

RAHALL TRANSPORTATION INSTITUTE



EDUCATION



RESEARCH



TECHNOLOGY
TRANSFER

PART A

“Intermodal Transportation and Economic Development in the Appalachian Region.”

www.njrati.org



The Nick J. Rahall, II Appalachian Transportation Institute (RTI) is a University Transportation Center funded by the U.S. Department of Transportation's Research and Innovative Technology Administration (RITA).

This publication is an annual report of RTI's transportation education, research and technology transfer activities for July 1, 2009 through June 30, 2010.

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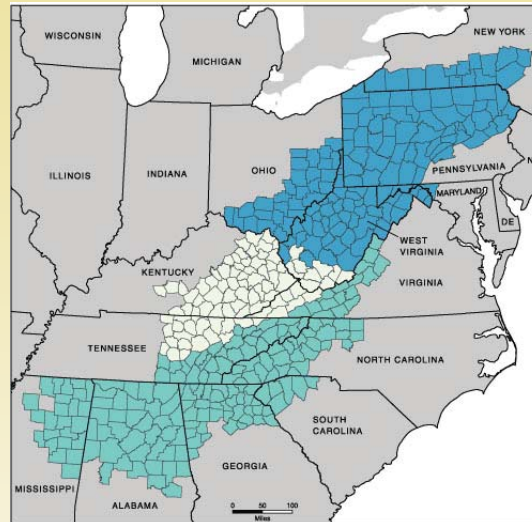
CENTER THEME

The Nick J. Rahall, II Appalachian Transportation Institute's (RTI) center theme is "Intermodal Transportation and Economic Development in the Appalachian Region."

The terrain and dispersed population of West Virginia, and the other 12 states in the Appalachian Region, make the planning, construction and maintenance of an efficient and safe transportation infrastructure a significant economic and technical challenge. West Virginia's abundant natural resources are geographically and economically land-locked, and the current reliance on coal has been challenged by increased regulation and social and economic uncertainties.

RTI intends to become a national center for technical expertise related to intermodal transportation in the Appalachian Region. To accomplish this, RTI performs site-specific research to support intermodal planning and analysis to improve mobility and global connectivity in the Appalachian Region. RTI focuses on developing transportation technologies, particularly Intelligent Transportation Systems, and customized web-based Geographic Information Systems.

West Virginia is the only state which is entirely encompassed within the Appalachian Region, and RTI's Huntington, W.Va. headquarters are located in the center of the 13-state region. This location provides easy access to the Port of Huntington, the largest inland river port in the nation (and 4th largest overall), and to the Ohio and Great Kanawha rivers. The location is also in close proximity to current and planned major highway systems, including the Heartland Corridor; the intersection of two major (CSX and Norfolk Southern) rail lines; and a number of intermodal facilities, both rail/river and rail/highway.



Intermodal transportation is broadly defined as more than one form of transportation, within the same mode or between different modes. The Appalachian Region is a 200,000-square-mile region that follows the spine of the Appalachian Mountains from southern New York to northern Mississippi. It includes all of West Virginia and portions of 12 other states (Table 1).

In 2000, Kenneth R. Wykle, Administrator of the Federal Highway Administration (FHWA), said: "I think all of the elements for a great intermodal system and program are right here in Appalachia." He encouraged broadening the transportation vision, "Certainly in this particular area, rail is much more important....primarily because of coal...but inland water transport is also important" and provided data illustrating that "11% of the total freight flows in the entire nation are within the Appalachian Region."

This theme not only supports the national strategy for surface transportation research by specifically addressing the United States Department of Transportation (USDOT) strategic objectives of "Mobility" and "Global Connectivity" for a critical geographical region of our Nation, but also addresses the remaining strategic objectives of USDOT through crosscutting mechanisms.

One of RTI's objectives is to advance the body of knowledge that is needed to help create, maintain and secure: the safest, most environmentally conscious, and most cost efficient intermodal transportation system for the Appalachian Region. RTI is ideally positioned to address the USDOT Strategic Objectives for the Appalachian Region thematically through the human resources and partnerships previously developed and physically through proximity to "nation critical" transportation assets.

RTI's strategic plan for 2007-2011 titled "Intermodal Transportation and Economic Development in the Appalachian Region" guides RTI's work as a National University Transportation Center and addresses United States Department of Transportation strategic objectives for surface transportation research in the United States.

Not only is the RTI headquarters located in the center of the Appalachian Region, but it is also located in the heart of the largest inland river port, and the 4th largest of all the Ports in the Nation. If exports and imports are excluded, only the Port of New Orleans transfers more domestic tonnage than the Port of Huntington-Tri-state. The Port infrastructure combined with several assets nearby (some under development) places RTI in close proximity to one of the most unique combination of living laboratories for site-specific intermodal transportation research in America.

The nearby assets include, but are not limited to:

- 1) The National Highway System (NHS) and the Appalachian Development Highway System (ADHS) (I-64 and Corridor B of the ADHS intersect nearby);
- 2) The intersection of two heavily congested coal transport railroad corridors. The CSX and Norfolk Southern rail lines intersect in Huntington and at times, more rail transported coal goes through this intersection than anywhere in the Nation;
- 3) A new highway/railway intermodal facility. (A new container transfer facility is scheduled to come on line in June 2010 as a key component for one of the "Corridors of National Significance" funded in SAFETEA-LU.
- 4) Two new highways are also under development nearby. (The I-73/74 "High Priority" Corridor will intersect I-64 near Huntington and this corridor also parallels the Heartland Corridor for the entire segment that traverses Southern West Virginia. I-73/74 will also intersect with the Coalfields Expressway, another new highway corridor under development in Southern West Virginia)

The new corridors identified above have the potential to increase the freight transportation capacity of the Nation significantly while helping to minimize the impact on the NHS. The authorization of a SAFETEA-LU University Transportation Center (UTC) has empowered RTI with the resources to build a comprehensive, broadly based, multidisciplinary research, education and technology transfer program focused upon this Region's intermodal transportation and intermodal transportation-related economic development challenges.

The Institute will perform site-specific research in the Appalachian Region that can support inter-modal planning and analysis to help improve the mobility and global connectivity for the Region. In order to help accomplish this objective, RTI will assume a leadership role in the development and deployment of transportation technologies. These include Intelligent Transportation Systems (ITS) and their application to highways, public transit, railways and the inland waterways. In addition, new information/data collection and management tools will be developed through the customization of web-based Geographical Information Systems (GIS) for the Region. These site-specific studies will include advanced, basic and applied research projects that can contribute to:

1. Technologies to help increase the number of efficient transportation modes for freight including rail and the inland waterways in addition to improving the in transit visibility (ITV) of the critical commodities in the region;
2. Accurate and comprehensive inventories of the physical and non-physical assets, their security and incident response parameters in addition to their capacities for, and challenges to, increasing intermodal transportation efficiencies for freight and passengers;
3. Identification of the locations and the types of intermodal transportation investments needed to allow coal, other natural resources and industries to improve their capability to compete in the global market place, and maintain the critical role of these commodities and the Region. The Region, as a whole, plays in the security and disaster recovery needs of our Nation;
4. Reduced planning, design, construction and maintenance cost in addition to improving safety and minimization of environmental impacts for the various surface transportation modes while ensuring that opportunities for concurrent infra- and info- structure development during new road construction are realized;
5. An enhanced trail/scenic byway system that will support continued growth of the emerging tourism industry; and,
6. Improved access to healthcare (non-emergency), work and education for the citizens through public transit and a better equipped first responder community.

