2009 Annual Report

Compiled by
Jay K. Lindly, PhD
Janet Lynn Norton, PhD

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COVER PHOTO: Bevill Building, The University of Alabama, Tuscaloosa, AL - the new headquarters of UTCA. Photo courtesy of University Relations, The University of Alabama.
During 2009 The University Transportation Center for Alabama (UTCA) continued its tradition of research excellence, technology transfer, and successful educational outreach.

- To facilitate more interdisciplinary research, UTCA headquarters moved to Bevill Building at the end of the summer. Our new offices adjoin those of the Aging Infrastructure Systems Center of Excellence (AISCE), and we look forward to renewed collaboration with this research partner.

- In December The University of Alabama at Birmingham’s University Transportation Center (UAB UTC), UTCA, and the Federal Transit Administration co-sponsored the Alabama Distracted Driving Summit. This summit was the first statewide forum on this important issue. US Transportation Secretary Roy LaHood was the featured speaker.

- We are also delighted with the popularity of a new educational outreach program. Participants in the ATI-5th Division-09 were middle and high school student members of The University of Alabama-Tuscaloosa, National Society of Black Engineers, Jr. Chapter. UTCA welcomes the opportunity to partner with this prestigious organization in “spreading the word” about careers in transportation engineering.

This 2009 Annual Report provides details of these and other accomplishments. It also describes the manner in which the faculty of The University of Alabama System and Alabama transportation professionals have supported and embraced the UTCA.

Sincerely,

Jay K. Lindly
Mission and Theme

The University Transportation Center for Alabama (UTCA) was created by a resolution of the Board of Trustees of The University of Alabama System (UA System) and began operation on March 15, 1999. The Transportation Equity Act for the 21st Century (TEA-21), Public Law 105-178, provided initial funding and established the UTCA as a “university transportation center” (UTC) under the US Department of Transportation’s Research and Innovative Technology Administration (RITA). The UTCA now operates as a Title III UTC under the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

The UTCA conducts transportation education, research, and technology transfer activities throughout the state and region. All faculty and staff members from The University of Alabama (UA), The University of Alabama at Birmingham (UAB), and The University of Alabama in Huntsville (UAH) are eligible to conduct projects in all of these service areas.

Mission

The UTCA mission contributes to the overall mission of the US Department of Transportation (USDOT). Specifically, the UTCA seeks to advance technology and expertise in the multiple disciplines that comprise transportation through the mechanisms of education, research, and technology transfer while serving as a university-based center of excellence (2006 UTCA Strategic Plan, p. 12).

Theme

The UTCA theme – Management and Safety of Transportation Systems – reflects the transportation needs of Alabama and the expertise of The University of Alabama System faculty. In allocating UTCA funding, the Executive Committee and Board of Advisors give priority to programs and projects that closely follow this theme. In 2006 the Executive Committee narrowed and sharpened the focus of the UTCA research program to emphasize the topic of congestion. Several management research projects now focus on maximizing traffic management and minimizing congestion. Similarly, safety research projects may now highlight infrastructure sustainability.
The UTCA headquarters is located in the Bevill Building at The University of Alabama campus. Each campus (UA, UAB, and UAH) has a branch office operating under the direction of an Associate Director. The Executive Director and Associate Directors form the Executive Committee which provides guidance and direction for Center activities. Faculty members engaged in UTCA projects work in their own offices on their own campuses.

The six individuals described on this page are continuously assigned to the UTCA, all on a part-time basis. Researchers from the three campuses are engaged for only the life of a particular project.

Mrs. Connie Harris; Administrative Secretary, UA: charris@eng.ua.edu
Dr. Janet Lynn Norton; Editorial Assistant, UA; jnorton@eng.ua.edu
The UTCA has a strong Advisory Board. Members include representatives from public and private transportation-related fields and organizations. The Advisory Board takes an active role in guiding operations and establishing the direction of growth for the Center, particularly in the areas of research and technology transfer. Its members initiate the Annual Research Plan, review proposals, and evaluate the UTCA’s annual accomplishments and progress.

**Transit Agencies & Organizations:**  
Mr. Steve Ostaseski, Chair  
Regional Planning Commission for Greater Birmingham  
Birmingham, AL

**FHWA Representative:**  
Mr. Mark Bartlett, Vice-Chairman  
Division Administrator  
Federal Highway Administration  
Montgomery, AL

**Academic Research:**  
Dr. Brian Smith  
Center for Transportation Studies  
University of Virginia  
Charlottesville, VA

**City Engineer:**  
Mr. Joe Robinson  
City of Tuscaloosa (AL) Engineer  
Tuscaloosa, AL

**County Engineer:**  
Mr. Randy Cole  
Shelby County (AL) Engineer  
Columbiana, AL

**Municipal Planning Organizations:**  
Mr. James Moore  
Transportation Planner  
City of Huntsville (AL)  
Huntsville, AL

**Highway Representative (Design):**  
Mr. Don Arkle  
Assistant Chief Engineer for Policy and Planning  
Alabama Department of Transportation  
Montgomery, AL

**Highway Representative (Geotechnical & Materials):**  
Mr. Larry Lockett  
Bureau Chief, Materials & Tests  
Alabama Department of Transportation  
Montgomery, AL

