Barrier Wire Rope

PI: Dr. John Reid, Professor, Mechanical Engineering

Co-PI: Robert Bielenberg, Research Associate Engineer, Midwest Roadside Safety Facility, University of Nebraska–Lincoln

DESCRIPTION:

This project proposes to develop methodologies and material models for simulating wire rope in large deformation impact scenarios. The first step in the development is to study the current wire rope through a series of dynamic component tests. The results of those tests will be used to characterize the behavior of the wire rope. This characterization, combined with existing information concerning wire rope behavior, will be used to develop strategies for effectively modeling wire rope.



BENEFITS: The capability to model wire rope performance will provide a basis and a springboard for innovations in cable barrier systems as well as in the wire rope itself. Ultimately, these innovations will result in a corresponding increase in the overall safety of the nation's transportation infrastructure.

Impact of Truck Loading on Design and Analysis of Asphaltic Pavement Structures

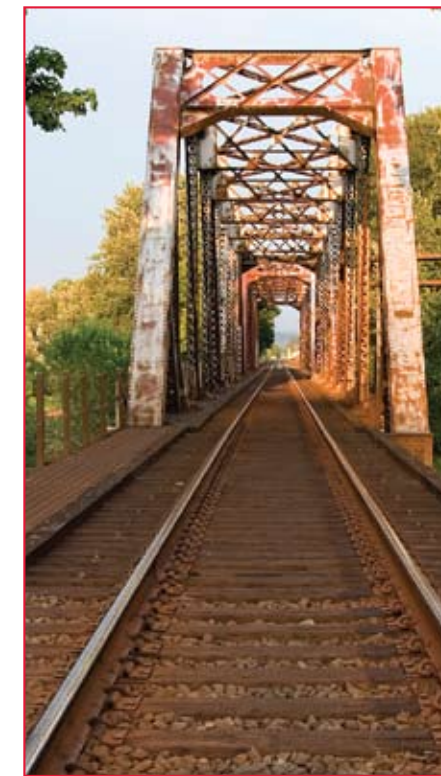
PI: Dr. Yong-Rak Kim, Assistant Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: Better preservation of existing highway infrastructure against the effects of heavy load trucks is necessary.



With more accurate and realistic analysis of pavement structures, more successful preservation will be attained. To this end, this study analyzes actual roadways in Nebraska and Missouri by comparing results from the newly-developed pavement design guide (i.e., the Mechanistic Empirical Pavement Design Guide: MEPDG) with the results from the purely mechanistic analysis based on the finite element method (FEM) to improve analysis of pavement structures.

BENEFITS: The results will provide a better understanding of the effects of heavy load trucks on the overall structural performance and life of pavements, as well as a potentially more appropriate implementation of the MEPDG into pavement designs.



Risk Mitigation for Highway and Railway Bridges

PI: Dr. Andrzej Nowak, Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: Bridges are vulnerable to hazards stemming from negligence and improper maintenance, overloading, collisions, intentional acts of vandalism, and extreme events such as natural disasters or terrorist attacks. These structures must be protected, however the current approach to risk is not always rational. Sensitivity analyses

will be performed to relate the reliability of bridges to the reliability of the transportation network.

BENEFITS: This project will develop risk analysis procedures for the transportation network including highway and railway bridges, selection criteria for the target risk level, and implementation procedures for risk control. The project will focus primarily on the development of rational selection criteria for the target risk for bridges, depending on the consequences of failure and the relative costs.

Study of RF Propagation Characteristics for Wireless Sensor Networks in Railroad Environments

PI: Dr. Hamid Sharif, Professor, Computer and Electronics Engineering, University of Nebraska–Lincoln

Co-PI: Dr. Michael Hempel, Computer and Electronics Engineering, University of Nebraska–Lincoln

DESCRIPTION: This project investigates the impact of signal propagation for Wireless Sensor Networks in railroad environments. The wireless transmissions' electromagnetic waves interact with the steel construction of freight cars. It is crucial to understand the impact of this interaction on the performance of wireless transmissions, and how the placement of the transceivers can be optimized to improve the performance. This is a vital issue for improving the safety and security of railroad operations, and will enable the monitoring of railroad trains, tracks, and the freight transported to protect the transported goods, the environment and human life.

