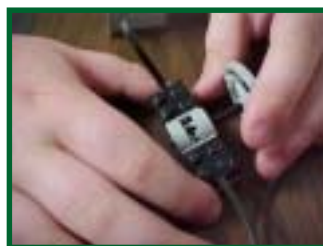

Nick J. Rahall, II Appalachian Transportation Institute

RTI.

2002-2003 Annual Report



Transportation and Economic Development
in Mountain Regions

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DISCLAIMER:

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CENTER THEME

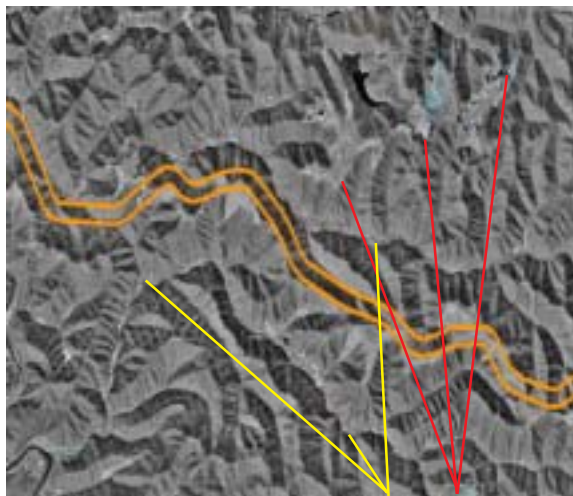
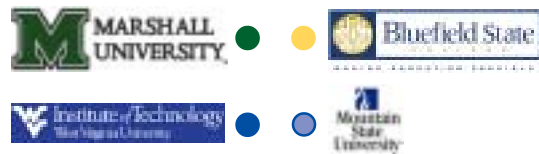
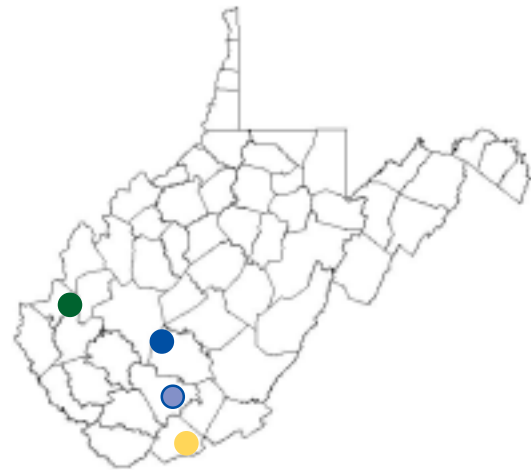
“Transportation and Economic Development in Mountain Regions”

The mountainous terrain and dispersed population of Southern West Virginia and other parts of Appalachia have presented and continue to present unique challenges to planning, construction, and maintenance of safe, cost-effective transportation infrastructure.

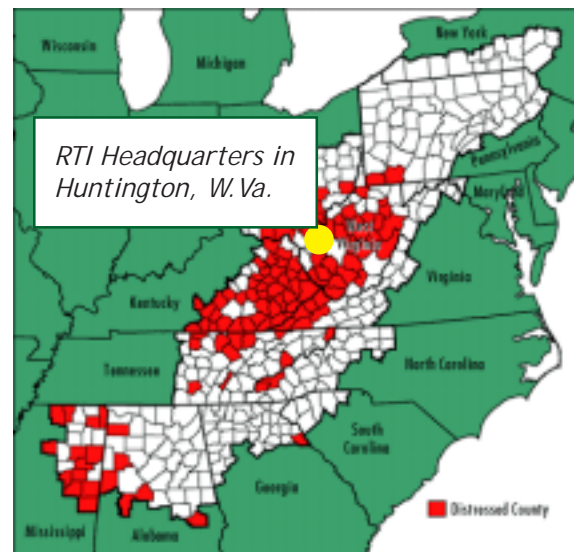
In addition, the implementation of post-mining land use, which can create flat land suitable for economic development in the region, has been hindered by transportation systems inadequate for commercial and industrial purposes.

RTI has been empowered through its designation as a University Transportation Center (UTC) to focus a comprehensive, broadly based, multi-disciplinary research, education and technology transfer program on this region’s transportation and transportation related economic development challenges.

The UTC at Marshall University may include activities at: Bluefield State College, Bluefield, W.Va.; Mountain State University, Beckley, W.Va.; and West Virginia University Institute of Technology, Montgomery, W.Va.



Above: Orange lines indicate the proposed route of the I-73 High Priority Corridor through portions of Southern West Virginia superimposed over high resolution aerial imagery. Red lines indicate the locations of surface mining activity. Yellow lines show the locations of rural communities.



Above: White shading represents state and county boundaries that comprise the Appalachian Region. Red shading represents counties that are distressed per National Standards (i.e., more than 150% of the National Unemployment Rate). The number of distressed counties in the region can be partially attributed to a costly and incomplete surface transportation system that is under development.

SUCCESS STORIES

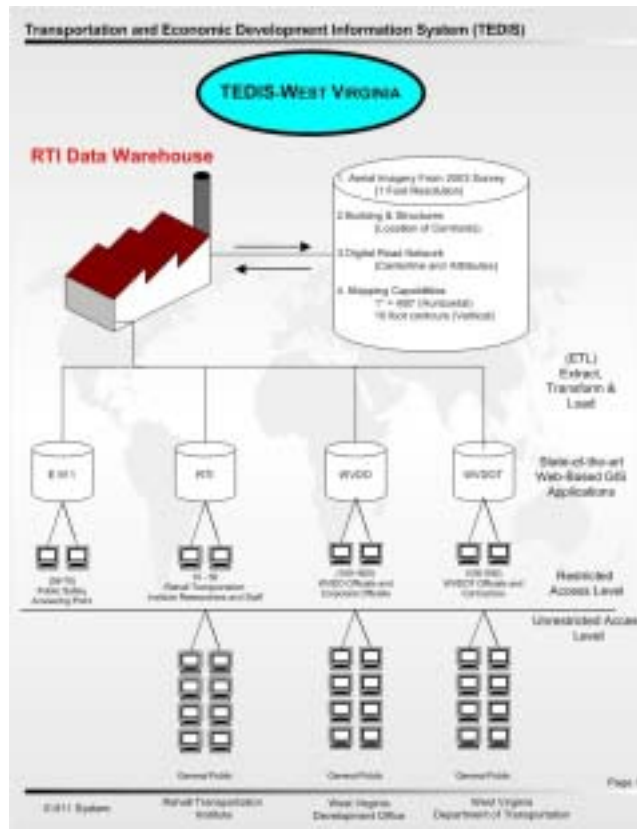
RTI to Create 911 Data Warehouse for West Virginia Statewide Mapping and Addressing Board, Allows Emergency Vehicles to Locate Rural Residences More Quickly and Easily

Emergency vehicles may be able to locate rural homes more quickly and easily thanks to an agreement between the Rahall Transportation Institute and the West Virginia Statewide Addressing and Mapping Board (WVSAMB).

Recently, research associates from RTI agreed to develop a detailed implementation plan that addresses the short, mild and long-term data requirements of the WVSAMB.

The goal is to provide city-style addresses for rural areas of West Virginia and to create a data warehouse that stores the information and ensures the same level of prompt, accurate emergency service currently enjoyed by the urban areas.

“In order for ambulance drivers, firefighters, police officers and other emergency personnel to locate homes in rural areas, the homes must be mapped and the maps must be stored in a form that is easily accessible from emergency command centers,” Bob Plymale, RTI director, said.



“We hope this project will allow emergency workers to more easily locate homes that need their assistance and arrive in a timely fashion.”

A multi-discipline team of information technology specialists, geologists, research associates and graduate research assistants from RTI will implement the system in three phases.

During phase one, the primary data house will be constructed at the Marshall University Drinko Library. In phase two, a secondary data warehouse will be constructed at an additional

site. In the final phase, the two sites will be brought into full production and the E911 structure will be serviced.

Through this agreement, geospatial and other intelligence and operational information may be provided to emergency personnel in the center from a variety of sources, at different times and rates, and on various media.

All information added to the system will be standardized and integrated to fit within the parameters of the data warehouse.

SUCCESS STORIES

RTI Brings Robotics Outreach Program, Educational Information, Research Findings to State Fair of W.Va.

RTI participated in the State Fair of West Virginia August 8-16 in Fairlea, W.Va. The annual event draws thousands, and more than 2,100 people visited RTI's exhibit during the nine day period.

"The exhibit allowed RTI to reach out to people with whom we would not normally have been able to make contact," David Cartwright, research associate, said. "We were able to take our goals, outreach programs and research to let people know what we are about."

Research associates, graduate research assistants and undergraduate student assistants explained RTI's technology transfer activities, research projects and results in transportation and how they impact economic development.

Students from partner school Bluefield State College (BSC) answered questions about the award winning Vasilius, a 300 pound, six feet tall robot constructed by the BSC Engineering Technology Team, which receives partial funding from RTI.

Visitors also picked up information about RTI, Marshall University and its partner schools: Mountain State University, BSC, West Virginia University Institute of Technology and Southern West Virginia Community and Technical College.

The highlight of RTI's exhibit was the opportu-



Above: Rep. Nick J. Rahall, II and graduate research assistants from RTI instruct students in programming intelligent vehicles using LEGO Robotics at the State Fair of West Virginia.

nity for fairgoers to tele-operate LEGO Robotic Vehicles, part of the Outreach program RTI operates from its Huntington headquarters. Guests operated three LEGO robots and programmed commands and vehicles in SENSORS City at RTI headquarters. They were also informed about engineering, mining, education and manufacturing degrees that use robot technologies.

"People came from all over the fair to operate the LEGO Robotics and SENSORS City," Cartwright said.

History Channel Consults RTI Associate Director for Episode of "Modern Marvels: Coal Mines"

RTI Associate Director Richard Begley, Ph.D., served as a consultant to the History Channel for an episode of the documentary series, "Modern Marvels: Coal Mines."



The episode, which premiered summer 2003, chronicles the history of coal mining and takes a look at the state of the industry today. The program documented the advances and history in coal extraction methods and how mines have become more safe and efficient.

Begley, who has extensive experience in mining engineering, provided information on the deployment of technology in underground and surface mining methods and the automation of these processes. He also advised the film crew in selecting subject matter and recommended West Virginia filming locations.

"Being recognized as a resource through my background in engineering, I am honored to have been able to help people understand more about mining history and technology," Begley said.

SUCCESS STORIES

Intelligent Robot “Vasilius” Wins National Competition, Designed by Partner School Team, Co-Sponsored by RTI

A team of research and engineering technology students from Bluefield State College, an RTI partner school, were rewarded with top placement at the world championships of Intelligent Ground Robotic Vehicle international competition at Oakland (MI) University.

The team, partially funded by RTI, earned championship trophies for “design” and the “most intelligent robot” in the competition that included engineering programs from institutions of higher education including Georgia Tech, Virginia Tech, University of Florida, University of Michigan and University of Colo-

rado. The competition included nearly 30 robots, some of which came from Japan or Canada.

“Vasilius,” is six-feet tall, 300 pounds and processes its environment using stereoscopic vision, laser movement systems, a differential global positioning system, digital compass, color and proximity sensors.

The team plans to refine the design and operation of “Vasilius” in preparation for next year’s IGRV event.



Left: BSC Engineering Technology Team: front row - Amy Snider and Jarrod Snider; back row - Mark Myers, Donnie Walker; Bruce Mutter (faculty advisor), Marcus Shapiro and Dr. Robert Riggins (faculty advisor).

RTI Hosts Marshall University Board of Governors Meeting

RTI hosted the Marshall University Board of Governors meeting July 16, 2003, at RTI headquarters, where members were briefed about current and future research projects and economic development activities.

Three new members, Michael J. Farrell, Gary Adkins and Brent A. Marsteller, were sworn in at the meeting. West Virginia Gov. Bob Wise appointed them to serve a four-year term ending June 30, 2007.

After being sworn into their positions, board members and Marshall University staff, faculty and student representatives toured RTI’s facilities.

