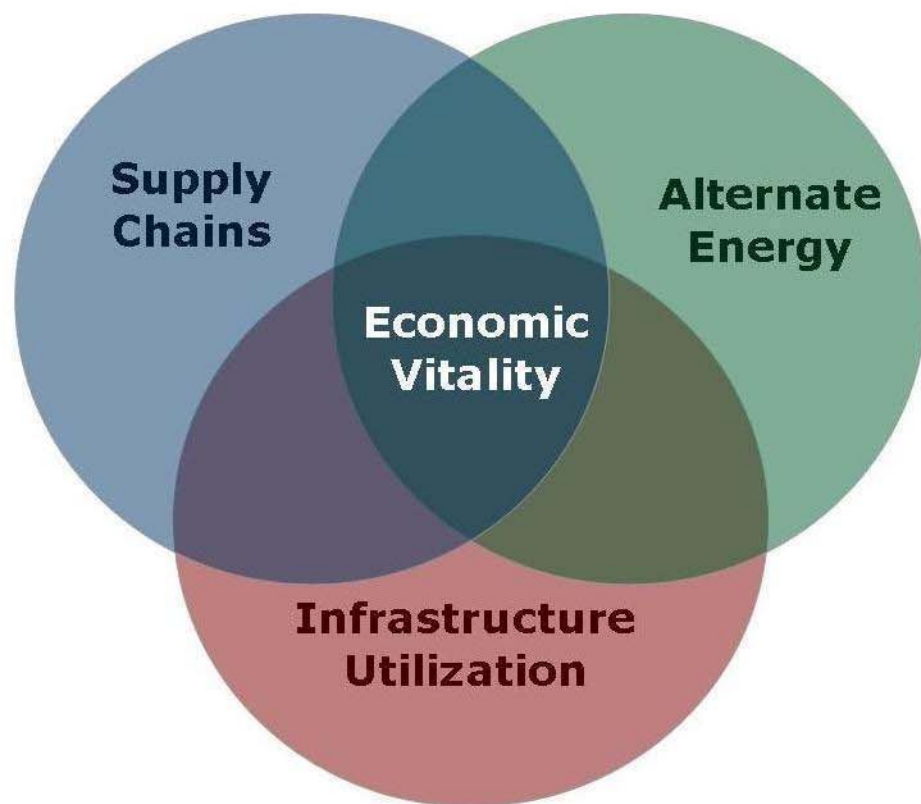




# **The University of Toledo University Transportation Center**



**Annual Report 2008-2009**

The University of Toledo University Transportation Center (UT-UTC) is funded by the U.S. Department of Transportation, RITA which paid for the development and printing of this document

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## Director's Message

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The sudden negative changes in the world economic environment have had a major impact on all aspects of our lives. Transportation and Logistics is unquestionably a proportionately large component of that economy and, therefore, can be a proportionately large component of economic solutions. The University of Toledo as an academic institution strongly believes that Transportation and Logistics is a key to driving the economic turnaround. So much so, that the trustees have identified Transportation and Logistics as one of the Centers of Excellence it intends to focus on.

At The University of Toledo Transportation Center we are concentrating our energies and strengths to implement initiatives and research that will enable us not only to overcome today's challenges, but allow us to build for the post-crisis era.

I am certain that the key to our future success will be agility. Agility to react to the opportunities and challenges these fast paced times may bring. Our research and involvement in the Transportation and Logistics community must keep agile. We at the UT-UTC are committed to providing solutions that lead to implementation and "customer satisfaction." This will always be the foundation of our reason for existing and I believe will create the pathway to our sustainability.

I want to thank everyone for their help and support this past year and look forward to your continuing support and encouragement in the years to come.

A handwritten signature in blue ink that reads "Richard S. Martinko". The signature is fluid and cursive.

Richard S. Martinko, P.E.  
Director  
University Transportation Center &  
Intermodal Transportation Institute



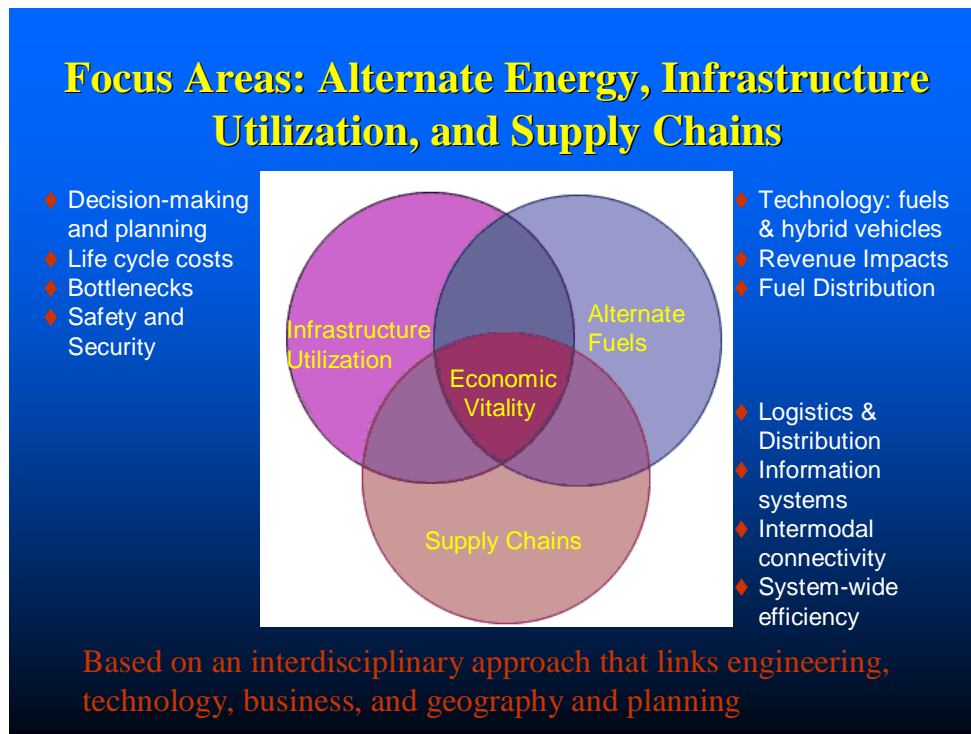


## CENTER THEME

The theme of The University of Toledo University Transportation Center is *Transportation for Economic Security and Development: Alternate Energy, Infrastructure Utilization, and Supply Chains*. Safe, secure, and efficient transportation systems are essential to the economic viability, quality of life, and strength of our nation. If the U.S. economy is to reach new heights, the transportation system must be capable of moving people and goods safely, quickly, and efficiently. This Center focuses on three critical elements in the transportation system: alternate energy for transportation, infrastructure utilization, and supply chain management. See Figure 1.

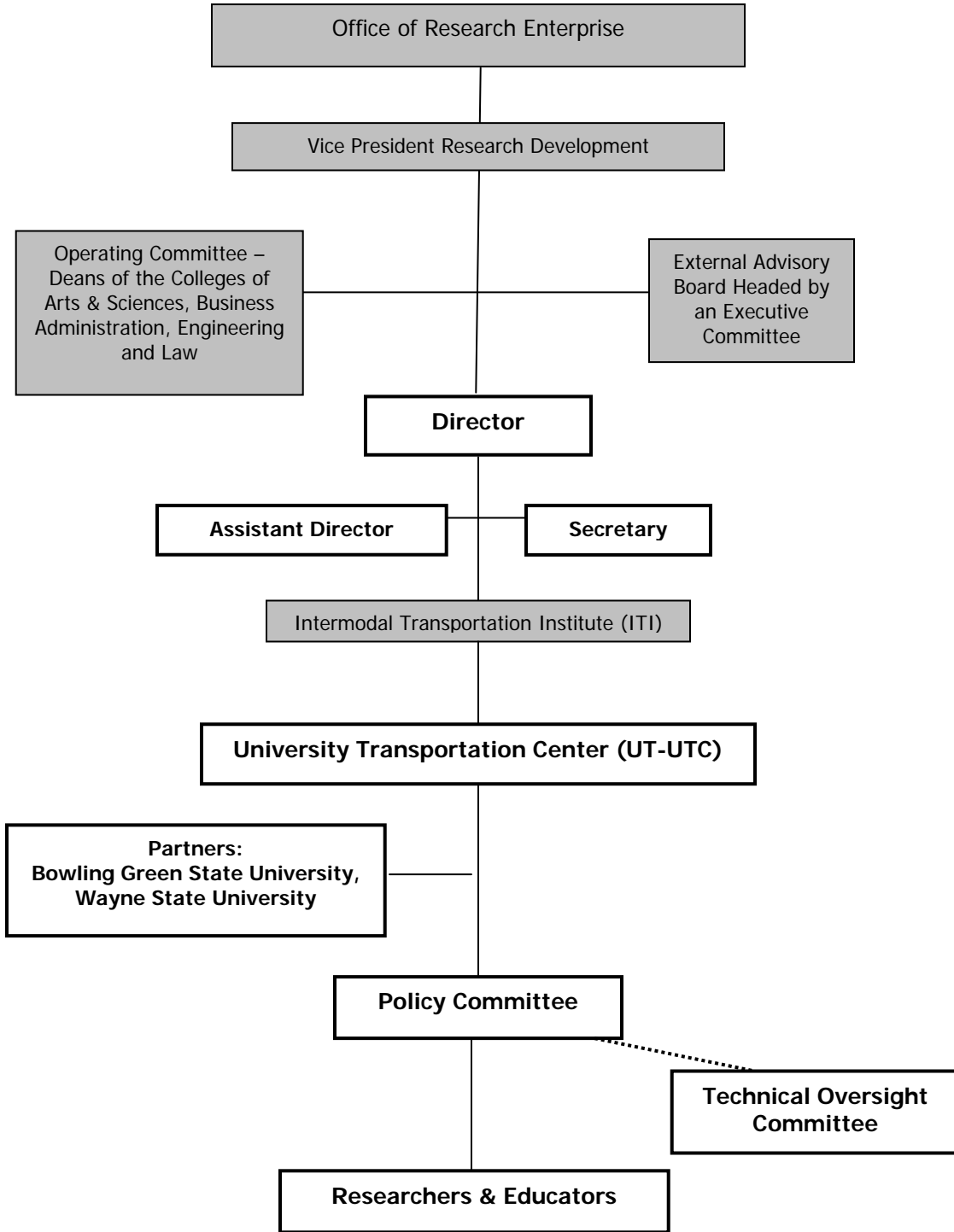
There is synergy between infrastructure utilization and supply chain management. One of the major problems in getting supply chains to work well is to streamline the flow of goods from suppliers to manufacturers and from manufacturers to wholesalers and retailers, and one of the largest obstacles in doing this is bottlenecks. So the application of information systems and transportation technology, as well as the development of intermodal solutions, are ways to improve infrastructure utilization and increase supply chain efficiency. The area of alternate energy is critical to transportation, and the University of Toledo is committed to alternate energy. In addition to our efforts as part of the UTC, there are significant efforts currently underway in the Department of Physics and the College of Engineering. UT is transforming its Scott Park Campus to a dedicated Campus of Energy and Innovation, the only university in the country to commit an entire campus to advancing renewable, alternative and sustainable energies.