BENEFITS: This proposed research and its outcomes will improve the overall network performance and robustness and will enable a wide range of novel applications in this domain. It will help improve the safety and security of railroad operation. In addition, the findings of this research will be applicable to other modes of surface transportation.

2009 MATC Research Projects



Truck Safety at Railroad Crossings

PI: Dr. Aemal Khattak, Associate Professor, Civil Engineering, University of Nebraska-Lincoln

DESCRIPTION: Truck safety at highway-railroad grade (HRG) crossings is a concern in Nebraska as well as nationwide. Large trucks constitute approximately 26% of the accidents reported at HRG crossings in Nebraska. This research assumes that unsafe interactions between trucks and trains are indicative of safety levels and a precursor to crashes. There is no current data on the frequency and rate of unsafe interactions between trucks and trains in Nebraska; neither is there available information on the factors that are associated with those unsafe interactions. The discovery of such information will facilitate a more complete assessment of the problem.

BENEFITS: The information obtained from observations of unsafe interactions between trucks and trains will be analyzed to discover information that will facilitate increased truck safety at HRG crossings, and will provide direction for the development and testing of equipment that reduces unsafe truck-train interactions.



Kansas State University Projects

Improving Safety of the Surface Transportation System by Addressing the Issues of Vulnerable Road Users: Case of the Motorcyclists

PI: Dr. Sunanda Dissanayake, Assistant Professor, Civil Engineering, Kansas State University

DESCRIPTION: While some highway safety improvements have been achieved in certain categories, the number and percentage of motorcycle crashes have increased significantly in the United States. Accordingly, it is necessary to focus attention on the topic of how to improve the safety of motorcyclists; this study proposes to analyze crash data related to motorcyclists in order to identify problem areas and issues. In addition, relationships between helmet usage and motorcycle safety will be established.



BENEFITS: Based on the findings of the project, areas requiring more attention in terms of improving motorcycle safety will be identified and ideas for mitigation measures will be developed.



Assessing the Damage Potential in Pretensioned Bridges Caused by Increased Truck Loads Due to Freight Movements (Phase 2)

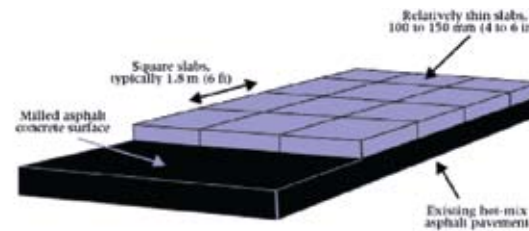
PI: Dr. Robert Peterman, Professor, Civil Engineering, Kansas State University

DESCRIPTION: This research is aimed at determining the existing stresses in a concrete member. The first step is to image the concrete in its in-situ stressed condition at a desired location, and then cut around the imaged area using a diamond core bit to a depth of approximately one inch. The result will be a "re-bounding" of most of the elastic strain carried by the concrete member at that point. By re-imaging the point after penetration by the core drill, the change in surface strain can be determined, and thus also an estimate of the initial internal stress. Phase 2 extends the work to pretensioned members with multiple bonded tendons.

BENEFITS: One of the most attractive features of this new measurement technique is that there is typically no surface preparation required. The reflective properties of the member's surface serve as a "fingerprint" of the unique location. Thus, an engineer or technician can begin taking initial baseline measurements within minutes after arriving at a bridge site.