Continuing as board members are Stephen E. Haid, Carol Hartley, Virginia King, Menis E. Ketchum, A. Michael Perry, Robert L. Shell Jr., Gary G. White, Thomas D. Wilkerson and Joseph L. Williams of Huntington.



SUCCESS STORIES

New Research Associates, Personnel Welcomed to RTI Staff



Lawson

David Lawson, Errin Jewell, Peter Dailey and Sang Hong Yoo were recently welcomed to the RTI staff.

Lawson joined the ranks at RTI in April as manager of information technology with dual responsibilities at the Robert C. Byrd Institute for Advanced Flexible Manufacturing.

He began his career at Marshall University as a computer programmer and returned to Marshall 17 years later after working throughout the eastern United States.

Previously, Lawson worked for the Genesis Software Corporation, Thomson/TEIR/TTCG, Legent Corporation, Hunter Associates Laboratory, Bell Atlantic, West Virginia University and the U.S. Army Corps of Engineers.

Lawson earned a Bachelor of Science in Computer Science and has completed 18 hours toward a Master of Science in Computer Science.

In May, Jewell filled the public affairs and desktop publishing specialist position. She previously served as a graduate research assistant and has occupied the interim public affairs and desktop publishing position since July 2002.

Jewell earned a Bachelor of Arts in Journalism and Master of Arts in Journalism from Marshall University. She worked as a public relations writer at Cabell Huntington Hospital before coming to RTI. Jewell also served as a graduate assistant in University Communications and the John Deaver Drinko Academy.



Jewell



Dailey

Dailey is a research associate who works exclusively on the Integrated Track Stability Measurement Systems (ITSAMS) research project. The ITSAMS project seeks to reduce maintenance costs associated with railway infrastructure through non-invasive technologies that measure and sense the railway and associated structure.

He graduated with a B.S. in Mining Engineering from West Virginia University and recently completed a M.S. in Technology Management from Marshall University. He previously served as an advisor for various engineered products including explosives and chemical processing equipment.

Yoo is a research associate and computer system administrator. He works on the Transportation and Economic Development Information System (TEDIS) project and is skilled specifically in geographical information systems and remote sensing. He also has experience with various mapping instrumentations.

He has worked for RTI since 2001 as a graduate research assistant and became full-time upon completion of a M.S. in Environmental Engineering and an M.S. in Physical Science in Geobiophysical Modeling.

Yoo received a B.S. in Inorganic Material Engineering at Gyeosang National University, Korea in 1999. As a tutor in the Marshall University H.E.L.P program Yoo taught science and engineering subjects to students with learning disabilities and attention deficit disorder.



Yoo

SUCCESS STORIES

Railroad Conductor Training Program Prepares Graduates for Workforce



Seventy percent of railroad conductors will reach retirement age during the next ten years. Fortunately, RTI is helping to train the railroad industry's next generation of conductors.

RTI, Marshall Community and Technical College (MCTC), the West Virginia Development Office and CSX Transportation have created the "Railroad Conductor Training Program" to prepare individuals to enter the railroad workforce. During this five-week training program students spend eight hours a day in classrooms or on railroad equipment learning basic railroading skills, safety, operating rules, signals, equipment and other topics essential for success as a conductor.

The "Railroad Conductor Training Program" consists of 200 hours of training as well as job interviews and medical evaluations during the third



Above left: Railroad Conductor Training Academy students receive instructions during a hands-on training session. Above: Dr. Diana Long addresses railroad students and their families during the first graduation. Bottom right: Railroad students complete assignments in the classroom.

and fourth weeks.

"This program will offer an excellent opportunity for men and women to be hired by a Class I railroad," Ashley Burcham, Coordinator of the MCTC Railroad Training Program, said. "Railroad companies are looking for well-qualified, well-trained applicants. With our railroad program, we will be able to supply them with exactly what they need."

More than 350 individuals have applied to the program since November 2002. The inaugural class of the Railroad Conductor Training Program began Jan. 27, 2003.

SUCCESS STORIES

Pre-Kindergarten-12 Outreach Activities in Area Schools Help Commemorate National Transportation Week

The Transportation Outreach on Wheels (TO²W) team guided area students in constructing and operating intelligent vehicles and model cities May 11-17, 2003, in recognition of National Transportation Week.

Linda Hamilton, Pre-K-12 Outreach Instructor, visited several West Virginia schools. These include West Middle School in Huntington, May 13 and 15, and Big Creek High School in War and the Larry J. Harless Community Center in Gilbert, May 14.

Students built intelligent model cities and vehicles from LEGO Robotics kits and completed ten challenges. The vehicles and city components, which include traffic signals, bridges and gates, contained RCX microcomputers that are programmed by the students. They created programs to repair the bridge, deliver goods through the city and operate an environmentally-safe windmill for energy and other real-life scenarios. Damon Ward, Nathan Estel and James Greene, graduate education majors from Marshall University, also presented LEGO Cities and Transportation kits to Milton Elementary May 16.



Left: Linda Hamilton and students from West Middle School celebrated National Transportation Week with LEGO Robotics activities. Above: Two students at West Middle School assemble intelligent vehicles during a Transportation Outreach on Wheels visit from RTI.



Other schools, including Barboursville Middle School, Davis Creek Elementary, Highlawn Elementary and Martha Elementary in Cabell County and Chesapeake Elementary in Ohio, participated in similar activities.

The purpose of the TO²W visits during National Transportation Week is to improve transportation career awareness among students at an early age. National Transportation Week and Month provide opportunities to create a greater awareness about the importance of transportation while making youth aware of transportation-related careers.

EDUCATION

Education Goal:

A multi-disciplinary program of course work and experiential learning that reinforces the transportation theme of the Center in addition to an increased number of students, faculty, and staff who are attracted to and substantially involved in the undergraduate, graduate and professional programs of RTI.

- 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)



EDUCATION

A partnership between RTI and Marshall University College of Information Technology and Engineering (CITE) created a new degree emphasis in Transportation Systems and Technologies for the Master of Science Degree in Technology Management. 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.

Technology Management combines concepts and methods from management, business, science and engineering with a specific technology emphasis to address organizational needs. The new MBA emphasis offers a variety of course sequences and alternatives that can be completed in two years or less with Friday evening and weekend classes.

Other alternatives can be pursued as needed. Additional transportation graduate and undergraduate programs are under development.

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.

Master of Science in Technology Management with Emphasis in Transportation Systems and Technologies

Core Courses

TM 600	Program Introduction Seminar*
TM 610	Technology and Innovation Management*
TM 612	Economic and Financial Analysis*
TM 615	Information Technology Strategies*

TM 620	Technology Planning*
TM 630	Quality and Productivity Methods*
TM 650	Human Resources in Technology Management*
EM 660	Project Management*

Area of Emphasis Courses selected from the following options:

SED 550	Traffic Engineering
SED 601	Safety in Transportation
SED 660	Human Factors in Accident Prevention
SED 669	Traffic Safety Management
GEO 510	Urban Geography
GEO 515	Regional Planning and Development
IE 639	Operations Research I
IE 640	Operations Research II
IS 645	Geographic Information Systems
TM 640	Intelligent Transportation Systems*
TM 699	Capstone Project* (Required)

Master of Business Administration with an Emphasis in Transportation and Logistics

Foundations Courses:

MKT 511	Marketing & Management
MGT 500	Statistics/Calculus
ECN 501	Economic Analysis
ACC 510	Financial Accounting
FIN 510	Finance

MBA Courses:

ECN 650*	Transportation Economics [Replaces: Managerial Economics-ECN 630] Profit Planning and Controls-ACC 613
MKT 650	Transportation Law and Public Policy [Replaces: LE 691 Government and Business Relationships]
MGT 601	Quantitative Controls in Business Management
MIS 687	Information Systems
MGT 672	Theories of Management

EDUCATION

MGT 674	Production/Operations Management
MKT 651*	Carrier Management [Replaces:
MKT 682	Advanced Marketing Management]
FIN 620	Financial Management
MGT 699	Business Policy (Capstone with Transportation Emphasis)*

**The Marshall University Graduate catalog is the only accurate source for degree requirements.*

Graduate or Undergraduate Minor in Off-Highway Vehicle Recreation:

- PLS 540/440 Introduction to Off-Highway Vehicle Recreation**
- PLS 541/441 Planning Off-Highway Vehicle Recreation**
- PLS 542/442 Managing for Quality OHV Recreation**

These courses may fulfill the specialization requirement for students enrolled in the PLS curriculum. Students enrolled in other majors may pursue a minor in Off-Highway Vehicle Recreation or take individual OHV courses as electives.

Other courses:

- IT 283 Special Topics Geographical Information Systems Concepts**

EDUCATION

RTI RESEARCH/EDUCATION FACULTY AND PROFESSIONAL ASSOCIATES

Marshall University College of Business

Dr. Mark Burton Professor of Economics
Dr. Michael Hicks Associate Professor in Economics

Marshall University College of Information Technology and Engineering

Dr. Richard Begley Professor in Engineering
Dr. Anthony Szwilski Professor in Engineering
Betsy Dulin, J.D. Professor and Associate Dean
Dr. Bill Pierson Professor in Engineering
Dr. Herb Tesser Professor in Computer Science
Dr. Michael Robinson Assistant Professor in Engineering

Marshall University College of Science

Dr. Dan Evans Professor in Biology
Dr. Frank Gilliam Professor in Biology
Dr. James Joy Professor in Biology
Dr. Michael Norton Professor in Chemistry
Dr. Dewey Sanderson Professor in Geology
Dr. James Brumfield Associate Professor in Geology
Ms. Linda Hamilton Assistant Professor in Mathematics
Dr. Liz Murray Assistant Professor Integrated Science and Technology
Dr. Ashok Vaseashta Assistant Professor in Physics

Other Marshall University Entities

Dr. Larry Arbogast Professor in Geography
Dr. Raymond Busbee Professor in Park Resources and Leisure Services
Dr. Bill Carter Professor in Teacher Education
Dr. Mack Gillenwater Professor in Geography
Dr. Peggy Gripshover Associate Professor in Geography
Dr. Stan Maynard Professor in Teacher Education
Ms. Jennifer Plymale Director, Robert C. Byrd Center for Rural Health, School of Medicine
Dr. Jim Sottille Associate Professor in Education Foundations
Dr. Robert Walker Chairman, Family and Community Health, School of Medicine
Mr. James Wolfe Project Engineer, Environmental and Geotechnical Center
Mr. John Willis Project Associate in Rural Health, School of Medicine

EDUCATION

RTI Graduate Assistants 2002-2003

Name	Major
Artemyev, Roman	Business Administration
Bailey, Josette	Physical Science
Barrios, Juan de Dios	Geography
Boggess, Farrah	Chemistry
Boggess, Megan	Geography
Bowe, Nathan	Physical Science
Brumfield, James II	
Bueno, Juan	Business Administration
Cains, Brad	Technology Management
Canaday-Yalniz, Brandie	
Channell, Katherine	Physical Science
Compton, Brandi	Education
Crawford, Kellie	Education
Dudding, Greg	Technology Management
Durrah, Steven	Geography
Edmonds, Amy	Business Administration
Estel, Nathan	Adult and Technical Education
Farrell, Peter	
Feazell, Erin	Forensic Science
Ferguson, John	Physical Science
Fet, Galina	Physical Science
Guerrero, Lorena	
Hanna, Afif	Biological Sciences
Hilton, Tiff	Physical Science
Howard, Sarah	Business Administration
Jarupath, Wannaporn	Information Systems
Jones, Ken	Environmental Science
Kaiser, Keith	Business Administration
Knubel, Adam	Forensics
Lewis, Kim	Counseling
Lewis, Mark	Information Systems
Li, Tianning	Information Systems
Litteral-Stanton Theresa	Physical Science
Lofgren-Skeide, Eline Marie	Business Administration
Mills, Randall	Mathematics
Murphy, Kelli	Adult and Technical Education
Naugle, Bart	Forensic Science
Ollis, Randy	
Ramirez-Sime, Carlos	Safety Technology
Reed, LeAndria	Safety Technology
Robirds, Josh	Technology Management
Robohm, Eric	Forensics
Sandu, Maria	Business Administration
Schlenker, Brooke	Physical Science
Sheng, Zhibin	Adult and Technical Education
Simental, Maria E.	
Simon, Tiffany	Business Administration
14 Simpkins, Irina	Physical Science