**Figure 1: Overview of University of Toledo UT-UTC**



# MANAGEMENT STRUCTURE AND PRINCIPAL CENTER STAFF

## Organization Chart





## **Institutional Resources**

The UT-UTC is a consortium that is led by the University of Toledo with its partners, Bowling Green State University in Bowling Green, Ohio and Wayne State University in Detroit, Michigan. The consortium allows for a pooling of institutional resources that allow for a concentrated effort in addressing the critical problems facing our transportation system in the areas of alternate energy, infrastructure utilization, and supply chains. In this way, more can be accomplished in the areas of research, education, and technology transfer than working independently. These universities possess strong faculty and research facilities, have diverse interdisciplinary educational programs, and ample numbers of graduate students to make a positive difference in the transportation area.

### **Center Staff**

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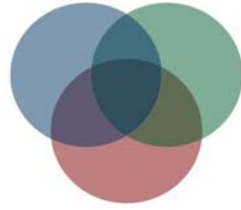
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## MEMBER UNIVERSITIES

### The University of Toledo – Lead University

The University of Toledo (UT) is a Carnegie Doctoral/Research-Extensive, state-supported university with an enrollment of approximately 20,700 undergraduate, graduate and professional students and more than 1,300 full time and part-time faculty members. The University of Toledo, a student-centered public metropolitan research university, integrates learning, discovery and engagement, enabling students to achieve their highest potential in an environment that embraces and celebrates human diversity, respect for individuals and freedom of expression. The University strives for excellence in its service to all constituents, and commits itself to the intellectual, cultural and economic development of our community, state, nation and the world.



UT offers more than 250 undergraduate, graduate and professional programs in the colleges of Arts & Science, Business Administration, Education, Engineering, Health and Human Services, Law, Medicine, Nursing, Pharmacy, and University College. On July 1, 2006, UT merged with the Medical University of Ohio, to form the third-largest public university operating budget in the state.

In January 2002, UT started the Intermodal Transportation Institute (ITI). The ITI is an interdisciplinary research, education, and outreach center. The vision for the ITI is to develop technology-enabled intermodal transportation systems and supply chains that promote economic development and quality of life. Its purpose is to work cooperatively with public and private sector partners in the fields of transportation, logistics, and supply chains to develop and implement ideas that increase safety, mobility, and access. The ITI actively seeks ways to work with its partners by providing research capabilities, educational programs, and planning and technical assistance. The ITI fosters collaborative efforts among faculty, staff, and students that contribute to learning and success, and it provides a convenient way for those outside UT to access University resources. The link between the University and the external community is an integral part of the ITI.

The ITI is currently working with organizations to investigate new transportation-related concepts and technologies and to assess current infrastructure capacity across the Midwest. It provides a vehicle to use resources from across the university in collaboration with government and private sector partners.

The ITI reports directly to the Office of Research Enterprise and is academically supported by the Colleges of Arts and Science, Business Administration, Engineering, and Law. This structure facilitates interdisciplinary programs and projects, and simplifies outreach and engagement with the community. The University of Toledo has undergraduate programs in Transportation Planning in Civil Engineering, in GIS and Transportation in Geography and Planning, and in Supply Chain Management in the College of Business Administration. The Civil Engineering Department has Masters and Ph.D. degrees in Transportation Planning. The Geography and Planning Department offers a Masters degree in GIS and Transportation. The College of Business currently has a Masters degree and a Doctoral degree in Manufacturing Management that include offerings in Supply Chain Management. A new Ph.D. in the Spatially Integrated Social Sciences with a transportation component will be offered in the coming academic year in the College of Arts and Sciences. There is active and on-going research in transportation planning and infrastructure utilization, supply chain management, and alternate energy; there are related programs in fuel cell design and development as well as hydrogen generation.

## Bowling Green State University - Partner

Bowling Green State University (BGSU) has a total enrollment of 20,300 students which includes 17,300 undergraduates. In 2005, BGSU achieved record overall enrollment as well as a record number of students with ACT scores of at least 30. With more than 200 undergraduate majors and programs, BGSU has been recognized by *U.S. News & World Report* for its first year programs and residential living/learning communities. Integral to campus life are the core values: respect, cooperation, intellectual and spiritual growth, creative imaginings, and pride in a job well done.



BGSU offers an outstanding educational experience. At BGSU, academic learning is paired with a campus wide commitment to values exploration which prepares graduates to be critical thinkers, skilled communicators, and ethical leaders in all areas of study. This vision uniquely distinguishes BGSU as a public university with a unified purpose.

The Supply Chain Management specialization, in the AACSB accredited College of Business Administration, is currently ranked 16<sup>th</sup> among U.S. schools according to the *U.S. News and World Report (2008)*. Seven full-time faculty members teach and do research in supply chain management. Beginning in Fall 2006, Dr. Hokey Min joined the faculty as the James R. Good Chair in Global Supply Chain Strategy. Dr. Min has developed an international reputation for his research in transportation and logistics.

In 2000, the College of Business Administration established the Supply Chain Management Institute (SCMI); Dr. Amelia Carr is the Director. The mission of the SCMI is to support excellence in supply chain education and practice by forging collaborative partnerships with supply chain professionals. Currently there are 15 member companies in the SCMI: BP, Bechtel Power Corporation, Bendix, Deere & Company, Eli Lilly, Emerson Climate Control, HP, GlaxoSmithKline, Honda of America Manufacturing, Lowes, Marathon, Nordson Corporation, Owens Corning, Parker Hannifin, and SAIC.

In 1993, the College of Technology established the Electric Vehicle Institute with the mission to develop and promote advanced electric propulsion technology and transfer the technologies to appropriate corporations and public agencies for production and implementation.

## Wayne State University - Partner

Wayne State University (WSU) is an urban university located in the heart of the City of Detroit, Michigan. The mission of the University, supported by the taxpayers of Michigan, is to "discover, examine, transmit and apply knowledge that contributes to the positive development and well-being of individuals, organizations and society." Through its research, teaching, and services, it endeavors to engage in a wide range of activities with the local communities. WSU's current enrollment of approximately 30,000 students includes more than 12,000 graduate students.



The College of Engineering offers programs leading to the Bachelor's, Master's, and Doctoral degrees in various branches of engineering. The College has been offering graduate programs (both at the Master's and Ph.D. level) in Transportation, housed in the Department of Civil Engineering, for more

than 30 years. A full breadth of transportation courses including traffic operation, highway safety, highway design, highway bridges, pavements, planning, and economics is offered through the Department. Students have the option of selecting their minor cognate from other programs including Urban Planning, Business, Industrial Engineering, Mathematics and Education. Transportation graduates of WSU are employed in various sectors including universities, state DOT's, USDOT, TRB, local and county governments and private corporations.

Transportation research in the Department of Civil Engineering has been supported by various agencies including the USDOT, Michigan Department of Transportation (MDOT), National Research Council, Michigan Office of Highway Safety Planning and others. The amount of research funding in transportation during the last five years exceeds \$4 million. Faculty members regularly publish their work along with their graduate students in refereed journals including those of the American Society of Civil Engineering, Transportation Research Board and the Institute of Transportation Engineers. They also actively participate in professional societies/committee activities, and present their research findings at national and international conferences. Research projects conducted under the transportation program encompass such diverse areas as traffic engineering and control, transit asset management, highway safety, transit planning and operations, transportation economics, transit privatization, Intelligent Transportation Systems, highway materials, and bridges. The Department currently (Fall 2008) has six full-time faculty members including those in bridges and materials.

There are a number of other programs in the College of Engineering that are involved in Transportation. These are Bio-Engineering focusing on automotive safety, the Center for Automotive Research (CAR) focusing on automotive engines, and Supply Chain Management involving transportation logistics. Of the above three, the Bio-Engineering program is a department by itself, the CAR program is a part of Mechanical Engineering, and the Supply Chain Management is a part of the Industrial and Manufacturing Engineering Department. The College also has a new graduate (Masters' and Certificate) program in the area of Alternative Energy Technology (AET). The program is not housed in any particular department; rather it is offered under the larger umbrella of the College and faculty members from all departments participate in the program.

The College of Engineering at Wayne State University has been a participant of the UTC program in the past. It was a part of the consortium of The Great Lakes Center for Truck and Transit Research (GLCTTR) at the University of Michigan – Ann Arbor, the UTC in Region V during 1988-1999. As part of this program, WSU conducted research on the structural and safety implications of seat belts in transit vehicles, ways to improve the operation of wheelchair lifts on transit buses, procedures to assess benefits and disbenefits of traffic signal preemption, performance assessment of transit agencies, and incorporation of IVHS (later named ITS) in transit research. Many of these research projects were jointly supported by MDOT. A total of four faculty members and a number of graduate students participated in the research program. The above program resulted in a total of 15 journal publications (Transportation Research Record, American Society of Civil Engineers Transportation Engineering Journal). Additionally, a large number of papers were presented in national and international conferences and published in conference proceedings.

WSU also received research funding from the Midwest Regional University Transportation Center (MRUTC), University of Wisconsin - Madison, established under the UTC program in Region V during 1999-2005. Research conducted under this program has resulted in two journal papers, two in Conference Proceedings, and four national presentations. Besides being a participant in the current University of Toledo/UTC program, WSU also is a member of the five university consortium of the MIOH/UTC program at the University of Detroit - Mercy (UDM).



## OVERVIEW OF EDUCATION, RESEARCH, AND TECHNOLOGY TRANSFER PROGRAMS

The University Transportation Center at The University of Toledo began in the 2006/2007 academic year. The groundwork that was established in the first couple of years came together this year in new relationships and accomplishments. The hard work of the early formative efforts began paying off.

### Education

- Total budgets for education projects reached \$158,587 with \$74,501 in new and on-going projects and completed projects totaling \$84,086.
- UTC funded projects for the development of a Ph.D. program in Spatially Integrated Social Sciences will admit its first students fall semester 2009 and the co-op program in supply chain management moved to the feasibility phase.
- The UT-UTC became the first sponsor of the newly formed UT Solar Car Team.
- New relationships with primary/secondary schools were developed including the Toledo Maritime Academy and the Toledo Technology Academy.
- The third Student-of-the-Year was recognized in Washington at the CUTC banquet in January.

### Research

- Total budgets for research projects, including economic development related projects, reached \$1,350,933 with \$722,219 in new and on-going projects and completed projects totaling \$628,714.
- Five final reports on UT-UTC funded research projects were posted and disseminated; three more are pending completion.
- Five successful phase I projects moved to phase II.
- International research and education involvement in the International Network of Scholars and Educators moved beyond Toledo and Korea and on to India with plans for Spain.