At the end of the current grant, RTI intends to be national center for technical expertise related to intermodal transportation in the Appalachian Region and similar mountainous and rural areas in the Nation. While the programmatic activities of RTI will primarily be focused on Appalachia, research projects and other types of activities outside the Region may also be undertaken as opportunities arise over the life of the grant.

KEY STAFF

Robert H. “Bob” Plymale, Director/CEO

As CEO and director of the Rahall Transportation Institute (RTI), Bob Plymale leads a dynamic team of business, academic and research professionals working to enhance safety and economic development opportunities through transportation. Under his leadership, RTI has received two US patents, developed the National Maritime Enhancement Institute at RTI, and produced the award winning Electronic Commercial Drivers Licensing (eCDL) program.

In addition to managing the day-to-day operations at RTI, Plymale is a highly effective and well-regarded public servant. He is currently serving his fifth term in the WV State Senate, District 5. He is chairman of the Senate Education Committee and serves on the Budget Conferees, Rules, Finance, Pensions, Confirmations, and Transportation and Infrastructure committees respectively.

In 2003, Plymale was appointed by Governor Wise to the Board of Control for the Southern Regional Education Board. He was reappointed by Governor Joe Manchin in 2006 and now serves on the executive committee. In 2004, Plymale was named to the National Council of State Governments (NCSL) National Task Force on “No Child Left Behind” and from 2005-2006, he was Chairman of the NCSL Education Committee and Blue Ribbon Commission on Higher Education. He is also President of the Council of University Transportation Centers.

He is the recipient of the Presidential Citation from Glenville State College, a Distinguished Service Award from the West Virginia Athletic Directors Association, and the Michael Prestera Award of Excellence in recognition of his efforts to improve the lives of individuals living with behavioral health issues. In 2005, Plymale received the Distinguished Service to the Community Award from Marshall University. More recently, he was named co-President of the Keith Albee Theater Performing Arts Center, Inc., and has been instrumental in reviving and maintaining this Huntington landmark as a performing arts and community center.

Plymale is a graduate of Marshall University.

Richard Begley, Ph.D., Director of Research

Dr. Richard Begley is director of research at the Rahall Transportation Institute (RTI). Under his direction, RTI established the Transportation and Economic Development System (TEDIS), the National Maritime Enhancement Institute, and a railroad safety research project, which produced the best academic research paper award at the 2005 International Conference on Railroad Engineering. His research has resulted in two US patents, one of which produced the first royalty stream for Marshall University.

Begley has authored and co-authored numerous publications and peer reviewed research documents. He received his Ph.D. and master’s degree from West Virginia University and a Bachelor of Science in Mining Engineering Technology from West Virginia Institute of Technology. He received the Marshall University Distinguished Artists and Scholars Award, Team, in 2003.

A tenured full professor in engineering, Begley previously served as the assistant dean for special projects and outreach for the Marshall University Graduate School for Information Technology and Engineering and chairman of the Marshall University engineering department. His experience includes more than 15 years in higher education, consulting and research project management.

Frank Betz, M.B.A., Chief Operating Officer

As Chief Operating Officer, Frank Betz is responsible for establishing, managing and implementing the goals for the Rahall Transportation Institute. Working with all departments, Frank ensures performance goals and objectives are achieved while adhering to project timelines and budget parameters. Utilizing an integrated approach that combines strategy implementation and operational processes with an emphasis on research and technology, Frank's analytical skills and business acumen make him highly effective in managing across disciplines to achieve accurate knowledge reporting and yielding positive outcomes.

Prior to joining RTI, Frank performed a variety of functions as an independent business consultant, working with some of the country's top product and technology firms like Hewlett Packard. Frank is a former VP of Finance & Operations for a multi-state healthcare company and also served as a European Strategic Planning Manager and Software Product Manager for 3M France, where he worked cross-functionally with business unit heads and product managers in streamlining their operations. Adept at developing complicated financial models and negotiating strategic alliances, he was cofounder and CIO of a multinational internet technology company based in Silicon Valley. Frank has also worked as a research coordinator at the University of Pennsylvania and has a plethora of experience working with government agencies.

Frank earned his Masters in International Business from Pepperdine University, Institut de Gestion Sociale and from La Sorbonne in Paris, France. Fluent in French, he is also a published author in the field of psychology and holds a B.A. in Philosophy from the University of Pennsylvania.

David Lawson, M.S., Chief Information Officer

David B. Lawson is the Chief Information Officer at RTI. Since joining RTI in 2003, Lawson has overseen the acquisition and implementation of the first and second generation of the Institute's computer and storage clusters, which are the backbone of the business and research components of RTI; as a result, the institute's capabilities in processing and managing the tremendous amount of data associated with transportation research projects have increased dramatically.

Lawson brings more than twenty years of experience in Information Systems and Computer Science to RTI, including five years as Vice President of a software engineering company and several more years as a Principal Engineer and Software Architect. This experience is a key factor in his success at leading large information systems projects that have been crucial to RTI and transportation agencies at the state and federal level that depend on the institute.

Before joining RTI, Lawson served in a similar role at the Robert C. Byrd Institute for Advanced Flexible Manufacturing. He also works as an adjunct faculty member at the Marshall Community and Technical College and in the College of Science. Lawson is a third generation Marshall graduate with a B.S in Computer Science and an M.S in Information Systems. He is pursuing a Doctorate in Higher Education Leadership and expects to complete the degree in 2011.

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EDUCATION OVERVIEW

RTI's higher education efforts focus on creating and supporting a multidisciplinary program of undergraduate, graduate and continuing education coursework and experiential learning that reinforces the transportation theme of the Institute and represents the uniqueness of Appalachia. RTI also seeks to increase the number of students, faculty and staff who are substantially involved in university and professional educational programs at Marshall University.

Through RTI's higher education efforts, new transportation-related courses, minors and degree programs have been created at Mountwest Community and Technical College, Marshall University and Marshall University Graduate College. Instructional content is geared to prepare students to support transportation systems in Appalachia and the United States.

A partnership between RTI and Marshall University's College of Information Technology and Engineering (CITE) resulted in a new degree emphasis in Transportation Systems and Technologies. Technology Management combines concepts and methods from management, business, science and engineering with a specific technology emphasis to address organizational needs.

Through CITE, an Engineering undergraduate degree is now available on the Marshall University (MU) campus in addition to new areas of emphasis in transportation for two advanced degrees. The RTI grant attracts students to the degree programs by funding student employment and experiential learning opportunities at RTI, while supporting faculty development of new courses.

A partnership between RTI and the Marshall University Lewis College of Business (LCOB) also created a new emphasis in Transportation and Logistics for the Master's Degree in Business Administration.

RTI awards a limited number of Graduate Research Assistantships (GRA) to full-time students pursuing the Transportation Systems and Technologies and Transportation and Logistics programs. The GRA provides a tuition waiver and a stipend to fully-admitted students who meet eligibility criteria. These students also work for RTI principal investigators gaining valuable experiences about transportation and transportation-related economic development challenges in the Appalachian Region and other rural regions of the United States.

