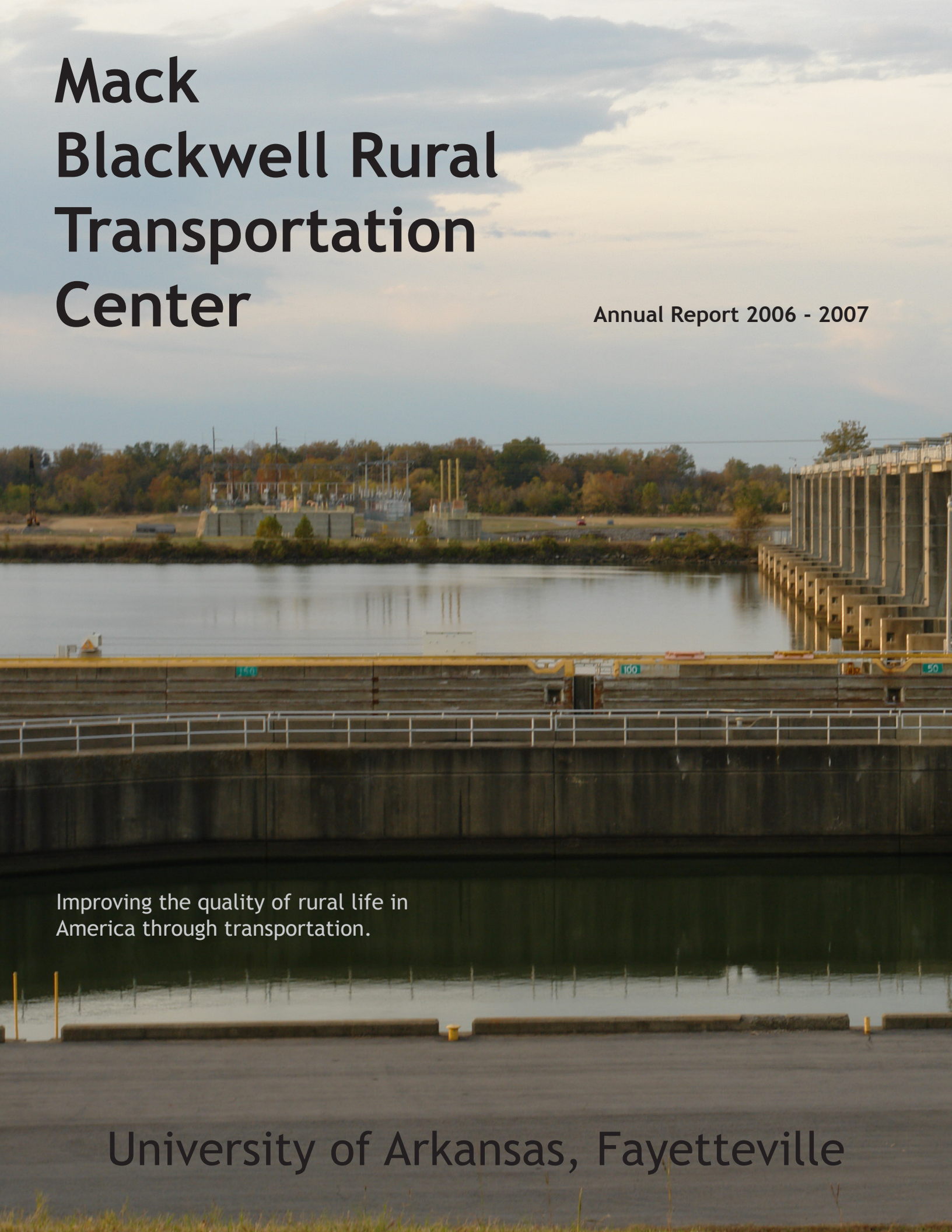
Mack Blackwell Rural Transportation Center

Annual Report 2006 - 2007



Improving the quality of rural life in America through transportation.

University of Arkansas, Fayetteville

Message from the Director

MBTC has completed another successful year filled with lots of challenges. During the period we hired a new Director, Dr. Heather Nachtmann who served as Associate Director for the past year. In a change to our organizational chart which is included later in this document, Dr. Kevin Hall, Head of the Department of Civil Engineering, has agreed to be our Executive Director. Kevin has been and remains on our Executive Committee and will become more involved in our long range planning and execution of projects in his new role as Executive Director. Both Kevin and Heather are featured in this report. I will remain as the Associate Director until my ultimate retirement at some point during the new FY.

Ms. Dana Ledbetter is doing a great job as Communications Director. Dana has a tremendous background and owned her own company for several years. She has made great strides in cleaning up our projects files and making them available to everyone with an interest, as well as providing more information on the Center's website. Dana also produces this annual report which I am sure you will agree is superb. Sandy Hancock has been our foundation in our financial dealings with the projects and the complicated and different accounting procedures at the various schools working on our projects.

MBTC's Center for Training Transportation Professionals (CTTP) continues to expand, teach more courses every year, inspect and certify more labs, and has become a most important arm for the Arkansas Highway and Transportation Department's drive to reach the highest of standards of excellence for the contractors working in Arkansas as well as its employees. Thanks to the hard work of Dr. Kevin Hall, Dr. Stacy Williams, Frances Griffith, Roselie Conley and Carrie Pennington as well as several of the professors and students, CTTP has become the showcase with many states attempting to emulate their success.

This past year has been marked by the completion of several projects of importance and the award of others with a great deal of potential such as Dr. Russell Meller's current study on "High Speed Rail for Freight Distribution". Our research projects continue to score high in the percentage that are adopted for use. Our thanks to our superb PI's for all their hard work. Our current and new projects are listed in the following pages along with short synopses.

Our Distinguished Lecture Series remain on our list of most meaningful events. We had our "Evening with the Pro's" where our students got to hear from and question previous graduates who have been successful in their careers. Bob Walters and the Arkansas Highway and Transportation Department (AHTD) spearheaded this most informative session. We also heard from General Vald Heiberg, former Chief of the Corps of Engineers, on the New Orleans flood situation. Following that Mr. Jimmy Slaughter, CEO of S&B Engineers and Constructors in Houston spoke on achieving zero construction accidents. Mr. Slaughter's company worked for five million hours without a lost time accident. He is currently spreading his gospel throughout the construction industry that there is no reason for someone being seriously injured on a construction project. In the spring we heard from the Assistant Secretary of Energy for Environmental Management, Mr. James Rispoli, on cleaning up nuclear waste in the United States.

This past year has brought roughly 30 new centers on line resulting in a total of sixty UTCs. Unsuccessful in this year's Tier 1 UTC competition, we have had to tighten our belts and cut down on the number of projects as a Tier II center. MBTC has included researchers from twelve different universities in nine different states over the past few years, and have historically seen our matching funds reach an average of one and a half times that of our federal funding. We will continue to search nationally to fund only the best projects supporting our theme of "Improving the quality of rural life through transportation", and hopefully fare better in the next round of competition in a couple of years.

We also want to thank our Professional Advisory Board and our Academic Advisory Board for their continued support. They, along with our Executive Committee, give us every reason to be more successful. MBTC grows stronger and becomes more of a contributor to improving the national rural transportation system each year, and we deeply appreciate the superb backing given us by the Department of Transportation and RITA in particular.

Jack Buffington

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Research Professor

Heather Nachtmann, Ph.D.
Associate Director
Associate Professor - Industrial Engineering

Dana L. Ledbetter
Communications Director

Sandra (Sandy) Hancock, CPS
Accountant

Stacy G. Williams, Ph.D., P.E.
Director, CTTP

Frances Griffith
EI Administrator, CTTP

Roselie Conley
Research Technologist, CTTP

Carrie Pennington
Secretary, CTTP

Mack-Blackwell Researchers

Principal and Co-Principal Investigators are the backbone of Mack-Blackwell Rural Transportation Center. MBTC has sponsored more than 143 researchers in 9 states over the past 15 years. Our researchers are engineers, economists, political scientists, landscape architects, and logistics specialists among many others. These are the profiles of just a few of the people who make MBTC's program a success!

Heather Nachtmann, Ph.D., University of Arkansas

Ph.D., Industrial Engineering, University of Pittsburgh
M.S., Industrial Engineering, University of Pittsburgh
B.S., Industrial Engineering, University of Pittsburgh

Edward Pohl, Ph.D., University of Arkansas

Ph.D., Systems and Industrial Engineering
University of Arizona
M.S., Engineering Management, University of Dayton
M.S., Systems Engineering, Air Force Institute of Technology
M.S., Reliability Engineering, University of Arizona

C. Richard Cassady, Ph.D., University of Arkansas

Ph.D., Industrial and Systems Engineering, Virginia Tech
M.S., Industrial and Systems Engineering, Virginia Tech
B.S., Industrial and Systems Engineering, Virginia Tech

Their research addresses vulnerability assessment of rural transportation networks. There are clear differences between rural and urban transportation networks including higher costs due to widely dispersed population and industry in rural networks. Exploration of rural transportation security issues is important because these networks are essential for enabling commercial shipping and linking rural residents with distant services. Their recently completed project (MBTC 2085) research investigates whether or not the methodologies of urban assessment studies can be applied to rural transportation networks and recommends preferred procedures for conducting rural transportation vulnerability assessments. An ongoing project (MBTC 2091) investigates rural transportation emergency preparedness plans. Sound and robust emergency preparedness plans and general emergency education will reduce the vulnerability of rural transportation systems to terrorist attacks as well as more common crises and assist in the efficiency of a response.

Stacy Williams, Ph.D., P.E., University of Arkansas

Ph.D., Civil Engineering, University of Arkansas
M.S., Civil Engineering, University of Arkansas
B.S., Civil Engineering, University of Arkansas

Current asphalt mixture design procedures and specifications produce asphalt mixtures that are relatively coarse, with aggregates typically ranging in size from 9.5 mm (3/8 in.) to 37.5 mm (1-1/2 in.). Such mixes are ill-suited for relatively thin overlays, for pavement structures which require little or no rainwater infiltration into underlying layers, or situations in which an appreciable amount of hand work is necessary – for example, a roadway containing multiple driveways, islands, and/or tight turning radius curves. Many agencies are investigating the use of asphalt mixtures featuring aggregates no larger than 4.75 mm (1/4 in.) for applications such as resurfacing (where additional pavement structure is not needed), maintenance, low-volume roadways, and other uses. Such 'fine-graded' mixes offer the potential for reduced segregation problems due to hand working, reduced permeability/infiltration of water into underlying pavement materials, and reduced overlay thickness – leading to potentially significant cost savings.

Dr. Stacy Williams has successfully produced 4.75 mm asphalt mixtures in the laboratory using source materials typically produced by Arkansas quarries and used by hot-mix asphalt plants around the state. Laboratory performance tests have demonstrated that these mixes offer equivalent or improved performance regarding resistance to rutting and surface friction (skid resistance). The first full-scale field application and construction of a 4.75 mm asphalt mix is slated for Fall 2007 in Hot Springs Village, Arkansas. Dr. Williams has worked closely with the Village Public Works Committee on mixture design and construction issues; she will also be involved in Quality Control testing during construction as well as coordinating field testing with the Arkansas State Highway and Transportation Department.