**Highway Representative (Maintenance):**  
Mr. George Conner  
State Maintenance Engineer  
Alabama Department of Transportation  
Montgomery, AL

**Transportation Engineering:**  
Mr. James Brown  
Gonzalez-Strength & Associates, Inc.  
Birmingham, AL

**Logistics/Commercial Vehicles:**  
TBA

**Construction Industry:**  
Mr. Billy Norrell  
Executive Director  
Alabama Road Builders Association  
Montgomery, AL

**FHWA Representatives:**  
Mr. Grant Zammit  
Traffic Management/System Operations Specialist  
FHWA Resource Center  
Atlanta, GA

Mr. Eddie Curtis  
Traffic Management Specialist  
Office of Transportation Management  
FHWA Resource Center  
Atlanta, GA
The UTCA Advisory Board held its annual meeting on Tuesday, July 28, 2009, in Room 320 of the Business Engineering Complex at The University of Alabama at Birmingham (UAB) campus. Dr. Jay K. Lindly, Executive Director, called the meeting to order at 11:00 AM. He welcomed Board members and introduced Mr. Steve Ostaseski, Advisory Board Chair.

This meeting marked two changes in the Board’s membership. First, Mr. George Conner, head of ALDOT’s Maintenance Bureau in Montgomery, joined the UTCA Advisory Board. Secondly, due to the demands of his restructured business interests, Mr. George Overstreet offered his resignation. For three years Mr. Overstreet represented the Alabama Trucking Association on the UTCA Advisory Board. Mr. Ostaseski recognized Mr. Overstreet’s years of service to the Advisory Board and wished him well in upcoming endeavors.

Following the adoption of the agenda and approval of prior minutes, Dr. Lindly and the three Associate Directors – Dr. Michael Hardin (UA), Dr. Fouad H. Fouad (UAB), and Dr. Houssam Toutanji (UAH) – provided an overview of the Center’s operations. This overview included the history, mission, theme, and organizational structure of UTCA. The team also highlighted recent accomplishments in UTCA’s education, technology transfer, and research programs.

Professors from two campuses presented brief summaries of current UTCA projects while the group enjoyed a lunch provided by UAB. Mr. Andrew Sullivan from The University of Alabama at Birmingham (UAB) shared Project #07211 – Traffic Signals and Rain-related Congestion. This project evaluated the effectiveness of using traffic responsive/closed-loop signal systems to address weather-related congestion, specifically congestion caused by rain. The project examined the environments and operating regimes under which closed-loop signal systems are most effective at reducing weather-related congestion, developed estimates of potential congestion reduction resulting from use of weather-responsive signal systems, and determined whether benefits justify implementation.

Dr. Houssam Toutanji from The University of Alabama in Huntsville (UAH) shared Project #07401 – Multimedia Package for Load and Resistance Factor Design. This project provided practical, hands-on materials for technical training necessary to transition structural design to “load and resistance factor design” (LRFD) methodology for the Alabama Department of Transportation (ALDOT) Bridge Bureau. Project #07401 was funded by ALDOT.

Continued on next page
Following their presentations, Dr. Lindly reviewed lists of projects authorized for 2009. He noted that approximately $750,000.00 will be available to fund research projects for 2010.

Mr. Ostaseski and Dr. Lindly reviewed the 2009 Annual Research Plan with Board members and asked for concepts and projects that could be used to create the 2010 Annual Research Plan. The Board discussed many possible research topics including

- how transportation funding should be addressed in the future,
- the impact of hurricane evacuation strategies on emergency personnel traveling to the coastal region,
- the effects of switching to the LRFR bridge rating system, and
- the continued threat to Alabama’s highway infrastructure posed by oversize/overweight (OS/OW) vehicles.

Mr. Steve Ostaskei thanked Dr. Fouad H. Fouad and particularly Ms. Jennifer Vinson for their hospitality and congratulated the Advisory Board on a productive meeting. He adjourned the meeting at 3:00 PM. The next meeting of the UTCA Advisory Board will be in the summer of 2010.

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Mr. George Conner is the State Maintenance Engineer for the Alabama Department of Transportation (ALDOT) in Montgomery, AL. As head of ALDOT’s Maintenance Bureau, he oversees a statewide highway maintenance program involving a mature system of over 10,000 miles of highways that handles almost 30 billion vehicle-miles of travel annually. Mr. Conner earned bachelor’s and master’s degrees in civil engineering from The University of Alabama and is a licensed professional engineer in the state. He is active in many professional organizations. Mr. Conner is currently Chair of the American Association of State Highway and Transportation Officials (AASHTO) BRIDGE-Ware Task Force and a member of the Subcommittee on Bridges and Structures.

In April 2009 Mr. Conner was inducted as a Distinguished Departmental Fellow of the Department of Civil, Construction, and Environmental Engineering at his alma mater. UTCA welcomes Mr. Conner to its Advisory Board.
UTCA will have an ongoing program of basic and applied research, the products of which are judged by peers or other experts in the field, to advance the body of knowledge in transportation (2006 Strategic Plan, p. 16).

Research Project Selection

The UTCA continues to encourage all faculty members in The UA System to compete for project funding. The Advisory Board and Executive Committee create an Annual Research Plan to define research topics of highest importance. Peer experts review proposals and recommend projects for funding.