Undergraduate courses that have been created, expanded or enhanced by RTI staff include:

- The reestablishment of an undergraduate degree in Engineering at Marshall University
- Nine upper-division undergraduate Marketing courses
- Six undergraduate Safety courses (five of which are upper division)
- Two online, upper-division Parks and Leisure Services/Off-Highway Vehicle Management (OHV) undergraduate/graduate courses
- Two additional online OHV courses are under development. Completion of the four courses earns a minor in OHV Management.
- Ten graduate Safety courses

Two master's degree emphasis areas at Marshall University were developed through RTI:

- A Master of Science in Technology Management with Emphasis in Transportation Systems and Technologies
- Master of Business Administration with an Emphasis in Transportation and Logistics (Accelerated Executive Program)

In addition, RTI financially supports students through graduate assistantships, internships and undergraduate hourly stipends. Students work with faculty to complete research, education and technology transfer projects. Faculty employed in the advanced degree programs will potentially be participating in transportation research or technology transfer projects that offer continuous opportunities to recruit students for relevant part time employment.

- Paid teaching and research assistant opportunities have been created and will be maintained for undergraduates that will help recruit graduate students for the advanced degree programs
- The partner school relationships will also continue to be utilized to recruit graduate students to the advanced transportation degrees developed at Marshall University as a result of the UTC grant
- The RTI Director and Director of Research will also continue to work with the appropriate student recruitment entities at the University to help develop a recruitment and marketing strategy in addition to specific activities such as summer transportation camps for future college students to help recruit students for the undergraduate transportation programs at the University
- Faculty employed in the advanced degree programs will potentially be participating in transportation research or technology transfer projects that offer continuous opportunities to recruit students for relevant part time employment.

Faculty from programs in Business, Engineering, Environmental Science, Geography, Geology and Physics have assisted in the additions to the transportation college course baseline in addition to contributing to a successful continuing education program reaching over 1000 transportation professionals each year.

EDUCATION HIGHLIGHTS

Blankenship Honored as RTI Student of the Year at CUTC Banquet

Research Associate and Marshall University doctoral candidate Amy Blankenship was honored as RTI's "Student of the Year" at the 13th Annual Council of University Transportation Centers Awards Banquet January 9, 2010, in Washington, D.C. Blankenship was chosen for her "personification of emerging transportation professionals of the future," said Dr. Diana Long, RTI Workforce Development Director and nominator. "Her expertise blends talents that complement the technical field of engineering and contribute to the workforce development of tenured and emerging workers."

As a doctoral candidate in higher education leadership, Blankenship is concentrating her studies in curriculum and instruction. Her research is aimed at developing and delivering geographic information system (GIS) skill sets to transportation professionals who

have less than a baccalaureate degree, utilizing open-source training materials and distance learning. Amy has spent her entire academic career at Marshall University, earning a bachelor of arts degree in English and master of science degree in environmental science and geography, with the latter including a graduate certificate in GIS. For her master's thesis in geography, she applied GIS data to economic development, resulting in a study of small-town urban revitalization. Amy is currently in a shared position as a research associate at RTI and as an assistant professor of geography at Marshall Community and Technical College. She has also taught physical geography and economic geography at Marshall as a teaching assistant.



U.S. Rep. Rahall Honored with CUTC Lifetime Achievement Award

U.S. Rep. Nick J. Rahall, II was honored with the Council for University Transportation Center's (CUTC) Award for Lifetime Achievement in Transportation Research and Education at the organization's annual awards banquet January 9, 2010, in Washington, D.C. The award was instituted in 2004 to honor individuals who contributed immensely throughout their professional lives to transportation research and education. Recipients have served primarily in government, business or non-governmental organizations and have legislatively, programmatically or administratively supported transportation research and education.

Rahall, who represents West Virginia's 3rd District, is Vice-Chairman of the Committee on Transportation and Infrastructure and one of its senior members. He serves on the subcommittees for Aviation; Highways and Transit; and Railroads, Pipelines and Hazardous Materials. He is also Chairman of the Natural Resources Committee, which affords him a unique perspective on how transportation can impact the utilization of natural resources. Actively involved with highway legislation since he was first elected in 1977, Rahall has promoted the construction of safe and modern highways in southern West Virginia and championed the efficient use of railroads and inland waterways. His "Three T's," Transportation, Technology and Tourism, guide his legislative efforts with transportation his top priority. Rep. Rahall was instrumental in the passage of the 1998 Transportation Equity Act for the 21st Century, which established 33 University Transportation Centers, including RTI at Marshall University. RTI fosters innovation and collaboration to plan efficient and safe transportation systems and enhance economic development. RTI uses an integrated approach to intermodal transportation through research, technology, education and workforce development.

Finding alternative ways to use existing resources, developing new technology, and promoting transportation education demonstrates Rep. Rahall's commitment to building a stronger, safer and more efficient transportation system. In 2002, Rep. Rahall succeeded in designating RTI as one of seven National Maritime Enhancement Institutes, which has contributed to additional research and education on inland waterways. Most recently, research and technology transfer efforts have expanded to include Intelligent Transportation Systems and workforce development programs.

EDUCATION HIGHLIGHTS

FLL LEGO Robotics Competition Trains Students, Teachers

On Saturday, December 12, 2009, RTI hosted the regional FIRST LEGO League (FLL) "Smart Move" Challenge, at the Morrow Library on Marshall University's Huntington campus.

This year's competition, "Transforming Transportation," called for teams to research and present their own creative solutions for accessing people, places, goods and services in the safest, most efficient way possible.

"At RTI we encourage innovation, communication, and collaboration in transportation through research and applied science," Bob Plymale, RTI Director and CEO, said. "This challenge applies those same ideals and gives our young people the opportunity to tackle situations they will face as adults."

Nearly 200 students from Cabell, Wayne and Mason counties participated in FLL, an international robotics program that ignites an enthusiasm for discovery, science, and technology in students ages 5 to 14.

Using LEGO MINDSTORMS technologies and LEGO materials while working with mentors, students spent eight weeks learning engineering and computer programming principles as they designed and built a fully autonomous robot capable of performing specific tasks. The program is sponsored by RTI and the NASA West Virginia Space Grant Consortium.

"This is a fun way to introduce younger students to science, technology, engineering and mathematics – or STEM," Linda Hamilton, LEGO Robotics Outreach Coordinator at RTI, said. "It's exciting to follow them through the discovery process."

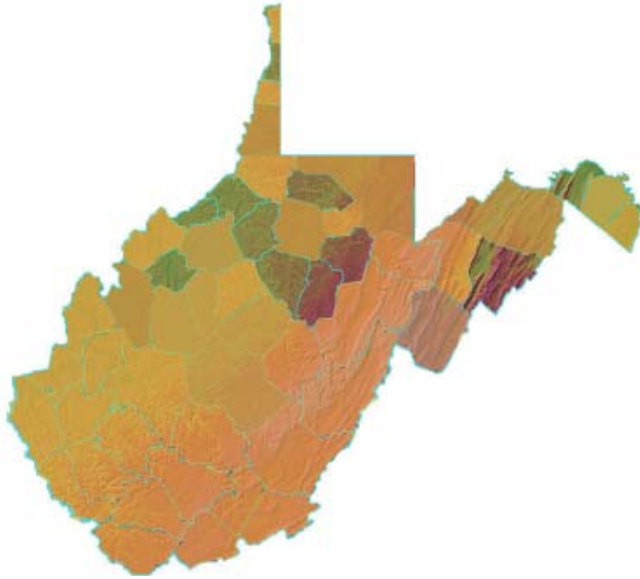
At the event students demonstrated problem-solving, creative thinking, teamwork and sportsmanship skills they developed during the program.