Ernie Heymsfield, Ph.D., P.E., University of Arkansas
Ph.D., Civil Engineering, The City University of New York
M.S., Transportation Planning and Engineering, Polytechnic Institute of New York
M.S., Civil Engineering, Polytechnic Institute of New York
B.S., Civil Engineering, Polytechnic Institute of New York

W. Micah Hale, Ph.D., P.E., University of Arkansas
Ph.D., Civil Engineering, University of Oklahoma
M.S., Civil Engineering, University of Oklahoma
B.S., Civil Engineering, University of Oklahoma

An airfield runway is designed to have adequate length for operating aircrafts to stop under normal conditions. Overruns occur when an aircraft stops beyond the runway length during a landing or an aborted takeoff. In most aircraft overruns, an aircraft stops within 1000-ft (305 m) of the runway threshold. The Federal Aviation Administration (FAA) recognizes the possibility of overruns and the potential hazardous consequences. Therefore, the FAA requires U.S. airfields to have a 1000-ft. (305 m) runway safety area in addition to the design runway length for aircraft overruns. However, at some airfields space is limited either by natural or man-made barriers. In this situation, airport operators need to consider alternative solutions. To satisfy the FAA requirements an airport operator can reduce the runway length and consequently limit the aircraft type landing at their airport. However, an alternative solution is for an airport to implement an engineered material arrestor system (EMAS). An EMAS is a passive system designed to stop an aircraft by inducing drag forces on the landing gears as the aircraft traverses the arrestor bed. The arrestor bed is designed using a crushable cementitious type material.

During the first year of this MBTC two year project, the investigators have concentrated their efforts in examining what are the critical aircraft characteristics and arrestor design parameters in stopping an aircraft during an overrun. The FAA computer code, ARRESTOR, was incorporated in a sensitivity analysis to compute aircraft stopping distances as a function of aircraft and arrestor bed properties.

In this sensitivity analysis, it was found that aircraft weight has the greatest impact on an aircraft's stopping distance. Although not as significant, gear wheel friction, and reverse thrust are also critical factors in determining an aircraft's stopping distance. In terms of arrestor material, an arrestor material's strength can be optimized to minimize an aircraft's stopping distance. In designing the arrestor bed thickness, additional bed thickness reduces stopping distance. However, simply adding thickness needs to be compared with available overrun space, maximum acceptable deceleration for passenger comfort, and material costs.

For the sensitivity analysis, the FAA ARRESTOR code was utilized. However, one drawback to the current FAA ARRESTOR computer code is the limited aircraft types that can be evaluated: B707, B727, and B747. Therefore, the investigators have been involved during this first MBTC project year in modifying an existing computer code to make it applicable to this current study. This revised computer code will allow the opportunity to analyze other aircrafts and user flexibility to incorporate the arrestor materials being developed by the Strong Company.

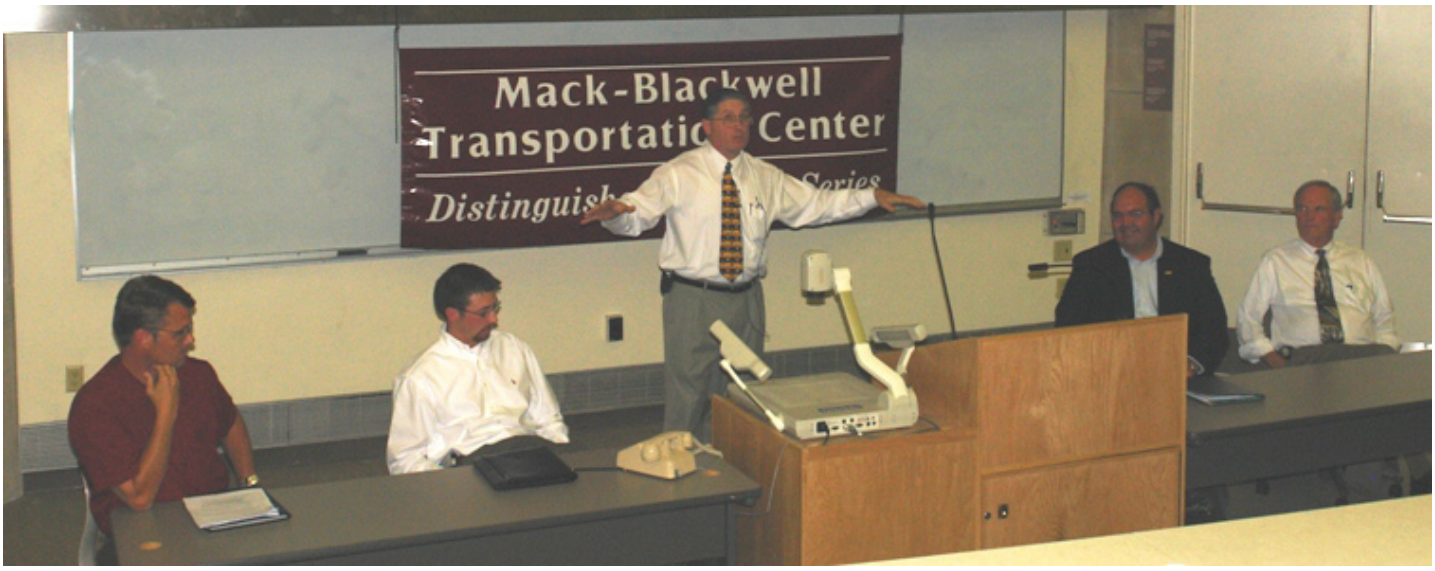
In the laboratory, researchers Eric Bailey and Sreeram Marisetty are working with P.I. Micah Hale on developing the lightweight concrete mixtures that will be used in the EMAS. Currently they have developed concrete mixtures with compressive strengths less than 30 psi at weights of 30 lb/ft3 and less. Ongoing and future work includes developing an appropriate coating for the material.

Steve L. Johnson, Ph.D., P.E., C.P.E.
University of Arkansas
Ph.D., Industrial Engineering, SUNY at Buffalo
M.S., Engineering Psychology, University of Illinois
B.A., Psychology, University of South Dakota

The technologies associated with in-vehicle information and control systems are advancing rapidly due to extensive efforts by both industry and governmental initiatives. The combination of "on-board" and "off-board" systems in commercial trucking operations has the potential to significantly increase safety, knowledge of driver performance and operational efficiency. In-vehicle information system such as navigation or collision warning devices can reduce the risk of accidents by reducing the driver's workload. However, if the total driving task and human-interface are not adequately addressed, the same device can actually have adverse effects due to potential distraction, startle, confusion, false or nuisance alarms, etc. The objective of this project was to develop a computer-based human performance model to address the effects of in-vehicle information systems on mental workload, interference, annoyance, and safety. The model will be useful to both system developers and user organizations to evaluate the effectiveness of in-vehicle information systems for commercial trucking operations.

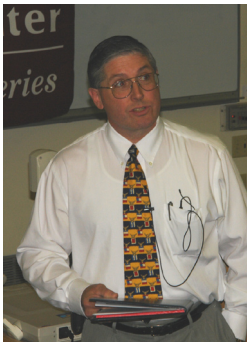
Dr. Johnson and his co-workers used a multiple-resource model developed by Wickens, in combination with the MicroSaint human performance simulation software as the basis for his modeling effort. The multiple-resource model compares the demands that a task places on the resources of perception, cognition and response. The impact of the competition for each of these resources is predicted in terms of overall task difficulty and the potential for degraded performance. The project investigated tasks performed by drivers using in-vehicle information and control systems. The computer-based simulation model based on the multiple resource model was used to address the mental workload placed on the driver by the myriad of information and response requirements associated with current and future on-board and off-board systems. The effort included a validation study using an interactive navigation task on a driving simulator in the Industrial Engineering Ergonomics Laboratory. The model can be used to assist in predicting the overall task demands and the potential for degraded performance. This will enhance the understanding of how in-vehicle information and control systems impact both performance and safety.

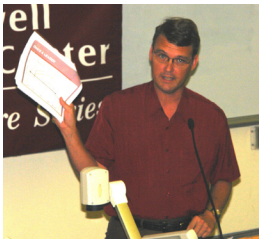
Evening with the Pros



The Arkansas Academy of Civil Engineers in conjunction with MBTC hosted the 14th Annual Civil Engineering Career Orientation Program, "Evening with the Pros," on Thursday, September 14th, 2006 in Combs Auditorium.

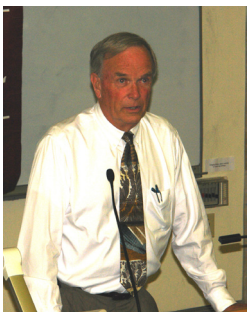
Students and other interested parties were invited to attend and learn about "Civil Engineering in the Real World." Free pizza and soda was served followed by the speakers. This year's panel included Bob Walters, Arkansas State Highway and Transportation Department of Little Rock, who acted as this year's emcee; Bert Parker, Garver Engineers of Little Rock; Kent Shreeve, Shreeve Engineering of Little Rock; Steven Beam, Crafton, Tull & Associates of Rogers; and Mike Marlar, Marlar Engineering of North Little Rock.

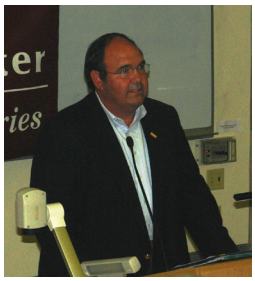

Bob Walters


Mike Marlar

Steven Beam, a recent graduate, described an average first day of work and how to prepare. Kent Shreeve explained how you should always double check your figures and keep your eyes on the progression of the work. Bert Parker gave an account of what an interviewer looks for in the resume and interview. Mike Marlar discussed some of the new requirements necessary to become a professional engineer.


Steven Beam


Kent Shreeve


Bert Parker

Students and other interested parties were able to ask questions and interact with the speakers to get a feel of what to expect when entering the workforce.

Director Addresses Senate Committee

Jack Buffington, interim director, and Kevin Hall, a member of the Executive Committee and head of the Civil Engineering Department, met with the Senate Committee on Public Transportation of the Arkansas Legislature on Saturday, September 23, 2006. The senate members held a session at Engineering Research Center's Dan Flowers Conference Room at the Center for Training Transportation Professionals with briefings from Mike Malone of the Northwest Arkansas Council, Ed Clausen, Department of Chemical Engineering and Mr. Buffington.

Opening remarks and introductions were given by state Representative Johnnie Bolin, chair of the House Transportation Committee, and state Senator Tracy Steele, chair of the Senate Transportation Committee. Mr. Buffington described funding for MBTC, ongoing research projects, and recent awards won by the Center. Mr. Buffington also discussed the Center's status as a U.S. Department of Transportation-funded University Transportation Center.

Following the session and presentation, members, staff, visitors and guests were given a tour of the facility by Dr. Hall.

Key Pieces in the Transportation Puzzle

By Kevin D. Hall, Ph.D., P.E.

Dr. Hall is Professor and Department Head of Civil Engineering and Executive Director of Mack-Blackwell Rural Transportation Center in Fayetteville, Arkansas. *This article previously appeared in the first quarter 2007 issue of Arkansas Good Roads Transportation Council Magazine - www.betterroadsbetterfuture.org*

The design, construction, maintenance, and rehabilitation of our transportation system represent a significant investment of financial resources and human expertise. A well-planned, well-constructed, and well-maintained transportation network provides economic vitality and an increased standard of living to a state or region – but requires an educated and trained workforce equipped with state-of-the-practice technology to do the job efficiently and cost-effectively. The University of Arkansas and MBTC help provide the people and the technology to meet the demands of the traveling public and freight distribution systems so vital to our society.

The mission of the University of Arkansas, as a land-grant institution, is three-fold: education, research, and service. MBTC also emphasizes education, research, and technology transfer. Together, the University and MBTC promote three primary efforts:

- Increase the number of well-educated engineers entering the transportation industry, and provide training for existing transportation professionals;
- Sponsor state-of-the-practice and state-of-the-art research targeted at solving pressing issues in transportation; and
- Ensure research products – new design techniques, analysis tools, materials, testing protocols, etc. – are moved quickly and efficiently into everyday practice.