Extending Asphalt Pavement Life Using Thin Whitetopping

PI: Dr. Mustaque Hossain, Professor, Civil Engineering, Kansas State University



DESCRIPTION: Thin white topping (TWT) can be a cost-effective measure that extends the life of existing asphalt pavements. This project is aimed at calibrating the TWT design method developed by the Colorado Department of Transportation using data from an experiment conducted under the accelerated pavement testing (APT) program at Kansas State University.

BENEFITS: The project is expected to produce recommendations regarding design of TWT for high truck traffic routes. The optimal design for a given existing AC pavement condition and truck traffic volume also will be identified.



Missouri University of Science & Technology Projects

Validation of the Mechanical Models of Asphalt Pavement Structures with Field Measured Data Associated with Increasing Freight Movements

PI: Dr. Yu-Ning Ge, Assistant Professor, Civil, Architectural and Environmental Engineering, Missouri University of Science & Technology

Co-PI: Dr. Genda Chen, Professor, Civil, Architectural and Environmental Engineering, Missouri University of Science & Technology

DESCRIPTION: This proposed study is aimed at better understanding the effects of heavy trucks on the performance of asphalt pavements. Sufficient field performance data will be collected in this study. The data will be used to validate the Mechanistic Empirical Pavement Design Guide (MEPDG) and the finite element method (FEM) in terms of the impact of heavy truck loading on pavement performance.

BENEFITS: The project will provide a better understanding of the effects of heavy truck loads on the overall structural performance and life of pavements, and by identifying further research issues, will allow for more appropriate implementation of the MEPDG into pavement designs. The potential development of a damage detection method could be an additional benefit of this research.



DESCRIPTION: Work-zone safety is of paramount importance for both drivers and workers, and vehicle speeds are directly proportional to such safety. At flagger-controlled work zones, approaching vehicles that fail to stop can result in severe crashes if a stationary queue is present. If the oncoming vehicle is a large truck, such a crash could involve many more vehicles. Consequently, alerting truck drivers at these locations can improve safety. This study will evaluate the potential of using temporary reusable rumble strip units to improve worker and driver safety at short-term work zones, particularly flagger-operated work zones that may result in unexpected queuing.

BENEFITS: The rumble strip unit could be an effective method of alerting drivers that they are approaching the work zone, and if so, will result in improved safety at flagger-controlled work zones.



Closed Course Testing of Portable Rumble Strips to Improve Truck Safety at Work Zones

PI: Dr. Steven Schrock, Assistant Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

Co-PI: Dr. Yong Bai, Assistant Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

Estimating Highway Pavement Damage Costs Attributed to Truck Traffic

PI: Dr. Yong Bai, Assistant Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

Co-PI's: Dr. Thomas Mulinazzi, Professor, Civil, Environmental, and Architectural Engineering; Dr. Steven Schrock, Assistant Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

2009 MATC Research Projects

DESCRIPTION: Previous studies have found that trucks place heavy loads on highway pavement, which lead to significant road damage, thereby resulting in increased highway maintenance costs nationwide. The primary objective of this research is to estimate the highway pavement damage costs attributed to truck (i.e., tractor-trailers) traffic.

to roadway segments, and to develop a framework for improving wind-related warnings to truck drivers for the forthcoming ITS system. Additional research will be conducted in order to differentiate at-risk vehicles based on profile and weight.

BENEFITS: The benefits of this research include improving safety for motor carriers on highways in Kansas, and subsequently the safety for other vehicles sharing the road with motor carriers. With a decrease in wind-induced crashes, the disruption in interstate commerce that costs stakeholders lost productivity and revenue also will decrease.



BENEFITS: Results of the study will be used to select cost-effective transportation modes for shipping goods and products, to better assess highway maintenance needs, to set up maintenance priorities, and to determine reasonable user costs.