The FLL competition is judged in four areas: project presentation; robot performance; technical design and programming of the robot; and teamwork. Select teams had the opportunity to participate at the FIRST LEGO League World Festival, which took place in conjunction with the FIRST Championship, April 15-17, 2010, at the Georgia Dome in Atlanta, Georgia.

To learn more about FIRST, go to www.usfirst.org. To learn more about the "Smart Move" Challenge, go to www.FIRSTLEGOLeague.org.



Education - Pre-K-12 Outreach



The goal of RTI's K-12 Outreach programs is to nurture a new generation of transportation professionals by *introducing transportation issues during the school years and to encourage students to consider transportation-related careers after graduation.*

Since 2000, graduate and undergraduate education students from RTI's Transportation Outreach on Wheels (TO²W) program have traveled to schools, libraries and civic organizations throughout Appalachia. Each year, thousands of student contacts from kindergarten through high school at approximately 55 schools have benefited from this program's activities. Workshops vary in length from one-half a day to five days.

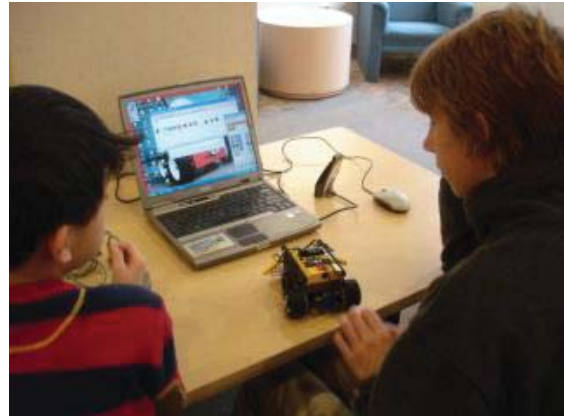
Students who have participated in RTI's outreach activities have come from West Virginia, Kentucky, Ohio, Virginia, New York, Pennsylvania, Indiana and Montana. More specifically, the program has benefited students from more than 40 West Virginia counties.



Education - Pre-K-12 Outreach

LEGO Robotics Activities

Linda Hamilton, RTI Coordinator of K-12 Outreach Intelligent Transportation Systems Workshops, teaches pre-K through 12th grade students about math, computer programming and science by using LEGO® Robotics, sets and projects focused on transportation and engineering.



- Younger students (ages 3-5) assemble vehicles, tracks and cargo carriers using pictorial charts and LEGO® DUPLO blocks and factor time, distance and weight into the transportation process.
- Older elementary students receive transportation-related “story challenges,” which must be solved using LEGO® DUPLO, CAD and WeDotm software to design vehicles and simple machines.
- Middle school students assemble intelligent MINDSTORM® RCX equipped vehicles and automated traffic control devices from LEGO® DACTA kits and use ROBOLAB™ software to write and download programs. High school students explore careers in automobile assembly, engineering, manufacturing, computer programming, education, transportation and robotics.

Hamilton works with teams of 9-14 year olds on the FIRST LEGO® League competition. The most recent focus was “Climate Connections.” Teams researched the effects of climate on two different communities and presented a single solution for both. Junior FIRST LEGO® League prepares younger children for the competition. Hamilton works with elementary schools in Cabell and Wayne counties, and brings them to RTI headquarters LEGO® Robotics City where they program the Red Rover, which simulates the communication NASA has with the Mars Rover Lunar Lander. During the summer, Hamilton visits libraries and community groups with the program “Building Fun,” which challenges children to build neighborhoods, places to work and vehicles using DUPLO® and LEGO®. Hamilton also conducts LEGO® camps sponsored by RTI, 4-H clubs and MCTC’s Division of Continuing Education.



Exploring Engineering: Academy of Excellence

Exploring Engineering: Academy of Excellence is designed to encourage high school students to explore engineering as a career by participating in hands-on engineering activities, touring engineering-related facilities, and interacting with practicing engineers.

The week-long, annual Academy is open to any high school student who has just completed 9th, 10th, or 11th grade. Preference is given to students who are rising juniors. A committee of faculty and staff members from the Marshall University College of Information Technology and Engineering reviews all application materials and selects students based on academic performance and school references. Thirty-six students from high schools in seven states participated.

Students are assigned to teams for completing such tasks as building trebuchets (catapults), LEGO® robots, and race cars. They also have the opportunity to meet current Marshall University engineering students and practicing professional engineers. Field trips to facilities such as the West Virginia-American Water Plant in Charleston, the Toyota Plant in Buffalo and J.H. Fletcher in Huntington are an important part of the experience.

Students are housed with 24-hour supervision in the Marshall University Commons Residence Halls to enhance the campus life aspect of education.

Support from individuals and corporations funds the Academy. This year's premier sponsors, Chesapeake Energy and the Nick J. Rahall II Appalachian Transportation Institute (RTI), contributed a combined \$50,000 in monetary and in-service donations to allow the academy to increase the number of students and expand activities.

TrailMakers Clubs

"TrailMakers" are transportation clubs for elementary through high school students in a four county region of rural southeastern West Virginia. RTI Principal Investigators Frank Adkins, who is also a long-time educator in Greenbrier County, and Dr. Mike Little, a professor of biology at Marshall University, developed the Trailmakers curricula and instructional materials.

The purpose of TrailMakers is to teach students the vital role transportation plays in their lives and provide the skill sets needed for careers in transportation and related industries. All TrailMakers participants use GPS and LEGO® robotics at an age appropriate level and content is connected to West Virginia Department of Education Content Standards and Objectives. Each club member receives an RTI shirt to establish a sense of pride and identity.

West Point Bridge Design Contest

The United States Military Academy offered the eighth annual West Point Bridge Design Contest. The nationwide Internet-based competition is intended to promote math, science, and technology education in U.S. middle schools and high schools. The contest provides students with a realistic introduction to engineering through a hands-on design experience. All U. S. students age 13 through grade 12 are eligible to compete for national-level recognition. Contestants may compete individually or in teams of two.

Students form a team, download and install the free West Point Bridge Designer software from the contest website, use the software to design, test, and optimize a highway bridge, upload the design to the contest website for automated judging, receive instant feedback on their standing in the contest, and submit as many designs as they wish. During the national contest, students may collaborate with their peers, teachers, parents, and contest volunteers.

The U.S. Military Academy provides this contest as a service to education and as a tribute to the Academy's 200 years of service to the United States of America. Last year, nearly 100 middle-school and high-school teachers organized local bridge design contests as class projects for their students.

Professional Engineers from RTI, the American Society of Civil Engineers (ASCE) West Virginia Younger Member Forum and the West Virginia Department of Transportation coach students to create computer models of the most cost effective bridge that would sustain AASHTO load conditions in this high-energy, mentoring and training program. Teams begin to create their designs in January and compete at a statewide competition in April.

