

Intermodal Transportation Institute The University of Toledo



Annual Report 2005-2006

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October 2, 2006



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The University of Toledo Intermodal Transportation Institute (ITI) Annual Report for 2005-2006

Vision Statement

To develop technology-enabled intermodal transportation systems and supply chains that promote **economic development** and **quality of life**.

Mission Statement

To provide **research, education and training**, and **planning and technical assistance** in developing and maintaining technology enabled, efficient, secure, and environmentally sound **transportation systems, supply chains, and logistic processes**.

Goals and Objectives

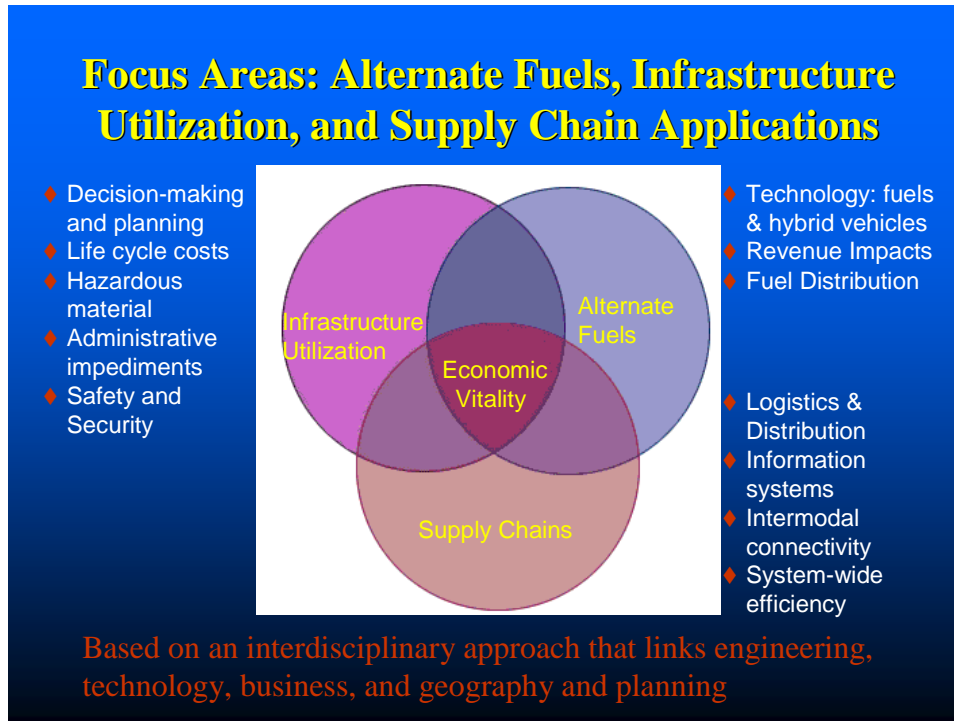
- Create an internationally recognized center of excellence
- Advance technology and expertise in the many disciplines comprising transportation
- Educate a multi-disciplinary work force
- Attract students, faculty, and staff in undergraduate, graduate, and professional programs
- Enhance diversity in the various fields related to transportation

Focus Areas:

Transportation as a vehicle for economic development (see Figure 1):

- Alternate Energy: Continuing dependence on high-cost, non-renewable fossil fuels imported from politically unstable regions of the world is a threat to the future development, security, and effective use of the transportation network in the U.S. The focus on research and commercialization seeks to develop and distribute renewable, homegrown, low-polluting energy sources to support transportation.
- Infrastructure Utilization: Growing demand for transportation is stretching current infrastructure to, and in many cases beyond, its capacity. By 2020, the demand for moving freight is expected to increase by more than 50 percent. Expanding infrastructure, by itself, may not be an effective solution because it is expensive and consumes valuable land that could be used for agriculture, recreation, and commerce.
- Supply Chains: The emergence of supply chains and sophisticated distribution systems is placing new demands on transportation. Understanding transportation's role in this new paradigm and adapting the transportation systems to meet the needs of suppliers, manufacturers, and customers is fundamentally important for economic development.

Figure 1: Focus Areas for the Intermodal Transportation Institute



Projects

1. U.S. DOT University Transportation Center (UTC):

A UTC is an internationally recognized center of excellence that is fully integrated within an institution of higher learning. It is designed to advance technology and expertise in the many disciplines comprising transportation. Through the efforts of the ITI and with the support of our public and private sector partners, the University of Toledo was designated as a University Transportation Center by the U.S. Department of Transportation in September of 2005. The University of Toledo is also part of the UTC designation that includes the University of Detroit Mercy (lead university) Bowling Green State University, Grand Valley State University, and Wayne State University. The UT led UTC brings to campus \$2.0 million in federal money over the next four years plus the required match. UT will also share in the \$2 million received by the UDM UTC. Both UTCs focus on alternate fuels, infrastructure utilization, and supply chain management.