In the highway field, the scope of activities undertaken by the University and MBTC is wide-ranging. Research and education programs have been completed and are ongoing which touch the entire spectrum of highway work – from the initial planning stages of location and feasibility, through design and construction, to performance monitoring and rehabilitation. Examples of MBTC/University research include integrating advanced technology such as Geographic Information Systems (GIS) and Global Positioning Systems (GPS) with transportation decision-support systems for emergency response planning; the safety benefits of various types of urban medians for separating traffic flow; laboratory equipment and test procedures to ensure asphalt mixes will not rut under traffic; methods for identifying risk and subsequently stabilizing embankment slops to prevent failure; and advanced imaging technology to digitally capture, catalog, and assess highway assets (such as signs) at normal driving speeds.

Education, training, and technology transfer are also a major focus for the University and MBTC. Since 1995, the Center for Training Transportation Professionals (CTTP), a division of MBTC, has provided hands-on training and certification for all persons involved with quality control and quality assurance testing on federal-aid highway construction projects. MBTC has produced an award-winning video on highway work-zone safety recognized nationally by the American Road and Transportation Builders Association (ARBTA), which helps drivers safely travel through roadway construction sites. A partnership between MBTC, the University, and the Arkansas Asphalt Pavement Association resulted in a series of nine on-site seminars held around Arkansas aimed at helping agencies implement a new asphalt mixture design system into local projects. These few examples illustrate the commitment to moving new technologies and information into the hands of users – agencies and the traveling public.

The overarching goal of any transportation agency or transportation system is the safe and efficient movement of people and goods. The incredible complexity of today's transportation systems, requires both far-reaching vision and proven technologies ready for immediate implementation. The University of Arkansas and the Mack-Blackwell Rural Transportation Center are providing such vision and technology for Arkansas, the U.S., and the world.

Center for Training Transportation Professionals (CTTP)

By Frances Griffith

Ms. Griffith is the Administrator for Training and Certification Programs at the Center for Transportation Professionals n Fayetteville, Arkansas. This article previously appeared in the June 2007 addition of South Central Construction.

CTTP began operation shortly after the Arkansas Highway and Transportation Department (AHTD) implemented its 1996 edition of Standard Specifications for Highway Construction. This new AHTD inspection system divided responsibility for quality assurance between contractors, who have primary responsibility; and AHTD personnel, who perform limited verification of the contractors' work. The Center works closely with AHTD, and about half of CTTP's students are AHTD personnel. Others are employees of more than 100 private construction firms involved in AHTD projects.

CTTP also certifies laboratories performing materials testing for quality control. This program is modeled after AASHTO R-18, which contains guidelines for ensuring quality in construction laboratory.

CTTP offers certification in three areas: Portland Cement Concrete Technician (ACI Concrete Field Testing Technician Grade 1), Hot-Mix Asphalt Concrete Technician and Soils/Aggregate Technician. A fourth course, Basic Aggregates, is the prerequisite for the technician-level courses. Classes are held throughout the year on the basis of need for a given topic. In addition, the technician training program has recently been expended to include ACI Concrete Strength Testing, Concrete Pavement Maintenance, and Roadway Construction Control.

Course content and format have been continuously fine-tuned since the Center launched its full class schedule in early 1997. Notes and specifications are also updated continually to ensure that the students have copies of the most recent editions of the specifications. Students evaluate each class delivery. As a result, more complete math computations are included in class work and the emphasis has been placed on the difficult testing procedures taught in classes.

The basic format of the courses-developed by Professor and Head of the Civil Engineering Department, and Executive Director of MBTC, Dr. Kevin D. Hall, Ph.D., P.E., has been successful from the start. Classes are limited to 20 individuals to ensure adequate lab time for each student.

L to R - Frances Griffith, Carrie Pennington, Stacy Williams, Roselie Conley. Photo Courtesy of CTTP.

Beginning in June of 2000, materials testing laboratories were required to become certified to work on federal projects in Arkansas. This certification includes initial enrollment, preparation of a quality manual, and finally an onsite inspection. Roselie Conley, CTTP Research Technologist, coordinates these functions for the program. Inspection and certification covers not only permanent laboratory installations but any temporary installations (satellite labs) set up for particular projects or contracts under the sponsorship of a primary laboratory.

At the time of enrollment, labs list the testing areas for which they wish to be certified: soils/aggregates, concrete and/or asphalt. They also indicate the specific test methods of desired certification. Next, each candidate laboratory prepares a Quality Manual in accordance with the guidelines contained in AASHTO R-18. The purpose of the manual is to show that the lab is in compliance with stated guidelines. The manual contains information on lab personnel and their certification, equipment inventory and equipment calibration information. "The example forms and documents in AASHTO R-18 show the types of information we need," said Conley, "but laboratories do have the freedom to adjust the AASHTO format to meet its own individual needs."

In the fall of 2004, CTTP moved to its new training facility. The facility was formally dedicated to Dan Flowers on October 29 of that same year. The new classroom features an enhanced classroom format and complete multi-media capabilities.

CTTP recently lost Kevin Hall's directorship when he took the position of Department Head for the Department of Civil Engineering. Replacing Dr. Hall as director is Dr. Stacy Williams. Dr. Williams has worked closely with the CTTP program since receiving her Ph.D. in the August of 2001. Her duties included oversight of the Laboratory Certification program as well as primary instructor in both the Basic Aggregates and Soils/Aggregates programs. Under her direction, CTTP will be redesigning the CTTP website, which will incorporate extensive on-line training modules.

Transportation Researchers Honored

Norman D. Dennis, Jr., Ph.D, P.E.

The University of Arkansas Teaching Academy inducted Norman D. Dennis, Jr., Ph.D., P.E. as a new member at its annual banquet held November 2, 2006.

Dennis joined the University of Arkansas department of Civil Engineering in 1996. Prior to that he taught at the U.S. Military Academy for more than two decades. He earned his doctoral degree at University of Texas. His specialty area is geotechnical engineering, but his passion is teaching, both undergraduate and graduate students, and mentoring junior faculty.

He has been honored by the American Society of Civil Engineers with its Excellence in Civil Engineering Education Leadership Award for 2006. He was also selected by the American Society for Engineering Education and the National Science Foundation as a distinguished lecturer on the topics of teaching and learning. He has given teaching and learning seminars at numerous universities both in the United States and abroad. For the past seven years he has held week-long summer workshops at the University of Arkansas for new faculty members in civil engineering designed to improve their teaching skills. The workshops are sponsored by the American Society of Civil Engineers.

Dennis and his wife, Theresa, have been married for 38 years and have three children and six grandchildren.

W. Micah Hale, Ph.D, P.E.

W. Micah Hale, Ph.D., P.E. was awarded the 2006-2007 John Imhoff Outstanding Teaching Award for the College of Engineering. Hale received his award on Thursday, April 12, 2007 at the College of Engineering Alumini Banquet.

Hale joined the University of Arkansas Department of Civil Engineering in August of 2002. Previously, while working on his doctoral, he was a research assistant at the University of Oklahoma where he also received his Ph.D. His research specialities are concrete materials, mixture proportioning, the use of self-consolidating and ultra-high performance concrete in prestressed members.

Hale is a member of the American Concrete Institute, Precast/Prestressed Concrete Institute, American Society of Engineering Education. He has been awarded the 2006 George D. Nasser Award from the Precast/Prestressed Concrete Institute, Outstanding Researcher for the Department of Civil Engineering for 2006-2007, and Best Professor Award presented by the University of Arkansas student chapter of Arkansas Society of Civil Engineers.

Hale enjoys running and has completed five marathons, but the most important event in the Hale household is the birth of his first child, Sarah Elizabeth Hale, with wife, Elizabeth, on July 12, 2007.

Brian Mattingly Nominated for Outstanding Student of the Year

Pictured left to right - Norman Y. Mineta, former Secretary of Transportation, Jack Buffington, and Brian Mattingly. Picture courtesy of Mineta Transportation Institute, Leslee Hamilton, and Dorota Tarnawska.

Mr. Brian Mattingly was nominated for the Mack-Blackwell Transportation Center (MBTC) Student of the Year Award at the University of Arkansas. Brian worked on two biodiesel projects culminating in his Master's in Science in Chemical Engineering degree from the University of Arkansas in July, 2006.

During his time as a student, in addition to his M.S. thesis, Brian contributed heavily to the technical completion of reports, made poster presentations at both the 2004 and 2005 MBTC Annual Projects Review Symposia, and delivered a technical paper at the 2005 International Petroleum Environmental Conference in Houston, Texas.

For the Spring 2006 semester, Brian was accepted as one of nine U.S. graduate students to the Renewable Resources and Clean Technology International Graduate Exchange Program from January, 2006 – June, 2006. During this time, Brian studied under Dr. Roland Verhe, renowned biofuels professor, at the University of Gent in Belgium.

Brian also served as an industrial coop student researcher with the international chemical company, DeSmet Ballestra, in Brussels, Belgium.

Brian is currently serving as Assistant Plant Manager for Earth Biofuels, Inc. at their Durant, Oklahoma facility. He is the son of Ken and Becky Mattingly of Conway, Arkansas.

The 16th Annual Outstanding Student of the Year Awards ceremony took place in conjunction with the Transportation Research Board (TRB) 86th Annual Meeting in Washington, D.C. on Saturday, January 20th, 2007 as part of the Council of University Transportation Centers (CUTC) Annual Banquet. For the past 15 years, the U.S. Department of Transportation (USDOT) has honored an outstanding student from each UTC at a special ceremony held during the TRB Annual Meeting. Each student is recognized during the ceremony by a Departmental official. Each student receives $1,000 plus the cost of attendance at TRB from his/her Center, plus a certificate from USDOT.

New Projects

MBTC 2086 - Routing Models for Rural Transportation Network with Time-Varying Constraints

Scott J. Mason, Ph.D., P.E.
Russell D. Meller, Ph.D.
Edward A. Pohl, Ph.D.
Industrial Engineering
University of Arkansas

The motivation for this work comes from the poultry industry, but can be broadened to other application areas. One problem of concern in the poultry industry is when an infected flock of birds has to be transported to another facility, but in doing so, the infected flock cannot come within a certain radius (e.g., five miles) of a breeding (or some other type of) facility. Alternately, a feed truck may not be allowed to come within a certain radius of an infected site/area. The poultry industry often has trouble solving these types of problem. In fact, they tend to solve the most restricted form of this problem, assuming a static radius value over time, rather than the real problem where the radius might vary over time, depending on site-specific conditions. Furthermore, conditions are clearly variable, as the disease may be one that spreads in the air and the spreading mechanism is dependent on the passage of time, wind speed, and other stochastic factors. The network that connects poultry facilities is primarily rural. In order to properly address such a problem, we will need to take a systems perspective and investigate methods to integrate the Geo-Spatial information available on rural transportation routes (CAST) with appropriate models for disease spreading mechanisms (Poultry Science) and our logistics decision support knowledge (Industrial Engineering) in order to efficiently route the movement of infected flocks while minimizing the risk of exposure to other poultry farms. This proposed research also applies to the transportation of toxic waste, network routing where rush hour traffic is a concern, and other important transportation applications where the network changes over time in a stochastic manner.