### Technology Transfer

- Through numerous presentations, radio and TV interviews, and print media articles, the awareness of intermodal transportation caused it to become the hot topic of discussion in the region.
- With the significant involvement of the director, agreements were made and public/private funding secured for the \$12.4 million expansion of an intermodal yard in Toledo

### Nomination as a Center of Excellence

- The "Transportation and Logistics Center of Excellence," of which the UT-UTC is an integral part, was one of three programs submitted to the Chancellor of the Ohio Board of Regents by The University of Toledo for selection as a Center of Excellence in Ohio.

### Cooperative Activities

- University of Toledo researchers continued affiliations and partnerships with the Great Lakes Maritime Research Institute, CFIRE, and the Michigan-Ohio UTC .

## EDUCATION

### UT-UTC Student-of-the-Year Sarah Schafer



*Sarah, far right, receiving her Student of the Year certificate from Dr. Randy Machemehl, the current President of the Council of University Transportation Centers, with former Secretary of Transportation Mineta and US DOT Administrator Paul Brubaker*

Sarah Schafer, a Masters student in the Department of Geography and Planning, was the UT-UTC Student of the Year for 2008. She received her award at the 18<sup>th</sup> Annual Outstanding Student of the Year Awards banquet in Washington, D.C. in January.

The focus of her study is maritime and intermodal transportation freight flows. She has worked in a leadership position on several Great Lakes regional transportation projects that support the Great Lakes Maritime Information Delivery System project at The University of Toledo GISAG Center. This system is a data collection and exchange resource for public policy decision makers and regional stakeholders of maritime commerce to draw the

linkage between maritime freight movements and the regional economy. Part of her function on the project team is to meet with key leaders of maritime commerce to promote the use of this system.

In addition to receiving \$1000, Sarah's registration and expenses for attending the Transportation Research Board (TRB) conference which followed the banquet were paid by the UT-UTC. Sarah has an analytical business background and holds a BBA in Finance.

### Spatially Integrated Social Sciences Ph.D. To Begin; Supply Chain Management Co-op Program Moves Forward

Among the first projects funded by the new University Transportation Center at UT in May 2007 were "Incorporating Intermodal Transportation into the Spatially Integrated Social Sciences" and "Develop a Plan for Cooperative Education in Supply Chain Management at the Undergraduate Level." The Ph.D. program is being implemented this fall and the co-op program is moving forward.

The multidisciplinary Ph.D. in Spatially Integrated Social Sciences (SISS) was approved by the Ohio Board of Regents in September 2008 and will have the initial five students start the program August 2009. As stated on the web site for the Center for SISS, <http://www.csiss.org/>:




**The CSISS Mission** recognizes the growing significance of space, spatiality, location, and place in social science research. It seeks to develop unrestricted access to tools and perspectives that will advance the spatial analytic capabilities of researchers throughout the social sciences. CSISS was funded in 1999 with support from the National Science Foundation under its program to promote research infrastructure in the social and behavioral sciences.

The new SISS program at UT is highlighted on a rolling banner of news on the site.

The cooperative effort involves the departments of geography and planning, economics, political science and public administration, and sociology and anthropology. Included in the curriculum is the course Spatial Transport Modeling and Planning described as “a specialized course dealing with the modeling and simulation of transportation systems and planning for future transportation facilities.” More information on the program can be found at <http://www.utoledo.edu/as/siss/index.html>

The UT-UTC funded project to develop a co-op undergraduate program in supply chain management was completed this year and has moved to the feasibility stage. Dr. James Pope, a professor in the Department of Information Operations Technology Management, has started visiting other universities who have active programs and talking to possible industry partners.

Ph.D. Program in Spatially Integrated Social Science



**Main Campus**  
University Hall  
[webmaster@utoledo.edu](mailto:webmaster@utoledo.edu)

*Locus enim est principum generationis rerum. (Roger Bacon)*

## UT-UTC Supports the New UT Solar Car Team to Rayce in 2010

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The North American Solar Challenge is a 2400 mile race from Dallas, Texas to Calgary, Alberta in a solar car that can go up to 65 miles per hour. The cars are built by students who raise the funding, design, test, transport, and rayce the cars. The University of Toledo did not have a team before Dr. Terry Bigioni, a faculty member in the department of chemistry,

decided UT, with its emphasis on solar photovoltaic research and first-class engineering college, was a natural for a team.

The mission of the Challenge includes the promotion of engineering creativity and fosters competition and teamwork. Students from many disciplines need to be involved including various aspects of engineering, physics, business, communications, and art and design. Additionally, the students need to work with volunteers from sponsor companies. It is truly an entrepreneurial activity. This interaction of academics, students and the business community was an attractive combination for the UT-UTC. With alternate energy one of the Center's focus areas, becoming an early sponsor of the team was a must.

The seed money provided by the UT-UTC enabled initial purchases of equipment and supplies. UTC staff has also helped the Team with administrative functions and, in the future, hopes to assist in the development of the necessary contacts in the transportation industry.



*UT:10, a student reported news program,  
featured the new UT Solar Car Team*

## Maritime Academy Students Expand Learning on UT-UTC Funded Field Trips

The Maritime Academy of Toledo is a publically funded, tuition-free charter school for grades 5 through 12 in Toledo, Ohio focusing on a maritime related education. Classmates are called cadets, wear uniforms, go to the mess hall for lunch and the brig for detention. Their classes have a marine related theme integrated into traditional subjects. This year the UT-UTC entered into an MOU to fund transportation for the field trips critical to engaging the students in real life hands-on learning.

Marine studies are logically of interest to a UTC located on one of the Great Lakes with one of the most diverse and productive seaports, but there is a more urgent element at play. There is a national maritime employment shortage and some industry analysts have suggested that the shortfall may reach 6,000 officers and 15,000 unlicensed crew within the next few years. The Department of Labor, MARAD, and other federal agencies are looking for ways to attract workers. One way of seeking future employees is through high school programs. The Toledo Maritime Academy of Toledo is one of 18 maritime themed schools whose focus is to prepare their students to enter maritime related jobs. They are one of only three in the country with grades 5 through 12. In July 2008, they were featured in an issue of *Workboat* magazine in the article "School Days: Maritime themed high schools may be a pipeline for future mariners."

[http://www.maritimeacademy.us/downloads/academic\\_programs/workboat.pdf](http://www.maritimeacademy.us/downloads/academic_programs/workboat.pdf)

As part of the association with TMA this year, the UT-UTC supported field trips that included visits to the Toledo Zoo for the student watershed watch; the Life Lab at Lourdes College, an interactive plant and animal laboratory; the Michindoh Outdoor Environmental School which combines life sciences with life skills; the Toledo Port Authority facilities as the final part of a class in the economics of the Great Lakes; and the Toledo Beach Marina where students worked real sailboats during 2.5 hour sails.

More exciting news is coming as TMA expands in the coming year. The UT-UTC again will support the transportation for field trips and will seek other ways in being involved in this dynamic educational opportunity for young future mariners.

Special thanks to Lt. Rick Brown of TMA for contributions to this article.



Worksheet from lessons on the economics of the Great Lakes which included a tour of the Port of Toledo



TMA students literally sailing the seas during a field trip to the Toledo Beach Marina/North Cape Yacht Club

## Alternative Energy Projects Funded for Toledo Technology Academy High School Students



Alt Energy Team

The Toledo Technology Academy already has an enviable track record in alternate energy, which is one of the focus areas of the UT-UTC. At TTA, the Alternative Energies Team is an extracurricular program that involves approximately 20% of the student body. The AET has investigated bio-fuels, solar energy, wind energy and hydrocarbons. They have developed projects using alternative energies to power test vehicles. The team has converted or built go-karts that are powered by propane, electricity, and E-85. They have produced a hybrid vehicle for the Toledo Zoo that is powered by electricity and propane with the intention to convert to bio-gas (methane generated from animal waste). The team has investigated bio-fuel production by experimenting with transesterification of vegetable oils and anaerobic digestion of elephant waste. Students have presented their karts at car shows and other public functions where they have explained the energy efficiency of hybrid vehicles and the different fuel source options for vehicles to the public. The TTA go-karts have been pace cars for several Junior Achievement Gran Prix races bringing attention to the different energy sources available.

This coming academic year TTA students will be tackling two more alternate energy projects. The UT-UTC has funded a senior "capstone" project which will convert cooking oil into biodiesel fuel including a "cracking" machine and a diesel engine and generator. The goal of the second project will be to improve the efficiency of the electric drive train of a golf cart, convert it into a solar/biodiesel/electric tribrid, and to improve the ability and capacity to produce biodiesel fuel.

The Toledo Technology Academy (TTA) is a four-year high school in the Toledo Public School system. It is a College Tech Prep School that provides high-level academics and a manufacturing engineering technology curriculum. Many students from surrounding suburban school districts, as well as private schools, attend TTA as their preferred educational choice. For more information on TTA and the alternate energy team, see <http://www.toledotechnologyacademy.org/AltEnergyTeam.htm>

Thanks to Ted Richardson of TTA for contributing to this article.



*Completed propane / electric hybrid vehicle  
built by the TTA Alternate Energy Team;  
the UT-UTC funded projects will build on this prior work*

## Funded Projects – New: Education

### UT Solar Car Team

#### *Focus Area: Alternate Energy*

**Abstract:** Through the newly formed student organization, UT Solar Car Team, bright motivated UT students will design, build and race a solar-powered car in the North American Solar Challenge. This is a 2400 mile race from Dallas, Texas to Calgary, Alberta to be held the summer of 2010. The mission of the Challenge is to “promote and celebrate educational excellence and engineering creativity. Fueled by the spirit of friendly competition and teamwork, the North American Solar Challenge (NASC) champions the creative integration of technical and scientific expertise across a range of exciting disciplines.”

The UT Team will consist of those studying a wide range of subjects including business, art, science, and engineering. Students from the College of Business will create a business plan and handle all business related activities including fund raising, marketing, public relations, accounting functions and the strategic plan for the race. Students from the Department of Art will design the exterior of the solar car. Engineering, physics and chemistry students will design the operating system. All involved will help in building and testing.

The University of Toledo with its top rated colleges in Engineering and Business and as a leader in the development of solar energy combines all of the elements that should make the UT Solar Car Team successful.

The UT-UTC grant will be the seed money to get the UT Solar Car Team project started.