A large number of faculty members have participated in this process, as illustrated in TABLE 3-1 and TABLE 3-2. The degree of participation has exceeded the initial goals of the Executive Committee and has produced a large network of interdisciplinary transportation experts.

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TABLE 3-1. Principal Investigators

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<th>Grant Year</th>
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<tr>
<td>Projects Funded by UTCA</td>
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<td>11</td>
<td>10</td>
<td>19</td>
<td>19</td>
<td>17</td>
<td>15</td>
<td>10</td>
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TABLE 3-2. Research Selection (UTC Funds)

UTCA will utilize an objective process for selecting and reviewing research that balances the multiple objectives of the program (2006 Strategic Plan, p. 12).
The UTCA funded ten projects with 2009 UTC monies. An additional four projects were funded by external agencies. These projects are briefly described in the following pages. Externally-funded projects are identified by a “4” as the third digit in the UTCA project numbering system.

**Project #08403 – Feasibility Study Guidelines for Public-Private Projects**, Dr. Jay Lindly, Principal Investigator, UA. The Alabama Department of Transportation (ALDOT) depends largely upon federal aid and the collection of motor fuels taxes to support new construction and rehabilitation projects. It is expected that ALDOT’s revenue will be seriously threatened by low fuel consumption due to the introduction of hybrid and alternative fuel vehicles in recent years. Alternative means of financing must be developed to address increasing financial shortfalls in Alabama’s transportation funding. ALDOT may wish to move towards Public-Private Partnerships (P3) whenever possible to improve roadway infrastructure. Results from this research project should enhance ALDOT’s ability to identify P3 opportunities and evaluate the economic feasibility of P3 proposals.

**Project #09104 – Optimal Traffic Resource Allocation and Management**, Dr. Burcu Keskin, Principal Investigator, UA. It is believed that concentrated traffic enforcement efforts have a positive impact in reducing the number of crashes and discouraging dangerous behavior due to their visibility. Relying on this belief, this research effort addresses the problem of covering (blanketing) critical crash zones while determining the location, number, and patrol routes of police officers. This problem will be undertaken by developing specific optimization models for maximum covering and patrol routing.

**Project #09108 – Advanced Transportation Institute 2009**, Dr. Daniel Turner, Principal Investigator, UA. The objective of the Advanced Transportation Institute 2009 (ATI-09) is to introduce junior and senior high school students, with preference to traditionally underrepresented groups in engineering disciplines, to transportation careers. The University Transportation Center for Alabama (UTCA) and the Alabama Department of Transportation (ALDOT) Personnel Bureau will co-sponsor the Institute. It will be held in ALDOT’s headquarters complex in Montgomery, AL. The agenda for the week-long program includes presentations on topics like transportation careers, how to select and enter a university, and how to obtain scholarships. Additional presentations will be made by practitioners to explore various sectors of transportation, including planning, design, construction, maintenance, traffic engineering, and bridge design. In 2008 a second session of ATI was initiated at the ALDOT 5th Division offices in Tuscaloosa (ATI-5th Div-08). The session leaders were members of the Tuscaloosa Junior Chapter of the National Society of Black Engineers. The Tuscaloosa session was held again in 2009.

**Project #09109 – Preparing for Transit-Oriented Development: A Primer and Training Course**, Dr. Daniel Turner, Principal Investigator, UA. In many locations in the United States, public transit is a viable alternative to large personal vehicles. Public transit reduces congestion, and it reduces traffic crashes. To date, transit has not been a widely accepted mode of travel to Alabama’s citizens due to their passion for individual travel. To summarize existing transit systems in Alabama, the user group is too small and too wide spread, convenience is low, and expectations of transit are low for both users and the general public. Transit-oriented development (TOD) solves one of the major difficulties by generating a small but densely populated cluster of transit users around each transit station. It has gained popularity as a strategy to address a number of urban problems, including traffic congestion, shortage of affordable housing, air pollution, lack of neighborhood identity, and urban sprawl. In effect, TOD encourages clusters of dense residential development around transit stations or transit pickup points. The objective of this project is to develop a primer that elected officials, planners, and transportation agencies may use to visualize, design, and implement transit-oriented
development patterns in Alabama. The Regional Development Commission of Greater Birmingham and the Alabama Department of Transportation will be the key players in any effort to implement TOD in Alabama, and these two agencies will be involved throughout this UTCA project.

**Project #09201 – Measuring Non-Recurrent Congestion in Alabama Cities**, Mr. Andrew Sullivan, Principal Investigator, UAB. To effectively allocate resources to address congestion, transportation managers need to better understand the relative magnitudes of recurrent vs. non-recurrent congestion in their region. Of the two, recurrent congestion is the easier to estimate; its predictable nature lends itself well to simulation modeling. Non-recurrent congestion is far more difficult to quantify. Some large US cities (Los Angeles, San Francisco, Seattle) have developed methodologies to quantify non-recurrent congestion on their roadway networks, but these methodologies are largely confined to freeway corridors and rely on extensive sensor networks already in place. In the small and medium sized cities common in the Southeast these sensor networks simply don’t exist and are too expensive to implement on a wide scale. This project will attempt to fill that void by developing methodologies that rely on low-cost data collection and analysis techniques to estimate non-recurrent congestion on key facilities. This study will initially focus on interstate and freeway facilities, but there is a need to develop methodologies that apply to arterial routes as well.