MBTC 2087 - A Nationwide High-Speed Rail Network for Freight Distribution

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In many areas of the country, congestion on the interstate and rural transportation network is significant, with billions of dollars a year in lost productivity associated with this congestion. In addition, it is predicted that the number of cars and trucks on the road will quadruple by the year 2050 and it is clear that the current interstate and rural transportation network cannot currently handle such volume efficiently (i.e., without even more significant delays in transit). These growth predictions are used by many public planners to advocate for high-speed passenger rail systems, which are generally defined as systems where the trains travel in excess of 100 mph. However, in countries like Germany and Japan, magnetic levitation trains (i.e., Maglev trains, which are single-car trains that are levitated above rails via magnetic fields for nearly frictionless travel) are being used effectively for such purposes at very high speeds. For example, the Yamanashi Maglev Test Line in Japan runs 42.8 km between Sakaigawa and Akiyama, achieving a top speed of 500 kph. With top speeds predicted to increase in the future by 60% (up to 500 mph), we ask why not explore this technology and other high-speed rail technologies in the U.S. for freight transportation? Due to the predicted 10x speed advantage, such a network would be commercially attractive for freight distribution, especially for "truckload" distribution, even on a network that is significantly smaller than the current interstate highway. And if such a network is well-utilized, highway congestion and its associated costs and negative impacts would be significantly reduced. This project will lead to a better understanding of high-speed rail technologies in terms of technological feasibility, network

design, and infrastructure challenges, including the design and operation of crossdock facilities for freight transfer in the resulting intermodal network. In addition, this project will result in the development of optimization models for designing systems to take advantage of these technologies and traffic load models that measure the impact that freight traffic on high-speed rail technologies has on highway systems.

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MBTC 2088 - Integration of GIS and Logistics Planning Methods for Arkansas Rural Transportation Emergency Planning

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With the advent of natural disasters such as Hurricane Katrina and the possibility of future events such as massive earthquakes in the New Madrid zone, terrorist attacks, avian influenza and others emergency planning in the area of transportation is a critical necessity. The development and testing of plans is difficult and labor intensive due to data requirements. In addition, the optimization of the plans and their simulation on computers is difficult without having the data in useful form and the domain knowledge necessary to formulate the optimization and simulation solutions. Governmental planners should have access to decision support tools that allow them to understand the feasibility of their plans and to assess the impact of "real" time changes on their plans. Such questions as where to locate emergency shelters and how to efficiently transport and arrange services need to be considered. In addition, the plans must be dynamic while assuring a certain level of humanitarian coverage.

This research will examine the feasibility of integrating disparate information when planning emergency operations as related to transportation for Arkansas and other states with large portions of rural areas. The expected output is a research report detailing what information is available, what information is missing, the specific formatting requirements for the data in order to integrate it into an emergency response logistics planning tool. A preliminary examination of the detailed requirements for the design of a decision support system based on GIS technology will be developed.

The research can be used by emergency planners to better understand how to utilize advanced technology in the planning process. In addition, the research will serve as a basis for future research in the area of decision support systems for rural transportation planning in emergency response situations.

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MBTC 2089 - Development of a Soft Ground Arrestor System

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The Federal Aviation Administration (FAA) requires airports to provide 1000 feet of overrun at the end of their runways. The 1000 feet is now an FAA mandate, but approximately 300 airports in the U.S. do not comply with the mandate. Natural terrain, local development, and environmental regulations prevent the airport from constructing the 1000 feet of overrun. In cases such as these, other suitable means of safely stopping an aircraft is required. Soft ground arrestor systems (SGAS) are a solution in those circumstances.

To achieve the object, the work plan will focus on concrete mixture proportioning, fresh and hardened concrete testing, and a bed design. The work plan is divided into five (six - dependent upon FAA) tasks: (1) Literatur Review, (2) Mixture Proportioning and Testing, (3) Concrete Production and Packaging, (4) Bed Design & Maintenance, (5) Field Study. (dependent upon FAA) and, (6) Preparation of Final Report.

MBTC 2090 - Performance Prediction of the Strong Company's Soft Ground Arrestor System Using a Numerical Analysis

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The Federal Aviation Administration (FAA) requires airfields to have a 1000' runway safety area beyond the design runway length for aircraft overruns. At many locations, this requirement cannot be satisfied because of natural or man-made barriers. Therefore, an alternative is to use an engineered material arresting system (EMAS). An EMAS is designed to significantly reduce an aircraft's stopping distance during an overrun.

The Strong Company proposes modifying the current design and materials used for an EMAS. The proposed alternative material will:

- be a cementitious material,
- satisfy the material properties included in FAA Advisory Circular 150/5220-22A, and
- be economically attractive.

The FAA requires that an EMAS design be validated using a design method which can predict the arrestor material's performance (AC 150/5220-22A). Instead of conducting expensive full-scale overrun tests on the modified system, a numerical approach using the FAA computer code, ARRESTOR, is proposed (White et al, 1993). ARRESTOR is an enhanced version of the computer program FITER1 (Cook, 1985) used for U.S. Air Force Operations. Overrun simulations during this study will be performed as a function of EMAS design characteristics, aircraft type, and aircraft runway exit velocity. These parameters will be used as a basis to evaluate performance. Empirical equations as a function of the new arrestor material, aircraft characteristics, and arrestor geometry will be developed during the study to summarize the computer simulations.

MBTC 2091 - Rural Transportation Emergency Preparedness Plans

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Sound and robust emergency preparedness plans and general emergency education will reduce the vulnerability of rural transportation systems to terrorist attacks as well as more common crises and assist in the efficiency of a response. Knowledge about and guidance for developing rural transportation emergency preparedness plans are needed. This research builds upon the findings from previous research by investigating and recommending Rural Transportation Emergency Preparedness Plans as well as education products for increasing public awareness and improving communication during and after an event. Multiple modes of rural transportation including highways, inland waterways, and rail are considered.

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MBTC 2092 - Yield Characteristics of Biodiesel Produced from Chicken Fat-Tall Oil Blended Feedstocks

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Biodiesel is an alternative to conventional diesel fuel made from renewable resources such as animal fats and vegetable oils. The main impediment to widespread commercial development of biodiesel is its relatively high cost compared to traditional petroleum based diesel and the production of large quantities of glycerol byproduct. Attendant feedstock and output price fluctuations for raw
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materials, energy costs and glycerol byproduct marketability as well as access to supply change distribution channels present challenges to biodiesel as an alternative fuel that are partially addressed in this research. Although biodiesel is most often produced from soybean oil in the U.S., other oil- and fat-containing raw materials animal fats (specifically chicken fat and beef tallow) may also serve as feedstocks and in turn reduce exposure to feedstock price risk. In Arkansas, one additional feedstock of interest is tall oil, a by-product of the paper mill industry. One potential advantage of tall oil is that glycerol is not produced during the esterification process. Therefore, to what extent a blended chicken fat/talloil feedstock is a technical and economic substitute for soybean oil in the production of biodiesel is an important consideration. Because this project utilizes Arkansas materials as feedstocks and results in a fuel that can be readily employed for transportation by farmers and truckers, it fits well within the MBTC mission of improving the quality of U.S. rural life through transportation.

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MBTC 2093 - Improved Traffic Signal Efficiency in Rural Areas Through the Use of Variable Maximum Green Time

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On April 20, 2005, the first National Traffic Signal Report Card was issued by a coalition of leading transportation organizations. This evaluation of traffic signal operations was based on input from 378 state, county, and local agencies. The overall national grade of D- clearly indicates need to address several key aspects of traffic signal operations. One key issue identified in the report: a lack of regular updates to traffic signal timing.

Such poor results came as little surprise to transportation professionals. The Federal Highway Administration reports that an estimated 75% of the 260,000 traffic signals in the United States could be improved "by updating equipment or by simply adjusting and updating the timing plans." The same report indicates that poor timing is likely responsible for "5-10% of all traffic delay or 295.8 million vehicle-hours of delay each year."

The importance of efficient traffic signal operations has increased significantly in the past two decades, as the growth of travel has greatly outpaced that of roadway capacity. From 1980 to 1998, growth in roadway capacity increased about 1% per year while travel grew by 72% . If agencies were able to provide proper traffic signal timing at all signalized intersections, estimates suggest that motorists could expect a 10 to 40% reduction in delay, up to a 10% reduction in fuel consumption, and up to a 22% reduction in harmful emissions.

In addition to the poor overall national grade, the Report Card also indicated that agencies responsible for very small signal systems (< 50 signals) "scored markedly lower… than larger systems." Virtually all rural areas will fall in this category, which averaged a full letter grade lower than their larger (i.e. suburban and urban) counterparts. The identified causes: staffing and funding. Rural agencies are unlikely to have dedicated traffic engineering staff, instead shifting traffic signal maintenance into a general public works department with little or no expertise in signal operations. Rural signals are also less likely to have dedicated funding for local or system-wide improvements, and are simply not considered candidates for the advanced upgrades which, though expensive, are becoming common in suburban and essential in urban systems.

Fortunately, the continuing reduction in cost for computing capabilities has brought with it more advanced traffic signal control capabilities built into standard controllers, including many which have not yet been tested. One such feature is commonly referred to as a Variable Maximum Green Time (VMGT). This feature, provided on at least five control platforms by at least two different manufacturers, allows a local signal controller to determine if a phase failed to serve all waiting vehicles, and to adjust its length accordingly in subsequent cycles. The goal: improved traffic signal efficiency through real-time adaptation of signal timing to current conditions.
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The current state-of-the-practice in isolated traffic signal operations is a fixed maximum green time which terminates a phase after a given period of time. While detection systems can allow a phase to terminate early in the absence of demand, there is no mechanism to determine or adjust for unmet demand. VMGT allows for variation in the maximum green based on the presence or absence of unmet demand, essentially providing more green time in the following cycle to phases with unmet demand in the current cycle, and vise-versa. While VMGT is available on several current controllers, it is rarely used due to a lack of data on its effectiveness, an absence of guidelines for its application, and a lack of understanding of its purpose.

Similar "adaptive" control strategies have been studied over complex systems of intersections with encouraging results. Reports indicate the potential for reduced delay (as much as 30%), increased throughput, and more equitable distribution of delay. To date, most such studies have focused on large, highly complex, very costly systems for multiple intersections without considering the the benefits of low cost isolated intersection techniques like VMGT.

The primary objective of this proposal is to investigate the potential to improve traffic signal operating efficiency in rural areas through the use of VMGT as low cost local adaptive control. The primary measures of intersection efficiency to be investigated are average delay and intersection throughput. The primary investigative method involves HITL and CSITL simulation, which allows for computerized traffic simulations to be connected in real time with field traffic signal controller hardware, thus allowing multiple strategies to be tested with identical traffic conditions and without the difficulties of in-field traffic disruption.

MBTC 2094 - Acceleration Lane Design for Higher Truck Volumes

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As both traffic volumes and percentages of heavy vehicles on the highways have increased, traffic problems at certain freeway entry ramps, such as those near truck stops and at heavy-vehicle weigh stations, become more likely. Where there are major concentrations of trucks, the number of slow-moving trucks reentering the highway combined with the volume of high-speed traffic on the main lanes, has created undesirable traffic situations. Longer acceleration lanes are needed at locations with significant volumes of trucks, so the trucks entering the highway can accelerate to through-highway speed before the point at which the trucks merge into through traffic.

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MBTC 2095 - Potential Applications of Nanotechnology for Improved Performance of Asphalt Pavements

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Nanotechnology is a field in which materials may be manipulated and improved at the molecular level. Successful applications of nanotechnology have been achieved in areas such as electronics, biotechnology, and material science (i.e. metallurgy). Given the composite nature of hot-mix asphalt (HMA) and Portland cement concrete (PCC) – each a mixture of aggregate and a binder – the potential for improvements in the engineering properties of HMA and PCC through the application of nanotechnology is significant, particularly in the areas of resistance to moisture damage (stripping in HMA), durability, and stiffness, among others. This project seeks to explore potential applications of nanotechnology to the performance of paving materials. Improvements to pavement performance
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would result in significant cost savings to pavement agencies. Ultimately, this research could result in longer-lasting, more durable pavements for highways, airfields, ports, and other facilities. The proposed project will also open new areas of research regarding the improvement of paving materials and pavement performance.