EDUCATION

Song, Zhuo
Tackett, Fred
Totten, Brandon
Tourre, Mark
Vance, Amber
Vaughn, Kristy
Villaire, Randy
Wang, Hui
Ward, Damon
Williamson, David
Workman, Jason
Woody, Joshua
Ye, Jiehua
Yoo, Sanghong
Zhang, Fan

Technology Management

Journalism and Mass Communications
Forensic Science
Health Care Administration
Adult & Technical Education

Business Administration
Elementary Education
Physical Science
Environmental Science
Safety Technology
Business Administration
Physical Science
Information Systems

RTI Undergraduate Assistants 2002-2003

Name

Major

Anderson, Wendy
Beckett, Matt
Bryant, Mike
Casto, Ken
Clark, Valerie
Cook, Timothy
Danzer, Joseph
Day, Kelley
Dowler, Brian
Gonsowski, Courtney
Harbour, Nicholas
Keenan, Benjamin
Kennedy, Brooke
Meddings, Jessica
Mwaura, Ab
Plymale, Lauren
Pugh, Michael
Smith, Lori
Specht, Dave
Stephens, Charles
Swecker, Casey
Walker, Matt
Williams, Vanessa

Journalism and Mass Communications
Information Technology
Biological Science
Integrated Science and Technology
Integrated Science and Technology
Geology
Integrated Science and Technology
Nursing
Journalism and Mass Communications
Environmental Science

Undecided
Biology
Special Education
Physics
Management Information Systems
Business
Journalism and Mass Communications

Management Technology
Integrated Science and Technology
Management Information Systems
Physics

RTI STUDENT OF THE YEAR: NATHAN BOWE

Nathan Bowe of Glasgow, W.Va., was selected RTI's 2001-02 Student of the Year for his outstanding contributions to RTI research and education projects.



Above: Nathan Bowe, RTI Student of the Year 2001-02.

“Nate’s skills and expertise with Geographical Information Systems (GIS) were critical to the success of several research projects and helped RTI gain recognition as a state of the art GIS resource provider for the transportation industry,” RTI director Bob Plymale said. “This recognition helped create additional project support from agencies in West Virginia and other states’ Departments of Transportation.”

Bowe also developed West Virginia’s first statewide highway GIS system, which has been expanded to include portions of the Appalachian Development High-

way System outside the state. Bowe’s participation in formal presentations and demonstrations for transportation professionals contributed to the success of that project and led to software customizations for end users.

Bowe began working for RTI May 2001 after he graduated from Marshall University with a BS in Environmental Science. His first project as a Graduate Research Assistant was to assist a team of Principal Investigators on a project titled *Endangered Species Identification along Roads Planned in West Virginia Using Geographic Information Systems and Remote Sensing Technologies (TRP 99-10)*. After collecting field data on locations of suspected endangered species using Global Positioning System technologies, Bowe set up a GIS system for storing, viewing and analyzing the data. He has also assisted faculty members in developing and teaching remote sensing and GIS courses.

Nate will soon complete a Master of Science in Physical Science with an Emphasis in Transportation Systems and the Environment.

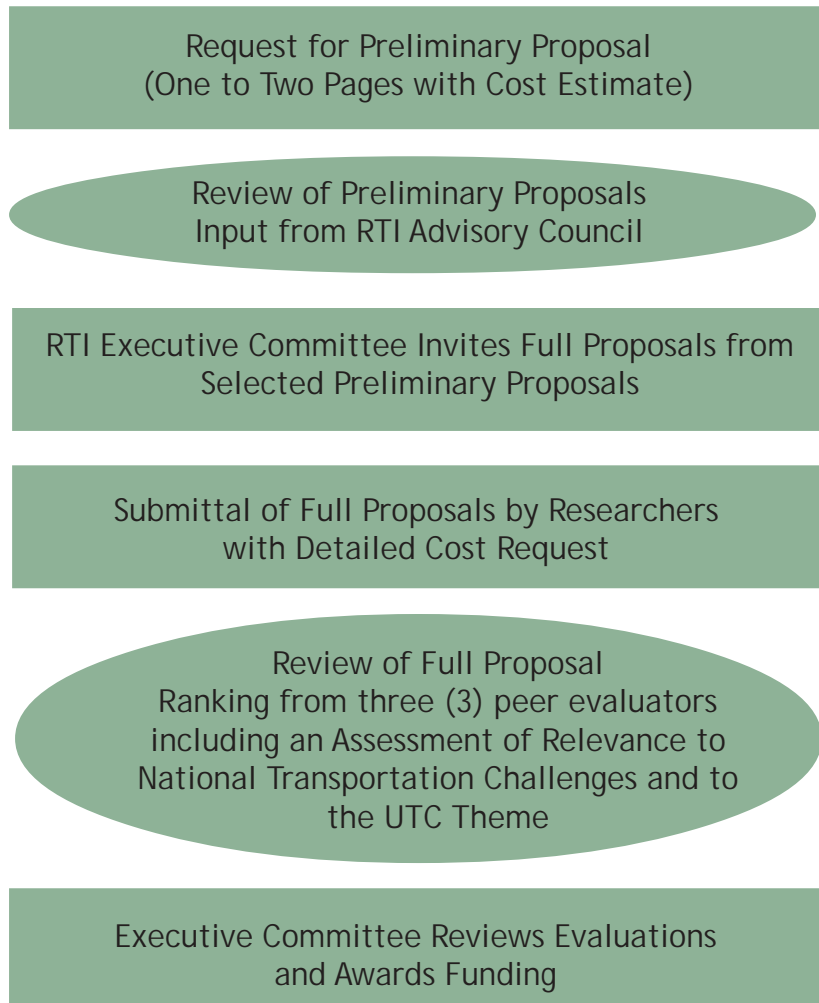


Pictured are student awardees from U.S. DOT’s University Transportation Centers (UTC) program at the 12th Annual Outstanding Student of the Year Awards ceremony, January 13, 2003. With the students are: Federal Highway Administration (FHWA) Deputy Administrator J. Richard Capka (far left, standing), and Research and Special Programs Administration (RSPA) Administrator Ellen Engleman (far right back row, standing). RTI’s Nathan Bowe is the fifth student from the right in the second row.

The UTC Research Goals Include:

- 1) **An objective process for selecting and reviewing basic and applied research project applications; and**
- 2) **A process for judging by peers or other experts in the field to advance the body of knowledge in transportation.**

RTI Research Solicitation and Selection Process Flowchart



RTI RESEARCH PROGRAM GOALS

RTI research goals, in addition to objective selection with peer review and monitoring, include performing site specific research projects that can contribute to:

- a reduced design, construction and maintenance costs with improved safety and minimal environmental impacts for the transportation system in the region;
- the identification of the best locations for future industrial parks and initiation of their development;
- ensuring opportunities for concurrent infrastructure and info-structure development during road construction are realized;
- improving access to healthcare, work and education for rural communities through public transit;
- an enhanced trail/scenic byway system that will support continued growth of the emerging tourism industry;
- the development and testing of new technologies and or products that can improve transportation safety and efficiency in rural settings and support the diversification of the regional economy simultaneously;
- assistance in the preparation of the future transportation workforce in the region.

RTI seeks to leverage its federal funding through a variety of sources, and in certain cases a traditional cyclical solicitation process may not be able to incorporate all of the opportunities to assist in doubling the value and acceleration of the institutionalization of the UTC.

Examples may include, but may not be limited to:

- the opportunity to respond to requests for proposals from non-federal entities;
- the availability of non-federal funding to resolve local climatic emergencies and/or issues related to the safety of the motoring public;
- certain private sector and/or non-governmental agency partnership opportunities and projects of the transportation technology demonstration and/or transfer nature in addition to projects that may have a positive impact on the transportation workforce.

However, consistency with the RTI theme, staff expertise, research goals and general goals of the UTC program are always considered. Projects that materialize from this approach will include a project advisory team from project conception to completion. Representatives from the Federal Highway Administration will be included in all research projects considered for funding with UTC funds.

RTI RESEARCH PROGRAM OVERVIEW

FOCUS AREAS

TYPES OF PROJECTS RECENTLY COMPLETED, ON-GOING OR UNDER DEVELOPMENT

Socio-Economical/Political

- Commodity Flows and Transportation Infrastructure Assessments
- Transportation Planning, Financing and Public Policies
- Rural, Intermodal/Public Transportation Issues
- Land Use Planning
- Tourism and Recreational Travel
- Rural Transportation Safety

Geotechnical/Environmental

- Wetland Mitigation
- Endangered Species Assessments
- Rock Cut/Slope Stability
- Inventories and Health Risk Assessments from Abandoned Tires
- Tunnel Expansions
- Rail Track and Road Bed Stability

Technology/ Transportation Product Development/Testing

- Geographical Information Systems/ Mapping Technologies
- Automatic Vehicle Tracking in Rural Settings
- Integration of Remote Sensing Technologies
- Optimizing Recoverable Materials in Transportation Components
- Intelligent Highway Signage with Improved Visibility and Energy Savings

Transportation Research Initiation

- Small start-up grants within the areas above.

RTI Research Project Summaries



RTI TRP 99-00

Commodity Flows and Transportation Inventory for 13 Counties in Southern W.Va.

This project gathers information that describes commodity flows and the cost of transportation services and identifies intermodal infrastructure improvements that may reduce transportation costs for a 13-county region in southern W.Va.



RTI TRP 99-01

Automated Road Extraction and Using Satellite Imagery

This project will aid in the development of an automated road extraction and update system (AREUS), which can recognize and extract roads, bridges, railroads and similar transportation-related structures from satellite imagery.



RTI TRP 99-02

Preserving Branch-Line Railroad Capacity in Southern W. Va.

This project identifies branch rail lines most likely to be abandoned in response to diminished coal production in southern W.Va. and evaluates available alternatives to maintaining the branch line capacity in that region.



RTI TRP 99-03

Lincoln County Transportation Study

This project will assess, develop and evaluate an efficient inter-modal transportation system for access to health care using currently available public vehicles for rural and economically-depressed areas in Lincoln County, W.Va.



RTI TRP 99-04

An Assessment of Site-Specific Geotechnical, Spatial and Climatic Parameters that Influence the Integrity and Stability of Railroad Track

This project will aid in the development of an improved integrated system for monitoring the stability of railroad tracks using remote sensing instrumentation including ground-penetrating radar and laser interferometry.



RTI TRP 99-05

Use of Electroluminescence Technology for Highway Signage

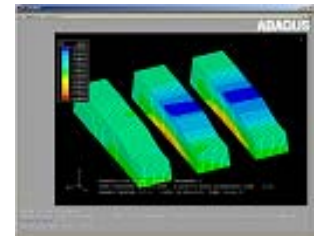
Objectives for this project are to develop a suitable prototype for highway signs based upon electroluminescence technology and to assess the economic development potential from the successful integration of this technology into the national transportation system.

RESEARCH

RTI TRP 99-06

Potential Uses of Fly Ash and Other Recoverable Materials in New Transportation Infrastructure Components

This project will develop and assess candidate prototypical applications for developing transportation and infrastructure components using recoverable materials. Initial emphasis will be placed on creating concrete railroad ties using coal combustion by-products (CCPS) including fly ash; however, using the materials to make other concrete-like transportation components will also be addressed. In addition, preliminary stability analysis of the prototype will be performed with computer modeling software.



RTI TRP 99-07

Rock Fall Rating, Evaluation and Data Management Systems for Highway and Railway Rock Slopes

Using technologies such as laser scanning, electromagnetic induction, GPS and GIS systems, this project develops methodologies for evaluating the safety of rock cuts and slopes.



RTI TRP 99-08

Abandoned Tire Health Risk Survey/Analysis

Researchers for this project will locate, identify and inventory abandoned tire sites in Nicholas County, W.Va., and assess the health risks to the citizens from mosquitoes that breed at these abandoned tire dumps. Findings from the project will provide the WV DOT with additional information on the locations and characterizations of abandoned tire pile accumulations.