TIPS (Transportation Injury Prevention and Safety) Activities

RTI and Saint Mary's Medical Center have entered into a partnership to provide transportation safety education and injury prevention programs to school-aged children (pre-K-12). The Transportation Injury Prevention and Safety (TIPS) program focuses on preventing injury while operating motorized and non-motorized recreation equipment, such as all-terrain vehicles, motorbikes, bicycles and motorized scooters, as well as vehicle safety including the dangers of drugs and alcohol. The program includes instruction on user behavior, equipment, demonstrations, special events and activities in the community, and education programs delivered to schools within the project area. Throughout the year, TIPS also brings a Bike Rodeo & Car Seat Clinic to local health fairs and public parks. During the clinics, participants learn to properly maintain their bicycles and maneuver them safely. Often, free helmets are given away, and car seats are also checked to ensure they are properly installed.

Research

Research results are published following peer review by university, government and private sector participants in the program. Research papers and technical reports are available at the RTI interactive website, [http:// www.njrati.org](http://www.njrati.org).

RTI has developed a variety of other methods to disseminate relevant applied research and development projects that enhance the region's economic development potential for use by the public and private sector. Activities include, but are not limited to, sponsoring symposia, funding post-research travel for researchers to address groups of end-users, and developing cost-effective materials to present the research in summary form for distribution to practitioners.

Research Selection and Advisory Team

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Research Highlights

Transportation Research Board Appoints Four RTI Team Members to a Total of Seven National Committees

Four transportation professionals from the Nick J. Rahall, II Appalachian Transportation Institute (RTI) have been appointed by the National Transportation Research board to a total of seven national committees.

“RTI and Marshall University are very fortunate to have the expertise of Dr. Junwook Chi, Dr. Diana Long, Dr. Andrew Nichols and Dr. Wael Zatar, as part of our team of transportation researchers,” Bob Plymale, RTI director, said. “Each of them brings a unique perspective and valuable contribution to the body of transportation research, and we are honored to see them recognized on a national level.

“These appointments further validate the impact of the team of transportation professionals assembled at RTI to meet the transportation, economic development and workforce development needs of West Virginia, the Appalachian Region and the nation.”

Dr. Chi, a transportation economist at RTI and MU, has been appointed to the Transportation and Economic Development Committee. The committee is concerned with the macroeconomic effects of transportation infrastructure investments, the effects of transportation cost changes on local and regional competitiveness, and methodological issues in defining and measuring effects of transportation investments on economic growth and performance. The committee is also concerned with the economic development effects of varying intermodal and modal investment strategies.

Dr. Long, RTI workforce development director, has been appointed to the Committee on Transportation Education and Training. The scope of this committee includes the improvement of communications among the academic community, the private and public sectors, and governmental agencies involved with academic training in the transportation field and the development of improved educational and training programs at all academic levels and for professional and pre-college education. The committee will be concerned with the present status of education in transportation, with new developments and innovations, with future personnel needs, and with professional training and development.

Dr. Nichols, an RTI principal investigator and MU assistant professor of engineering, has been appointed to the Highway Traffic Monitoring Committee and the Expert Task Group on LTPP Traffic Data Collection and Analysis. The Highway Traffic Monitoring Committee is concerned with all aspects of research in the fields of highway traffic monitoring, including detection, counting, classification, and in-motion weighing of highway vehicles. Its scope encompasses the full range of monitoring technology, including traffic sensors (both intrusive and non-intrusive), installation materials and techniques, signal processing algorithms, analysis and reporting techniques, and comprehensive monitoring programs. The committee is also concerned with highway monitoring standards to ensure the applicability and quality of traffic data in all its applications.

The Expert Task Group (ETG) on LTPP Traffic Data Collection and Analysis is a subsidiary committee of the TRB Long-Term Pavement Performance Committee. Its purpose is to advise the TRB Long-Term Pavement Performance Committee on matters related to collection, processing, uploading into the LTPP database, and analysis of traffic data collected at LTPP test sites throughout North America. The ETG provides comments and advice intended to help solve operational problems encountered in these activities. The work of the ETG is intended to facilitate the accumulation in the LTPP database of high-quality traffic data in quantities sufficient to support LTPP analysis projects. These projects are designed to produce outcomes that lead to products addressing the high-priority pavement-related needs of state highway departments. The work of the ETG also

includes reviewing those parts of the plans, activities, and progress of LTPP's data analysis and product development activities that pertain to the use of LTPP traffic data, and reporting its findings and suggestions to the TRB Long-Term Pavement Performance Committee.

Dr. Zatar, RTI principal investigator and professor of engineering at MU, has been appointed to three committees: Structural Fiber Reinforced Polymers Committee, Properties of Concrete Committee and the SHRP 2 Technical Expert Task Group on Nondestructive Testing Techniques for Mapping Voids, Bonding, and Moisture Behind or Within Tunnel Linings (Project R06-G). Zatar was selected to serve as Communications Coordinator for the Structural Fiber Reinforced Polymers Committee. This committee is concerned with the development and use of structural applications of fiber-reinforced polymer (FRP) composites for transportation related structures; including bridges, maintenance buildings, pipes, sign and luminaire support poles, guide rails, and guard rails. Activities of this committee help develop an awareness of the potential impacts of using composites for a wide range of structural applications and provide information for development and conduct of academic courses on FRP composites for civil engineers.

The Properties of Concrete Committee is concerned with the properties of conventional and high-performance concrete and test methods and procedures for measuring the properties of concrete, including non-destructive testing, and procedures for concrete quality control and quality assurance. The SHRP 2 Technical Expert Task Group on Nondestructive Testing Techniques for Mapping Voids, Bonding, and Moisture Behind or Within Tunnel Linings (Project R06-G) will advise SHRP 2 staff on the technical progress of Project R06-G, so that the outcome of the project will meet the research objectives set forth in the general plan of contract research established by the SHRP 2 Technical Coordinating Committee on Renewal Research and the scope of work included in the request for proposals.

New Research Projects 2009-2010

210031 Feasibility Study of Integrating WV DOT Linear Referencing System Center Line with Statewide Addresses and Routing Information

Primary Investigator: Mr. Sang Yoo

The objective of the proposed study is to review technical issues regarding the feasibility of road network integration in West Virginia which incorporates linear referencing, addressing, and routing capabilities. This study will (1) identify and review existing transportation models, as well as DOT data needs, (2) create an integrated road network pilot; and (3) identify requirements for integration.

210233 Signing for Preventing End of Queue Accidents

Primary Investigator: Dr. Andrew Nichols

The objective of this project is to evaluate potential mitigation measures for work zone end of queue crashes. The researchers will explore possible new ideas and make recommendations how to address end of queue crashes.

210144 Workforce WV (Skills Gap Analysis)

Primary Investigator: Dr. Diana Long

This objective of this project is to complete a skills gap analysis for existing training providers for the transit industry. This project will provide asset mapping to identify major training assets relative to the needs of the transit industry, cataloging courses and training providers who can deliver related training. The outcome of the mapping process is providing information to the training partnership stakeholders on the availability of training, by region, to meet their needs.