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MBTC 2096 - Solar Powered Lighting for Overhead Highway Signs

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The purpose of the present research is to design and develop a solar powered lighting system for overhead highway signs with a view to improving night visibility, driving conditions, and highway safety. Two systems will be developed and tested: one system will utilize regular fluorescent tube lights for shining light on the sign, and the other system will employ Electroluminescent (EL) fibers to highlight the letters in the sign and/or the boundary of the signboard. The engineering aspect will involve designing a highly efficient dc to ac inverter at 60 Hz for fluorescent system and at 1 KHz for the EL system. An improvement in inverter efficiency will allow use of more compact solar panels and reserve energy for rainy or cloudy weather conditions. The inverter signal quality will be similar to that of utility supply (reduced harmonics) for extended life of the fluorescent tubes as well as EL fiber. The system will incorporate a power management controller to adjust the lighting effect to compensate for weather conditions for days with inadequate solar charging. Both the systems will be tested outdoor in a highway environment, and their performance will be closely monitored. A group of volunteers will be recruited to determine their perceptions concerning any benefit to traffic safety due to the overhead lighting.

MBTC 2097 - Automated Inventory and Analysis of Highway Assests - Phase II

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In addition to pavements, bridges, and tunnels, highway assets include signs, markings, guardrails, billboards, and others. Sign inventory is important in studying the need of using traffic control and advisory devices, and assessing conditions of existing signs. Sign inventory in a state highway agency is mostly managed in an analog format through paper files. Furthermore, the management of lane markings for no-passing zone is largely a manual process. Inventory for no passing zones and knowing their condition are important for safety management on two-lane highways. Through the use of modern gyro sensors and image processing, it is possible to study the necessity of setting up no-passing zones and also archive existing no-passing zones into digital imaging databases. Thirdly, roadside structures, such as guardrails and billboards, need frequent condition survey. All existing technologies for asset inventory are based on post processing, labor-intensive and costly. Full automation of asset inventory and analysis through this research will vastly reduce surveying cost. This project will (1) develop technologies in inventorying these types of structures and signs, and conducting automated condition survey on them, (2) obtain sub-meter positioning data to each and every asset element under study, through the use of Differential Global Positioning (DGPS) technology. In the end, performance studies of these man-made objects over time can be carried out, and integration of the collected and analyzed data sets with GIS databases can be conducted. The significance of this project will be exhibited at the end of the project in providing the Arkansas highway department a surveyed database for a state highway network.
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MBTC 2098 - A Model-Based Risk Map for Roadway Traffic Crashes

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Visualization of traffic safety data that transforms spatial data into a visual form can help highway engineers and traffic safety officials to effectively analyze the data and make decisions on which roadways and road side features to improve by providing the spatial distribution of the data. However, research efforts in the visualization of traffic safety data, which are usually stored in a large and complex database, are quite limited because of methodological constraints (Miaou and Song, 2005b; Miaou, Tandon, and Song, 2005; Smith, Harkey, and Harris, 2001). For example, there are only a few model-based maps that can account for the high variance of traffic crash estimates in low population areas, and at the same time clarify overall geographic trends and patterns. In addition, designers of roadways historically did not take into account the full range of driver characteristics, such as driver perception-response time, age differences, etc. (Dewar and Olson, 2002). One of the most important components of the roadway transportation is the human driver whose error is a factor in about 90% of traffic crashes (Treat et al., 1977). Therefore, it is very important for highway engineers and traffic safety officials to identify and understand the basics of human factors as relevant to driving and traffic safety. The objective of the proposed project is aimed at developing a user-friendly geographic information system (GIS) that displays traffic crash data in Arkansas, estimated traffic risk based on the statistical model to be developed, and human factors in traffic accidents.

MBTC 2099 - Identification and Analysis of Points and Segments of High Fatality Crashes

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According to the assessments of injuries and fatalities in traffic crashes by NHTSA, approximately 42,850 persons died in an estimated 38,356 motor vehicle traffic crashes in the United States in 2002. This represents an increase of 1.7% fatalities from the 42,116 reported in 2001 and is the highest level of fatalities since 1990. An additional 2,914,000 persons were injured on U.S. public roads and highways in 2002. In 2004, Arkansas had 704 highway fatalities; the fatality rate per 100,000 persons in Arkansas was 25.58 versus 14.52 for the national average and 7.42 for the state with the lowest rate. Moreover, fatality rate per 100 million vehicle miles traveled (VMT) for Arkansas in 2004 was 2.22 versus 1.44 for the national average and 0.87 for the state with the best rate. In addition to the lost of lives, roadside crashes cost society $80 billion per year. The economic costs to society in medical expenses, worker losses, property damage, and emergency services compound the personal tragedies resulting from highway fatalities and crashes. With fatality rates in Arkansas higher than the national average, the proposed research needs to be undertaken to decrease the number of fatalities, rate and severity of crashes, and to reduce the economic cost to society.

A GIS based research approach is proposed to pinpoint fatalities and crashes, rank highway segments and points by rates and severity, forecast future rates and severity of crashes at highway segments and points and suggest remedial measures to improve safety using best practices in highway and traffic engineering.

MBTC 2100 - Evaluation of the Role of Driver's Knowledge of Who Has the Right-Of-Way Contributes to Interstate On-Ramps Crashes

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The characteristics and circumstances of interstate ramp crashes have been sparingly studied although entrance and exit ramps are one of the locations of highest crashes per mile driven of any segment of the interstate system. For ramp related crashes, studies have shown that about 50 percent of all crashes occur on exit ramps and about 36 percent occur on entrance ramps. For exit ramps, the most common type of crash is run-off-road whereby speeding was found to be often a major factor. However, for entrance ramp the most common crash type is rearend and sideswipe or cutoff. These frequently involve at-fault drivers merging from entrance ramps into the sides of other vehicles and mostly trucks already on the freeway mainline lanes.

While speeding and ramp geometric design related factors have been studied extensively, however, very little has been researched on the factors that contribute to on-ramp merging drivers not yielding the right-of-way to freeway mainline-through traffic. Some states' driver's testing license booklets inform new drivers of accelerating at onramp to attain the freeway mainline speed. This is also in accordance with AASHTO Policy on Geometric Design of Highways and Streets whereby auxiliary (acceleration) lanes are provided in order to minimally affect the through traffic operations. Normally no yield sign is needed for ramps having standard acceleration lanes. The foregoing reasons may lead some on-ramp merging drivers to think that they share equally the right-of-way with the mainline-through traffic and hence become one of the major causes of on-ramp area collisions.

Ongoing Projects

MBTC 2006 -Investigation of the Long Term Stability of Highway Slopes, Phase III
Norman D. Dennis, Jr., Ph.D., P.E.

MBTC 2007 - Estimating Subgrade Resilient Modulus for Pavement Design
Norman D. Dennis, Jr., Ph.D., P.E.

MBTC 2026 - Using Multi-Spectral Satellite Imagery to Enhance Slope Failure Prediction
Norman D. Dennis, Jr., Ph.D., P.E.

MBTC 2037 - Route and Site Characterization Using Multi-Spectral Satellite Imagery
Norman D. Dennis, Jr., Ph.D., P.E.

MBTC 2047 - WebShipCost – A Geographical Information System for Waterway Utilization
Manuel D. Rossetti, Ph.D., P.E.

MBTC 2055 - Roadway Median Treatments
James L. Gattis, II, Ph.D., P.E.

MBTC 2056 - Applicability of Microelectronic and Mechanical Systems (MEMS) for Transportation Infrastructure Management
Kelvin C.P. Wang, Ph.D., P.E.

MBTC 2057 - Independent Graduate Assistantship – Comparison of the Evaluator of Rutting and Stripping of Asphalt with the Rotary Asphalt Wheel Tester (Bret Taylor)
Kevin D. Hall, Ph.D., P.E.

MBTC 2061 - Modeling, Assessing and Managing Risk in Transportation Systems
Edward H. Pohl, Ph.D.

MBTC 2063 - Highway Collison Warning Technology: Determination of Criteria for Detecting and Logging Hazardous Events in Tractor-Trailer Safety and Training Programs
Roy McCann, Ph.D., P.E.
Steven L. Johnson, Ph.D., P.E., C.P.E.

MBTC 2064 - Assisted Night Vision for Motorists in Highway Construction Zones: Phase II (Field Testing & Assessment)
Hirak C. Patangia, Ph.D
John M. Faucett, Ph.D.

MBTC 2066 - Surface Friction Measurements of Fine-Graded Asphalt Mixtures
Stacy G. Williams, Ph.D., P.E.

MBTC 2067 - Roadway Median Treatments
James L. Gattis, II, Ph.D., P.E.

MBTC 2070 - Development of Methods for Estimating Remaining Life of Hot-Mix Asphalt Field Mixes
Kevin D. Hall, Ph.D., P.E.
Norman D. Dennis, Jr., Ph.D., P.E.

MBTC 2071 - Prestress Losses in Prestressed Bridge Girders Cast with Self Consolidating Concrete
W. Micah Hale, Ph.D., P.E.

MBTC 2072 - Roundabout Feasibility Study for West Memphis
John V. Crone
Carolyne Garcia
Otto Loewer

MBTC 2073 - Effects of Freeway Frontage Road Conversion
J.L. Gattis, Ph.D., P.E.

MBTC 2074 - Evaluation of Pavement Thickness and Modulus Using Spectral Analysis of Surface Waters
Norman D. Dennis, Jr., Ph.D., P.E.

MBTC 2075 - Non-Nuclear Methods for Density Measurements
Stacy G. Williams, Ph.D., P.E.

MBTC 2077 - Networked Sensor System for Automated Data Collection and Analysis
Kelvin C.P. Wang, Ph.D., P.E.

MBTC 2078 - Evaluation of Economic Impacts on NAFTA on the Transportation System/Sector of Selected Southern States
Gregory L. Hamilton, Ph.D.

MBTC 2079 - A Safety Analysis of Driver Reaction to Alternative Traffic Control Devices at Rail-Highway Grade Crossings
Eugene R. Russell, Ph.D., P.E.
Margaret Rys, Ph.D.

MBTC 2080 - Effects of Not Wearing Safety Belts on Injury Safety
Sunanda Dissanayake, Ph.D.

MBTC 2083 - Human Factors Study of Driver Assistance Systems to Reduce Lane Departure and Side Collision Accidents
Steven L. Johnson, Ph.D., P.E., C.P.E.

MBTC 2084 - Development of an Intermodal Container/ Trailer Load Status and Security Monitoring System
Roy McCann, Ph.D.

Completed Projects

MBTC 1802 - Developing A Viable Poultry Litter Transport Option for the Ozark Region

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Management of poultry litter as a resource to enable continued environmentally and economically sound utilization is a public policy issue. A public policy is a causal model designed to create social change (or stabilization). The policy assumes that we are at point X and want to get to Point Z. A public policy, at least formally is the insertion of a new variable (program or policy Y) between X and Z that will move us from X to Z. This study assumes that we are currently at point X, which is one of deteriorating water quality in the Ozarks region owing in part to generation of large quantities of poultry litter, and the goal is to move to Point Z, which would be where the increasing levels of poultry litter can be managed to control further deterioration of water quality and maintain a viable poultry industry. The primary objective of this study is to identify what the new variable (Policy Y) which could help this region move from Point X to Point Z.