RTI TRP 99-09

Establishment of Pre-Construction Baseline Data as a Control for Evaluation of the Long-Term Success of a Mitigated Constructed Wetland Site (Case Study along the Tolsia Highway)

The objective of this proposal is to establish pre-construction baseline data for the US 52 (Tolsia Highway) wetland mitigation site in Wayne County, W.Va.



RTI TRP 99-10

Endangered Species Identification Along Roads Planned for W.Va. Using GIS and Remote Sensing Technologies

This project will establish the infrastructure for a web-delivered, interactive mapping system developed from satellite imagery and integrated with Geographical Information Systems (GIS) that will locate endemic, threatened or endangered species affected by transportation systems in W.Va.





RTI TRP 99-11

Maximizing Economic Benefits from a Rails to Trails Project in Southern W.Va.: A Case Study of the Greenbrier River Trail

This project collects data from trail users surveys and public meetings to determine the economic feasibility of creating a “Rails to Trails” project to Greenbrier County, W.Va. Results from this project may be used to identify and expand the local economic impact of recreation trail systems in other W.Va. locations and to mobilize community support in the marketing and promotion of such trail systems.



RTI TRP 99-13

Commodity Flows in Northern W.Va.

This project will gather information describing commodity flows and the cost of transportation services and identify inter-modal infrastructure improvements that could reduce transportation costs for a 19-county region in Northwestern W.Va.



RTI TRP 99-14

Drowsy/Fatigued Driving: Prevalence and Under-Reporting in W.Va.

This project will first compare accident data related to drowsy driving in W.Va. to data from the remainder of the United States and then suggest preventive strategies including targeted outreach activities to reduce drowsy-driving accidents.



RTI TRP 99-15

Impacts of the Appalachian Corridor on Small Business Development

This project will develop statistical methodology capable of estimating the relationship between micro-business development and access to highway transportation in Appalachia.



RTI TRP 99-16

McDowell County Transportation Project

This project will assess, develop and evaluate an efficient inter-modal transportation system for access to health care using available public vehicles for rural and economically depressed McDowell County in Southern W.Va.

RTI TRP 99-17

Magnetic Levitation Transportation and Economic Development Opportunities for W.Va.

This project will review the various applications of magnetic levitation around the United States and assess its applicability as a potential mode of transportation in W.Va.



RTI TRP 99-18

ITS Research Initiation Project

This project will review a variety of Intelligent Traffic Monitoring Systems and suggest the most applicable project to propose a demonstration project in Huntington, W.Va. Findings may provide a better, interactive navigation mechanism to facilitate the increasing traffic flow in W.Va. and other areas.



RTI TRP 99-19

Public/Private Port Case Studies

The proposed research is aimed at assessing the economic efficiency of public port development with the hope of clarifying the roles that might be best played by public and private sector entities.



RTI TRP 99-23

Survey of Truck Parking Places (Private) in W.Va.

This project seeks to conduct a survey of available public and private parking spaces and the amenities available at each site in W.Va. It also reviewed the designs of current rest areas to determine possible upgrades that would increase parking and amenities. Further, it reviewed the design of DOH weigh stations for innovations to allow for better use of the surrounding acreage and improvements to the overall facilities.



RTI TRP 99-24

Railroad Tunnel Size Restrictions

This project will identify costs and benefits of modifying railroad trackage to accommodate double-stack equipment by increasing the size of railroad tunnels in W.Va.



RTI TRP 99-25

Improving Safety and Operational Conditions at Railroad Crossings: An Analysis of Bolt Installations, Designs and Torque Procedures

This project will identify, develop and test procedures for reducing maintenance costs and reducing safety risks at railroad crossings as a function of the bolt and nut connections currently employed.





RTI TRP 99-26

Beckley Exhibition Mine Expansion: Project Management and Evaluation for a Transportation Enhancement Project to Be Built along a National Scenic Byway in W.Va.

The objective of this project is to provide project management assistance for a Southern W.Va. community to ensure environmental quality and logistical feasibility for a transportation enhancement project along the Coal Heritage Trail. The project will also propose a model to other transportation enhancement projects that will be constructed along this National Scenic Byway related to matching funds determinations and project selection processes.



RTI TRP 99-27

Using FLI-MAP Technology for Transportation Applications: Research Initiation Demonstration Project

This project will review the uses of FLI-MAP software by various states' Departments of Transportation and identify steps for the West Virginia Department of Transportation to consider how to implement this technology in work completed by the West Virginia Division of Highways.



RTI TRP 99-29

Development of a Plan for a Non-Motorized Transportation Corridor in Southern W.Va.: Case Study for Alternate Sources of Transportation between Huntington and Charleston

This project explores the possibility of developing a “greenway,” or non-motorized transportation corridor, between Charleston and Huntington, W.Va. The proposed greenway will contain natural, open space, bikeways and walking or jogging paths.



RTI TRP 99-32

Development of a GIS Implementation Strategy for WVDOT

This project will review the uses of Geographical Information Systems (GIS) software by various Departments of Transportation and identify steps for the WVDOT to consider for GIS implementation.



RTI TRP 99-33

Major Corridor Financing Options

This project identifies options used in the United States to finance major corridor construction and assess the applicability for consideration and implementation in W.Va. The study will provide the most cost effective plan to help acquire critically needed improvements in the transportation infrastructure of some of

the most rural and economically depressed regions in W.Va. with applicability to similar regions in the U.S.

RTI TRP 00-01

Integrated Track Stability Assessment and Monitoring System (ITSAMS): Phase II

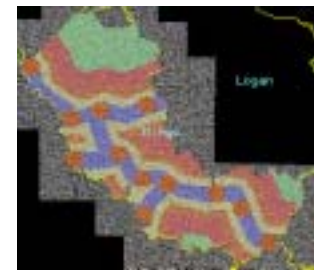
The first objective is to continue the development of a remote sensing technology that will rapidly assess the integrity of various track structure and substructure layers, such as the ballast, sub-ballast and subgrade, and to locate, identify and quantify weak track segments. The second objective is to continue the development of a new technology for the real-time measurement of vertical track deflection, based on the use of the laser interferometer.



RTI TRP 00-02

Master Land Use Plans for Six Southern W.Va. Counties

The objective of this project is to assist in the development of long-term land use policies with utilization criteria based upon proximity to the current and proposed transportation systems in the region.



RTI TRP 00-04

Expected Flood Damages to Transportation Infrastructures as a Proportion of Total Event Costs: a Methodological Exploration

This project is designed to improve the estimation of flood related transportation infrastructure damages in the Tennessee Valley as a proportion of total event costs. With the overall aim of improving a priori flood damage assessment, RTI and the TVA propose a joint study effort designed to improve the estimation of transportation infrastructure damages as a proportion of total event costs.



RTI TRP 00-05

Integrated Track Stability Assessment and Monitoring System (ITSAMS): Phase III

This project continues to develop of remote sensing technologies that can be integrated and deployed in a mobile inspection vehicle i.e. Integrated Track Stability Assessment and Monitoring System (ITSAMS).





RTI TRP 00-06

Transportation and Market Feasibility Analysis for Innovative Coal Combustion By-products to be Manufactured Adjacent to the I-64 High Tech Corridor in Southern W.Va.

This project is designed to determine the transportation challenges and costs that will be necessary for the successful marketing of a coal combustion product proposed for manufacturing adjacent to the newly designated high technology corridor in Southern W.Va. (Rainelle, Greenbrier County).



RTI TRP 00-07

Opportunities to Improve Transportation Efficiencies through Enhanced Intermodal Capabilities and Increased Utilization of the Appalachian Development Highway System.

This project is a multi-phased intermodal freight transport study that will identify strategic opportunities for enhancing the efficiency of intermodal transportation within Appalachian.



RTI TRP 00-08

Development of a Research Protocol that Relates Culvert Structure to Fish Migration in Southern W.Va.

This project enables the WVDOH to efficiently choose type and site of future culverts, identify watersheds most likely to be adversely impacted by culvert construction and choose cost-effective ways to remediate culverts that are problematic to fish migration.



RTI TTP 00-10

Improving Transportation Access to Rural Health Care in Lincoln County: Process Implementation

This project's objective is to directly implement the results of a previous RTI research project (TRP 99-16) that designed solutions to improving access to health care for the elderly, disabled, chronically ill and poor citizens of a rural W.Va. county through a coordinated effort between health care providers and the public transportation system.



RTI TTP 00-11

Development of Transportation and Economic Development Information System (TEDIS) Delivered over the Internet for W.Va.

The objective is to design, develop and test a system for delivering important transportation and economic development information using GIS technology via the Internet for users including governmental agencies and the general public.

RTI TTP 00-12

A Deployment Plan for the W.Va. High Technology Corridor

This project's objective is to support the direct implementation of expanding the "High Tech Corridor" designation for the Southeastern Virginia portion of I-64 into West Virginia between Beckley and White Sulphur Springs.



TTP 00-14

GIS of Major Transportation Corridors along the Kanawha River in West Virginia and along the Ohio River

RTI will provide GIS coverage, including major transportation corridors, for the Kanawha River and portions of the Ohio River. RTI will also link some ORSANCO data to existing coverages. This work will support a second grant that will collect data on fish utilization of bridge abutments and other transportation-related structures near the Kanawha River and the Robert C. Byrd pool of the Ohio River. A series of ORSANCO Data will be linked to these coverages.



TTP 00-15

Harrison, Mingo and Webster County Tax Map Conversion

The methodology for this project will digitize current maps using GIS software. This process will represent a valuable layer of data for transportation planning in the future.

TTP 00-17

Development and Evaluation of a GIS Mapping System for West Virginia's Hatfield McCoy Trail Systems

The project will implement the deployment of GIS technology into the Hatfield McCoy trail system's operations and will include training of employees in utilizing the GIS system for current and new trail mapping applications. RTI will also assist in creating a database for the system in addition to designing a system for dissemination of the trail system through a web-based Geographic Information System to the general public.



TTP 00-XX

Proposed GIS Mapping System for Appalachian Development Highway System (ADHS) Corridors

This project will provide a more accurate digital map inventory of the ADHS corridors for transportation and economic development issues in Appalachia.

TTP 00-18 West Virginia

TTP 00-19 Tennessee

TTP 00-22 Alabama

TTP 00-23 North Carolina

TECHNOLOGY TRANSFER



TTP 00-21

Three-Dimensional Laser Scanner Pilot Project

Primarily, this project seeks to determine the feasibility of utilizing 3-D laser scanned data for identification and enhancement of geological features. This will be accomplished by comparing the scanned data to an independent geological interpretation.

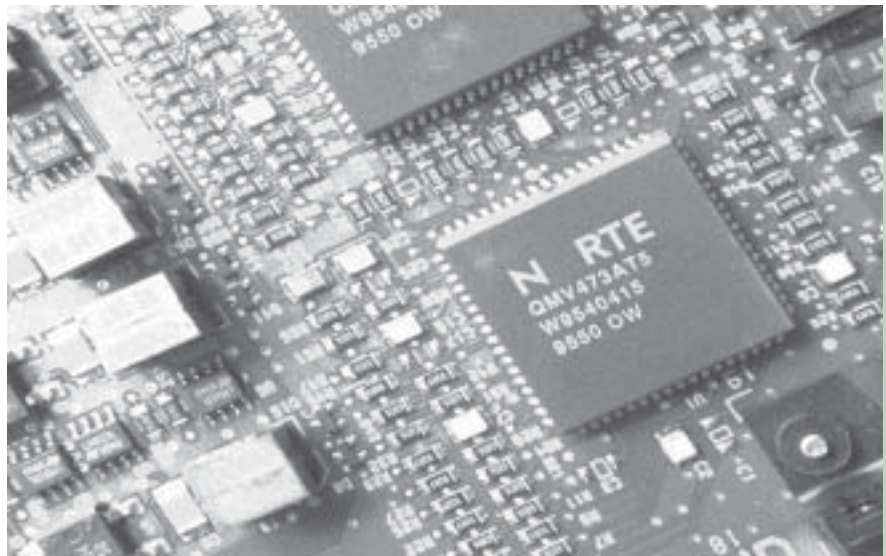
TECHNOLOGY TRANSFER

Technology Transfer Goal:

Availability of research results to potential users in a form that can be directly implemented, utilized or otherwise applied. A variety of technology transfer mechanisms will be used to distribute the findings of the Institute. These will include, but may not be limited to: research papers, technical reports, a quarterly newsletter, workshops, seminars and a website.