In May of 2006, the ITI completed the necessary application to receive the funding for the UT led UTC. This was the earliest possible date for application because of delays at US DOT. The ITI also worked with the University of Detroit Mercy and its partners to successfully complete their application. Funding for both UTCs was released on July 21,

2006 in the federal transportation reauthorization bill. The Strategic Plans for both UTCs were submitted shortly after this date. The Strategic Plans determine how the funds will be spent. Preparation of these plans, which are large comprehensive documents, began in January of 2006.

The UT-UTC funding will continue through 2010 subject to annual renewal by the U.S. DOT and congressional appropriations.

2. Midwest Regional Freight Planning and Research Institute:

The transportation reauthorization bill also provided funding for a National University Transportation Center at the University of Wisconsin-Madison that focuses on freight transportation. The concentration is on the safe, efficient and sustainable infrastructure for the movement of freight. The ITI is a member of the group of universities led by UW-Madison and will receive about \$100,000 per year over a five year period as a participant in this effort. The notification of the affiliation took place in October of 2005 with the funding commitment coming in the summer of 2006.

3. Upper Midwest States Freight Study:

Phase 2 of the Upper Midwest Freight Study (Illinois, Indiana, Iowa, Ohio, Michigan, Minnesota, and Wisconsin) was completed in the Spring of 2006. The results of Phase 2 were presented to the CEOs for the state DOTs at the Mississippi Valley AASHTO meeting. Based on this work, it was agreed to add three states to the project (Missouri, Kansas, and Kentucky). They also signed a Memorandum of Understanding to work together to identify regional transportation problems and needs and to work together toward resolutions. UT – ITI was a participant in both Phase 1 and Phase 2 of this study. UT currently houses all of the data for the Upper Midwest States and will continue to play an important role. The end date for this project is unknown as it continues to evolve in response to stakeholder needs.

4. The International Cargo Handling and Coordination Association (ICHCA):

ICHCA International Limited (IIL) and the Intermodal Transportation Institute have agreed to work together to develop a global network of universities that focuses on enhancing global supply chain performance. This affiliation of universities will function as a panel of IIL and will cooperate with IIL to define focus areas for investigation and education within the broad area of global supply chain management.

During 2006, the first and second meetings of the ICHCA panel were held in Singapore. At the ICHCA Biennial Conference, the second Singapore meeting, seven additional universities were identified and will be asked to participate in the ICHCA Panel.

UT – ITI will host the next meeting of the ICHCA International Board on November 6th and 7th of 2006. One whole day will be devoted to the discussion of short sea shipping opportunities on the Great Lakes.

As part of the UT-UTC projects, activities will continue through the life of the grant and, it is hoped, beyond.

5. Affiliation with Great Lakes Maritime Research Institute:

The ITI and the University of Toledo have become affiliated with the Great Lakes Maritime Research Institute. As part of this association, the ITI is working on a project to study the river crossing between Detroit and Windsor. The U.S. Federal Highway Administration lists the Detroit Windsor border crossing as the most active in the United States and their Freight Analysis Framework 2020 forecasts the crossing will exceed its current capacity. The study develops a business case to examine alternatives to expand the existing capacity; it is funded at about \$34,000.

In another project, UT – ITI is working to develop “Regional Freight Information Resources for the Upper Midwest: The Great Lakes Maritime Information Delivery System.” Phase I will establish a transportation information system that enables using market analysis to determine opportunities for moving freight on the Great Lakes. The project is funded at \$49,600 extending from January 2006 to August 2006.

To link this study to the “real world,” an advisory board composed of Great Lakes maritime and shipping experts has been established to provide input into the research agenda. Members of the board include the Maritime Administration, the St. Lawrence Seaway Development Corporation, the U.S. Coast Guard, the Lake Carriers Association, the Great Lakes Commission, the American Association of Great Lakes Port Authorities, The Society of Naval Architects and Marine Engineers, and the Army Corps of Engineers.

Funding is pending on “Expanding Regional Freight Information Resources for the Upper Midwest Phase II: The Implementation of the Great Lakes Maritime Information Delivery System.” Funds were requested in the amount of \$178,400.

Funding is pending for a proposal to investigate “Ship Technology for Great Lakes Containers and Trailers: Review and Analysis.” Funds were requested in the amount of \$75,200.