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MBTC 2008 - Automation of Pavement Surface Distress Survey Through Parallel Processing

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As a part of the Digital Highway Data Vehicle (DHDV), the automated survey system developed at the University of Arkansas is the implementation of a real-time system for pavement surface cracking survey. The researchers faced tremendous tasks in optimizing imaging algorithms to speed up the processing at the same time without sacrificing accuracy in identifying and classifying cracks. This report introduces the automated real-time system and summarizes the experiences in developing parallel algorithms in imaging processing used in the real-time system. The hardware system for processing images is based on the ubiquitous multi-CPU x86 platform that has the capability of parallel processing at multi-CPU level (Symmetrical Processing, SMP) and within CPU level (Single Instruction Multiple Data, SIMD). The paper also presents results of a network level survey with the Digital Highway Data Vehicle (DHDV) and the Distress Analyzer on a network of about 161 kilometers (100 miles) of pavements. In addition, a manual survey was conducted on the same network of pavements. World Bank's Universal Cracking Indicator (CI) is used in the study. Because the Distress Analyzer is fully automated and results of the analysis are provided in synch with image collection, the potential cost savings when compared with manual survey methods and other semi-automated survey technologies are tremendous.

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MBTC 2027 - Investigation of the Affect of Fines on Base Course Performance

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It has been long recognized that pavement service life is highly dependent on the strength characteristics and permeability (hydraulic conductivity) of the underlying base material. Current Arkansas State Highway & Transportation Department (AHTD) specifications limit the maximum fines (material passing a # 200 sieve) content in its Class 7 base aggregate to 10 percent. To decrease costs associated with the production of granular base course, aggregate producers in the State of Arkansas have proposed that the upper limit on fines be increased. The overall objective of this study was to determine if an increase in fines content, above the currently specified 10 percent, would have detrimental effects on base course performance.

In this study samples of Class 7 base course from five (5) different quarries, representing a wide range of geologic materials used in the State of Arkansas, were tested in the laboratory to measure hydraulic conductivity, moisture retention and strength properties at varying fines contents. The focus of this laboratory work was to determine the effect of fines on the strength, hydraulic conductivity and moisture retention of unbound aggregate base course materials. For this study a model gradation blend was developed for each quarry based upon historical gradations and AHTD specifications. Model gradations were developed for 6 percent, 8 percent, 10 percent, 12 percent, 14 percent, and 16 percent fines. The quantity of material retained on the # 40 and larger sieves did not vary for the different gradations from each quarry, only the percentage of fines was varied. A modified proctor of the upper and lower limit gradations from each quarry was performed to establish target dry densities and optimum moisture contents to be used in preparing specimens for testing.

In accordance with AASHTO specifications, replicate 152mm (6 inch) diameter by 117mm (4.265 inch) high samples containing 6 percent and 8 percent fines were tested by the constant head method (T-215). Samples containing 10 percent, 12 percent, 14 percent, and 16 percent fines were tested by the falling head method (ASTM D5084, method C). Two (2) replicate samples were tested for each percentage of fines. Samples were tested for capillary rise (suction) by a procedure developed in this study.

Strength and modulus testing was conducted in accordance with ASTM 2850, using consolidated-drained triaxial testing procedures on replicate 150mm (6 inch) diameter by 305 mm (12 inch) high specimens. Each test specimen was subjected to an initial stress controlled cyclic loading at an effective confining pressure of 5 psi to establish and initial modulus value. This loading was followed by strain controlled staged testing at 5, 10 and 20 psi to establish strength parameters c and φ.

It was determined that historical gradations of Class 7 base course used in Arkansas have hydraulic conductivity values that are from 2 to 6 orders of magnitude lower than what is considered to be "freely draining". Any increase in the percentage of fines above the current maximum of 10 percent will have only minor effects on the hydraulic conductivity of the granular base course and will not affect its drainability at all. In addition, is was determined that strength and stiffness of Class 7 bases from the selected quarries actually increased as fines contents increased from 8 to 12 percent. For some quarries strength decreased marginally at 14 percent fines, while for others the strength remained essentially constant at fines contents of 14 and 16 percent. Overall the variation in strength for fines contents ranging from 6 to 16 percent was generally less than 10 percent.

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MBTC 2030 - Development of 4.75 MM Superpave Mixes

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Civil Engineering
University of Arkansas

Until recently, the Superpave asphalt mix design specification did not include the 4.75mm nominal maximum aggregate size (NMAS). Such mixes have the potential to create a smooth riding surface, extend pavement life, improve ride quality, improve safety characteristics, enhance appearance, increase durability, reduce permeability, and reduce road-tire noise. Also, because of the ability to place these mixes in thin lifts, they can be used to correct surface defects, decrease construction time, decrease construction costs, and to extend maintenance dollars. The Arkansas State Highway and Transportation Department does not currently use a 4.75mm NMAS mix. Thus, the objectives of this project were to evaluate the benefits and impacts associated with 4.75mm mixture implementation.

In this study, three aggregate sources (limestone, sandstone, and syenite) were used to develop 4.75mm nominal maximum aggregate size (NMAS) mixtures. From each source, six mixtures were designed at varying design air void contents and design compaction levels. Two air void levels
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(4.5 and 6.0 percent) and three compaction levels (Ndes = 50, 75, and 100) were evaluated in order to determine the most advantageous design parameters with respect to rutting, stripping, and permeability. Also, the use of natural sand was investigated.

The results of the study indicate that 4.75mm mixes can be successfully designed using existing aggregate sources. In some cases, minor modifications to existing stockpile gradations improved design success. Design air voids and compaction level were both important to the performance of the mixes. The greatest resistance to rutting and stripping was provided for low- and medium-volume mixes when designed at 6.0 percent air voids, and for high-volume mixes when designed at 4.5 percent air voids. Thus, different design air void levels were recommended for different applications. Some aggregate sources were able to tolerate the addition of natural sand. In general, however, rutting and stripping potential increased as the natural sand content increased. When compared to mixes with larger NMAS, the 4.75mm mixes exhibited rutting and stripping resistance similar to, and sometimes greater than, that of typical 12.5mm surface mixes. The permeability of the 4.75mm mixes was determined to be very low, and thus there is excellent potential for using these mixes to seal surfaces that may be prone to permeability problems.

Overall, the results of the study indicated that 4.75mm mixes have the potential to successfully provide many benefits. Thus, it was recommended that the 4.75mm NMAS be added to the Arkansas mix design specification.

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MBTC 2034 - Community Impact of Regional Transportation Infrastructure: Revisited After Completion of Airport and Major Highway

Will Miller, Ph.D.
Political Science
University of Arkansas

Not enough is known about the impact of transportation infrastructure on citizen satisfaction and quality of life. This study was an interdisciplinary project involving Public Policy, Public Administration, and Political Science. Measuring against a baseline data set created in 1993, this study examined the change in Northwest Arkansas citizens' attitudes toward recent improvements in both ground and air transportation infrastructure including the opening of the Northwest Arkansas Regional Airport and Interstate 540. Our primary research hypothesis was that residents of Northwest Arkansas support increased growth in this area, but may be experiencing higher levels of uncertainty as their community changes in the transition from a rural to a more urban corridor. The methodology was a mail survey sent to residents of Northwest Arkansas, and to expand on the 1993 research, we also sent the survey instrument to a selected group of public officials and policy decision makers in Northwest Arkansas.

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MBTC 2040 - Supplemental Signing for Stop Signs - Phase II

J.L. Gattis, Ph.D., P.E.
Civil Engineering
University of Arkansas

Signs warning motorists that "traffic on the cross street does not stop" can be found at some stop-controlled intersections. These CROSS TRAFFIC signs have been installed to furnish an extra warning at intersections where motorists on the stop-controlled approaches may incorrectly assume that the major crossing or through street traffic also has STOP signs.

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MBTC 2042 - Automated Survey and Visual Database Development for Airport and Local Highway Pavement

Kelvin C.P. Wang, Ph.D., P.E.
Civil Engineering
University of Arkansas

This report describes a new imaging technique applied in the pavement distress survey on airport runways. The Digital Highway Data Vehicle (DHDV) developed at the University of Arkansas was used to conduct the runway pavement distress survey for Hartsfield Atlanta International Airport (HAIA) in October 2001 and September 2004. DHDV is a multi-function
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survey device designed to collect and analyze various data sets on highway and airport pavements. The pavement imaging sub-system in the DHDV successfully accomplished the survey tasks for the airport runways. It is faster, safer and more consistent than manual surveys. Analysis results between the two surveys in 2001 and 2004 are presented in the paper which shows the trend of the deterioration of the runway pavement in HAIA and the effectiveness of the higher resolution of the imaging system at 1-mm.

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MBTC 2053 - Development of an In Situ Permeability for Concrete Structures

W. Micah Hale, Ph.D., P.E.
Civil Engineering
University of Arkansas

Durability is a very important factor for concrete structures. Concrete durability is significantly affected by its permeability. The penetration of the aggressive liquids, frost action, and steel corrosion are all influenced by the concrete's permeability. These problems could be decreased by reducing the permeability of concrete. Even though there are many well documented ways to reduce the permeability of concrete, there are very few non-destructive methods to measure the permeability of in place concrete.This research presents the development and evaluation of a new device to measure the air permeability of in place concrete. Several concrete mixtures with water to cementitious materials ratios (w/cm) ranging from 0.26 to 0.60 were evaluated using the in place device and a standardized test. The results from the research program show that the concrete air permeability (CAP) device has the potential to be a useful tool in measuring concrete permeability.

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MBTC 2054 - A Comprehensive Study of Field Permeability Using the Vacuum Permeator

Stacy Williams, Ph.D., P.E.
Civil Engineering
University of Arkansas

The permeability of coarse-graded asphalt mixtures has been a great concern in recent years. Asphalt mixes that are permeable are susceptible to a number of distresses such as moisture damage, raveling, cracking, and binder oxidation. This project examined three field devices for the determination of permeability. These methods were the NCAT falling-head field permeameter (NCAT), the Kuss constant-head field permeameter (KSFP), and the Kuss vacuum permeameter (VACP).

Seven sites were mapped according to the VACP method in order to determine the location and distribution of permeable voids. These results were compared to the permeability measurements obtained by the NCAT and KSFP methods. Mixes having three different nominal maximum aggregate sizes were tested, and field cores were cut in order to provide a relationship of permeability and density. Also, the variability of the pavement sites was evaluated as a means to determine the minimum required sample size for field permeability testing.

Overall, the various methods for determining field permeability do not yield similar results. In most cases, the falling head test (NCAT method) yielded the largest values.

Pavement sections that clearly failed the density specification had high permeability, and sections that clearly passed the minimum density specification were relatively impermeable. Pavements with marginal density were somewhat permeable, and contained variable levels of permeability. In general, high permeability was exhibited near the longitudinal joints.

The variability of the sites was evaluated in order to determine an appropriate sample size. Relatively impermeable pavements were consistent, and pavements with moderate or high permeability were more variable. Relationships between sample size, reliability, and testing discrimination were presented. Based on the range of standard deviations measured in this project, a minimum sample size of 10 is recommended for pavements with marginal densities or variable consistency. This sample size is based on the variability of the pavement, not the variability of the device(s) used for testing.

Based on the results of this study, permeability test results are highly dependent upon the placement of the permeameter during testing and the variability of

the pavement. Field permeability testing may have value as a forensic tool, but the large required sample size is not conducive to standard quality control procedures. Therefore, extreme caution should be exercised before implementing field permeability testing as a quality control or quality assurance measure.