#### **Principle Investigator:**

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**Project Dates:** 12/03/2008 – 4/30/2009; extended to 09/30/2010

**Project Awarded:** FY 2009

**UT-UTC Designation:** UTUTC-AE-3

#### **Funding:**

UT-UTC Grant Amount	\$14,400
Match Amount	\$14,400
Total Project Budget	Minimum \$28,800

## Funded Projects – Ongoing: Education

### Developing a Certificate Program in Transportation, Logistics, and Supply Chain Management

*Focus Area: Supply Chain Management*

**Abstract:** It is essential to train and educate professionals, who are responsible for managing and organizing transportation and logistics services. These services are vital to the success and continuing improvement of the supply chains that connect various industries to consumers both nationally and internationally. The program that is being developed is a nine credit hour certificate program to be offered initially by the University of Toledo and will carry with it college credit. As this program succeeds, it may be offered by other universities. The program will focus on basic concepts in managing and operating transportation and logistic systems such as dispatching, inventory, and scheduling. The efforts to develop the curriculum will be guided by private sector shippers and carriers as well as companies who support these carriers such as firms who provide insurance or equipment. This program is targeted at people who are currently working in transportation and logistics who are interested in furthering their education but are not prepared to begin a two-year or four-year degree program. The program will be offered in a distance learning format, so employees from around the region can continue working while making progress towards a management career in transportation and logistics. Because these courses are offered for college credit, they could become part of a plan to achieve an associate degree and eventually a bachelor's degree in the field.

#### Principle Investigator:

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**Project Dates:** 05/05/2008 – 12/31/2008; extended to 12/31/2009

**Project Awarded:** FY 2008

**UT-UTC Designation:** UTUTC-SC-5

#### Funding:

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UT-UTC Grant Amount	\$10,000
Match Amount	\$18,289
Total Project Budget	\$28,289

# Incorporating Intermodal Transportation into the Spatially Integrated Social Sciences

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## *Focus Area: Infrastructure Utilization*

**Abstract:** The purpose of this proposal is to request development funds to expand the role of intermodal transportation in the newly proposed Spatially Integrated Social Science Ph.D. Program to be administered jointly between the Departments of Geography and Planning, Economics, Political Science and Public Administration, and Sociology and Anthropology at The University of Toledo. The particular transportation-related areas of interest that the SISS program that complement the UT UTC will be in the areas of Transportation for National Security, Transportation and Regional Economic Development, Infrastructure Utilization, and the spatial dimensions of Supply Chains. Each of these topics readily lend themselves to the faculty expertise, the available geospatial technology, and the regional economic needs of northwest Ohio. Furthermore, the SISS faculty will focus on the movement of people among all modes of the transportation system and in the conflicts that arise between the movement of freight and the movement of passengers. Specific areas of transportation research and teaching will include: 1) Transportation and urban form; 2) Transportation, Public Administration and Policy; 3) Transportation Analysis and Quantitative Methods; 4) Intermodal Transportation—Passenger and Freight; 5) Infrastructure Utilization and Planning; and 6) Transportation and the Environment. It is anticipated that transportation and all of its spatial dimensions will play a pivotal role in this program and will attract students with an interest in combining an analytical approach to studying transportation, but from a perspective that appreciates the contribution of diverse social science disciplines to understanding this important spatial process.

### **Principle Investigator:**

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### **Co-Principal Investigators:**

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Assistant Professor, Department of Geography and Planning  
The University of Toledo

**Project Dates:** 05/03/2007 – 06/30/2009; extended to 08/31/2009

**Project Awarded:** FY 2007

**UT-UTC Designation:** UTUTC-IU-3

### **Funding:**

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UT-UTC Grant Amount	\$8,706
Match Amount	\$8,706
Total Project Budget	\$17,412

## Funded Projects – Completed: Education

### Development of a Secondary Level Education Program in Transportation, Logistics, and Supply Chain Management

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*Principle Investigator:*

*Doug Greiner*

Department of Applied Organizational Technology

College of Business Administration, The University of Toledo

*Project Dates:* 05/05/2008 – 04/30/2009

*Project Awarded:* FY 2008

*Final report:* Pending

*Web site:* <http://www.utoledo.edu/research/ututc/researchprojects/UTUTC-SC-6.html>

### Develop a Plan for Cooperative Education in Supply Chain Management at the Undergraduate Level

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*Principle Investigator:*

Mark Vonderembse, Ph.D.

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College of Business Administration, The University of Toledo

*Project Dates:* 09/01/2007 – 08/31/2008

*Project Awarded:* FY 2007

*Final Report:* <http://www.utoledo.edu/research/ututc/docs/Coop-Final-Report.pdf>

### Global Supply Chain Management/Transportation Efficiency Systems Graduate Degree Program

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*Principle Investigator:*

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*Project Dates:* 05/08/2007 – 12/31/2007

*Project Awarded:* FY 2007

*Web site:* <http://www.utoledo.edu/research/ututc/researchprojects/UTUTC-SC-3.html>



## Research

### The International Network of Scholars and Educators: Symposium and Workshops Go Around the World

#### 3<sup>rd</sup> Symposium – Coimbatore, India



*Dr. Paul Hong, PI of the International Network of Scholars UT-UTC project, gives opening remarks at the Coimbatore Symposium*

The International Network of Scholars and Educators, a project funded by the UT-UTC, continued to gather academics and students from around the world to share their research and build collaborative relationships. The first International Symposium and Workshop on Global Supply Chain, Intermodal Transportation and Logistics was held on the campus of The University of Toledo October 2007, the second in Busan, Korea in May 2008.

January 6<sup>th</sup> and 7<sup>th</sup>, 2009, the 3<sup>rd</sup> International Symposium was held in Coimbatore, India. The meeting was sponsored by PSG Institute of Management (India), The College of Business Administration at The University of Toledo (USA), and Instituto de Empresa (Spain).

Each international symposium has shown growth:

	1 <sup>st</sup> Symposium (University of Toledo 2007)	2 <sup>nd</sup> Symposium (Pusan University, Korea 2008)	3 <sup>rd</sup> Symposium (Coimbatore, India 2009)
# of Papers Submitted and Presented	20	30	43
Attendees	70	100	200

The meeting in Coimbatore brought together faculty from more than twenty universities in six different countries (USA, India, Korea, Japan, Sri Lanka, Spain) to discuss research ideas, to build research partnerships, and to identify specific actions that will allow us to work together. The objectives of the meeting were to identify best practices in global supply chain management, to continue to build a global network of universities to study supply chain management, and to develop education and training programs through faculty and student exchanges, cooperative research projects, and joint program development.

The following specific actions were identified as the results of this conference.

1. Publication two special journal issues (International Journal of Logistics and Systems Management and International Journal of Services and Operations Management). Drs. Mark Vonderembse, Paul Hong and Udayan Nandkeolyar of The University of Toledo College of Business Administration are guest editors for these two special journal issues.
2. Publish working papers based on the full papers presented at the conference.
3. Faculty from Waseda University, PSG Institute of Management, Instituto de Empresa will work together to exchange research ideas and skills and to help faculty publish in top journals.
4. In August and September 2008, Dr. Youngwon Park from Waseda University of Japan and Dr. Soon W Hong from Youngdong University of Korea spent three man-months on cooperative research initiatives.
5. Dr. Paul Hong, PI of the International Network of Scholars UT-UTC project, planned visits to Waseda University and University of Tokyo, Japan to give seminars and collaborate with Dr. Youngwon Park of Waseda University.
6. Opportunities for student exchange developed. This was discussed specifically with Instituto de Empresa, Spain, PSG Institute of Management, India and Waseda University, Japan. (The University of Toledo currently has such an arrangement with PSG Institute of Management in Coimbatore, India.)



## 4<sup>th</sup> Symposium – Madrid, Spain



The fourth Supply Chain Management Symposium and Workshop will be held in Madrid, Spain September 23<sup>rd</sup> and 24<sup>th</sup>, 2010 on the campus of Instituto de Empresa. This fourth conference is being organized by Instituto de Empresa (IE) Business School, Madrid, Spain; The University of Toledo, Toledo, USA; PSGIM, Coimbatore, India; University of Tokyo, Tokyo, Japan; Pusan University, Pusan, Korea.

Again the symposium will provide a platform for professionals, practitioners, academics, educators and researchers in the field of Supply Chain Management and related issues to disseminate and share

the latest research, knowledge and experiences in the field. However, the focus will change to address current world circumstances.

Increasingly during the last couple of years firms are experiencing the impacts of economic crisis on a massive scale all around the world. These global economic conditions have resulted in recessions, downsizing, loss of jobs which have created greater challenges for global supply chains. The theme of the Madrid conference focuses on addressing these challenges as well as opportunities for supply chain management in these turbulent times.

The organizers are inviting scholars and practitioners to submit papers for inclusion in the conference proceedings. Topics of interests in management and business include, but are not limited to, the following issues:

- Supply chains in the current economic crisis
- Emerging supply chain practices in turbulent times
- Evolution of supply chains
- Global networks and/or proximity networks
- Effective cost management in the supply chains
- Coordination of functional strategies for supply chain effectiveness
- Best supply chain practices from emerging economies
- The role of small and modicum enterprises (SMEs) in global supply chains
- Socio-political issues in supply chain management
- Technological challenges in global supply chains
- Trends in global logistics
- Role of governments in global supply chains
- Product lifecycle management for supply chains
- Implementation of green supply chains

Contributions to the symposium and workshop are invited in the following categories: refereed research papers, non-refereed extended research abstracts (up to 1,000 words), workshops and panel discussions on education, training and outreach activities on the theme of the symposium. All submitted papers, extended abstracts, and proposals will be published as proceedings available in CD-ROM format. Additionally, full research papers will be refereed with the best papers considered for

publication in special journal issues. Awards will be given for the Best Conference Paper and Best Student Paper. Abstracts and full papers must be received by January 31, 2010; panel and workshop proposals by May 1, 2010.

Participation without paper presentation is also welcome.

Thanks to Dr. Paul Hong for contributing to this article.

## Freight Study Grows into Multifaceted Data Resource

Dr. Peter Lindquist never realized what he was getting into when he started work on the Upper Midwest Freight Corridor Study. Initially he was responsible for analysis of the freight transportation system's capacity in the Interstate 80/90/94 corridor. The study area included the Great Lakes among its assets. Once his work was finished, it was suggested that the data could be part of a bigger data system. From that beginning it has grown into "Pete's baby." With additional funding from the Great Lakes Maritime Research Institute (GLMRI), CFIRE (the national UTC at the University of Wisconsin – Madison), the UT-UTC and contracts with the US Army Corps of Engineers, a major data resource has emerged. It took three years to build the architecture and develop the system. A multidisciplinary effort, faculty from political science, economics, math, business administration, as well as geography and planning joined in the work. The results:

### The Great Lakes Maritime Information Delivery System (<http://www.maritime.utoledo.edu/>)

This web page currently provides information for ports, government agencies, trade associations, and other resources dealing with maritime commerce in the great lakes. Eventually the site will be expanded to include research findings, an atlas of maritime commerce, summary statistics and other features requested by users. In addition, the web page provides access to the GIS *DataViewer* managed at the Toledo web server.