210171B 2009 WV State High-Speed and Intercity Rail Plan

Primary Investigator: Dr. Junwook Chi

The objective of this project is to explore the feasibility of building a High-Speed Rail System in West Virginia. This project will discuss economic and non-economic benefits of High-Speed Rail (HSR), factors contributing to the success of HSR, and a potential HSR network in West Virginia.

210193 WVDOH 511 Feasibility Study

Primary Investigator: Dr. Andrew Nichols

The objective of the 511 Feasibility Study is to consider an implementation that shall cover the major corridors within the state of West Virginia. A 511 Steering Committee will be formed and engaged to provide direct oversight for the Study. At its most basic, 511 should be understood simply as a way for people to get traveler information they need in order to make informed decisions about how and when to travel, anywhere in the state.

TECHNOLOGY TRANSFER OVERVIEW

The goal of the technology transfer mechanism is to make RTI's research results available to potential users in a form that can be directly implemented, utilized or otherwise applied. Appropriate modes of interdisciplinary technology transfer include, but are not limited to:

- publication of research papers, technical reports and a newsletter
- transfer and licensing of intellectual property
- practical and commercially relevant workshops and industry specific seminars that impact the economy
- an interactive website

RTI incorporates a technology transfer element as an integral part of each funded project and activity. The vision is for RTI to be recognized beyond the Appalachian Region as a source of essential technical knowledge that enhances the development of new transportation products and systems. This knowledge will be disseminated in the form of publications, tech transfer activities and patents.

The results of each research, education or outreach project will be presented by principal investigators in at least one refereed or conference paper in a transportation focused journal/conference. Although journal publications are favored for advanced research, conferences such as TRB or ASEE may be more appropriate for other types of research or educational development. The webpage is being revamped to include new publications available online; the quarterly newsletter is published and distributed in hard copy and on-line, and a major portion of the annual research needs assessment, request for proposal distribution, and proposal responses are conducted via e-mail and the webpage.

In addition to producing cost saving planning and management technologies, several RTI research projects have also produced safety improving technologies. And all new technologies are in various stages of being transferred into the transportation industry. (See media clippings) Furthermore, several other research projects have contributed to improvements in the physical railway and recreational trail infrastructure in the region with the potential to not only increase the number of trips that drivers take but also decrease the amount of freight on the regions highways while helping to eliminate several dozen freight transportation physical restraints for a "Corridor of National Significance."

In addition to transferring specific research project results, RTI also partnered with the Transportation Research Board (TRB) for several national conferences on transportation and economic development, and RTI developed the Geo-hazards in Transportation in the Appalachian Region Technical forum. RTI also sponsored several other conferences and seminars in cooperation with the local FHWA and other state DOT on an as needed basis.

TECHNOLOGY TRANSFER HIGHLIGHTS

eCDL Partnership with WVDMV Wins Council of State Governments' Innovations Award



In 2009, Gov. Joe Manchin and Congressman Nick Rahall jointly announced the award-winning partnership between the state Division of Motor Vehicles CDL section and the Rahall Transportation Institute (RTI).

The eCDL Program was developed to make the testing aspect of getting a Commercial driver's license free of fraud and paperless by utilizing a laptop computer with a Global Positioning System (GPS) to track the test. Other benefits of the program include savings of \$500,000 to the state and the decrease of the DMV state fleet by 60 percent.

Representatives from both organizations were in attendance Tuesday, August 18, 2009, in Winston-Salem, N.C., at the Southern Legislative Conference of the Council of State Governments' (CSG) Annual Meeting. The winners of the 2009 Innovations Award, Southern Region, were announced at a reception that evening, and the award was presented to DMV and RTI at the Annual National Meeting in La Quinta, California, November 12-15. There, the eCDL program will compete against other regions, including the other Southern Region winner, the Kentucky Reentry Hotline, for the national award. According to the CSG, the Innovations Awards Program was established in 1986 "to bring greater visibility to exemplary state programs and practices, and to facilitate the transfer of those successful experiences to other states. The program is the only comprehensive national awards program that focuses exclusively on state programs and policies."

"We're very proud that West Virginia is receiving national recognition for this deserving program," Gov. Joe Manchin said. "The WV eCDL Program was the first system of its kind in the nation. It was invented, developed, and directed by the DMV, in partnership with the Rahall Transportation Institute, and funded by DMV and federal grants through the Federal Motor Carrier Safety Administration. I appreciate everyone's efforts on this because it is truly a top-quality program."

The DMV and RTI submitted the eCDL Program for consideration of the Innovations Award. Out of 110 submissions, the field was narrowed to eight. Each of the eight finalists gave presentations, and the eCDL Program was named one of two winners for CSG's Southern Region.

"This program is a model of accomplishment by a partnership of state and federal government, agencies and authorities, and the private sector," said Rahall. "Winning this award is an honor for the Rahall Institute, our State, the agencies and organizations who worked hard on this project, and it serves as an inspiration and signal of opportunity for the people of West Virginia."

DMV Commissioner Joe Miller said of the award, "The West Virginia Division of Motor Vehicles is working toward making all of our programs state-of-the-art, and the eCDL project is an example of these

TECHNOLOGY TRANSFER HIGHLIGHTS

efforts. I'm very pleased with the group of DMV employees that worked diligently on this project-Dempsey Totten, Wilbur Thaxton, Steve Shelton, and Mark Holmes, to name a few, and I feel they should be commended. Additionally, the partnership that arose from this project shows how groups can work together for a common goal with excellent, award-winning results."

RTI Director and CEO Bob Plymale expressed the importance of this nationally recognized partnership. "The eCDL represents the best of West Virginia – creativity, innovation, and collaboration," Bob Plymale, RTI Director and CEO said. "We couldn't have asked for better partners than the WV DMV and the FMCA. RTI continuously fosters a collaborative environment and we look forward to more successful partnerships to develop new technology, improve safety, and enhance economic development in West Virginia and abroad."

The eCDL Program was developed to make the testing aspect of getting a Commercial driver's license free of fraud and paperless by utilizing a laptop computer with a Global Positioning System (GPS) to track the test. Other benefits of the program include savings of \$500,000 to the state and the decrease of the DMV state fleet by 60 percent. In 2003, 2007, and 2009, the West Virginia DMV CDL Program received funding from the Federal Motor Carrier Safety Association. This funding was used to work with the Rahall Transportation Institute to develop the software that applied the capabilities of the GPS to record and document verifiable skills tests.

TECHNOLOGY TRANSFER HIGHLIGHTS

Rahall Transportation Institute to Develop Custom Software Application for First Responders to Maritime Emergencies

RTI has been selected to receive funding to develop and deploy a custom software application designed to assist first responders with maritime disasters and severe weather emergencies. RTI's Maritime Enhancement Institute will manage the project.

RTI's Maritime Enhancement Institute will collaborate with Operation Respond Institute in Washington, D.C., and AccuWeather of State College, Penn., to develop the custom maritime software application.

The funds are provided under the Federal Emergency Management Agency (FEMA) Port Security Grant Program and the State of West Virginia. The new application will be designed for use by all emergency responders in the 26 tri-state counties that border the Ohio River within the Port of Huntington. This unique public safety tool will be available on wireless handheld platforms and desktops. The technology will provide immediate, on-scene hazardous materials guidance for use in dealing with incidents involving maritime activities, highway freight transportation, and materials storage and distribution centers along the Ohio, Kanawha and Big Sandy Rivers. In addition, it will be equipped to provide incident-specific weather monitoring, severe weather displays and warnings.