In addition to research papers, technical reports and conference proceedings, RTI maintains a website to promote programmatic activities and to archive and disseminate research results.

RTI also sponsors workshops and seminars to promote the transfer of transportation technology and information from experts in the field to practicing transportation professionals, UTC researchers, UTC student assistants and K-12 students.



TECHNOLOGY TRANSFER

PEER REVIEW PAPERS AND TECHNICAL REPORTS AS A RESULT OF UTC FUNDING

Papers Presented or Published

Tesser, Herbert, Ph.D. and Theron Trout. *A Note on Evaluation of Image Recognition Systems*, Lecture Notes in Computer Science: Springer-Verlag Heidelberg Volume: Volume 2749 / 2003: 60-66.

Tony Szwilski, Ph.D., Richard Begley Ph.D., John Ball, P.E., Peter Dailey, Research Associate. *Application of Geophysical Methods to Evaluate Rail-Track Subsurface*. Symposium on the Application of Geophysics to Environmental and Engineering Problems (SAGEEP), April 6-10, 2003, San Antonio, Texas.

Tony Szwilski, Ph.D., and Richard Begley Ph.D., *Developing an Integrated Track Stability Assessment and Monitoring System Using Non-Invasive Techniques*. Transportation Research Board, 82nd Annual Meeting, Jan. 12-16, 2003, Washington, D.C.

Tony Szwilski, Ph.D., and Richard Begley Ph.D., *Evaluating Geophysical Technologies for Real-Time Assessment of Near-Surface and Subsurface Conditions*. 7th International Symposium on Environmental Issues and Waste Management in Energy and Mineral Production Conference (SWEMP 2002), October 7-10, 2002, Cagliari, Sardinia, Italy.

Tony Szwilski, Ph.D., and Richard Begley Ph.D., *Rockfall Hazard Evaluation and Data Management System for Highway and Railway Rock Slopes*. 7th International Symposium on Environmental Issues and Waste Management in Energy and Mineral Production Conference (SWEMP 2002), October 7-10, 2002, Cagliari, Sardinia, Italy.

Fernando Pascual, Emilio Larrodé Pellicer, Luis Castejón Herrer, Richard Begley, Ph.D. and Tony Szwilski, Ph.D. *A Numerical Model for Analyzing a Concrete Crosstie's Resilient Pad Under Heavy Haul Traffic Conditions*. 5th Congress on Transportation Engineering (CIT 2002), June 11-13, 2002, Santander, Spain.

Francisco Lezaun De Ubago and Fernando Pascual, *A Dynamic Model for Studying Comfort on Locomotives Mounting Nose-Suspended Motors*. 5th Congress on Transportation Engineering (CIT 2002), June 11-13, 2002, Santander, Spain.

Robert B. Walker, M.D., *Transportation-Related Barriers to Medical Care: A Grant Supported Study of a Rural West Virginia County*, Transportation and Economic Development 2002 (TED2002), May 5-7, 2002, Transportation Research Board, Portland, Oregon.

Mark L. Burton, Ph.D., *Measuring the Cost Of Incremental Railroad Capacity: A GIS Approach*, presented to the Transportation and Public Utilities Group of the American Economics Association, March 21-22, 2002, Atlanta, Georgia.

Mark L. Burton, Ph.D., *Improving Access to Rail/Highway Intermodal Transport: Lessons from West Virginia*, Transportation and Economic Development 2002 (TED2002), May 5-7, 2002, Transportation Research Board, Portland, Oregon.

Mark L. Burton, Ph.D., *Assessing Transportation-Related External Costs: Valuing Decreases in PM-10 Emissions due to Mode Switching*, Transportation and Economic Development

TECHNOLOGY TRANSFER

2002 (TED2002), May 5-7, 2002, Transportation Research Board, Portland, Oregon.

Michael J. Hicks, Ph.D., *The Impact of Appalachian Highway Corridors on the Scope of Small Business Activity*, Transportation and Economic Development 2002 (TED2002), May 5-7, 2002, Transportation Research Board, Portland, Oregon

Marc W. Simpson, Ph.D., *Highway Financing: Alternatives, Mixes, Instainability and Public Policy*, Transportation and Economic Development 2002 (TED2002), May 5-7, 2002, Transportation Research Board, Portland, Oregon.

Herbert Tesser, Ph.D., *RoadFinder Front End: An Automated Road Extraction System*. Paper presented at 15th International Conference on Pattern Recognition, ICPR 2000. September 3-8, 2000, Barcelona.

Technical Reports Presented

Raymond L. Busbee, Ph.D., *Development of a Plan for a Non-Motorized Transportation Corridor in Southern W.Va. - Case Study for Alternate Sources of Transportation between Huntington and Charleston*. (Aug. 2002).

Mark Burton, Ph.D., *Improving Efficiency of Truck/Rail Intermodal Transportation* (Aug. 2002)

Mark Burton, Ph.D., *Public/Private Port Case Study* (Aug. 2002).

Michael Robinson, Ph.D., P.E.; James Wolfe, M.S.; Sean Litteral, M.S.; Kurt Donaldson, M.S.; and Trevor Harris, Ph.D. *GIS Implementation Strategy for WVDOT*. (Aug. 2002).

Richard Begley, Ph.D., Anthony Szwilski, Ph.D., John Ball, P.E. and Fernando Pascual, Ph.D. Candidate. *Briefing Report: Integrated Track Stability Assessment and Monitoring System (ITSAMS)*. (Spring 2002).

James E. Joy, Ph.D., *Abandoned Tire Health Risk Survey/Analysis*. (Jan. 2002).

Richard Begley, Ph.D., Anthony Szwilski, Ph.D., John Ball, P.E. and Fernando Pascual: *Improving Safety and Operational Conditions at Railroad Crossings - An Analysis of Bolt Installations, Designs and Torque Procedures* (November 2001).

Jennifer T. Plymale, M.A.; Jonathan M. Willis, M.S.; and Robert B. Walker, M.D. *Survey of Truck Parking Places (Private) in W.Va.* (Nov. 2001).

Robert B. Walker, M.D.; Charles Braun, Ph.D.; Mark Burton, Ph.D.; Lesley Burton, M.S.C.; Michael Hicks, Ph.D.; Jennifer T. Plymale, M.A.; Amber Vance, M.S.; and Jonathan M. Willis, M.S. *Lincoln County Transportation Study* (Nov. 2001).

Raymond L. Busbee, Ph.D., *Maximizing Economic Benefits from a Rails to Trails Project in Southern West Virginia - A Case Study for the Greenbrier River Trail*. (May 2001)

Mark Burton, Ph.D., *Commodities Flows and Transportation Inventory for 13 Counties in Southern West Virginia* (Dec. 2000).

Mark L. Burton, Ph.D. *Transportation and the Potential for Intermodal Efficiency Enhancements in Western West Virginia*. Final Phase I Report (May 2000). Final Phase II Report (November 2000).

TECHNOLOGY TRANSFER

Transportation Professional Development Activities

Transportation professional development courses, transportation seminar series, workshops and conferences allow practitioners, UTC researchers and students to hear from experts in the field, network with others and identify new resources while earning Continuing Education Units (CEUs).

Year 3 Transportation Professional Development Courses

1) Survey and Image Map Base Integration with GIS, Huntington, W.Va., July 8, 2003

This course focused on integrating multiple types of aerial and satellite imagery into a Geographic Information System (GIS).

GIS technology, along with imagery, can provide a more realistic image of the Earth's surface, and can incorporate spatial and statistical solutions to complex transportation problems.

2) Railroad Conductor Training Program, Graduation Ceremony Marshall Community and Technical College and Cabell County Career and Technology Center, February 28, 2003, Huntington, W.Va.

This was the inaugural graduating class of the Railroad Conductor Training School. Twenty-five students were issued a certificate of completion and were then qualified to enter the workforce as railroad conductors.

The course consisted of five weeks of strenuous instruction which taught students railroad safety, operating rules, signals, equipment and topics essential for success in the workforce.

3) Railroad and Highway Traffic Safety and Operations Seminar, Berkeley Springs, W.Va., November 19-20, 2002

Personnel who design, engineer, and maintain West Virginia's infrastructure of railways and roadways provided a basic understanding of the key aspects of design, construction, maintenance and temporary traffic control for each other's facilities during this seminar.

Upon completion of the course participants were:

- Aware of and understood the mission and organization of railroad companies and state highway agencies.
- Understood the physical and operational characteristics of railroad locomotives/cars and highway vehicles.
- Understood the basic criteria for intersection design.
- Understood normal maintenance practices employed by the railroad and state highway.
- Aware of the basic principles of highway traffic control devices and railroad signaling devices.
- Able to identify and establish key communications between the two entities.

5) Train the Trainer for the Transportation Industry Huntington, W.Va., June 18-20, 2003

Upon successful completion of the workshop, attendees received an adult teaching permit from the West Virginia Department of Education and approval to teach Maritime Transportation courses offered through the RTI Workforce Development Program.

TECHNOLOGY TRANSFER

6) National Highway Institute Course 151018 A, Application of FHWA Traffic Monitoring Guide, June 10-11, 2003

This course was taught for FHWA field office planners and state transportation or planning personnel responsible for or interested in traffic counting, vehicle classification, or truck weight data programs. Participants earned 1.2 continuing education units for taking the course.

The course included:

- overview of the application of TMG procedures to develop data and information needed to support state and national programs including the Highway Performance Monitoring System, pavement management, safety management, congestion management and environmental management.
- discussion of specific issues that impact the application of the TMG procedure in traffic counting, vehicle weighing, etc.
- discussion of automated procedures for data collection and analysis and presentation of examples.
- discussion of the AASHTO guidelines for traffic monitoring and the coordination of data collection to other federal and national programs.
- discussion of Traffic Monitoring System required in the Intermodal Surface Transportation Efficiency Act (ISTEA).

7) Railroad and Highway Traffic Safety and Operations Seminar, Bluefield, W.Va., March 18-19, 2003

Personnel who design, engineer, and maintain West Virginia's infrastructure of railways and roadways provided a basic understanding of the key aspects of design, construction, maintenance and temporary traffic control for each other's facilities during this seminar.

Upon completion of the course participants were:

- Aware of and understood the mission and organization of railroad companies and state highway agencies.
- Understood the physical and operational characteristics of railroad locomotives/cars and highway vehicles.
- Understood the basic criteria for intersection design.
- Understood normal maintenance practices employed by the railroad and state highway.
- Aware of the basic principles of highway traffic control devices and railroad signaling devices.
- Able to identify and establish key communications between the two entities.

TECHNOLOGY TRANSFER

Year 3 Transportation Seminar Series

RTI has created a Transportation Seminar Series that enables Marshall University faculty, principal investigators for RTI funded projects, to present their research findings. The seminars are free and often include guest speakers.



1) Waste Tire Remediation in West Virginia: Associated Economic and Public Health Impacts; Marshall University Graduate College, South Charleston, W. Va., October 24, 2002

George Carico-CEGAS Marshall University; Robert Gross, USDOT; Brian Hatfield, Liberty Tire Service; Jeff Hottenstein, Clarke Mosquito Control Products, Inc.; James Joy, Marshall University; Jim Riggs, West Virginia Department of Transportation; Jane Rooney, West Virginia Department of Health and Human Resources; Karol Wallingford, Kanawha Co. Health Department; and representatives from the West Virginia Department of Natural Resources and a West Virginia State Representative spoke about the legal and environmental aspects of waste tires and how to deal with the problem.