**Project #09203 – Design of VMS Bridge Support Structures for Fatigue Loads**, Dr. Fouad H. Fouad, Principal Investigator, UAB. The 2001 edition of the *Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals* by the American Association of State Highway and Transportation Officials (AASHTO) has been revised in its entirety through a major research project conducted under the auspices of the National Cooperative Highway Research Program (NCHRP 17-10). A major part of the revision includes updated provisions and criteria for extreme wind loads and new provisions and criteria on fatigue design. These provisions differ considerably from those in previous editions of the *Standard Specifications*. The impact of the fatigue criteria on the design of highway overhead variable message sign (VMS) support structures has not been evaluated and is not currently being implemented by the Alabama Department of Transportation (ALDOT). The main goal of this study is to conduct an experimental program to develop realistic loading criteria for the use in fatigue design of bridge-type overhead VMS support structures.

**Project #09207 - Evaluation of Cracking Potential of Concrete Mixtures**, Dr. Lianxiang Du, Principal Investigator, UAB. Cracking of Portland cement concrete is always a headache for structure and pavement engineers. Currently, several test methods have been used to evaluate the cracking potential of concrete. However, results are not satisfactory. This project will explore a new test method which tries to produce a pure tension condition. This new method will use a pancake-shape specimen and monitor the strain development with time of concrete under a controlled environment. The results from the new test method will be compared to other test methods, and the effectiveness of this method will thus be verified.

**Project #09301 – Modeling Damage in Concrete Pavements and Bridges**, Dr. Ken Zuo, Principal Investigator, UAH. The objective of the proposed research project is to develop a micromechanics-based constitutive model capable of predicting damage and failure in concrete pavements and bridges under general (three-dimensional) loading conditions. It is also the objective of the project to numerically implement the constitutive model into ABAQUS finite element code for engineering analysis. Concrete material is brittle under normal conditions and is subject to cracking and damage under low tensile loading. Repairing or replacing of damaged concrete pavements and bridges can be very costly. An ability to accurately model the evolution of damage in concrete under three-dimensional, cyclic mechanical and thermal loading can help the engineer to make more informed assessment as to whether an existing bridge or pavement with damage is still safe under the design load. The project will first study the response of microcracks in concrete under three-dimensional stress state (e.g., opening, shear, growth of cracks), and the new macroscopic (continuum level) model will be developed by applying statistical averaging to the response of an ensemble of microdefects in the material. The project will also numerically implement the new model as a user-defined material subroutine in ABAQUS analysis code and conduct numerical tests to verify the model implementation.

**Project #09305 – Road Embankment and Slope Stabilization**, Dr. Mohamed Ashour, Principal Investigator, UAH. The objective of this project is to develop a rational design technique that characterizes and evaluates the stability of slopes and road embankments using a single or multiple rows of driven piles. Compared to current methods, the project will provide realistic modeling for pile-stabilized slopes and appropriate evaluation for the safety of existing slopes/road embankments pre and post pile
installation. The soil mass driving forces caused by failed or vulnerable slopes/road embankments will be determined along with the size/type of piles needed to stabilize these slopes or road embankments. The influence of ground surface topography and soil types on pile resistance will be considered in the project. The project aims to increase the level of design confidence and to expedite the restoration of the traffic service. A computer program with graphics user interface will be developed to implement the proposed procedure. Such a design tool will provide the length and size of desired piles, pile lateral response (i.e. pile deflection, moment, and shear force), pile performance ratio, and slope/embankment safety pre and post pile installation.

Project #09306 – Transportation Engineering Advancement and Mentoring Program (TEAM), Dr. Kathleen Leonard, Principal Investigator, UAH. The Transportation Engineering Advancement and Mentoring (TEAM) Program is a hybrid of the past UTCA summer program aimed at middle-school females with the addition of school visits to science classes. The strategy of this program is aimed at producing students who know “how to find out” and “how to examine and evaluate evidence.” Mentors (students and professionals) will make several visits to their classes for one-on-one time. The first visit will coincide with National Engineers’ Week in February and culminate with a design build competition at a fall campus visit day. The hands-on activities were developed in previous UTCA grants program (GUTEP). This year will also include new alternative energy technologies and more female senior personnel. The participants will use real world transportation examples and new technologies in their activities. The Principal Investigator will continue to work with local school districts to incorporate transportation engineering-related topics into the science curriculum.

Project #09307 – Student Funding to Attend TRB Conference, Dr. Michael Anderson, Principal Investigator, UAH. Students from the three campuses of The University of Alabama System are engaged in a variety of transportation-related research activities. This project intends to provide a mechanism to (1) identify deserving transportation students; (2) establish a forum for the students to present the results of their research to transportation professionals, faculty, and other student in a professional setting; and (3) allow the students to expand their education by attending the annual meeting of the Transportation Research Board in Washington, DC.