Mitigating Wind-induced Truck Crashes

PI: Dr. Thomas Mulinazzi, Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

Co-PI: Dr. Steven Schrock, Assistant Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

DESCRIPTION: The objective for this research is to increase the safety of motor carriers traveling across Kansas by reducing the likelihood of a wind-induced crash. The work will be done in concert with the Kansas Department of Transportation, the National Weather Service, and the Kansas Highway Patrol, among other stakeholders, to identify high-risk corridors and subsequently to enable the correlation of wind advisories



University of Iowa Projects

Improving Freight Fire Safety: Analysis and Testing of Real Engine Conditions to Advance Development of Mist-controlling Additives for Fire Mitigation

PI: Dr. Albert Ratner, Assistant Professor, Mechanical and Industrial Engineering, University of Iowa

DESCRIPTION: Previous research has found that mist-controlling agents appear to reduce the danger posed by fuel fires for diesel-engine-based ground transportation vehicles, and this proposal will endeavor to establish the actual fluid shear rates that occur in various phases of the diesel vehicle fuel system, and relate these data to liquid



drop test conditions that are the primary focus of laboratory work. There are three key regimes that will be examined, including normal flow and pumping (low shear), accident-induced fuel release (medium shear), and engine injection (high shear). This research intends to establish values for the various fuel systems and for the range of diesel formulations.

BENEFITS: The goal is to establish a framework and identify fluid shear-stress regimes that will enable the development of polymer additives that provide mist-control while being otherwise transparent to diesel fuel supply and to engine operation.

MATC-Funded Research Projects Fiscal Year 2008

University of Nebraska Projects

Safety Investigation and Guidance for Work-Zone Devices in Freight Transportation Systems Subjected to Passenger Car and Truck Impacts with New Crash Standards

PI: Dr. Ronald Faller

Co-PI's: Karla Lechtenberg, James Holloway

Foundation Design for High Tension Cable Guardrails

PI: Dr. John Rhode

Co-PI's: Dr. Ronald Faller, Karla Lechtenberg, James Holloway

Investigating RFID for Roadside Identification Involving Freight Commercial Vehicle Operators (CVO)

PI: Dr. Erick Jones

Co-PI: Dr. Judy Perkins

Impact of Trucks on Signalized Intersections

PI: Dr. Elizabeth Jones

Investigation of Factors Associated with Truck Crashes Related to Skid Resistance in Region VII.

PI: Dr. Aemal Khattak

Kansas State University Projects

Assessing the Damage Potential in Pretensioned Bridges Caused by Increased Truck Loads Due to Freight Movements (Phase 1)

PI: Dr. Robert Peterman

Characteristics and Contributory Causes Related to Large Truck Crashes (Phase I)

PI: Dr. Sunanda Dissanayake

Extending Pavement Life Using Thin Surfacing to Counter the Effect of Increased Truck Traffic Due to Freight Movements on Highways

PI: Dr. Mustaque Hossain

University of Kansas Projects

A Preliminary Appraisal of the Safety and Operational Effects on the Regional Transportation System Created by New Rail-Truck Intermodal Facilities

PI: Dr. Thomas Mulinazzi

Co-PI: Dr. Steven Schrock

Feasibility of Using Cellular Telephone Data to Determine the Truckshed of Rail-Truck Intermodal Facilities

PI: Dr. Steven Schrock

Co-PI: Dr. Tom Mulinazzi

Missouri University of Science & Technology Projects

Pilot Study on Rugged Fiber Optic Brillouin Sensors for Large Strain Measurements to Ensure the Safety of Transportation Structures

PI: Dr. Genda Chen

Co-PI: Dr. Hai Xiao

Impact of Trucks in the Development of Work Zone Capacity Guidelines

PI: Dr. Ghulam Bham

Co-PI: Dr. Praveen Edara

Safer Work Zones for Heavy and Light Weight Vehicles: Speed Limit Up or Speed Limit Down

PI: Dr. Ghulam Bham

Co-PI: Dr. Praveen Edara

Improving Work Zone Safety for Freight Vehicles: Effective Design Patterns for Vehicle Mounted Attenuators