TECHNOLOGY TRANSFER

Year 3 Conferences

Geohazards in Transportation in the Appalachian Region UK Mining & Minerals Resources Building, Lexington, Ky. August 7, 2003

This was the third annual technical forum, an activity of the Appalachian States Coalition for Geohazards in Transportation. The forum was co-sponsored by the Kentucky Geological Survey.

The forum covered possible ways to categorize and systemize rockfall and hazard probabilities, the hazards of building roads in Karst terrain, how to use digital maps and other discussions about geohazard subjects.

WVUIT ASCE

John Ball, PE, RTI Senior Program Engineer, presented the “Future of Transportation in West Virginia” during the 38th Annual Fall Technical Conference at West Virginia University Institute of Technology in Montgomery, W.Va.

The conference took place Nov. 21, 2002, in conjunction with the American Society of Civil Engineers and RTI.

“The conference was a success, and it is always good to return to my alma mater and see the next generation of engineers. They are literally the future of transportation, not only for West Virginia, but for the United States,” Ball said.



Engineers and industry professionals also discussed topics such as the “Liability of Design Professionals,” “Application of Corrugated Metal and Plastic Products to Highway Drainage” and “Hydraulic and Scour Studies for the Proposed U.S. Route 50 Bridge over Blennerhasset Island.”

WVUIT engineering students also met with the Civil Engineering Advisory Board and discussed ideas and issues related to their field of study.

Intelligent Transportation Systems Technology Fair

RTI, in conjunction with Congressman Nick J. Rahall, II, hosted the first Intelligent Transportation Systems (ITS) Technology Fair at the Marshall University Student Center, Monday, Oct. 7, 2002.



Leading ITS companies from throughout the United States exhibited their products and technologies during the event. Students and visitors had the opportunity to network and speak with exhibitors.

During a network luncheon sponsored by Verizon, Congressman Rahall, Marshall University President Dan Angel and ITS Joint Program Office Program Manager Jeff Paniati addressed the role of ITS Technology in research.



TECHNOLOGY TRANSFER

Other events included an ITS panel discussion in which Dr. Michael Hicks, Moderator, MU Center for Business and Economic Research; Jason Conley, ITS America; Tom McChesney, Strictly Business Computer Systems, Inc.; and Dr. Richard Begley, RTI; spoke about RTI's future research projects and activities.

Exhibitors:

- Computer Recognition Systems, Cambridge, Md.
- Control Technologies, Stanford, Fla.
- Federal Highway Administration, Charleston, W.Va.
- Federal Transit Administration, Washington, D.C.
- Huntington District Corps of Engineers
- ITS America, Washington, D.C.
- ITS Mid-America, Columbus, Ohio
- Meadow River Enterprises, Inc., Lewisburg, W.Va.
- Navigation Technologies, Fairfax, Va.
- Quixote Transportation Safety, Chicago, Ill.
- Smartek Systems, Arnold, Md.
- Strictly Business Computer Systems, Inc., Huntington, W.Va.
- TRW, Kettering, Ohio
- The Transit Authority (TTA), Huntington, W.Va.
- MU Center for Business and Economic Research, Huntington, W.Va.
- MU College of Information Technology and Engineering, Huntington, W.Va.
- Marshall Community and Technical College, Huntington, W.Va.
- MU Forensic Science Center, Huntington, W.Va.
- Nick J. Rahall, II Appalachian Transportation Institute, Huntington, W.Va.

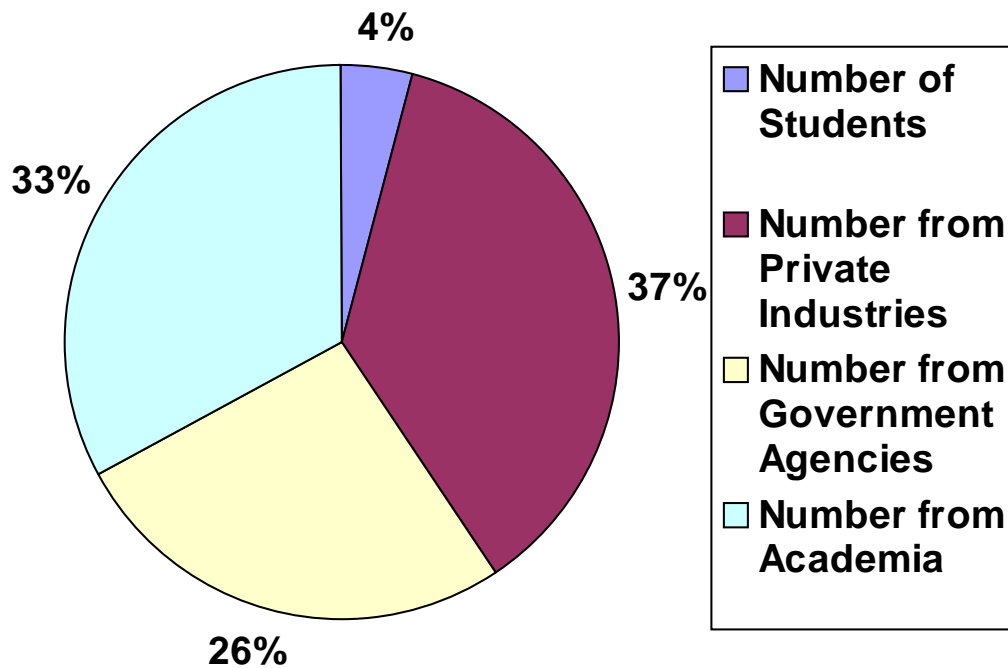
Second Off-Highway Vehicle Program Coordinators Conference and National Off-Highway Vehicle Conservation Council (NOHVCC) Annual Conference Charlotte, NC March 27-30, 2003

On March 27-30, 2003, RTI co-sponsored the NOHVCC conference, which was designed to bring together the off-highway vehicle community to share ideas, address issues and enhance opportunities, but most of all to find ways to provide safe and responsible outdoor recreation for all off-highway vehicle recreation enthusiasts.



TECHNOLOGY TRANSFER

During Grant Year 4, attendees from 17 states and Washington, D.C., attended RTI Transportation Professional Development Activities. Attendees represented government agencies, private industries and academe as indicated in the following graph.



TECHNOLOGY TRANSFER

Year 3 Newsletters

RTI publishes *Transportation Focus*, a quarterly newsletter, to inform the transportation community of research, educational programs, technology transfer activities and upcoming events at RTI. Researchers, professionals, government leaders, educators and students receive *Transportation Focus* four times each year. The newsletter is available on RTI's website, and readers can request printed copies to be sent to them via mail or electronic mail.

Spring 2000
TRANSPORTATION
Building Jobs through Transportation **FOCUS**
 News and Information from the Rahall Transportation Institute

RTI, MCTC Workforce Development Programs Graduate New Railroad Conductor, Towboat Deckhand Classes

Winter 2000
TRANSPORTATION
Building Jobs through Transportation **FOCUS**
 News and Information from the Rahall Transportation Institute

SPECIAL INSERT: HIGHLIGHTS FROM THE TRANSPORTATION TECHNOLOGY MARSHALL UNIVERSITY

Summer 2000
TRANSPORTATION
Building Jobs through Transportation **FOCUS**
 News and Information from the Rahall Transportation Institute

STUDENTS EXPLORE SIMULATED 'MARS' TERRAIN THROUGH RTI, MU PROGRAM

RAHALL RECEIVES DISTINGUISHED SERVICE AWARD FROM MU ALUMNI ASSOCIATION

TECHNOLOGY TRANSFER

Pre-K-12 Outreach

Goal: 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 later in life. Pre-K-12 Outreach activities include: Transportation Outreach on Wheels, Transportation Outreach on the Web and other workshops and activities at Marshall University and partner schools.



TECHNOLOGY TRANSFER



Since 1999, graduate and undergraduate education students from RTI's Transportation Outreach on Wheels (TO²W) program have traveled to schools, libraries and civic organizations throughout Appalachia. During the 2002-2003 academic year and summer term, approximately 4,200 pre-kindergarten through high school students at approximately 41 schools have benefitted from this program's activities. Workshops vary in length from one-half a day to five days.

Students who have participated in RTI's Transportation Outreach on Wheels have come from

states. These include: West Virginia, Kentucky, Ohio, Virginia, Pennsylvania, Indiana and Montana. More specifically, students from West Virginia who have benefitted from the program come from counties including:

- Cabell
- Fayette
- Gilmer
- Greenbrier
- Kanawha
- Lincoln
- Mason
- Mercer
- McDowell
- Mingo
- Pocahontas
- Putnam
- Raleigh
- Summers
- Wyoming



TECHNOLOGY TRANSFER

LEGO DUPLO WORKSHOPS



Left: An elementary school student assembles a LEGO DUPLO vehicle by referencing a pictorial chart. Below: A student creates a track made from LEGO DUPLO bricks to transport goods. Bottom: A Pre-K student presents a vehicle he assembled during an RTI workshop.



RTI instructors use LEGO DUPLO blocks to introduce basic transportation concepts to Pre-K through third grade students during workshops and other activities.

Younger students (ages 3-5) learn to assemble vehicles, tracks and cargo carriers from pictorial charts and LEGO DUPLO blocks. After creating railroad or highway systems, students move “cargo” from one location while factoring time, distance and weight into the transportation process.

Older students (ages 5-8) receive transportation-related “story challenges,” which must be solved using LEGO DUPLO blocks. The students use LEGO CAD to design vehicles or simple machines, which contain gears, levers or pulleys, to solve the “story challenges.”



TECHNOLOGY TRANSFER



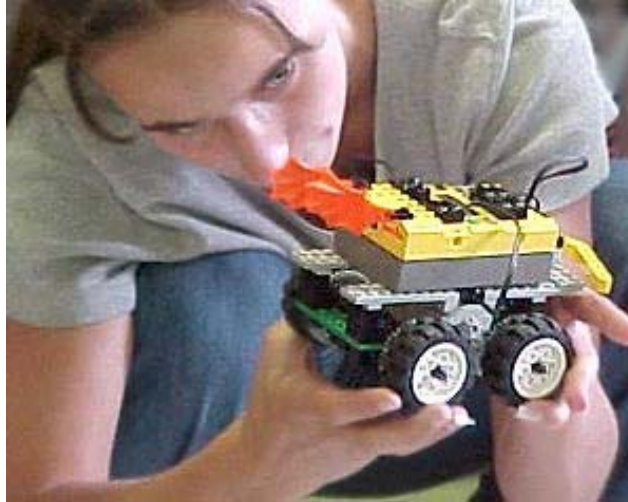
Intelligent Transportation Systems with LEGO Robotics Workshops

Middle school students learn to assemble and program intelligent vehicles and automated traffic control and monitoring devices at workshops sponsored by RTI.

Pre-service teachers and graduate assistants from Marshall University guide students in assembling vehicles and traffic control components from LEGO DACTA kits and installing RCX microcomputers, light sensors, digital timing devices and motors.

Using ROBOLAB software, middle school students write computer programs and download them to the RCX equipped vehicles and traffic control devices, which include cars, gates, signals and speed measuring devices.

High school students also explore careers in automobile assembly, engineering, manufacturing, computer programming, education, transportation and robotics while learning the basics of LEGO CAD, ROBOLAB and RCX programming. The students are also exposed to Transportation Outreach on the Web.



Left: A high school student from McDowell County assembles and programs an intelligent vehicle using LEGO Robotics. Bottom: ROBOLAB software allows RCX equipped vehicle and traffic control devices to be programmed by middle school students to simulate real vehicles and traffic control devices.



TECHNOLOGY TRANSFER

Bridging the Future: Engineers to Marshall University



Two Professional Engineers, John Ball of RTI, and Jeff Ball of the West Virginia Department of Transportation, guided 19 students from Marshall University's Early Education Center through the process of constructing roads and bridges Feb. 20, 2003.

RTI's "Bridging the Future: Engineers to Marshall University" program informed students about transportation concepts through discussions and hands-on learning.