The screenshot shows the homepage of the Great Lakes Maritime Research Information Clearinghouse. The header includes the logo for the Great Lakes Maritime Research Institute and The University of Toledo. A navigation bar contains tabs for Home, Overview, Resources, Atlas, Data, Ports, Docks, and Contact. The main content area is divided into several sections: a welcome message, a description of the clearinghouse's mission, a photo of a ship, a login form for updating docks, project sponsors, additional links, and a data viewer section. The data viewer section includes a link to the Data Viewer and a user's guide.

**Midwest FreightView** is a customized GIS based system available only by password. It includes census, transportation networks and economic data. It does not include any proprietary information.

**The Data Repository** contains all the data collected including proprietary information. It is available to academic departments and affiliates associated with the system.

Director Martinko was immediately enthusiastic about the data available through Dr. Lindquist's work. He recognized its potential as an integral part of the economic development activities of the ITI/UT-UTC. Funding was raised for Dr. Lindquist and his group to look at commodity flows through the Toledo region as an adjunct to an economic impact study focusing on the proposed expansion of the Airline Junction intermodal railroad yard. The group not only supplied critical data but applied value added processing for a successful completion of the study.

To spread the word so others in the community can have access to and use the power of the information in the Great Lakes Maritime Information System and the Midwest FreightView, Dr. Lindquist and his staff made a presentation to the Toledo Lucas-County Port Authority Advisory Committee, the first among other presentations and workshops to be held in the coming year. (They also joined a technology transfer workshop in Kansas City with the national UTC, CFIRE.)

While work continues at the University on the development of the database as well as writing the supporting documentation, efforts are being made to gather sponsors to expand the resource even further. With everything in place, Pete says, "Now we're ready to really move." More to come next year.

(For a companion article see page 25.)

## Funded Projects – New: Research

### Reducing Noise and Vibration of Hydraulic Hybrid and Plug-In Hybrid Electric Vehicles – Phase II

#### *Focus Area: Alternate Energy*

**Abstract:** The University of Toledo University Transportation Center (UT-UTC) has identified hybrid vehicles as one of the three areas of the research. The activities proposed in this research proposal are directed towards the noise, vibration, and harshness (NVH) solutions for hybrid vehicles. The soaring fuel prices require imperious steps in developing alternate propulsion technologies. The design and development of hybrid vehicles is a critical issue for an economy dependent on an efficient, fast, and secure transportation system. To date, better fuel economy has been mainly achieved by combining two propulsion sources (hybridization) and/or by developing better managing algorithms for the internal combustion engines. Examples for the hybridization are the plug-in hybrid electric and the hydraulic-hybrid vehicles. An example of managing internal combustion engines is the cylinder on demand as a solution that Honda has recently introduced. One common problem with these solutions is excessive noise and vibration that is caused by switching between the propulsion sources and propulsion modes. To mitigate this problem there is a need to develop vibration isolation devices that can provide isolation over a wide range of frequencies. This proposal seeks to study the NVH problem of the hybrid vehicles and to introduce isolation mounts to overcome these issues.

Hydraulic and elastomeric mounts are generally used to dynamically isolating engines and power trains from the chassis, while statically holding these elements together. Hydraulic mounts overcome some of the drawback of the elastomeric mounts. The stiffness and damping of the hydraulic mounts vary with frequency and amplitude of vibration. It is possible to design a hydraulic mount that has a significantly larger static stiffness, compared to an elastomeric mount, and has a much smaller dynamic stiffness at a specific frequency. To achieve low vibration transmissibility, the mount can be tuned to the primary frequency of the vibration source. On the other hand, to isolate the high frequency vibration of the engine the mount should have low stiffness and low damping, which is not possible to achieve.

This proposal proposes to continue the development of a semi-active mount, which will be realized by improving the existing hydraulic mounts through adding a magnetorheological (MR) fluid element. In response to magnetic fields, MR fluids change their viscosity, which can be harnessed in a variable stiffness and damping mount. The resulting mount will provide shock and vibration isolation over a wide range of frequencies. This extended isolation frequency range will be achieved through the variable dynamic stiffness of the MR portion of the mount. This solution will make it possible to improve the noise and vibration characteristic of hybrid vehicles with alternative propulsion systems.

#### **Principle Investigator:**

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**Project Dates:** 08/01/2008 – 7/31/2009; extended to 12/31/2009

**Project Awarded:** FY 2009

**UT-UTC Designation:** UTUTC-AE-2

#### **Funding:**

UT-UTC Grant Amount	\$50,000
Match Amount	\$51,289
Total Project Budget	\$101,289

## Developing and Testing a Framework for Alternative Ownership, Tenure and Governance Strategies for the Proposed Detroit-Windsor River Crossing – Phase II

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### *Focus: Infrastructure Utilization*

**Abstract:** The United States and Canada share the largest trading relationship in the world, and currently account for approximately \$200 billion of annual surface trade between Southwestern Ontario and Southeastern Michigan. This figure is expected to reach \$300 billion by the year 2030. The Central Business Districts of the cities of Detroit and Windsor are currently connected by a bridge and a tunnel, both built during the late 1920s, that constitute the vital trade corridor between the two countries. The Ambassador Bridge (a four lane facility) is privately owned and operated, while the Detroit-Windsor Tunnel is a two-lane facility jointly owned by the two cities and operated by a private corporation.

During the last few years, a number of studies have been undertaken by the Michigan Department of Transportation and the Ontario Ministry of Transportation to investigate the need, location and type of a proposed third river crossing connecting the cities of Detroit and Windsor. These studies appear to indicate a strong need for such a river crossing, even though its exact location, access and type (tunnel, bridge, etc) are yet to be determined. Nor has any decision been made on the Ownership, Tenure and Governance (OTG) of the proposed crossing.

The purpose of this study is to develop an analytic framework that can be used to test alternative OTG scenarios for the proposed river crossing, including public, private and various joint ownership scenarios. The proposed framework will, among other things, incorporate the concept of “investment decision under uncertainty.” The estimates of the project costs and benefits (particularly those beyond the immediate future) are likely to be characterized by significant variances. The risks and uncertainties associated with these estimates will be incorporated in the proposed framework. The framework developed will be tested with data that may be available from different published reports and from the Michigan Department of Transportation.

The project is to be conducted in two phases. Phase I, which is currently nearing completion, is directed towards identifying different OTG strategies and developing a preliminary framework for analyzing different OTG strategies. Phase II (for which funding is being sought in this proposal) will be devoted to a more detailed testing of the framework with demographic, travel, toll and cost data relative to the local area and the bridge. This will be followed up with further “fine-tuning” the framework that may be deemed necessary following the testing.

### **Principle Investigator:**

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**Project Dates:** 08/01/2008 – 07/31/2009; extended to 12/31/2009

**Project Year:** FY 2009

**UT-UTC Designation:** UTUTC-IU-9

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### **Funding:**

UT-UTC Grant Amount	\$41,010
Match Amount	\$41,090
Total Project Budget	\$82,100

## Value of ITS Information for Congestion Avoidance in Inter-Modal Transportation Systems – Phase II

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### *Focus Area: Infrastructure Utilization*

**Abstract:** This research project addresses a major issue contributing to the transportation network efficiency that directly affects supply chain efficiency. The issue is the effect of congestion at inter-modal terminal facilities and road network incidents on the delivery reliability within inter-modal freight transportation networks. Non-recurring events on road network, such as incidents, as well as inter-modal terminal incidents (accidents, repair, construction, equipment breakdown, labor strikes, etc.) and peak period congestions (e.g., due to seasonal loads) at the inter-modal terminals are the major sources of delay in inter-modal transportation systems. Traditional methods such as capacity expansion with infrastructure investments (network and inter-modal terminals) or buffering methods (e.g., inventory, headways, surplus fleet capacity) prove to be expensive coping mechanisms. Alternative to these expensive and temporary coping mechanisms, Intelligent Transportation Systems (ITS) can provide real-time inter-modal network status information to the users who can then respond to avoid and/or reduce the impact of transportation delays. Specifically, we plan to evaluate the benefits to supply chain logistics from real-time information available through current and future ITS Systems to reduce congestion at both inter-modal freight terminals as well as road networks. More specifically, we will develop simulation and optimization models and algorithms to reduce the impact of and/or avoid congestion in inter-modal freight transportation for supply chain logistics efficiency. Next, will we implement these models validate their effectiveness in improving inter-modal delivery reliability of selected carriers (UPS and C.H. Robinson) and JIT supply chains (Ford inbound and outbound logistics). Finally, we will perform a selective cost/benefit analysis of utilizing real-time information from ITS systems for our collaborators.

### **Principle Investigator:**

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**Project Dates:** 08/15/2008 – 08/15/2009; extended to 12/31/2009

**Project Awarded:** FY 2009

**UT-UTC Designation:** UTUTC-UI-10

### **Funding:**

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UT-UTC Grant Amount	\$ 50,000
Match Amount	\$ 81,840
Total Project Budget	\$131,840



# Magnetic Sensor for Nondestructive Evaluation of Deteriorated Prestressing Strand

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## *Focus Area: Infrastructure Utilization*

**Abstract:** The objective of this project is to develop a prototype magnetic sensor that can reliably estimate the remaining cross sectional area of exposed or hidden corroded prestressing strands in a laboratory setting. The proposed sensor is based on the Hall effect.

Unexpected failure of prestressed concrete box beam bridges due to prestressing strand corrosion has occurred. To determine the remaining flexural capacity of a prestressed bridge, the engineer must know the useable cross sectional area of the strand. The corrosion of the exposed strands is manifest, but their useable area must be estimated. The state of the strands where there is no spalling is unknown. It is desirable to be able to estimate the area of these strands without removing their cover. Despite national studies, no effective nondestructive sensor technology has been identified.

Bridges with prestressing are widely used. In the northern states, 25% of total area of bridges is prestressed. The Ohio Department of Transportation (ODOT) has estimated that prestressed concrete box beam bridges represent approximately 10% of the bridge square footage in the Ohio bridge inventory.

Visual inspection is the method currently used to detect corrosion in prestressing strands in box beam bridges. Visual inspection is not adequate even when it is known a priori that the structure has extensive deteriorated strand. An accurate and convenient nondestructive inspection technique for detecting in-situ corrosion of prestressing strand, particularly in box beam bridges, would improve safety for the traveling public and assist in better maintenance planning.

The state-of-the-art in magnetic sensor capabilities has advanced to the point where design of a practical sensor can be undertaken with a reasonable prospect of success. The magnetic properties of rust are vastly different than the magnetic properties of uncorroded steel. Therefore, with a sensitive enough sensor and appropriate imaging techniques, the volume of uncorroded steel can be interfered from the magnetic properties of the specimen.

This research is an initial step on the road to the development of a practical magnetic sensor for in situ estimation of the cross sectional area of corroded prestressing strands. This sensor should be able to estimate the area of exposed or hidden corroded strands. Such a sensor would be immediately useful to inspect, rate and manage the inventory of precast box beam bridges and other prestressed bridge structures.