PI: Dr. Ghulam Bham

Co-PI: Dr. Praveen Edara

A Framework for the Nationwide Multimode Transportation Demand Analysis

PI: Dr. Hojong Baik

University of Iowa Projects

Improving Freight Fire Safety: Assessment of the Effectiveness of Mist-controlling Additives in Mitigating Crash-induced Diesel Fires

PI: Dr. Albert Ratner

Performance Measures of Warm Asphalt Mixtures for Safe and Reliable Freight Transportation

PI: Dr. Hossin Lee

Safety Climate of Commercial Vehicle Operation

PI: Dr. Linda Boyle

MATC Advisory Board Members



Mr. E. Dean Carlson
Former Executive Director, FHWA; Former Secretary of Transportation, Kansas



Mr. Dan Murray
Vice President, Research, American Transportation Research Institute



Mr. Ed Trout
Chairman, American Trucking Association; President, Cornhusker Trucking, Cornhusker Motor Lines, Omaha



New MATC Board Members



Mr. John Craig
Director
Nebraska Department of Roads



Since 1999, John Craig has been the director of the Nebraska Department of Roads, which is the surface transportation agency responsible for highway, rail, public transportation and other programs throughout Nebraska.

He is on the board of directors of the American Association of State Highway and Transportation Officials (AASHTO) and chair of the Nebraska Railway Council. He is a past member of the Executive Committee of the Transportation Research Board, National Academies.

Craig previously served 24 years as a commissioned officer in the U.S. Army Corps of Engineers with assignments in the continental United States, Alaska, Korea and Europe.

He has bachelor of science and master of science degrees from Central Missouri State University and a master of science degree from the University of Alaska.



Mr. Richard Reiser
Executive Vice President and General Counsel
Werner Enterprises, Inc.



Dick Reiser is executive vice-president and general counsel of Werner Enterprises, Inc., an Omaha-based motor-carrier and logistics company that provides trucking service in 48 states. Dick is responsible for managing all of the legal, regulatory, and legislative affairs of Werner Enterprises, which include all general transportation and corporate legal matters.

As a transportation expert, Reiser serves as Chairman of the Transportation Council of the Greater Omaha Chamber of Commerce, Nebraska State Highway Commissioner for District 2, Vice-Chairman of the Litigation Center Board of Directors for the American Trucking Association, and Member of the ATA's Board of Directors. Recently, Reiser also agreed to serve on the Board of Trustees of the Greater Omaha Alliance for Business Ethics.

Reiser's educational background includes a bachelor of science degree in business administration from the University of Nebraska-Lincoln (1968) and a juris doctorate degree from the University of Nebraska (1972). Prior to joining Werner Enterprises, he was in private practice in Omaha, Nebraska from 1972 through 1993. He is admitted to practice law in Iowa, Nebraska, the U.S. District Court for the District of Nebraska, and the U.S. Circuit Court of Appeals for the 8th Circuit.



Mr. David Connell
Vice President, Engineering, Union Pacific Railroad



Dr. Judy Perkins
Chair and Department Head, Department of Civil and Environmental Engineering, Prairie View A&M University



Mr. Robert VanderClute
Senior Vice President, Safety and Operations, Association of American Railroads



Association of American Railroads



Mr. Michael Flanigan
Director, Office of Technology, Office of Research, Demonstration and Innovation, Federal Transit Administration



Mr. David Sehrt
Senior Vice President, Ingram Barge Lines



Mr. Joseph Werning
Division Administrator, Nebraska Division, Federal Highway Administration



Dr. Ray Krammes
Technical Director, Research and Development, Turner-Fairbank Highway Research Center



Mr. Mark Stiles
Senior Vice President, Trinity Industries Inc.