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MBTC 2058 - Biodiesel Production from Varying Grades of Beef Tallow and Chicken Fat

Robert E. Babcock, Ph.D., P.E.
Edgar C. Clausen, Ph.D., P.E.
Chemical Engineering
University of Arkansas

Michael P. Popp, Ph.D.
Agricultural Economics and Agribusiness
University of Arkansas

As biodiesel becomes an increasingly important source of fuel in the United States (Ginder and Paulson, 2006), investors in biodiesel production facilities will continue to search for economically feasible sources of vegetable oil and animal fats that can be used to produce biodiesel (Zhang et al., 2003). One of these animal fats is poultry fat, a feedstock that is relatively inexpensive when compared to other oil and fat sources such as soybean oil (Mattingly et al.,2004). However, the free-fatty acid (FFA) content of poultry fat can vary greatly depending on the fat profile of the bird which, in turn, can be affected by seasonal feed ration changes as well as exposure of trimmings to ambient temperatures during transport from slaughter to rendering facilities (Fox, 2004). This is important, since the FFA content affects the biodiesel yield potential (Canacki and van Gerpen, 2001; Haas et al., 2000) and thereby has a major impact on the economic feasibility of this feedstock (Mattingly et al., 2004). High FFA content, in combination with conventional base-catalyzed transesterification,lowers the yield of biodiesel and produces by-products like soapstock and glycerine.

The purpose of this research effort was to collect chemical reaction and yield data and to analyze the economic feasibility of utilizing two different alternatives for FFA removal during biodiesel production. This completion report presents the laboratory results and the analysis of the impact of by-product and poultry price changes on the economic feasibility of selecting among the alternative technologies proposed for dealing with FFA in the untreated poultry fat.

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MBTC 2062 - Development of a Human Performance Simulation Model to Evaluate In-Vehicle Information and Control Systems in Commercial Trucking Operations

Stephen L. Johnson, Ph.D., P.E., C.P.E.
Industrial Engineering
University of Arkansas

As technology advances and the number of in-vehicle tasks increases, safety concerns associated with driver distractions create a need to more clearly understand these distractions. Accurate measures for determining the workload levels demanded by the distractions have emerged, and models of driver workload during these distractions show great promise in detecting the least safe activities. From the review of the literature concerning driver workload modeling, the model for the current study has been developed. This model, a theoretical one, seeks to provide baseline values for the workloads required during various combinations of tasks and, most importantly, strives to accurately represent the driver's resources at specific points while driving.

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MBTC 2065 - Automated Inventory and Analysis of Highway Assets

Kelvin C.P. Wang, Ph.D., P.E.
Civil Engineering
University of Arkansas

The goal of this project was to develop a technology which can automatically detect and localize traffic signs and other roadway assets, in order to provide a comprehensive database for asset inventory purposes in real-time. This report
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describes the research work on system design, data acquisition, image processing, object tracking, feature extraction, and database recording.

The project work focuses on systems integration of existing technologies to create reliable applications for high performance road data asset inventory. The fundamental methods used for feature extraction, object tracking and retrieval in these applications are well-established. Exploration of the advanced, state-of-the-art or experimental algorithmic development is also made during the project.

The system developed in this project is capable of reliably capturing the Right-Of-Way (ROW) images. The software developed in this project can detect and recognize many of the commonly used road signs with a high accuracy rate in a driving speed up to 60 mph. In certain cases of field tests in urban areas, the accuracy rate for sign detection achieved good result for the 160 signs in the library developed for the project. Included at the end of this report are technical issues relating to errors of sign detection and identification, reasons for not including technologies for automated inventory of assets other than signs, and recommendations for implementation.

Sign detection means that a sign is detected. Sign identification means the sign's content is identified.

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MBTC 2076 - Physical and Chemical Characteristics of Superpave Binders Containing Air Blown Asphalt from Two Different Feedstocks

John R. Hardee, Ph.D.
Chemistry
Henderson State University

Asphalt blends containing air-blown asphalt were compared with non air-blown asphalt blends from two different feedstocks. Data indicated one of the purported non air-blown asphalts was actually air blown, so a third feedstock was brought into the study. Inverse gas liquid chromatography, kinematic viscosity, refractive index, solubility, and diffuse reflectance Fourier Transform spectroscopy (DRIFT) were used to compare asphalt blends. Differences were observed between air-blown and non air-blown blends which led to predictions about relative polarities and a comparison between air-blown asphaltene aggregates and those of non air-blown asphaltenes. DRIFT data showed carbon-nitrogen, carbon-sulfur, and carbon-oxygen are oxidized in the air blowing process. The results may lead to three simple tests that can predict the presence of air-blown asphalt.

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MBTC 2082 - Ancillary Benefits of the Ouachita River Navigation System

Heather Nachtmann, Ph.D.
Industrial Engineering
University of Arkansas

The Ouachita River, one of five designated commercially navigable waterways in the state, is economically and socially beneficial to the region's communities and industries. The river provides barge service via two public ports in addition to privately owned terminals and riverfront industrial sites. The Ouachita has been classified as a "low-use river" and is at high risk of losing its federal funding for maintenance and operation. This study investigates the ancillary benefits of the Ouachita River to the State of Arkansas including recreation, tourism, commercial shipping, water supply and electrical generation. The goal of this report is to provide information that may be useful in seeking ongoing funding of the river.

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MBTC 2085 - Homeland Security for Rural Transportation Networks

Heather Nachtmann, Ph.D.
Edward A. Pohl, Ph.D.
C. Richard Cassady, Ph.D.
Industrial Engineering
University of Arkansas

This project addresses vulnerability assessment of rural transportation networks. There are clear differences between rural and urban transportation
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networks including higher costs due to widely dispersed population and industry in rural networks.

Exploration of rural transportation security issues is important because these networks are essential for enabling commercial shipping and linking rural residents with distant services. This research investigates whether or not the methodologies of urban assessment studies can be applied to rural transportation networks and selects preferred procedures for conducting rural transportation vulnerability assessments. After a comparative methodology analysis, the United States Department of Transportation's *Guide to Highway Vulnerability Assessment for Critical Asset Identification and Protection* is selected to be the most robust vulnerability assessment tool for rural transportation networks. A modification of this vulnerability assessment tool is developed as an alternative means of rural transportation vulnerability assessment. Two examples based on Jackson County, Arkansas are conducted to show the applicability of each methodology on a rural transportation network.

MBTC 9202 - Supplemental Materials for Use with Educational Videotapes

Frances Griffith
Civil Engineering
University of Arkansas

Three videotapes on the profession of civil engineering were produced in 1996 under a grant from MBTC. The objectives were to educate children about professions in transportation and civil engineering in an interesting, age-appropriate way as well as to help educators explain the role of civil engineers in our society. The tapes have been widely disseminated and very well received.

Although the objectives of producing the videotapes have been met, the tapes provide only a quick look at the profession. Moreover, elementary teachers and counselors may find it challenging to incorporate the content of the videos into more formal classroom activities. Thus, the proposed project will develop materials to increase the usefulness of the two videotapes directed to K-8 students. Materials may include an Internet site, reference and descriptive documents, science projects, math exercises, displays, coloring books, or similar items.

Two types of materials will be developed. First, descriptive information will be prepared on such topics as civil engineering sub-disciplines, potential employers, types of employment, academic requirements, and professional organizations. Second, classroom materials will be developed that apply engineering principles and knowledge, such as projects, homework assignments, and coloring books. These documents will give students a better sense of what it takes to become a civil engineer as well as insight into the challenges and rewards of the profession.

MBTC 9204 - Development of a Construction Staking Certification Course

Rodney D. Williams, Ph.D., P.E.
Kevin D. Hall, Ph.D., P.E.
Civil Engineering
University of Arkansas

The Arkansas Highway and Transportation Department (AHTD) currently requires contractors to perform a number of surveying-related activities prior to and during the construction process. Some of these tasks include grade/slope staking, horizontal and vertical curve layout procedures, curb and gutter staking, culvert staking, earthwork volume calculations, instrument checks/calibration, and establishment of secondary control. To ensure that these vital tasks be performed consistently, training must be provided to technicians in proper techniques. Successful completion of such training and demonstrated competence in subject areas should lead to certification of the technician. There are currently no certification programs in Arkansas for construction surveying personnel. This proposal outlines steps necessary to develop and implement a training and certification program for roadway construction surveying.

Publications Available

Characterization and Modeling

2007

Miller, Will
MBTC 2034 - Community Impact of Regional Transportation Infrastructure: Revisted After Completion of Airport and Major Highway

Wang, Kelvin
MBTC 2042 - Automated Survey and Visual Database Development for Airport and Local Highway Pavements

Hale, W. Micah
MBTC 2053 - Development of an In Situ Permeability for Concrete Structures

Williams, Stacy
MBTC 2054 – A Comprehensive Study of Field Permeability Using the Vacuum Permeator

Babcock, R.E.
MBTC 2058 – Biodiesel Production from Varying Grades of Beef Tallow and Chicken Fat

Wang, Kelvin
MBTC 2065 – Automated Inventory and Analysis of Highway Assets

Hardee, John
MBTC 2076 – Physical and Chemical Characteristics of Superpave Binders Containing Air Blown Asphalt from Two Different Feedstocks

2004

Hardee, John R.
MBTC 2049 - A Study of Physical and Chemical Characteristics of Superpave Binders Containing Air Blown Asphalt

2003

Kutanoglu, Erhan and Michael Cole
MBTC 2012 - Modeling and Analysis of Transportation Flows Created by E-Commerce Transactions

Mason, Scott J. and Erhan Kutanoglu
MBTC 2023 - Impact of Wireless Data Systems on the Transportation Systems of the Future

Rossetti, Manuel D. and Terry Collins
MBTC 2015 - Online Benchmarking Database for Transportation Providers

Russell, Eugene R. and Margaret J. Rys
MBTC 2016 - Further Study of Roundabouts

2002

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MBTC 2013 - Efficient Timing of Pickup and Delivery Assignment Decisions Through Simulation and Optimization

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2007

Wang, Kelvin
MBTC 2008 – Automation of Pavement Surface Distress Survey Through Parallel Processing

Dennis, Norman
MBTC 2027 – Investigation of the affect of Fines on Base Course Performance

2005

Patangia, Hirak C.
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2004

Li, Guoqiang
MBTC 2033 - Repair of Damaged Concrete Structures Using Prepreg Composites

Russell, Eugene R.
MBTC 9206 - Update and Modification of the Kansas Low-Volume Roads Handbook and the Handbook of Traffic Engineering Practices for Small Cities

Tran, Nam and Kevin D. Hall
MBTC 2014 - Development of a Simplified Asphalt Concrete Stiffness/Fatigue Device

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MBTC 9205 - Application and Advancement of the Next Generation Highway Data Vehicle

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2004
Mason, Scott J.
MBTC 2041 - Integrated Analysis of Transportation and Inventory In Intermodal Distribution Networks

2002
Nutter, Darin W.
MBTC 2017 - Determining Optimal Trailer Duty as a Function of Use and Age

2001
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MBTC 2004 - Efficient Dispatching in a Terminal City Network

Nutter, Darin W., C. Richard Cassady, John R. English and Chet Tuck Wong
MBTC 2005 - Quantifying the Impact of Refrigerated Unit Failures

Transportation Planning, Economics, and Institutional Issues

2007
Goodwin, Harold
MBTC 1802 - Developing A Viable Poultry Litter Transport Option For The Ozarks

Nachtmann, Heather
MBTC 2082 – Ancillary Benefits of the Ouachita River Navigation System

Heather Nachtmann
MBTC 2085 – Homeland Security for Rural Transportation Networks

2005
Asfahl, C. Ray
MBTC 2038 - Physical, Economic, and Political Feasibility for Trade of U.S. Grain for Russian Oil

Nachtmann, Heather and Manuel D. Rossetti
MBTC 2035 - WebShipCost – Quantifying Risk in Intermodal Transportation