### **Principle Investigator:**

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**Project Dates:** 01/01/2009 – 06/30/2009; extended to 12/31/2009

**Project Awarded:** FY 2009

**UT-UTC Designation:** UTUTC-UI-10

### **Funding:**

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UT-UTC Grant Amount	\$ 33,568
Match Amount	\$ 52,094
Total Project Budget	\$ 85,662

## Global Supply Chain Management/Transportation: Building a Global Network of Scholars and Educators – Phase II

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### *Focus: Supply Chains*

**Abstract:** Research on Global Supply Chain Management/Transportation Efficiency Systems is critical to US competitiveness. Global Supply chain management integrates global information, material and, cash flow processes across all functions including sourcing, operations, return and recycling, and logistics and planning – for all partners. Supply chain system professionals are the agents of change for e-business, manufacturing, high-tech, service and consulting companies. Transportation system analysis and planning stress the conceptual and quantitative approaches to the analysis of transportation and related systems. The objectives are (1) to engage an international network of research collaboration to identify, analyze, and solve complex transportation and supply chain problems and to communicate those solutions to achieve successful implementation and (2) to develop education and training programs that meet the needs of transportation, logistics, and supply chain professionals around the world.

The planned activities are with researchers and educators from Africa, Asia, Australia, Europe, North America, and South America. The development of these programs depends on leveraging the diverse collaborative work that has been established with the International Manufacturing Strategic Survey (IMSS), Supply Chain Symposium, the MIOH UTC, the International Cargo Handling and Coordination Association (ICHCA) International Ltd, Great Lakes Maritime Research Institute (GLMRI) , the International Business Institute at The University of Toledo and The University of Toledo Manufacturing Management Alumni network.

During the stage I of the project, we successfully completed two international symposia and workshops on global supply chains, logistics and transportation. The work for building an international network of scholars and educators has been initiated in these two meetings. There has been great interest and enthusiasm shown for building such a network in these two conferences.

This proposal is seeking funding to continue the work by 1) holding the third symposium in Coimbatore, India (January 2009) and a fourth one in Spain (October 2009), and 2) plan for a fifth symposium in 2010 (possible candidates: Taiwan or Toledo) and 3) establish a research center by 2010.

### **Principle Investigator:**

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*Paul Hong, Ph.D.*  
Professor, Information Operations Technology Management  
College of Business Administration  
The University of Toledo

**Project Dates:** 08/01/2008 – 06/30/2010

**Project Year:** FY 2009

**UT-UTC Designation:** UTUTC-SC-8

### **Funding:**

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UT-UTC Grant Amount	\$ 53,505
Match Amount	\$ 53,491
Total Project Budget	\$ 106,540

## Funded Projects – Ongoing: Research

### A Novel Image Database Analysis System for Maintenance of Transportation Facility

*Focus Area: Infrastructure Utilization*

**Abstract:** Transportation is critical to the global economy and plays a particularly vital role in this region's economic growth. Transportation informatics is an emerging interdisciplinary area with focus on innovative use of information technologies for transportation purposes. The goal is to ensure safe and efficient movements of passengers and freights through speedy processing of complex information for on-time decision making.

A group of UT faculty members with diverse expertise related to transportation informatics have worked together to collaborate on research. Image analysis, pattern recognition and decision making for transportation applications have been identified as an area of common interest. Several members have been engaging in research using imaging technologies, including applications for transportation facility inspection purpose. The demands for automated inspection, monitoring, and pattern recognition for transportation applications are ever increasing, partly driven by homeland security concerns, while the costs of imaging technologies have becoming more affordable. Some technologies developed for military or medical applications could be suitable for civilian transportation used. The research group's vision is to develop a self-sustained, externally funded research area in transportation informatics at UT to develop a functioning prototype system to automatically process, store, analyze, and extract information from images for the purpose of inspection, monitoring, and detection of transportation facility.

#### Principle Investigator:

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**Project Dates:** 05/01/2008 – 04/30/2009; extended to 4/30/2010

**Project Awarded:** FY 2008

**UT-UTC Designation:** UTUTC-IU-5

#### Funding:

UT-UTC Grant Amount	\$12,000
Match Amount	\$16,124
Total Project Budget	\$28,124

## Regional Freight Information Resources in the Great Lakes Maritime Transportation System – Phase II

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*Focus Area:* Infrastructure Utilization

**Abstract:** The purpose of this proposed project is to expand the Great Lakes Maritime Information Delivery System's information gathering efforts to include AIS vessel tracking and to incorporate these data into the comprehensive maritime database. The Great Lakes Maritime Information Delivery System is a comprehensive data repository and information clearinghouse for the maritime industry in the Great Lakes and Seaway. The main objective for the system is to promote sustainable maritime transportation in the region by serving as an information resource for public policy decision making and for drawing the link between maritime freight movements, economic viability, and environmental quality throughout the region. The system is designed to be a diversified web-based information delivery site that houses a detailed data repository consisting of 1) vessel movements and commodity flows, 2) port and dock functions, 3) regional economic activity, and 4) regional population/socioeconomic patterns. One important element in this phase of the project will be to develop methods and techniques needed to acquire data through the Automatic Identification System (AIS), currently being developed in the GL MTS. The project team will work with third party data providers to obtain vessel movements and port calls down to the specific dock location. These data will then be aggregated into the system's data repository as a means to measure the volume of traffic and cargo flows through the system. In time, the project team can use these data to track trends in ship traffic, identify locations for intermodal connections to landside transportation networks, and to provide an important foundation for developing a Great Lakes Maritime Exchange for the system. This project will also enable the expansion of the information delivery system to provide data pertaining to the economic impact of great lakes shipping on the regional economy, linking the GL MTS to the wider regional intermodal freight system. Users can thus retrieve data concerning such factors as tonnages, value of cargo, scheduled service, ship technologies, dock and port facilities and intermodal connections.

### **Principle Investigator:**

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**Project Dates:** 05/01/2008 – 04/30/2009; extended to 9/30/2009

**Project Awarded:** FY 2008

**UT-UTC Designation:** UTUTC-IU-6

### **Funding:**

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UT-UTC Grant Amount	\$ 50,000
Match Amount	\$ 50,409
Total Project Budget	\$100,409

## Funded Projects – Completed: Research

### High Speed Transportation Corridor: A Conceptual Framework

*Focus Area:* Supply Chains

*Principle Investigator:*

Udayan Nandkeolyar, PH.D.

Associate Professor, Information Operations Technology Management

College of Business Administration, The University of Toledo

*Project Dates:* 05/01/2008 – 05/01/2009; extended to 6/30/2009

*Project Awarded:* FY 2008

*Final Report:* Pending

*Web site:* <http://www.utoledo.edu/research/ututc/researchprojects/UTUTC-SC-7.html>

### Combined Truck Routing and Driver Scheduling Problems Under Hours-of-Service Regulations

*Focus Area:* Supply Chains

*Principle Investigator:*

Hokey Min, Ph.D.

James R. Good Chair in Supply Chain Strategy,

Department of Management, College of Business Administration

Bowling Green State University

*Project Dates:* 07/01/2007 – 02/28/2009; extended to 5/31/2009

*Project Awarded:* FY 2007

*Final Report:* Pending

*Web site:* <http://www.utoledo.edu/research/ututc/researchprojects/UTUTC-SC-1.html>

### Travel Behavior of U.S. Domestic Airline Passengers and Its Impacts on Infrastructure Utilization

*Focus Area:* Infrastructure Utilization

*Principle Investigator:*

Bhuiyan M. Alam, Ph.D., M.ASCE

Assistant Professor, Department of Geography and Planning

The University of Toledo

*Project Dates:* 05/12/2008 – 05/11/2009

*Project Awarded:* FY 2008

*Final Report:* Pending

*Web site:* <http://www.utoledo.edu/research/ututc/researchprojects/UTUTC-IU-7.html>

## **Value of ITS Information for Congestion Avoidance in Inter-Modal Transportation Systems**

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*Focus Area:* Infrastructure Utilization

*Principle Investigator:*

Alper E. Murat, Ph.D.

Assistant Professor, Department of Industrial & Manufacturing Engineering  
Wayne State University

*Project Dates:* 08/14/2007 – 08/14/2008; extended to 12/31/2008

*Project Awarded:* FY 2008

*Final Report:*

[http://www.utoledo.edu/research/ututc/docs/UT-UTC-IU-4\\_Final\\_Report\\_Murat.pdf](http://www.utoledo.edu/research/ututc/docs/UT-UTC-IU-4_Final_Report_Murat.pdf)

## **Reducing Noise and Vibration of Hydraulic Hybrid and Plug-In Hybrid Electric Vehicles**

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*Focus Area:* Alternate Energy

*Principle Investigator:*

Mohammad Elahinia, Ph.D.

Assistant Professor, Department of Industrial and Manufacturing Engineering  
The University of Toledo

*Project Dates:* 08/01/2007 – 07/31/2008; extended to 12/31/2008

*Project Awarded:* FY 2007

*Final Report:*

[http://www.utoledo.edu/research/ututc/docs/UTUTC-AE-1\\_Phase\\_I\\_Final\\_Repor.pdf](http://www.utoledo.edu/research/ututc/docs/UTUTC-AE-1_Phase_I_Final_Repor.pdf)

## **Global Supply Chain Management/Transportation: Building a Global Network of Scholars and Educators**

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*Focus Area:* Supply Chains

*Principle Investigator:*

Subba Rao, Ph.D.