In December 2005, Congressman David L. Obey (D-Wisconsin) announced The Great Lakes Maritime Research Institute (GLMRI) would received \$2 million; this is considered to be an indication of the likelihood of future funding. GLMRI is a joint effort by the University of Wisconsin-Superior and the University of Minnesota Duluth. In the second year of the GLMRI collaboration, their awards now total \$2.75 million. Congressman James L. Oberstar (D-Minnesota) secured the original authorization for the initiative, and Congressman Obey secured the funding in the recently passed transportation appropriations bill. Funding beyond this \$2.75 million is in progress.

The GLMRI’s goal is to help maintain and promote maritime transportation on the Great Lakes. Initial research will focus on the economics and development of the Great Lakes marine transportation system, the economics of port development in the Great Lakes,

security issues, inter-modal transportation opportunities, and marine transportation and port environmental issues. In addition to the two local universities, GLMRI has established research affiliations with the Great Lakes Maritime Academy in Traverse City, Michigan; the University of Wisconsin-Madison's Midwest Regional University Transportation Center; the University of Michigan in Ann Arbor; the Michigan Technological University in Houghton; and The University of Toledo.

6. BIO-Diesel Fuel Study:

The U.S. Department of Transportation (Transit Authority), "Bio-Diesel Study" focuses on the impact of using a mixture of renewable bio-fuel and diesel fuel on operating costs as well as engine emissions, performance, and expected life in a subset of the TARTA bus fleet. 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. Buses began to use bio-diesel in the Spring of 2006; preliminary results for pollution levels were achieved by June 2006. This project is in conjunction with the Toledo Public Schools as well as TARTA and is funded at \$1.48 million (UT's share \$575,605). It began in July 2005 and will continue through June 2008.

7. Hybrid Vehicles:

The central focus of a Wright Center for Innovation (WCI) proposal submitted to the Ohio Department of Development is to create a vehicle platform that is efficient, economical, and reliable and that is not fuel dependent (such as petroleum, bio-fuel, natural gas, and hydrogen). The ITI provided the commercialization strategy for the application. Hybrid technology provides the ability to optimize engine performance and the mechanism to capture braking and deceleration energy, store it, and reuse it. Two basic technologies with different strengths and weaknesses are currently available as the storage medium: 1) electricity in the form of batteries and ultra-capacitors and 2) hydraulics in the form of hydraulic cylinders/accumulators.

A Plug-in Hybrid Electric Vehicle (PHEV) would have the capabilities of a traditional hybrid plus the ability to capture inexpensive plug-in power at home or at work. Estimates by the Electric Power Research Institute are that fuel economy (measured in equivalent units of energy) for a PHEV will be double that of a conventional vehicle and substantially more (50 percent) than currently available hybrids. In addition, the costs of generating electric power during non-peak periods as well as the level of emissions at a central location are significantly less than internal combustion engines. To further reduce emissions, a PHEV can run in "engine shut-off" mode in urban areas where pollutant levels are high.

A Hydraulic Hybrid (HH) can provide substantial torque over a short time period. This makes it ideal for large, heavy vehicles with repeating stop and go cycles that require large amounts of power to overcome inertia. Hydraulic systems are very efficient, which means there is limited energy loss in the storage and reuse of the energy. Advanced HH derive their

fuel economy improvement from the application of key design and control strategies: recovery and reuse of over 70 percent of braking energy, optimization of engine operation at the “sweet” spot, and reduction of engine operation (e.g., the engine is shut off when the vehicle is not moving, so there is never any engine idling) (Source: Next Energy Hydraulic Hybrid Working Group).

The hybrid vehicle program at the University is on-going and is expected to remain a focus area well into the future.

8. Ship and Port Design for Short Sea Shipping on the Great Lakes:

Short Sea Shipping is the ability to move freight by water as an alternative to overland hauling via rail or truck. Shipping routes on the Great Lakes and along the coast of the U.S. are substantially underutilized. This is an opportunity to move freight off congested highways and rail corridors onto water.

To help relieve growing congestion on the highways and rail lines around the Great Lakes, the ITI is working with public and private sector organizations as well as unions to identify and develop new technologies in ship and port design that could expand shipping on the Lakes. Efforts are currently underway involving ICHCA to address this need.

9. Metropolitan Utility Link for Transportation to Industry:

This project facilitates the movement of materials between suppliers and manufacturers on a just-in-time basis in an urban environment. It moves freight without using city streets or expressways. Currently, funding is being pursued through the ODOT and DaimlerChrysler.

10. Transportation Cluster Leadership:

The ITI is providing leadership for the regional economic development Transportation Cluster. A detailed marketing plan is in preparation. Economic development activities include international air freight and distribution via highway, ship to rail to truck connectivity, and warehousing and distribution center development that support retail operations. During 2005-06, the ITI was heavily involved with the development of a marketing plan for the region including providing substantial technical and managerial support for a consultant who was hired to complete this task.