2004
Rossetti, Manuel D. and Heather Nachtmann
MBTC 2024 - WebShipCost – Intermodal Transportation Linkage Cost Assessment Via the WWW

2003
Tooley, Melissa S.
MBTC 2022 - Development of a Strategic Plan for Statewide Deployment of Intelligent Transportation Systems in Arkansas

Tooley, Melissa S.
MBTC 2009 - Regional Mobility Plan: Development of Technical Scope of Services

2002
Anderson, Michael
MBTC 2020 - Design of a Mobility Information Management System (MIMS)

Nachtmann, Heather
MBTC 9208 - Economic Evaluation of the Impact of Waterways on the State of Arkansas – Phase II

2001
Russell, Eugene R., E. Dean Landman and Avijit Mukherjee
MBTC 2001 - Quick Response Community Planning

Behavioral Sciences and Human Performance

2007
Gattis, J.L.
MBTC 2040 – Supplemental Signing for Stop Signs - Phase 2

Johnson, Stephen
MBTC 2062 – Development of a Human Performance Simulation Model to Evaluate In-Vehicle Information and Control Systems in Commercial Trucking Operations

2006
Sabo, George and Lela Donat
MBTC 2044 - Cost Efficient Management Tools for Assessing Cultural Resources

2005
Johnson, Steven L.
MBTC 2048 - Total System Cost/Benefit Assessment of Heavy Truck-Automobile Speed Differentials on Rural Highways

Transportation Education and Technology Transfer

2007
Griffith, Frances
MBTC 9202 – Supplemental Materials for use with Educational Videotapes

Williams, Rod
MBTC 9204 – Development of a Construction Surveying Certification Course

2006
Rossetti, Manuel D. and Michael Cole
MBTC 9209 - Training and Course Materials for Transportation Applications of GIS

2005
Dissanaykke, Sunanda
MBTC 2051- Identification of Countermeasures to Reduce Severity of Rural Highway Crashes

2004
Edwards, Findlay G. and Steven J. Burian
MBTC 9210 - Training and Course Materials of Stormwater Pollution Prevention

Gattis, James L.
MBTC 9211 - Video Tapes/DVD's: "Driving in Orange"

Hall, Kevin D.
MBTC 9201 - Development of Superpave Training Materials for Local Agencies

2001
Gattis, James L.
MBTC 9203-A - Video Tapes/DVD's: "Lane Closures"

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MBTC 9203-B - Video Tapes/DVD's: "Pavement Markings"

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Williams, Stacy
MBTC 2030 – Development of 4.75 MM Superpave Mixes by

2006
Dennis, Norman D.
MBTC 2032 - Development of Testing Protocol and Correlations for Resilient Modulus of Subgrade Soils

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MBTC 2018 - Environmental Technology Verification Report of the Low-Cost Stormwater BMP Study

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MBTC 2031 - GIS-Based BMP Planning Tool for Stormwater Quality Management

Hardee, John R.
MBTC 2049 - Physical and Chemical Characteristics of SuperpaveTM Binders Containing Air Blown Asphalt

Patangia, Hirak C.
MBTC 2050 - Assisted Night Vision for Motorists in Highway Construction Zones: Phase I

Rys, Margaret J. and Eugene R. Russell
MBTC 2039 - Life Cycle Economic Comparison of Common Sign Post Materials and Types

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MBTC 2052 - Comparative Esterification of Agricultural Oils for Biodiesel Blending

Edwards, Findlay G.
MBTC 2018 - Stormwater Pollution Prevention Best management Practices for Transportation Facilities

2003
Gattis, James L.
MBTC 2019 - Designing Horizontal Curves for Low-Speed Environments

Hall, Kevin D.
MBTC 2014 - Development of Simplified Asphalt Concrete Stiffness/Fatigue Testing Device

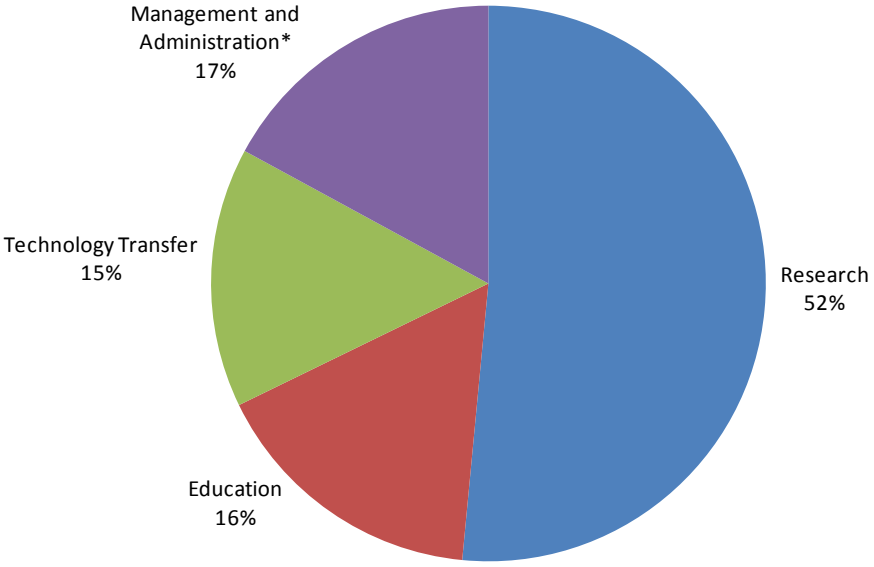
Tooley, Melissa S. and James L. Gattis
MBTC 2025 - Evaluation of Automated Work Zone Information Systems

Financial Status

Grant Year: July 1, 2006 - July 30, 2007

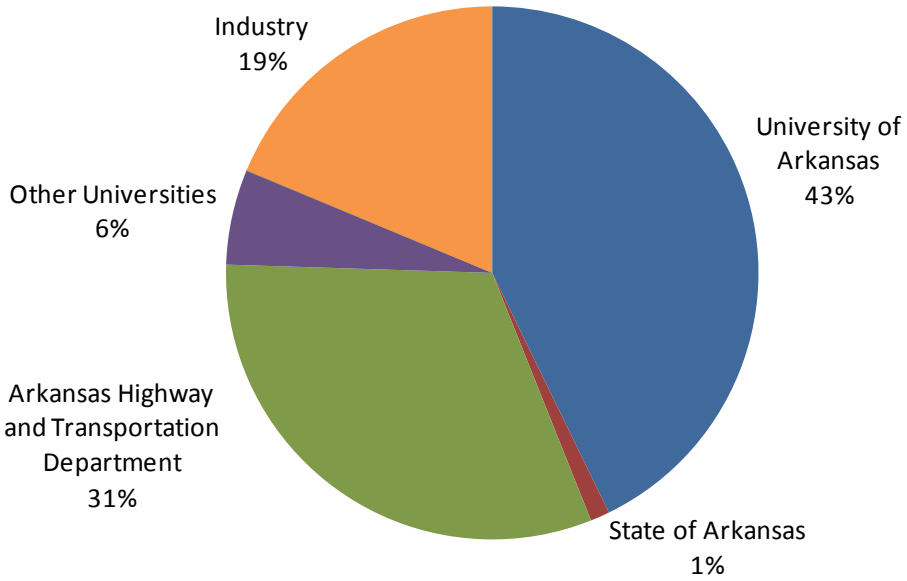
Federal Share - $ 780,741.59
Matching Share - $1,456,502.04
Total - $2,237,243.63

MBTC Expenditure Distribution
July 2006 - June 2007

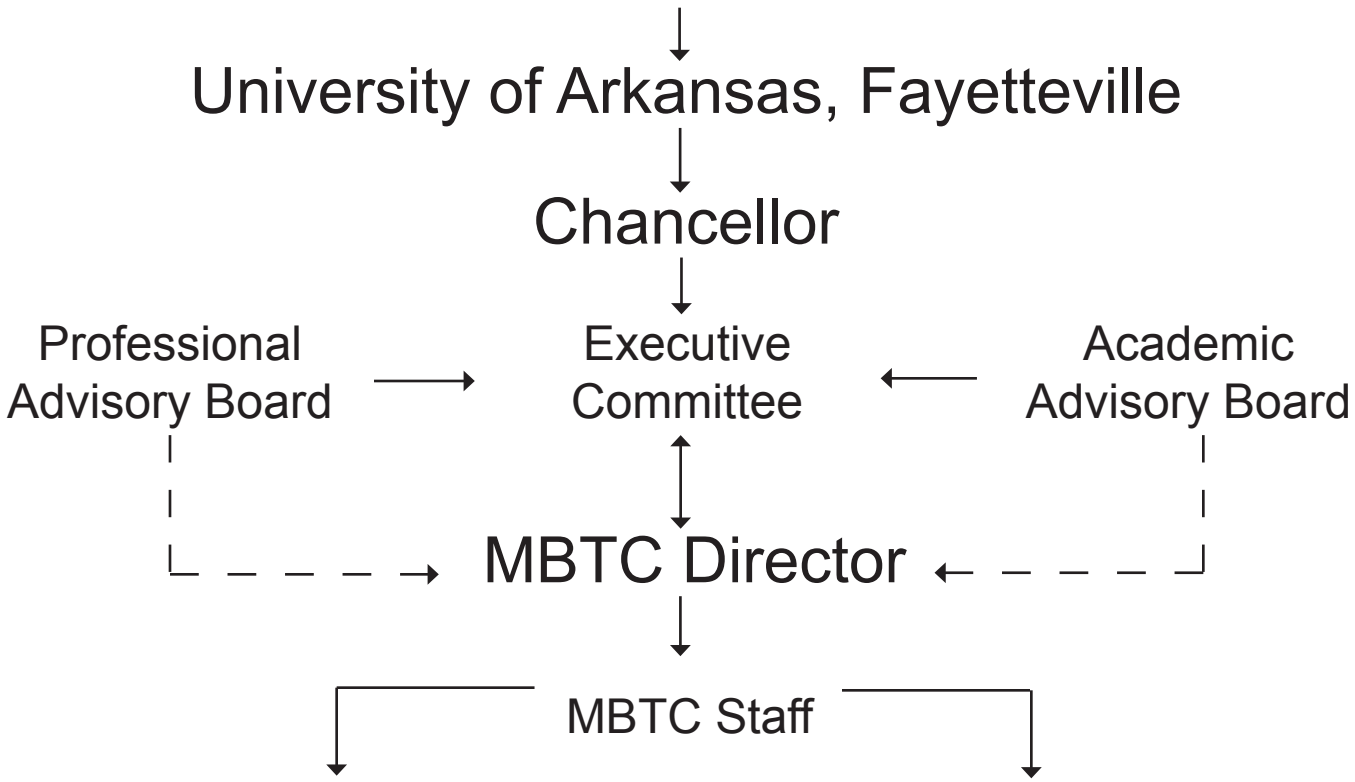


*35.6% of Management and Administrative Expenditures come from Match Sources

MBTC Match Source Expenditures
July 2006 - June 2007



Organizational Chart



Participating Universities

Auburn University

Henderson State University

Kansas State University

Louisiana State University

Tennesse Tech University

University of Alabama - Huntsville

University of Arkansas - Little Rock

University of Dayton

University of Missouri - Rolla

University of Oklahoma - Norman

University of Tennessee

University of West Virginia

Participating University of Arkansas Fayetteville Colleges

College of Education and Health Professions

College of Engineering

Dale Bumper College of Agriculture, Food, and Life Sciences

J. William Fulbright College of Arts and Sciences

The School of Architecture

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