Professor, Information Operations Technology Management Department  
College of Business Administration, The University of Toledo

*Project Dates:* 05/08/2007 – 12/31/2007; extended to 12/31/2008

*Project Awarded:* FY 2007

*Final Report:*

[http://www.utoledo.edu/research/ututc/docs/UTUTC-SC-2\\_Final\\_Report\\_Revise.pdf](http://www.utoledo.edu/research/ututc/docs/UTUTC-SC-2_Final_Report_Revise.pdf)

## **Developing and Testing a Framework for Alternative Ownership, Tenure and Governance Strategies for the Proposed Detroit-Windsor River Crossing**

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*Focus Area:* Infrastructure Utilization

*Principle Investigator:*

Snehamay Khasnabis, Ph.D., P.E.  
Professor, Civil and Environmental Engineering  
Wayne State University

*Project Dates:* 06/15/2007 – 09/30/2008; extended to 11/15/2008

*Project Awarded:* FY 2007

*Final Report:*

[http://www.utoledo.edu/research/ututc/docs/UTUTC-IU-1\\_Final\\_Report1.pdf](http://www.utoledo.edu/research/ututc/docs/UTUTC-IU-1_Final_Report1.pdf)

## **Regional Freight Information Resources for Market Opportunities in the Great Lakes Maritime Transportation System**

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*Focus Area:* Infrastructure Utilization

*Principle Investigator:*

Peter S. Lindquist, Ph.D.  
Associate Professor and Chair, Department of Geography and Planning  
The University of Toledo

*Project Dates:* 05/03/2007 – 06/30/2008; extended to 08/31/2008

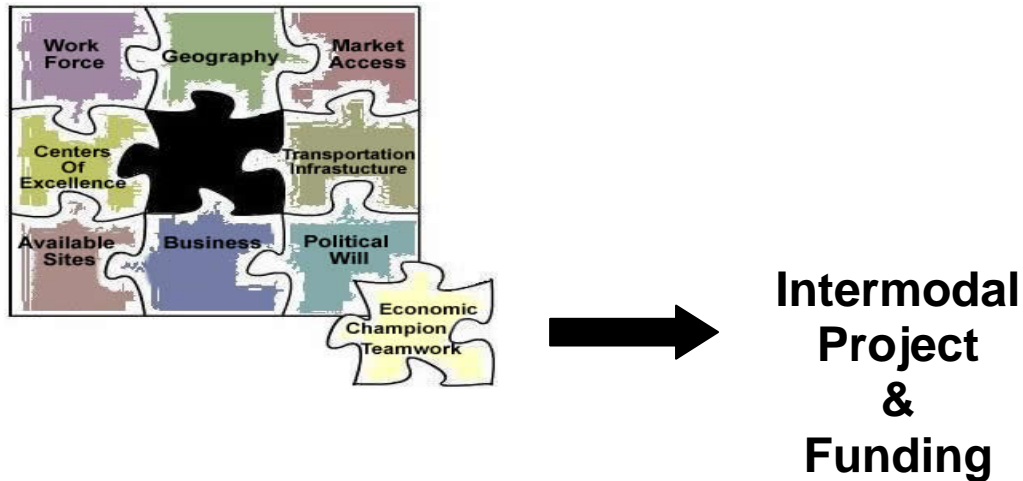
*Project Awarded:* FY 007

*Final Report:*

[http://www.utoledo.edu/research/ututc/docs/Lindquist\\_UTC\\_Phase\\_I\\_FinalReport.pdf](http://www.utoledo.edu/research/ututc/docs/Lindquist_UTC_Phase_I_FinalReport.pdf)

# TECHNOLOGY TRANSFER

## “Putting the Pieces Together” Brings Results:



### Collaboration with transportation and logistics stakeholders

The ITI/UT-UTC has been heavily involved in the initiatives to build the region through newly identified transportation related projects. This activity culminated in the successful identification and public/private funding of an expanded intermodal facility in Toledo, Ohio.

A major development in the role of Director Martinko came as the possibilities for the location of intermodal facilities in the region became a focus of local media. As new shipping routes and deep water ports are brought on-line to handle cargo from Asia, the hope of building facilities to move the flow of freight has become a prized economic development prospect. Various public and private entities fed the discussion and the Director was called upon to explain what transportation means to the region and how it impacts economic development. In addition to interviews on radio, TV, and for the print media, he made presentations to numerous interested public and private forums

#### Newspaper articles

- Toledo Blade
- Toledo Free Press
- Toledo Business Journal

#### Radio and Television Interviews

- WGTE public television - transportation and logistics educational program
- All local television stations - subject matter expert on numerous talk show segments
- WSPD drive time talk radio - interviews



## Presentations

Toledo Regional Chamber Of Commerce - breakfast speaker at series on transportation

Technical Society of Toledo - luncheon speaker

Rotary - luncheon speaker

Toledo City Council Economic Development Committee guest speaker

Regional Growth Partnership – presentation to the board

Toledo-Lucas County Port Authority – presentation to the board

Toledo Metropolitan Area Council of Governments – presentation to the board

Transportation Advocacy Group of Northwest Ohio – presentation to the membership

Ohio Department of Transportation 21st Century Transportation Task Force – presentation at public hearing

## Joint Intermodal Task Force for Logistics and Transportation



As an outcome of the increased public interest in transportation opportunities in the region and the growing understanding that transportation is at the core of economic development, the Joint Intermodal Task Force for Transportation and Logistics was created by the Mayor of Toledo. With wide ranging public/private sector representation, the group studied the transportation assets, demographic and economic data, and market characteristics of Northwest Ohio and Southeast Michigan.

Out of that study, in which Director Martinko played a significant role and for which The University of Toledo and the UT-UTC served as a prime resource, recommendations for action emerged.

### **Recommendation #1:**

Pursue Airline Junction as a rail intermodal site in partnership with Norfolk Southern and the State of Ohio (ODOD).

### **Recommendation #2:**

Build regional economic development strategies that maximize the Airline Junction return on investment, including the re-development of over 2,000 acres of industrial land in target development areas in the City of Toledo.

### **Recommendation #3:**

Pursue a Lake Erie West Commerce Corridor Strategy that incorporates a joint marketing effort and alliance with that region's stakeholders.

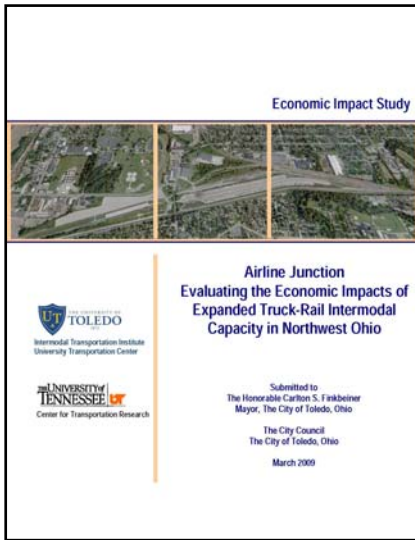
### **Recommendation #4:**

Build a new Schenker / Bax Customs Facility at the Toledo Express Airport.

### **Recommendation #5:**

Acquire a modern crane and reach stacker at the Toledo Seaport for more efficient and competitive intermodal cargo handling ability.

## Bringing an intermodal project to Toledo



The first of the recommendations, to pursue an expansion of the intermodal operations at Airline Junction, was funded with federal economic stimulus money and private funds. Director Martinko was integral in bringing the necessary public and private parties together to move the project from recommendation to reality. This is a prime example of how the ITI/UT-UTC is not only an academic institute and community resource, but an active catalyst in making real things happen in transportation economic development projects.

Integral to the process of securing funding was presenting the economic impact the project would have on the region. Input from two UT-UTC projects spelled out the benefits to the City, the region, and the State.

<b>Incremental industrial development (7 yrs)</b> 98 acres (1,500,000 sq. ft.)	<b>\$27 million</b>
<b>Total New Permanent Jobs (direct + indirect) (7 yrs)</b> 438 direct + 455 indirect	<b>893 Jobs</b>
<b>Value Added</b> Construction Jobs During Build Out (7 yrs)	<b>300 to 500 Jobs</b>
<b>Annual salaries</b> Average annual salary (\$28,736)	<b>\$25.6 million</b>
<b>Total State &amp; Local Annual Tax Impact</b> Total Local Annual Tax Impact (\$1,231,866) Total State Annual Tax Impact (\$1,491,137)	<b>\$2,723,033</b>
<b>Total regional output (7 yrs)</b>	<b>\$112,266,320</b>

### Air Line Junction Project Costs

<b>\$9,250,000</b>	<b>Stimulus Funding Granted</b>
<b>\$3,510,000</b>	<b>Norfolk Southern Contribution</b>
<b>\$12,760,000</b>	<b>Estimated Total Cost</b>



*Director Martinko(left) listens to a question from a reporter at the press conference unveiling the Airline Junction intermodal project. Toledo Mayor Finkbeiner (center) and James Tuschman, Chair of the Joint Intermodal Task Force also spoke at the event held at the University of Toledo Scott Park Campus just north of the rail yard.*

## Intermodal Transportation in the News

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A list of the numerous newspaper articles with access to the publications and radio interviews can be found at <http://www.utoledo.edu/research/iti/intermodnews.html>

## 2008 Ohio Conference on Freight: UTC Project Report Received with Enthusiasm

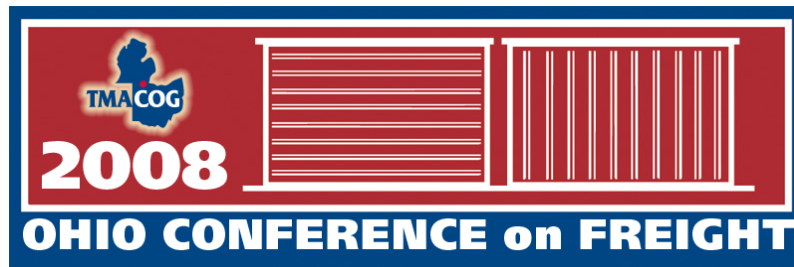
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The Toledo Metropolitan Area Council of Governments (TMACOG) held the second annual 2008 Ohio Conference on Freight September 15 -17 in Toledo. Director Martinko gave a presentation on "Current Research in Transportation Logistics"

([http://www.tmacog.org/OCF\\_08/OCF\\_Presentations/316/Martinko\\_OCF.pdf](http://www.tmacog.org/OCF_08/OCF_Presentations/316/Martinko_OCF.pdf)) in which he described current UT-UTC projects. A major portion of the presentation addressed the capabilities of the Great Lakes Maritime Information Delivery System. Although project PI Dr. Lindquist was not able to be at the session, Sarah Schafer (Student-of-the-Year 2008) and Samir Dhar (Student-of-the-Year 2007), both of whom had worked extensively on the project, were in the audience. As more and more detailed questions came from the enthusiastic listeners, Sarah and Samir joined Rich in providing the sought out information. There was genuine excitement among the listeners as they were shown ways the data could directly help their work.

In response to this positive reaction, public education workshops are planned by the UT-UTC in the coming year.

See the companion story on page 25.



## Funded Projects – New: Economic Development

### Commodity Flow for the Toledo Region

**Focus Area:** Infrastructure Utilization for Economic Development

**Abstract:** Dr. Lindquist, chair of the Department of Geography and Planning, will do a commodity flow study of the Toledo Region to assist in analyzing the need for and probable success of various transportation related economic development projects in the area. This work coordinates with projects UTUTC-IU-2 and UTUTC-IU-6.

#### Principle Investigator:

*Dr. Peter Lindquist*  
Associate Professor and Chair  
Department of Geography and Planning  
The University of Toledo  
Toledo, OH 43606  
419.530.4287  
[Peter.Lindquist@utoledo.edu](mailto:Peter.Lindquist@utoledo.edu)

**Project Dates:** 08/01/2008 – 06/30/2009; extended to 9/30/2009

**Project Awarded:** FY 2009

**UT-UTC Designation:** UTUTC-IU-11

#### Funding\*:

UT-UTC Grant Amount	\$ 0
Match Amount	\$ 50,000
Total Project Budget	\$ 50,000

Note: This project was funded with nonfederal matching funds. As stated in the abstract, the project is a direct extension of UT-UTC funded projects.