Project #09401 – Development of a Work Plan for the Second Edition of the Highway Safety Manual, Dr. Daniel Turner, Principal Investigator, UA. The objective of this project is to develop a draft work plan, with a suggested timeline and estimated expenses, for the second edition of the Highway Safety Manual (HSM). The first edition of the HSM will be published in early 2010. It was developed through a series of NCHRP projects and with the guidance of the TRB and AASHTO Task Forces on the HSM. It provides the best currently-available factual information and tools to help practitioners make planning, design, and operations decisions based upon safety. However, like all first editions, there are other topics that could be included and additional research that can extend materials in the first edition. The current project will examine the content of the first edition of the HSM, gather input from the individuals, agencies, and organizations that helped develop the first edition, and develop a draft work plan for the second edition. The draft will be shared with the AASHTO and TRB Task Forces at the 2010 TRB Annual Meeting, then revised and provided to these groups in the spring of 2010.

Project #09402 - UTCA Research Forum, Dr. Jay K. Lindly, Principal Investigator, UA. The University of Alabama, in collaboration with the Federal Transit Administration (FTA), Office of Research, Demonstration and Innovation (TRI), will plan and make arrangements for at least two research forums/workshops for the University Transportation Centers.

Project #09403 – Development of Access Management Criteria, Dr. Daniel Turner, Principal Investigator, UA. In some locations the highway system has contributed to too much success – healthy growth in development and population – to the point that roads are now crowded and travel is congested, slow, and frustrating. In these locations it is desirable to provide additional transportation facilities to allow continued economic health. However, development has absorbed all available land so that right-of-way purchase and new highway construction is not feasible. Fortunately, there is an alternative – access management – which provides carefully-selected access to roadside development while ensuring continued roadway health. This project will develop access management criteria and policies that will provide a uniform statewide condition of roadway health (capacity to move cars) and roadside economic health (access to property in a way that promotes good development) for the Alabama Department of Transportation (ALDOT).
Sources of Revenue for New Projects in 2009

As shown in TABLE 3-3, the UTCA received most of its revenue for new projects funded in 2009 from RITA’S University Transportation Centers Program. The Alabama Department of Transportation (ALDOT) was also an important source of revenue.

As a Title III UTC, UTCA is no longer required to provide University Matching Funds. However, UTCA anticipates that ALDOT funds will continue to be instrumental in supplementing UTC support.

FIGURE 3-1 illustrates the relative roles of these funding sources.

Expenditures for New Projects in 2009

TABLE 3-3 shows categories of UTCA expenditures in 2009. Roughly 14% of expenditures were related to the administration of UTCA. The remaining 86% was spent on projects. Management was by far the largest category of expenditures for new projects funded in 2009. Bridge projects represented 16% of expenditures, while education-related projects consumed 9% of the budget. Safety-related projects accounted for 4% of 2009 expenditures.

Even though only 7% of expenditures focused exclusively on technology transfer activities in 2009, UTCA faculty were active in a number of technology transfer activities. (See Section 4 of this Annual Report for specific examples.)

FIGURE 3-2 illustrates the breakdown of expenditures. The UTCA emphasis on management and safety is reflected in the statistic that together they account for 48% of all expenditures.
TRB’s 2009 Alabama Field Visit

Every year representatives from the Transportation Research Board (TRB) visit state departments of transportation (DOTs) to identify problems these groups are facing and to investigate how TRB can assist in solving those problems. These visits often include meetings with universities, transit organizations, and industry leaders that work with DOTs.

Dr. Richard Pain, TRB’s Transportation Safety Coordinator, performed TRB’s 2009 Alabama Field Visit. On Tuesday, November 3rd, he met with Mr. Jeffery Brown of ALDOT’s Research and Development Bureau. The next day Dr. Pain and Mr. Brown visited the UTCA headquarters in Tuscaloosa and were welcomed by UTCA Executive Director Dr. Jay Lindly.

During the meeting that followed, Dr. Lindly discussed the history and mission of the Center and reviewed several research projects UTCA is currently conducting in collaboration with ALDOT. These projects include Project #08401 - Driver Reaction at Railroad Crossings, Project #08402 - Evaluation of Public Private Partnership Proposals, and Project #09403 - Development of Access Management Criteria.

Even though UTCA and ALDOT pursue unique research interests, UTCA is proud to support and extend the work of the Alabama Department of Transportation. This collaboration is essential to successfully meet the transportation challenges of the future.

FIGURE 4-1. Dr. Richard Pain, Transportation Safety Coordinator from the Transportation Research Board.
The UTCA and the Federal Transit Administration (FTA) sponsored a one-day research workshop on March 11, 2009 at the Holiday Inn Rosslyn in Arlington, VA. The workshop was one of several similar opportunities sponsored by the FTA in such cities as Reno, Toronto, Denver, and Birmingham. At each location representatives from academia, the FTA, and transit systems met to produce practical research agendas on two transit topics chosen for that workshop. The Arlington workshop offered a unique opportunity to define critical research needs in two important transit areas – (1) Developing a Transit Safety Culture and (2) Workforce Planning.