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MID-AMERICA
TRANSPORTATION CENTER

IMPROVING SAFETY AND MINIMIZING RISK ASSOCIATED WITH INCREASING MULTI-MODAL FREIGHT MOVEMENTS

Associate Directors



Dr. Elizabeth G. Jones
Associate Professor, Civil Engineering;
Associate Director, Mid-America
Transportation Center, University of
Nebraska-Lincoln

Dr. Elizabeth "Libby" Jones is an associate professor in the Department of Civil Engineering at the University of Nebraska-Lincoln (Omaha campus). She directs and oversees the MATC Intelligent Transportation Systems Lab at the University of Nebraska's Peter Kiewit Institute. Dr. Jones has been a principal



investigator or co-principal investigator on more than 15 research projects. She has authored or co-authored 18 journal papers and served as committee chair for 18 masters' students. Currently she is supervising five masters' students and one Ph.D. student. Dr. Jones will serve as the MATC Associate Director for UNL.



Dr. Mustaque Hossain
Professor, Civil Engineering
Associate Director, Mid-America
Transportation Center, Kansas State
University

Dr. Mustaque Hossain is a professor and the graduate program director in the Department of Civil Engineering at Kansas State University. His main areas of interest include the application of new technologies in construction, quality control/quality assurance, mechanistic analysis and design of pavements, non



destructive testing of pavements, and pavement and maintenance management systems. Dr. Hossain has conducted over 25 research projects, published over 40 peer-reviewed journal articles and has four patents related to his research. Dr. Hossain will serve as the MATC Associate Director for Kansas State University.



Dr. Genda Chen
Professor, Civil, Architectural and
Environmental Engineering
Associate Director, Mid-America
Transportation Center, Missouri
University of Science & Technology

Dr. Genda Chen is a professor in the Department of Civil, Architectural, and Environmental Engineering at the Missouri University of Science & Technology (formerly, University of Missouri-Rolla) and the interim director of the Center for Infrastructure Engineering Studies (CIES). He is a registered professional engineer in the state of California. Dr. Chen has been



principal investigator and co-principal investigator on over 40 research projects, totaling more than \$6 million for his teams and approximately \$2 million for his share. He has supervised 13 doctoral students and 11 masters' students, and has published over 35 peer-reviewed journal papers and an additional 100 conference papers. Dr. Chen will serve as the MATC Associate Director for the Missouri University of Science & Technology.



Dr. Paul Hanley
Assistant Professor, Civil and
Environmental Engineering and Public
Policy Center;
Associate Director, Mid-America
Transportation Center, University of
Iowa

Dr. Paul Hanley is an associate professor of transportation in civil and environmental engineering as well as in urban and regional planning at the University of Iowa. He also has an appointment at the University's



Public Policy Center, where he is the director of transportation policy research. His principal research interests are transportation engineering, planning, and economic policy analysis. In general, his work focuses on assessing the impacts of policy changes on transportation behavior and on infrastructure provision as a means of enhancing safety, ensuring economic welfare, and promoting sustainable urban patterns. He will serve as the MATC associate director for the University of Iowa.



Dr. Linda Boyle
Assistant Professor, Department of
Mechanical and Industrial Engineering
and Public Policy Center;
Associate Director, Mid-America
Transportation Center, University of
Iowa

Dr. Linda Boyle is an assistant professor in the Department of Mechanical and Industrial Engineering at the University of Iowa. She holds a PhD in civil and environmental engineering



and a MS in inter-engineering from the University of Washington. She is on the editorial board of the Accident Analysis and Prevention journal and is the recipient of the NSF Career Award. Her research area focuses on human factors and statistical modeling. She will serve as the MATC associate director for the University of Iowa.



Dr. Tom Mulinazzi
Professor, Civil, Environmental and
Architectural Engineering;
Associate Director, Mid-America
Transportation Center, University of
Kansas

Dr. Tom Mulinazzi is a professor and former department chair of civil engineering at the University of Kansas (KU). In 2000, he was named Engineer of the Year by the Kansas Society of Professional Engineers and received the Outstanding Faculty Award from the Order of Omega, a KU honor fraternity. Dr. Mulinazzi will serve as



the MATC associate director for the University of Kansas.