# Norfolk Southern Airline Yard Intermodal Project

**Focus Area:** Infrastructure Utilization for Economic Development

**Abstract:** A variety of commercial, industrial, and public sector constituencies in Northwest Ohio have come to realize the economic potential that is likely attributable to the further development of intermodal freight operations within the region. During 2008, these interests joined together as the Joint Intermodal Task Force for Transportation and Logistics (Task Force) to begin a formal exploration of these possibilities.

The Task Force's initial report and recommendations were released in an October 2008 study document. Chief among the report's findings are the recommendations that the region further explore an expanded role for the existing Norfolk Southern (NS) intermodal facility at Airline Junction in Toledo and that this exploration simultaneously consider how a more active NS intermodal facility might be integrated into broader efforts to redevelop nearby available commercial properties.

As an action item contained within these recommendations, the Task Force called for the estimation of the economic benefits that might be expected under such an initiative. Accordingly, Task Force members and representatives from NS initiated informal discussions with the University of Tennessee's Center for Transportation Research (CTR). CTR faculty and staff have extensive experience in performing precisely the sort of analyses sought by the Task Force. As a result of these discussions, the University of Toledo's Intermodal Transportation Institute and University Transportation Center (ITI/UTC) have joined in a project with CRT as the subcontractor to explore the economics of the Airline Junction recommendation.

In conjunction with work done in the University of Toledo Department of Geography and Planning (UT-UTC project "Freight Flow Description of the Toledo Region"), the resulting information and data will be used to evaluate possible project options. If the decision is made to pursue this effort, the work done on this project will provide the necessary background material to move the project forward.

The project is a joint effort of the University of Toledo UTC and the City of Toledo.

## Principle Investigator:

*Richard S. Martinko, P.E.*  
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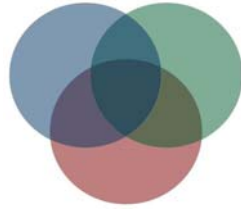
**Project Dates:** 01/01/2009 – 06/30/2009; extended to 12/31/2009

**Project Awarded:** FY 2009

**UT-UTC Designation:** UTUTC-IU-13

## Funding\*:

UT-UTC Grant Amount	\$ 5,139
Match Amount	\$ 30,660
Total Project Budget	\$ 35,799



## ASSOCIATED RESEARCH ACTIVITIES

### Partnership in the National UTC CFIRE



In a continuation of work started by the ITI, the University of Toledo will participate as a partner in the UTC at the University of Wisconsin-Madison, the National Center for Freight & Infrastructure Research & Education – CFIRE. Dr. Peter Lindquist in the Department of Geography and Planning is the PI on a project which has been awarded \$200,000 over two years. This is an outgrowth of the work originally started with the Midwest Regional UTC as part of the Upper Midwest Freight Corridor Study.

See more about CFIRE at <http://www.wistrans.org/cfire/>

### Partnership in the Michigan-Ohio UTC



The University of Toledo is also a partner in the Michigan-Ohio University Transportation Center led by the University of Detroit – Mercy. Along with the other partners (Bowling Green State University, Wayne State University, and Grand Valley State University) UT participates in projects which share the same basic theme as the UT-UTC. The UT-UTC has funded a sister project with MIOH and five UT-UTC researchers also have been funded projects by the MIOH-UTC.

The Director and the Vice President, Research Development both sit on the policy committee of the MIOH-UTC. See more about the MIOH-UTC at <http://mih-utc.udmercy.edu/>

## UT an Affiliate University at GLMRI

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The University of Toledo is an affiliate university in the Great Lakes Maritime Research Institute, a coalition of the University of Wisconsin-Superior and the University of Minnesota-Duluth. UT-UTC researcher Dr. Peter Lindquist is also PI on a project which received funding for 2008-2009: "Expanding Regional Freight Information Resources for the Upper Midwest Phase IV, The Great Lakes Maritime Information Delivery System: A Resource for the Regional Analysis of Intermodal Freight Flows in the Great Lakes Region." A summary of the project can be found at <http://www.glmri.org/research/>. The final report from a project funded in 2007-2008, "The Great Lakes Maritime Information Delivery System: A Resource for the Regional Analysis of Intermodal Freight Flows in the Great Lakes Region" can be found at <http://www.glmri.org/downloads/lindquist08a.pdf>

The UT-UTC has been working with GLMRI to bring their very successful Great Lakes Maritime Transportation Summer Institute for K-12 teachers to Toledo the summer of 2010. The institute will be co-funded with CFIRE.





## ITI Biodiesel Fuel Study



The Intermodal Transportation Institute at The University of Toledo is the lead on a U.S. Department of Transportation (Transit Authority) funded "Biodiesel Study" which focuses on the impact of using a mixture of renewable biofuel and diesel fuel on operating costs as well as engine emissions, performance, and expected life in a subset of the local transit authority bus fleet and City of Toledo vehicles. It will also examine the economic and financial impacts of these alternatives on operations. Unique aspects of the project include 1) its large scale signified by the use of new vehicles to set an effective benchmark, 2) the collection of

extensive emission (in-bus, tail pipe) and engine wear data, 3) the examination of the impact of technology and economies of scale on large scale production. The project is funded at \$1.48 million (UT's share \$575,605) and will finish in 2009.

The Summary of the Progress Report for June 2008 states how this project is different from other studies:

With the vision and leadership of Congresswoman Marcy Kaptur, the Toledo Area Regional Transit Authority (TARTA) and the Intermodal Transportation Institute (ITI) at the University of Toledo developed a long-term, large-scale comprehensive research project to understand and assess the impacts of using a mixture of renewable biodiesel (B-20: 20% biofuel and 80% ultra-low sulfur diesel) compared to ultra-low sulfur diesel. The following make this study unique.

1. The first study that does on-road testing of ultra-low sulfur diesel and first attempt to investigate the impact of using B-20 made with ultra-low sulfur diesel.
2. The testing is exhaustive including nearly 60 vehicles over a three year period and involves more than 5 million miles of operation.
3. With three years of data, it is possible to estimate and compare the life cycle costs of using ultra-low sulfur (ULS) diesel fuel versus B-20 made with ULS diesel.
4. In addition to tail pipe emission testing, this study examines in-bus air quality.
5. The first study that examines the use of hydrogen gas as an additive to B-20.

The progress report for the period ending June 2008 is available on the ITI web site at <http://www.utoledo.edu/research/iti/biodiesel.html> The report for the year ending June 2007 is also available on the site. The paper "Characterization of Emissions and Indoor Air Quality of Public Transport Buses using Biodiesel" is also available on the site. It includes a list of publications, student posters, thesis/dissertations and presentations associated with the study. Part of this work on emissions and air quality was funding by the Michigan-Ohio UTC.

### New Activities Planned For Year 3

1. Conduct tests on the fuel economy in stop-and-go or over-the-road runs.
2. Complete life cycle costing.
3. Conduct a detailed analysis of maintenance costs to determine if there is a relationship between the type of fuel used and engine related maintenance.
4. Investigate the characteristics in the use of different levels of biodiesel from B-5 up to B-100.
5. Investigate the possibility of using additives in ULSD and in B-20 to determine if there are differences in fuel economy and emissions.



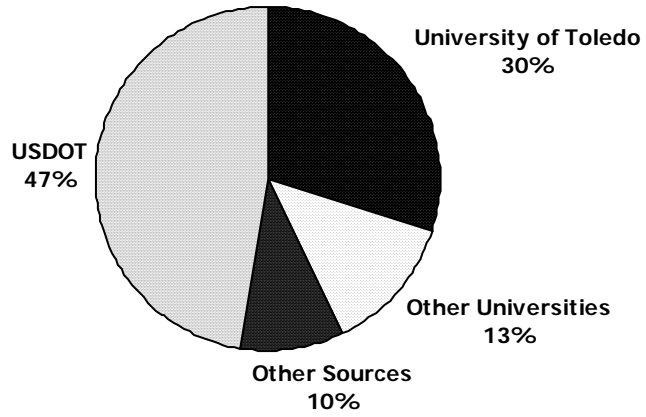
## SUPPORTING U.S. DOT PRIORITIES

<b>Meeting US Department of Transportation Priorities</b>				
	<b>Safety</b>	<b>Sustainability</b>	<b>Livability</b>	<b>Economic Recovery &amp; Growth</b>
<b>UT-UTC Projects and Activities:</b>				
Combined Truck Routing and Driver Scheduling Problems Under Hours-of-Service Regulations	✓			
Regional Freight Information Resources for Market Opportunities in the Great Lakes Maritime Transportation System - Phase I & II		✓		✓
Global Supply Chain Management/Transportation Building a Global Network of Scholars and Educators - Phase I & II		✓		✓
Reducing Noise and Vibration of Hydraulic Hybrid and Plug-In Hybrid Electric Vehicles - Phase I & II	✓		✓	
Developing and Testing a Framework for Alternative Ownership, Tenure and Governance Strategies for the Proposed Detroit-Windsor River Crossing - Phase I & II	✓	✓		✓
Value of ITS Information for Congestion Avoidance in Inter-Modal Transportation Systems - Phase I & II	✓	✓	✓	
A Novel Image Database Analysis System for Maintenance of Transportation Facility	✓		✓	
Magnetic Sensor for Nondestructive Evaluation of Deteriorated Prestressing Strand	✓		✓	
Travel Behavior of U.S. Domestic Airline Passengers and its Impacts on Infrastructure Utilization		✓	✓	
High Speed Transportation Corridor: A Conceptual Framework	✓	✓	✓	✓
UT Solar Car Team			✓	
Studies directly related to transportation economic development projects and activities	✓	✓	✓	✓
Development of Airline Junction Intermodal Yard	✓	✓	✓	✓
Educating the Community: Intermodal presentations to public and private sector leaders & citizens	✓	✓		✓
<b>Intermodal Transportation Institute Research:</b>				
Biodiesel Fuel Study			✓	

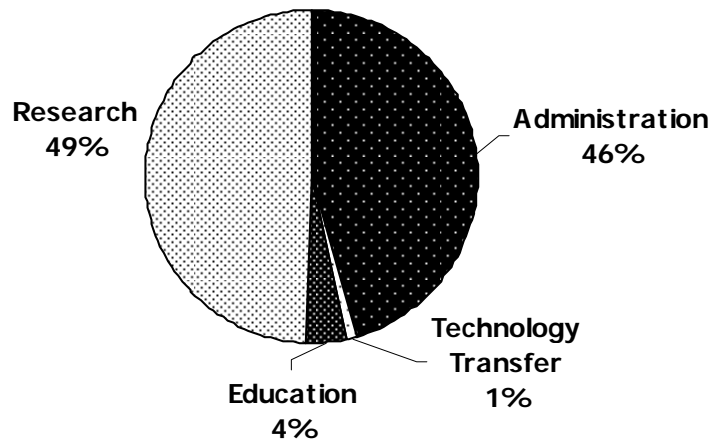


# FUNDING SOURCES AND EXPENDITURES

## FY 2008-2009 Funding Sources



## FY 2008-2009 Expenditures





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Phone: 419-530-5221