The workshop began with opening remarks by Mr. Vincent Valdes, Associate Administrator for Research, Demonstration, and Innovation in the FTA. Then, participants heard presentations from FTA officials, transit providers, and university transportation center researchers. These presentations highlighted the problems, needs, and available resources in the two critical research areas. Mr. James Corless, Campaign Director for Transportation for America, summarized the intent of the workshop in a keynote presentation that emphasized two areas:

- the importance of making safety consciousness a system-wide goal
- the importance of succession planning in workforce development

In the afternoon, focus discussion groups met and brainstormed practical research agendas for FTA consideration. Dr. Beverly Sauer, Professor at the McDonough School of Business of Georgetown University, was the facilitator of the discussion group on Developing a Transit Safety Culture. This group addressed several issues related to transit safety culture including developing techniques to assist in risk analysis, formulating reports that will drive safety improvements, and communicating management’s safety goals to first line workers.

Mr. Bill Harvey, FTA representative on the Learning and Development Council of the US Department of Transportation, was the facilitator of the discussion group on Workforce Planning. Questions guiding this session included: (1) How focused should recruiting be? (2) Where is the best place to recruit? (3) How does succession planning fit in with overall recruiting efforts?

At the end of the day, the two discussion groups reconvened and shared their ideas. This workshop provided a forum for FTA representatives, transit providers, and university researchers to collaboratively address common transportation problems and identify potential research partners. Approximately 55 attendees from 19 states as well as the District of Columbia and Canada shared their expertise.

This workshop was coordinated by Ms. Lisa Colbert of the FTA and Dr. Jay K. Lindly of The University of Alabama and was sponsored by a grant from the FTA’s Office of Research, Demonstration, and Innovation and UTCA Project #06112.
Alabama Distracted Driving Summit

In December The University of Alabama at Birmingham’s University Transportation Center (UAB UTC), The University Transportation Center for Alabama (UTCA), and the Federal Transit Administration co-sponsored the Alabama Distracted Driving Summit. The summit, held in Birmingham, was the first ever statewide forum on this important issue.

Modeled on the national Distracted Driving Summit that the USDOT convened in the fall, Alabama’s Summit brought together over 300 people including state leaders in transportation, policy, law enforcement and science to discuss how to reduce motor-vehicle crashes resulting from distracted driving through legislation, enforcement, public awareness, and education. The summit also featured a keynote address from US Transportation Secretary Ray LaHood, who praised the UTCs for their initiative and leadership in hosting the event. “[This] summit – the first of its kind outside Washington – helps continue the national conversation on distracted driving and will put more good ideas on the table to prevent needless deaths. I hope other states will follow [Alabama’s] lead.”

During the first panel discussion, participants learned about the latest distracted driving statistics and findings from researchers representing The University of Alabama System, as well as other transportation research centers. Subsequent panels allowed the discussion of various approaches to reducing or regulating distracted driving and the development of an Alabama action plan. “Secretary LaHood issued a challenge to the states to move quickly to address the issues of distracted driving,” said Russ Fine, PhD, Executive Director of the UAB UTC. “Alabama’s response has been gratifying.”

In support of Secretary LaHood’s challenge, UTCA has funded Project #10206 – Impact of Distracted Driving on Congestion, Dr. Despina Stavrinos, Principal Investigator, UAB.

(This article was written by Ms. Carla Little, Research Writer at The Western Transportation Institute (WTI), and Mr. Stephen Albert, Director, WTI. It first appeared in CUTC’s January 2010 newsletter. For more information on the Distracted Driving Summit, please visit the UAB University Transportation Center website at http://www.uab.edu/utc/.)
Optimal Traffic Resource Allocation and Management

Traffic crashes pose a great danger to passengers’ lives. During the past decade, the rate of traffic crash fatalities in the United States has increased, and the numbers continue to rise. State troopers are determined to reduce these numbers, but patrol cars and manpower are limited. In UTCA Project #09104 – Optimal Traffic Resource Allocation and Management – Dr. Burcu B. Keskin, Principal Investigator, investigated ways to maximize these limited resources and eventually reduce the number of traffic accidents. The research team also included Mr. Dana Steil, PhD candidate from Computer Science; Mr. Rong Li, PhD student from Operations Management, and Ms. Sarah Spiller, an undergraduate Finance and Computer-based Honors Program student.

Dr. Keskin, Assistant Professor of Operations Management at The University of Alabama (UA), and Dr. Allen Parrish, Professor of Computer Science and the Director of CARE Research and Development Lab at UA, collaborated with the Department of Public Safety in planning and managing effective resource allocation. They addressed such issues as determining the number and deployment of officers needed to reduce the number of crashes, minimizing the response time to a crash, and eliminating idle patrolling while increasing the visibility of officers.

Identifying “crash hot spots,” that is, certain lengths of highway with high frequencies of crashes over a certain time frame, is crucial to maximizing the effective use of patrol cars and state troopers. Complete electronic crash data is available in CARE (Critical Analysis Reporting Environment) approximately three months after the crash date. Using CARE crash data from 2006 to 2008, the research team first identified crash hotspots on Alabama highways.

Then, the hot spots were integrated into optimized patrol routes for state troopers. Development of this integrated optimization model is a methodological contribution to the current literature and an extension of the classical vehicle routing problem. In these optimized patrol routes, troopers can visit hot spots multiple times and choose whether to visit a hot spot or not as well as choose when to start and when to stop a visit.