The program took place in recognition of National Engineer's Week and was planned and implemented by RTI graduate research assistants and Marshall University Education majors. During the event, the engineers and students discussed common types of bridges, their structure and how they are used. They also informed students about how engineers build bridges using different types of equipment and the names of bridge components. The students also completed hands-on activities, such as constructing model bridges from craft supplies, to emphasize the knowledge base of terms presented by the engineers and instructors.



Left: Professional Engineers John Ball of RTI and Jeff Ball of the West Virginia Department of Transportation inform students at Marshall University's Early Education Center about different types of bridges and how they are constructed.

TECHNOLOGY TRANSFER



Exploring Engineering Academy of Excellence

Practicing engineers led 31 high school students through constructing and programming intelligent vehicles, mapping GPS points, building robots, assembling CO2 racers and other activities during the "Exploring Engineering Academy of Excellence" camp at Marshall University June 22-27.

Juniors from 23 high schools in West Virginia, Ohio and Indiana attended the third annual camp, which was hosted by the College of Information Technology and Engineering (CITE) and co-sponsored by RTI and other engineering, transportation and technology organizations.

Dr. Betsy Ennis Dulin, Dean of CITE; Dr. William Pierson, Interim Division Chair; and Dr. Richard McCormick, Ph.D. coordinated the camp and served as instructors. RTI research associate Asha Puttaiah, an environmental engineer, assisted as a counselor.

The students were broken into groups to provide a more intimate learning environment and use teamwork while completing exercises. A panel of practicing engineers also spoke daily to the students. Field trips to Beechfork Lake, the Toyota plant at Eleanor, W.Va., the locks and dams at Hawk's Nest State Park and the New River Gorge Bridge allowed them to see examples of environ-



Above: An engineer from Toyota speaks about careers in automotive and systems engineering to EEAE students. Left: A representative from Hawk's Nest State Park discusses the role of engineering in maintaining locks and dams with EEAE students.

mental, systems, automotive, hydraulic and civil engineering applied to real settings.

At least three of the original 2001 attendees were enrolled in engineering programs at institutions of higher learning for the 2002-2003 academic year. Two EEAE alumni returned to speak to this year's participants to give them a better understanding of expectations for engineering majors. As additional EEAE classes increase in size and graduate from high school, more students are expected to enroll in post-secondary engineering programs.

Participants were selected based on their performance in college preparatory courses and letters of recommendation from guidance counselors.

TECHNOLOGY TRANSFER

Operation Lifesaver Railroad Safety Camp



From July 6-11, RTI and Operation Lifesaver hosted the WVOL Rail Camp. Thirty-two 12-17 year olds from five states participated in the camp.

The primary focus of the project is to keep civilians, or non-railroad employees, from being injured by railroad apparatus or otherwise injured.

The five day camp entwined typical camp activities such as swimming and rock climbing with railroad safety and instruction. Each camper had the opportunity to drive a real locomotive and participate in activities such as hand car races and take a motor car rail trip. For the first time the camp featured the Norfolk Southern mobile locomotive simulator.

Mark Burton, director of the Marshall Center for Business and Economic Research said project objectives are to reduce injuries and fatalities at highway-rail grade crossings in West Virginia. The program also targets ways to eliminate the problem of trespassing on railroad properties and the injuries that can result.

“Studies have shown the years prior to adulthood are when safety habits are formed,” he said. “Operation Lifesaver targets this age group in an attempt to form rail-safe lifestyles.”

As a partner in the WVOL program RTI is helping convert a school bus into a mobile presenta-



Above: West Virginia Operation Lifesaver summer camp attendees learn about railroad safety from transportation professionals.

Left: Four students who attended West Virginia Operation Lifesaver's Rail Camp operate a hand car to reinforce railroad safety concepts.

tion center. This will allow the program to reach residents throughout the state. RTI also agreed to help improve and host the web site www.wvol.org.

“RTI has taken a program that was doing great things, and through its partnership has made the program exceptional,” Burton said.

For the past three years, the RTI has partnered with CSXT and Norfolk Southern and the West Virginia State Public Service Commission to assist West Virginia. Operation Lifesaver operates on volunteer labor, mostly from transportation professionals throughout the state.

TECHNOLOGY TRANSFER

Transportation outreach on the WEB

As part of the Transportation Outreach on the Web, RTI has developed and hosts three interactive websites:

- **Design a Future Vehicle (DFV) Workshops & DFV Teacher's Corner Website**
- **Intelligent Transportation Systems - LEGO Robotics City**
- **Science and Engineering NASA Site of Remote Sensing (SENSORS City)**

in addition to direct video links with several elementary schools in the Huntington area.

Links to the websites are available at www.marshall.edu/ati/towii/lego.htm.

TECHNOLOGY TRANSFER

Design a Future Vehicle Workshop and DFV Teacher's Corner Website



During RTI's Design a Future Vehicle (DFV) Summer Workshop 2003, students learned about the six technologies needed to design and construct vehicles: propulsion, suspension, guidance, control technology, support and structure.

From June 30-July 9 in Huntington, W.Va., research associate David Cartwright and other instructors taught the students how each technology was used in modern vehicles and guided students to plan future vehicles that use these technologies.

Each student was introduced to computer-aided design and drafting software and

used it to create a future vehicle for presentation.

Workshop instructors guided students through hands-on training activities using a studio learning approach and developmentally appropriate materials. Each instructor was assigned a small group of students to promote a supervised, but non-restrictive, creative atmosphere. Participating in small groups encouraged students to work as teams to reach their fullest potential and cooperate with a diverse group of individuals.

Workshop participants were also exposed to careers in technology and transportation and told the access to these careers was through higher education. Students completed entrance and exit surveys to ascertain knowledge retention.



RTI's Design a Future Vehicle (DFV) website contains information for students, parents and teachers about the six technologies of transportation used to create vehicles and road systems. Lesson plans that integrate transportation concepts into subjects including math, science,

social studies, language arts and computer technology are available at the DFV Teacher's corner.

Lesson plans for the following activities are available on the DFV Website. Children can build these projects with items that may be purchased at a discount and electronic stores.



- Aluminum Foil Boats
- Hovercraft
- Simple Motor
- Newton's Law Car
- Remote Control Vehicle
- Production Line
- Seat Belt Egg Vehicle
- Solar Energy Collector
- Balloon-Powered Vehicles
- Bridge Experiment
- Magnetic Street Board

TECHNOLOGY TRANSFER



LEGO Robotics City

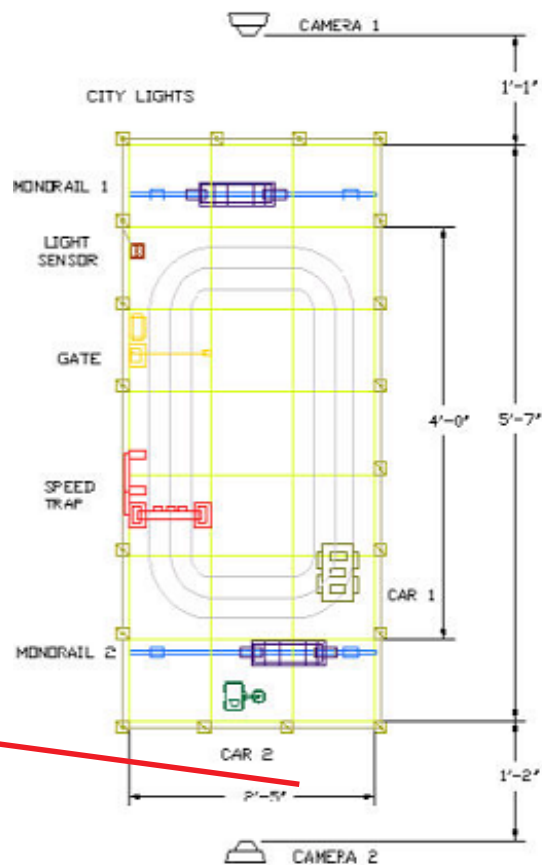
LEGO Robotics City is located in the information technology laboratory at RTI headquarters. This small, robotic city has two web cameras that provide live views of a simulated LEGO city with an oval track, two monorails, a traffic gate and an autonomous, line-following vehicle.

Middle school students learn the concept of teleoperation through this system, which is usually integrated into an Intelligent Transportation Systems LEGO Robotics workshop at RTI headquarters or through site visits to elementary schools by RTI staff.

LEGO Robotics City can be operated through the web and viewed with a live web camera after viewers download Red Rover Operating System software from the RTI site.



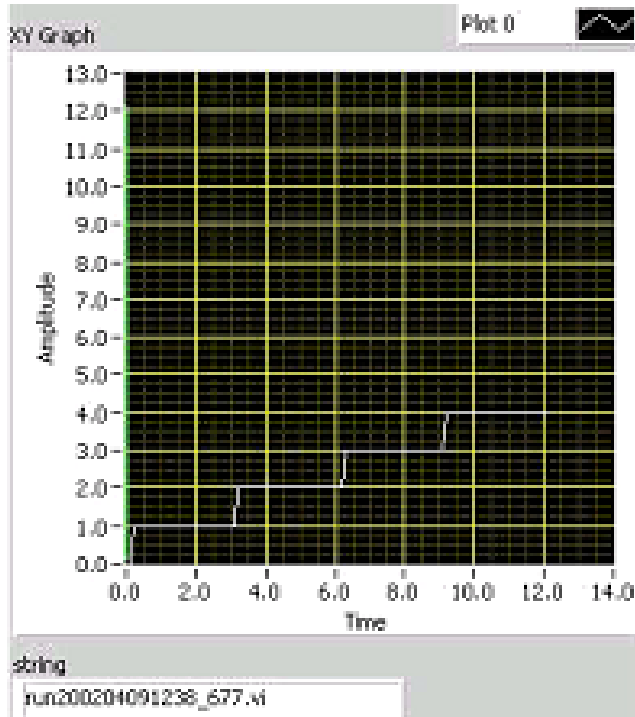
Left: The Red Rover Operating System control screen facilitates interactive e-mail exchanges from visitors with RTI operators. The system has control buttons that operate the monorail forward or backward. Programs may be written and sent to the system to perform advanced operations such as opening the traffic gate or moving the monorail.



Top right: The red line shows an ITS monorail as seen from AppaLEGO City (viewed from web camera 2) and indicated on a schematic drawing.

TECHNOLOGY TRANSFER

Science and Engineering NASA Site of Remote Sensing (SENSORS City)



Through the Science and Engineering NASA Site of Remote Sensing (SENSORS) City, students use sensors to obtain feedback related to operation, control and “teleoperation” of intelligent vehicles and traffic control devices. Students use the SENSORS site to send computer programs to operate ITS components, which can be seen through a typical web connection and requires no special operating software.

After a program or “mission” is submitted, the system returns results, which include graphs that illustrate data collected by the sensors, such as changes in direction, temperature, light or elevation. Computer programming challenges and competitions for students who have ROBOLAB software are also posted on the SENSORS Site at www.sensorscity.marshall.edu.

Above: Shows the resultant graph that is returned to the sender if the program was executed properly. In this case, the graph shows four steps over time indicating that the monorail sensed it came into contact with the end of the monorail track four times. For example, if the monorail did travel back and forth two times it would have come into contact a total of four times with the end of the track.

Below: Shows the location of SENSORS City “mission submitters.” The educational levels of the students range from middle school to high school.



Left: This program can be downloaded and submitted to the SENSORS City web site to tell the monorail to move back and forth two times. Note: the computer programming process is identical to some high level professional programming software packages i.e., objects or icons representing computer commands are strung together as opposed to written computer commands.