"This innovative program will be customized to address the unique challenges associated with maritime disasters," Dana Robertson, former Director of the Maritime Institute at RTI said. "It will be equipped with a comprehensive, area-wide GIS platform adapted and formatted with electronic navigation charts, local and regional geographic features, and other attributes for use by public safety dispatch points to precisely locate river and river-related incidents."

Additional features of the software application will include critical security, hazmat, and operational safety data to assist in dispatching activities, such as determining the best access to a specific location. Professional meteorological assessments and severe weather response guidance will also be available with

TECHNOLOGY TRANSFER HIGHLIGHTS

National Celebration Honors Maritime Workers and Contributors

Towboats, barges, US Coast Guard and US Army Corps of Engineer vessels along with sternwheel boats were docked at the Point Pleasant Riverfront Park in support of National Maritime Day. Activities celebrating this year's National Maritime Day kicked off September 4, 2009, at 10 a.m. at the Point Pleasant Riverfront Park. Brian Billings, Mayor of Point Pleasant opened the event welcoming participants and visitors to the celebration.

The 3 days of activities were sponsored by the Rahall Transportation Institute, the Huntington District Waterways Association, the Huntington District, US Army Corps of Engineers, the US Coast Guard Marine Safety Unit Huntington and numerous inland marine industries. Dana Robertson, former Director of the Maritime Enhancement Institute, at the Rahall Transportation Institute, stated that, "while rail and roads have exceeded their capacity to transport products, barges are underutilized." As a 15 barge tow silently passed by the ceremony moving downstream on the Ohio River, Fred Nyhuis, President of the Huntington District Waterways Association, told the assembled crowd "that tow represents over 1000 18 wheel truck/trailers that are not tearing up our highways. It is the safest, most environmentally friendly and cheapest mode of transportation in the United States."

Three individuals were presented with a Maritime Impact Award signed by Congressman Nick J. Rahall. Captain Charles T. Jones was presented with the first award for his tireless dedication, support and service in support of the inland marine industry. Captain Richard Kern was recognized for his outstanding service to several marine safety and navigational committees. Mr. Jack Fowler was presented with an Impact award for his perseverance and intense personal involvement and support as the Director of the Point Pleasant River Museum.

Tours were open to the general public for the M/V Mountain State, the newest boat of the American Electric Power/MEMCO fleet, and Madison Coal & Supply's M/V J S Lewis, one of the oldest working towboats on the Inland Rivers, along with other vessels. Visitors were able to participate in deckhand activities, learn about the history of the rivers, how a lock and dam operate, how the Coast Guard is promoting homeland security and obtain information on river employment.



Trails Day at the Legislature Takes Place at State Capitol

RTI Trails Specialist Jordan Cox and Research Associate Theresa Litteral participated in Trails Day at the Legislature Monday, July 5. This annual event, initiated by the West Virginia Trails Coalition, allows the trail community in West Virginia to come together in a high profile event that documents the economic benefits of trails for the State's leadership. Tourism is one of West Virginia's fastest-growing industries and the escalating use of trails of all kinds is expected to continue. RTI is helping the state meet the challenges to increase access to this scenic landscape, protect it from over-development, preserve history and culture, create a significant economic development tool, and improve livability for all West Virginians.

TECHNOLOGY TRANSFER HIGHLIGHTS

RTI to Host 2010 National Rural Intelligent Transportation Systems Conference in Huntington, W.Va.

RTI will host the National Rural Intelligent Transportation Systems Conference in Huntington, W.Va., in August 2010. The conference's theme will focus on incorporating the "3Ts" - Technology, Transportation and Tourism with Intelligent Transportation Systems (ITS) in rural settings that provide a unique set of challenges and objectives not found in urbanized areas.

Dr. Andrew Nichols, RTI Research Associate, said, "The purpose of the conference is to provide an opportunity for transportation professionals to share research, education and technology transfer ideas on issues that are pertinent to our areas. In addition to participating in breakout sessions and listening to presentations from experts in the field, we will provide networking opportunities for rural transportation professionals to share information and ideas that may solve the transportation needs of our respective regions."

RTI Director Bob Plymale said that because RTI is based in the only state located entirely within the Appalachian region, "We understand the challenges and needs of expanding and maintaining intelligent transportation systems in rural areas."

RTI will work closely with the West Virginia Department of Transportation, the West Virginia ITS America Chapter and Meetings Northwest to make the conference a success. Bruce Kenney, ITS Project Manager with the WV DOT, said, "The conference will be a great opportunity to showcase ITS projects that are underway in the state. With our management center and future statewide ITS applications, our ITS initiative literally adds a third dimension to our transportation infrastructure, which also allows the WV DOT to partner with various state and regional stakeholders in promoting transportation safety and mobility."

Tom Smith of the Federal Highway Administration, who has been instrumental in developing ITS projects at the Rahall Transportation Institute, said "We plan to use the conference as an opportunity to share and explore education, safety, security and efficiency issues that are specific to rural intelligent transportation systems. We also want to increase the visibility of ITS in this region by including smaller agencies and constituents that could potentially benefit from these ITS projects. By the time of this conference, we believe that West Virginia will be able to showcase some of the best success stories in the nation in rural ITS. Those successes will be due in large part to the great partnership that exists in this area between WV DOT, RTI and FHWA."

Approximately 300 transportation professionals from across the United States are expected to attend the five day conference. These professionals will represent other state transportation agencies, academic institutions, consultants and equipment vendors.

Steve Albert, director of the Western Transportation Institute in Bozeman, Mont., said, "Bringing the NRITS conference back to the east coast and the unique transportation, economic development and partnership provide a great opportunity for RTI and West Virginia to showcase how they are addressing rural transportation challenges. ITS America and the Rural Stakeholder Group look forward to working together in partnership to bringing the national rural ITS experience to West Virginia, and vice versa."

For more than 15 years, ITS America has been the foremost advocate for the development and deployment of intelligent transportation systems in the U.S. ITS America members come from private corporations, public agencies, academic institutions and research centers. ITS America Members share a common goal: to improve the safety, security and efficiency of the nation's transportation system for the traveling public through the deployment of ITS.



TECHNOLOGY TRANSFER ACTIVITY HIGHLIGHTS

Appointments to TRB Committees

- Chi, Junwook. Transportation Research Board Transportation and Economic Development Committee.
- Fraser, Janet. Transportation Research Board ABE40 Committee on Critical Transportation Infrastructure Protection.
- Long, Diana. Transportation Research Board Committee on Transportation Education and Training.
- Nichols, Andrew. Transportation Research Board Expert Task Group on LTPP Traffic Data Collection and Analysis and Highway Traffic Monitoring Committee.
- Zatar, Wael. Transportation Research Board Structural Fiber Reinforced Polymers Committee, Properties of Concrete Committee and the SHRP 2 Technical Expert Task Group on Nondestructive Testing Techniques for Mapping Voids, Bonding, and Moisture Behind or Within Tunnel Linings (Project R06-G). Communications Coordinator for the Structural Fiber Reinforced Polymers Committee.