The algorithm uses a clustering factor to limit travel time from one hot spot to the next to ensure efficient patrol routes. Intuitively, one thinks that with more state trooper cars, more hot spots can be covered. However, the marginal benefit of one additional car deeps decreasing, especially after a certain threshold hotpot coverage. The technical model helps estimate that threshold value and determine the optimal number of state trooper cars and their patrol routes. Based on these results, the research team is able to provide decision makers with recommendations on how many state trooper cars are needed per shift per day and per city; it also provides a numerical evaluation of the coverage percentage of hot spots.

During August and September 2009, Dr. Keskin and Mr. Steil conducted five workshops on crash hotspot identification. Over 165 participants – including representatives from the trucking industry, municipal agencies, safety commissions, ALDOT, and the Alabama State Troopers – attended these informative presentations.

FIGURE 4-3. Alabama state troopers attend workshop.
The UTCA faculty conducted/sponsored nine seminars, short courses, and symposia in 2009 with 527 transportation professionals in attendance. The following descriptions illustrate that practitioners are receiving the benefits of UTCA research projects and new transportation courses.

Alabama Distracted Driving Summit. Co-sponsored by UAB UTC, FTA, and UTCA. Attended by state leaders in transportation, policy, law enforcement, and science, Birmingham, AL, December 2009. (300 participants)


National Transit Research Workshop. Co-sponsored by FTA and UTCA. Attended by representatives from academic, FTA, and transit systems, Arlington, VA, March 2009. (55 participants)


Steil, D., and B. B. Keskin. Crash Hotspot Identification. Attended by Alabama post commanders and state troopers from each of the Department of Public Safety posts, Montgomery, AL, August 26, 2009. (50 participants)


Steil, D., and B. B. Keskin. Crash Hotspot Identification. Attended by representatives from the Alabama Department of Public Safety, Federal Motor Carrier Safety Administration, Alabama Department of Transportation, the trucking industry, and over 26 municipal agencies, Montgomery, AL, September 9, 2009. (35 participants)

Turner, D. S. Alabama Strategic Highway Safety Plan — Impact on Counties. Attended by members of the FHWA/AASHTO Domestic Scan Team and local and state government safety officials, Montgomery, AL, November 2009. (50 participants)

During 2009 the UTCA faculty reported presenting 25 papers at 15 different meetings including one international meeting and five webinars. The wide range of meetings provided good exposure for the UTCA faculty and their research.


Griffin, R. The Effectiveness of Recent Developments in Automobile Safety. Presented as part of the Research in Progress ONLINE Seminar Series sponsored by UAB UTC, Injury Control Research Center, and UTCA, January 2009.


Sharma, D., Q. Cui, R. Baldwin, and D. Arkle. Big or Small, Does Warranty Contracting Provide Equal Opportunities to All? Presented at the 1st International Conference on Transportation Construction Management, Orlando, FL, February 2009.

Sisiopiku, V. P., and F. Germin. Analysis of Impacts from Temporary Left- and Right-Shoulder Lane Use as an Active Traffic Management Strategy. Presented at the Huntsville Simulation Conference, Huntsville, AL, October 2009.


Sutton, M. L. The Effects of Gender and Affect on Risky Driving Behavior in Adolescents. Presented as part of the Research in Progress ONLINE Seminar Series sponsored by UAB UTC, Injury Control Research Center, and UTCA, May 2009.


Turner, D. S. Implementing the Highway Safety Manual, Fiction or Fact? Presented at the Annual Meeting of the Southern District of the Institute of Transportation Engineers (SDITE), Birmingham, AL, April 2009.

Turner, D. S. School Bus Seat Belts: Good for Us? Bad for Us? Presented at the Annual Meeting of the Southern District of the Institute of Transportation Engineers (SDITE), Birmingham, AL, April 2009.


Watson, S. Analysis of the Effects of Aging Transportation Infrastructure on Heavy Construction Projects. Presented as part of the Research in Progress ONLINE Seminar Series sponsored by UAB UTC, Injury Control Research Center, and UTCA, March 2009.
Faculty members reported that 11 papers were published in refereed journals and conference proceedings in 2009. These papers were based on the results of UTCA research projects. Specific details of each paper are provided in the following section.


All of UTCA’s final reports may be downloaded from the Center’s website at http://utca.eng.ua.edu.
Section 5

Overview of Education Program

UTCA will provide a multidisciplinary program of course work and experiential learning that reinforces the transportation theme of the center (2006 Strategic Plan, p. 17).

4th Annual Student Awards Luncheon Celebrated the Achievements of Transportation Students

Students from the three campuses of The University of Alabama System are engaged in a variety of transportation-related research activities. A UTCA project (#09301) headed by Dr. Mike Anderson of The University of Alabama in Huntsville helped identify deserving transportation students and provided a forum in which they could present their research. First, students were invited to present abstracts of their research to a panel of representatives from each campus, and then winners were selected.

These students were invited to present their research at the 4th Annual Student Awards Luncheon on November 20, 2009. This award luncheon, held at The University of Alabama at Birmingham (UAB), was organized and hosted by the Institute of Transportation Engineers (ITE) Student Chapter at UAB.

Three students from each campus - UA, UAB, and UAH - presented technical papers to showcase their research activities. The following students made presentations: Ozge Cavusoglu (UAB), Morgan Chamberlain (UAH), Santosh Chitikesi (UAB), Mary Catherine Dondipati (UAH), Ian Hosch (UAB), Kenyona Pierre (UA), Nitin Sharma (UAH), Menasse Tekewold (UA), and Moses Tefe (UA). All presenters received monetary awards allowing them to attend the 89th Annual Meeting of the Transportation Research Board in Washington, DC in January 2010.