TECHNOLOGY TRANSFER



Adopt-a-School Program



Barbourville
Elementary



Davis Creek
Elementary



Highlawn
Elementary



Miller Elementary



Spring Hill
Elementary



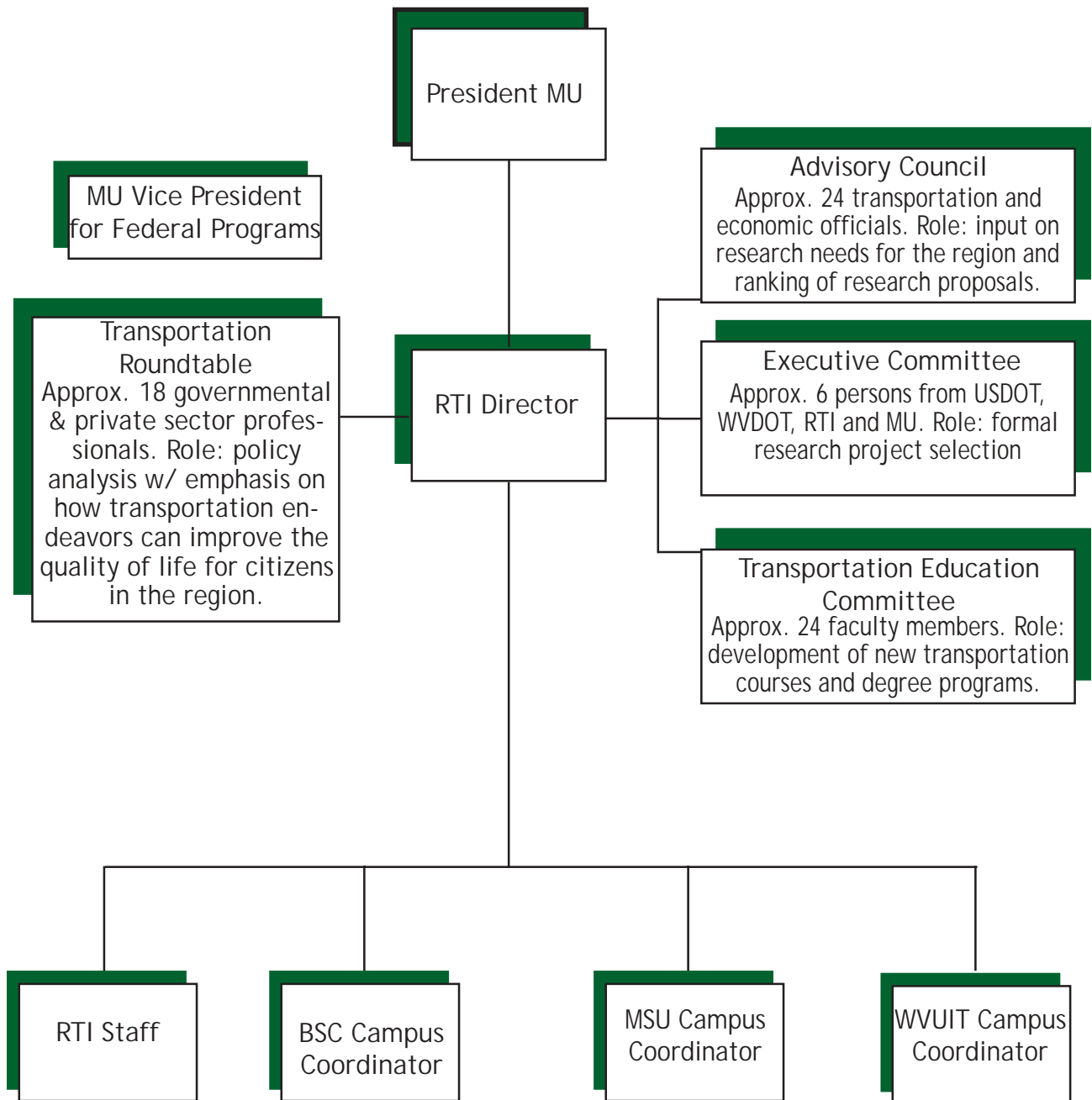
Student Aspect
Preparatory School

As part of RTI's Adopt a School program, RTI instructors use Robolab Cities and Transportation sets along with LEGO designed teacher curriculum to spark an interest in math and science among local students. The program takes place twice a month during the academic year.

Experiments conducted during Adopt a School sessions include:

- Building 3-D objects using 2-D drawings
- Measuring speed using light sensors
- Learning about friction using LEGO cars
- Constructing rubber band powered cars
- Using LEGO CAD to design LEGO vehicles
- Programming LEGO Robotics one-turn vehicle
- Creating chain and pulley drive vehicles
- Operating a Robotic Arm
- Telecommunicating with LEGO RCX's
- Building a small transportation system using LEGO Robotics sets
- Gearing experiments using LEGO DUPLO
- Building a Snail Car
- Simulating a Cross Country Adventure
- Driving Bumper Cars
- Exploring gear trains: teaching ratios and proportions
- Programming cars to go into and out of a tunnel
- Building a snowplow
- Learning about "The Little Blue Engine"

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MANAGEMENT STRUCTURE

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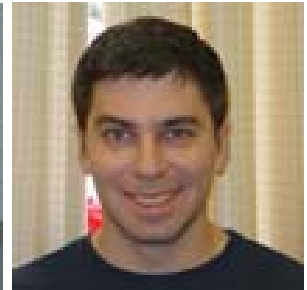
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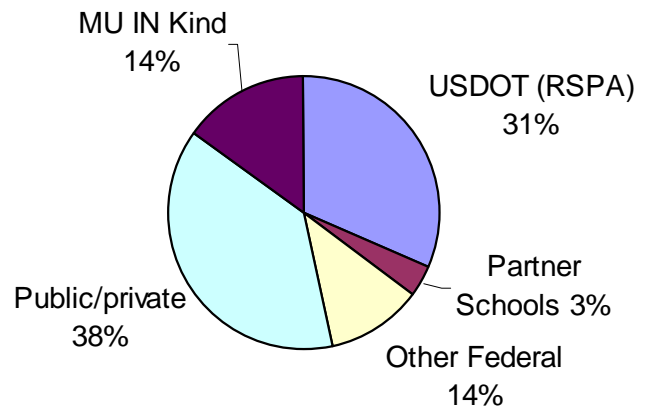
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Alabama Department of Transportation
 Appalachian Regional Commission
 Assumption College
 British Petroleum
 Business & Industrial Development Corporation
 CSX
 Cabell County Schools
 Cabell County Career Technology Center
 Federal Railroad Administration
 Greenbrier Valley Economic Development Corp.
 Great 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
 NOVHCC
 Norfolk Southern
 North Carolina Department of Transportation
 Ohio Department of Transportation
 Ohio Rail Development Commission
 Ohio River Valley Water Sanitation Commission (ORANSCO)
 Putnam County Development Authority
 Tennessee Department of Transportation
 Tennessee Valley Authority
 United States Department of Energy
 Wayne County Commission
 West Virginia Department of Natural Resources
 West Virginia Development Office
 West Virginia Disaster Recovery Board
 West Virginia Division of Highways
 West Virginia Geological and Economic Survey
 West Virginia Governor's Office
 West Virginia Housing Development Fund
 West Virginia Operation Lifesaver
 West Virginia Public Port Authority
 West Virginia Public Service Corp.
 West Virginia Trails Coalition



*Cash

NOTE: Expenditures include funds encumbered for the categories shown.

PROJECT LISTING

Number	Title	Principal Investigator
NEW		
00-02	Master Land Use Plans for Six Southern W.Va. Counties W.Va.: A Regional Approach for Six Counties in Southern W.Va.	Mr. Bob Plymale
00-04	Expected Flood Damages to Transportation Infrastructures as a Proportion of Total Event Costs: a Methodological Ex- ploration	Dr. Mark Burton
00-05	Integrated Track Stability Assessment and Monitoring System (ITSAMS) Phase III	Dr. Tony Szwilski
00-06	Transportation and Market Feasibility Analysis for Innovative Coal Combustion Byproducts to be Manufactured Adjacent to the I-64 High Tech Corridor in Southern W.Va.	Dr. Mark Burton
00-07	Opportunities to Improve Transportation Efficiencies through Enhanced Intermodal Capabilities and Increased Utilization of the Appalachian Development Highway System.	Dr. Tony Szwilski
00-08	Development of a Research Protocol that Relates Culvert Struc- ture to Fish Migration in Southern W.Va.	Dr. Mike Little
00-10	Improving Transportation Access to Rural Health Care in Lincoln County: Process Implementation	Dr. Mark Burton
00-11	Development of Transportation and Economic Development Information System (TEDIS) Delivered over the Internet for W.Va.	Mr. Sean Litteral
00-12	A Deployment Plan for the W.Va. High Technology Corridor	Dr. Michael Hicks
ONGOING		
99-01	Automated Road Extraction Using Satellite Imagery	Dr. Herbert Tesser
99-02	Preserving Branch Line Railroads	Dr. Mark Burton
99-06	Potential Uses of Fly Ash and Other Recoverable Materials in New Transportation Infrastructure Components	Dr., Tony Szwilski
99-09	Establishment of Pre-Construction Baseline Data as a Control for Evaluation of the Long-Term Success of a Mitigated Constructed Wetland Site (Case Study along the Tolsia Highway)	Dr. Mike Robinson
99-10	Endangered Species Identification along Corridors Using GIS	Dr. Mike Little
99-13	Commodity Flows in Northern W.Va.	Dr. Mark Burton
99-15	Impacts of the Appalachian Corridors on Small Business Develop- ment	Dr. Michael Hicks
99-16	McDowell County Transportation Project	Ms. Jennifer Plymale
99-18	ITS Research Initiation Project	Dr. Ashok Vaseashta

PROJECT LISTING

Number	Title	Principal Investigator
99-19	Public/Private Port Case Study	Dr. Mark Burton
99-23	Survey of Truck Parking Places (Private) in W.Va.	Ms. Jennifer Plymale
99-26	Beckley Exhibition Mine Expansion Project Management and Evaluation for a Transportation Enhancement Project to be Built along a National Scenic Byway in W.Va.	Dr. Richard Begley
99-27	Using FLI-MAP Technology for Transportation Applications Research Initiation Demonstration Project	Mr. Bruce Mutter
99-32	Development of a GIS Implementation Strategy for WVDOT	Dr. Herbert Tesser
99-33	Major Corridor Financing Options	Dr. Michael Hicks
99-05-2	Use of Electroluminescence Technology for Highway Signage - Phase II Demonstration Highway Sign	Dr. Richard Begley
99-06-2	Potential Uses of Fly Ash and Other Recoverable Materials in New Transportation Infrastructure Components (Phase 2)	Dr. Tony Szwilski
99-10-2	Endangered Species Identification along Corridors in W.Va. Using GIS (Phase 2)	Dr. Mike Little
99-24-2	Improving the Efficiency of Truck/Rail Intermodal Transportation - The Case of W.Va. (Phase 2)	Dr. Mark Burton
00-01	Integrated Railroad Track Stability and Monitoring System: Phase II	Dr. Tony Szwilski

COMPLETED

99-00	Commodity Flows and Transportation Inventor for 13 Counties in Southern W.Va.	Dr. Mark Burton
99-03	Lincoln County Transportation Study	Dr. Mark Burton
99-04	An Assessment of Site-Specific Geotechnical, Spatial and Climatic Parameters that Influence the Integrity and Stability of Railroad Track	Dr. Richard Begley
99-05	Use of Electroluminescence Technology for Highway Signage	Dr. Richard Begley
99-07	Rockfall Rating, Evaluation and Data Management Systems for Highway and Railway Rockslopes	Dr. Tony Szwilski
99-08	Abandoned Tire Health Risk Survey/Analysis	Dr. James Joy
99-11	Maximizing Economic Benefits from a Rails to Trails Project in Southern W.Va.: A Case Study of the Greenbrier River Trail	Dr. Raymond Busbee
99-14	Drowsy/Fatigued Driving: Prevalence and Under-Reporting in W.Va.	Dr. Robert Walker
99-17	Magnetic Levitation Transportation and Economic Development Opportunities for W.Va.	Dr. Richard Begley
99-24	Railroad Tunnel Size Restrictions	Dr. Mark Burton

PROJECT LISTING

- 99-25 Improving Safety and Operational Conditions at Railroad Dr. Richard Begley
Crossings: An Analysis of Bolt Installations, Designs and Torque
Procedures
- 99-29 Development of a Plan for a Non-Motorized Transportation Dr. Raymond Busbee
Corridors in Southern W.Va.: Case Study for Alternate Sources of Transportation
between Huntington and Charleston

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