Conferences Hosted, Sponsored or Co-Sponsored

- Geohazards in Transportation in the Appalachian Region, 9th Annual Technical Forum, Lexington, Ky., August 4-6, 2009.
- GIS-T Conference, Charleston, WV, April 12-14, 2010.
- Marshall University ASCE Technical Conference, Huntington, WV, January 2010.
- National Rural Intelligent Transportation Systems Conference, Portland, Oregon.

Journal Publications

- Cetin, M. and A.P. Nichols. "Improving the Accuracy of Vehicle Reidentification Algorithms by Solving the Assignment Problem," *Transportation Research Record; Journal of the Transportation Research Board*, No. 2129, pp. 1-8, 2010.
- Cetin, M., C. Monsere, A. Nichols. "Bayesian Models for Re-Identification of Trucks over Long Distances on Axle Measurement Data." *Journal of Intelligent Transportation Systems*. (accepted for publication)
- Chi, Junwook. "Carriers' pricing behaviors in the United States airline industry." *Journal of Transportation Research (Part E: Logistics and Transportation Review)*. (Volume 45, Issue 5, September 2009, Pages 710-724).
- Chi, Junwook, Won W. Koo and Siew H. Lim. "Price Dispersion in the U.S. Airline Industry 39." *Journal of Transportation Research Forum (Volume 48, Issue 3, Fall 2009, Pages 39-58)*.
- Zatar, Wael. "Upgrading of Ductility and Shear Capacity of Girders of Highway Bridge Reinforced Concrete Bents," *International Journal of Bridge Structures*, August 2009.

TECHNOLOGY TRANSFER ACTIVITY HIGHLIGHTS

Presentations/Moderations at Technical Conferences

- Dingus, Rebecca, Junwook Chi and Sam Waugaman. "High-Speed Rail in the U.S. - Economic Perspectives." ASME 2010 Joint Rail Conference University of Illinois-Urbana, Urbana, Illinois. April 27-29, 2010.
- Litteral, Theresa. Breakout Session Facilitator, West Virginia State Trails Conference, Site Selection for Trail Systems Breakout Sessions, September 8-9. 2010.
- Nichols, Andrew. "Extracting Freight Corridor Performance from Weigh-in-Motion Data." Presentation at the National Rural Intelligent Transportation Systems Conference, Seaside, OR, August 25, 2009.
- Nichols, Andrew. Presenter and Session Moderator, North American Travel Monitoring Exhibition and Conference, Seattle, WA, June 2010.
- Zatar, Wael. "*Development of Simplified Design Guidelines for Reinforced Self-Consolidating Concrete Bridge Piers Confined with CFRP Grids*," TRB Committee on Structural Fiber Reinforced Polymer Composites, 89th Transportation Research Board Annual Meeting, January 2010, Washington, D.C.
- Zatar, Wael. "*Structural Risk Identification and Assessment of Highway Bridge Systems along Priority Routes*," Engineering Club of Huntington, Huntington, WV, April 2010.
- Zatar, Wael. "*Seismic Hazard Mitigation of Transportation Structures*," Geohazards in Transportation in the Appalachia Region, 9th Annual Technical Forum, Lexington, Ky., August 2009.
- Zatar, Wael. "*Upgrading of Ductility and Shear Capacity of Girders of Highway Bridge Reinforced Concrete Bents*," 5th New York City Bridge Conference, New York, NY, August 2009.
- Zatar, Wael. "*Structural Risk Assessment of Highway Bridge Systems along Priority Routes*," WV Expo, Charleston, WV, 2009.
- Zatar, Wael. "*Sustainable Structures with Fiber Reinforced Polymer Composites - Innovations and Applications*," Winter Technical Conference of the Society of American Military Engineers Student Chapter, Marshall University, Huntington, WV, January 2009.

Public Events

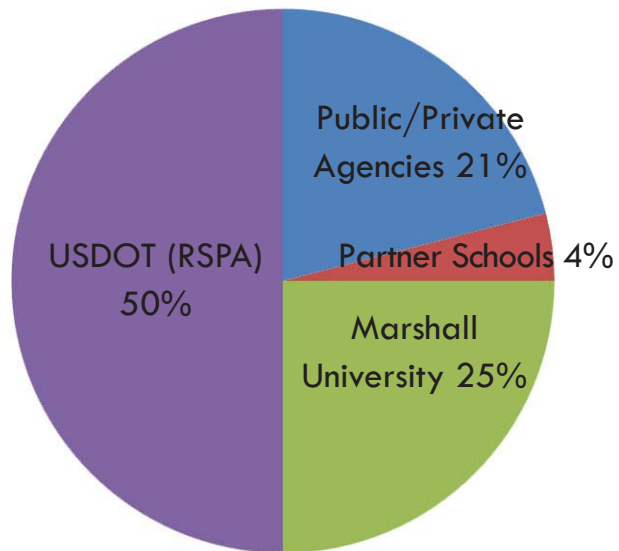
- National Maritime Days Celebration, Point Pleasant, WV. September 4-6, 2009.
- RTI, Marshall University and Citizens' Conservation Corps Construction of 1 Mile of the PATH, St. Clouds Commons, Huntington, WV, Sept. 11, 2009.
- FitFest '09 5K Run/Walk, Kids' Races and Community Event to Benefit the PATH Trail, Huntington, WV, Sept. 11, 2009.
- Trails Day at the Legislature, Charleston, WV, July 5, 2010.

SOURCES OF FUNDING

SINCE RTI INCEPTION

- Appalachian Regional Commission (All 13 States' Departments of Transportation)
- Assumption College
- Benedum Foundation
- British Petroleum
- Business and Industrial Development Corporation
- CSX
- Cabell County Schools
- Federal Railroad Administration
- Greater Kanawha Resource Conservation and Development Area
- Hatfield-McCoy Regional Recreation Authority
- Huntington Area Development Council
- KYOVA Interstate Planning Commission
- Lincoln County Economic Development Authority
- Marshall Community and Technical College
- Meadow River Enterprises, Inc.
- Mid-Ohio Valley Regional Planning and Development Council
- Norfolk Southern
- Ohio Department of Transportation
- Ohio Rail Development Commission
- Operation Respond
- Putnam County Development Authority
- Raleigh County
- Raleigh County Assessor
- St. Mary's Medical Center Foundation
- Tennessee Department of Transportation
- Tennessee Valley Authority
- United States Army Corps of Engineers
- United States Department of Energy
- United States Department of Justice
- United States Department of Transportation Federal Highway Administration
- Wayne County of Commission
- West Virginia Bureau of Employment Programs
- West Virginia Department of Natural Resources
- West Virginia Department of Tax and Revenue
- West Virginia Department of Transportation/Division of Highways
- West Virginia Department of Transportation/Division of Motor Vehicles
- West Virginia Development Office
- West Virginia Disaster Recovery Board
- West Virginia Division of Highways
- West Virginia Governor's Office
- West Virginia Housing Development Fund
- West Virginia Public Port Authority
- West Virginia Public Service Corporation
- West Virginia Statewide Addressing and Mapping Board
- West Virginia Trails Coalition

FUNDING SOURCES YEAR 10



EXPENDITURES YEAR 10