FIGURE 5-1. Student presenters and their advisors at annual awards luncheon.
Dr. Lou Wins Prestigious CUTC Award

Dr. Yingyan Lou, Assistant Professor in the Department of Civil, Construction, and Environmental Engineering at The University of Alabama, was awarded the Pikarsky Award for Outstanding Doctoral Dissertation in science and technology by the Council of University Transportation Centers (CUTC).

The Pikarsky Award is the highest award given by the Council of University Transportation Centers. Dr. Lou was selected as one of the two recipients for the $2,000 award.

Her dissertation, A Hierarchical Framework for Congestion Pricing of Transportation Networks, examined how road pricing methods can reduce traffic congestion.

(The article is used with the permission of the Office of University Relations at The University of Alabama. The article first appeared in UA’s faculty/staff newsletter, dialog, Vol. 30, No. 11, March 29, 2010.)

ITE Student Chapter at UAB

The Institute of Traffic Engineers (ITE) Student Chapter at The University of Alabama at Birmingham (UAB) continues to grow under the guidance of Dr. Virginia Sisiopiku. 2009-2010 officers are Mr. Santosh Chitikesi (President), Ms. Ozge Cavusoglu (Vice-President), Mr. Abdul Muqueet Abro (Secretary), and Mr. Sujit Rathi (Treasurer).

Over the past year the ITE Student Chapter organized and participated in field trips, conferences, guest speaker presentations, fundraisers, and paper and poster sessions. For example, members attended the 2009 Spring Meeting of SDITE from April 19th – 21st in Birmingham, AL were they met with Mr. Ken Voigt, President of ITE. Several members of the Student Chapter also attended the Fall Meeting of ALSITE on October 7, 2009 held at the Talladega Super Speedway.

On November 5th, the ITE Student Chapter at UAB attended a seminar sponsored by the Regional Planning Commission of Greater Birmingham. Presenters at this seminar – “Modern Roundabouts: A New Perspective” – discussed the many benefits of using roundabouts in roadway design. Additionally, the Chapter organized and hosted the 4th Annual Student Awards Luncheon at UAB on November 20, 2009. (See page 21 for highlights from this event.)
The eighth annual Advanced Transportation Institute (ATI-09) was held in June for rising high school juniors and seniors from the west-central region of Alabama. Forty-three students participated in this week-long event which was conducted at the Alabama Department of Transportation (ALDOT) headquarters in Montgomery, AL. Since its inception in 1999, UTCA has been committed to recruiting minority students to careers in transportation engineering. As in preceding years, ALDOT co-sponsored this important outreach event. In July a second three-day Institute (ATI-5th Div-09) was taught at the ALDOT 5th Division office and UTCA facilities at The University of Alabama in Tuscaloosa. ATI-5th Div-09 participants were middle and high school student members of the University of Alabama-Tuscaloosa, National Society of Black Engineers, Jr. Chapter (UAT-NSBE, Jr.). These Institutes were funded by UTCA Project #09108 and organized by Dr. Daniel Turner (UA).

Institute presentations, lab experiences, design competitions, and field trips were designed to give participants a general overview of ALDOT, an introduction to transportation engineering as a career, and hands-on examples and challenges. Results from comprehensive evaluations indicated students enjoyed their experiences and were influenced to consider transportation careers.

ATI’s impact was recently highlighted in an issue of The University of Alabama Capital Campaign Newsletter.

Jakkera Allen of Selma knows participating in ATI can change lives. When she attended ATI 2004, the first person she encountered was a smiling and welcoming Dr. Turner. At his encouragement, Allen, now a senior at UA, chose civil engineering as her major.

“My freshman year at The University of Alabama, I walked up to Dr. Turner. He still knew who I was, and that tells me a lot about his passion for his work,” says Allen. “Dr. Turner taught me one very important lesson: If you find a job you love, then you’ll never work a day in your life.”
Middle School Students Enjoyed Summer TEAM Program

During the past ten years over 400 middle school students from the Huntsville area have enjoyed the summer outreach programs organized by Dr. Kate Leonard from The University of Alabama in Huntsville (UAH). This year Dr. Leonard and her colleagues re-designed and expanded their traditional summer program to include several visits to middle school science classes. The goal of this new program – the Transportation Engineering Advancement and Mentoring (TEAM) Program – is to produce students who know “how to find out” and “how to examine and evaluate evidence.”

Mentors (engineering students and professional engineers) began visiting selected middle school science classes in February during National Engineers’ Week. They spent valuable one-on-one time with these science students conducting hands-on activities developed in previous UTCA grant programs. These visits culminated with a Civil Engineering (CE) Bridge Competition in April. Over 60 students participated in the CE Bridge Competition. Students designed bridges using the West Point bridge computer program and then built their trusses using Popsicle sticks and hot glue. Winners of the individual competition received t-shirts, and the best classes were treated to pizza parties.

Several students from these middle schools attended a week-long program held on the UAH campus in June. Participants learned about the role of transportation planning, management, safety, and design in modern society. They also explored new alternative energy technologies.

According to Dr. Leonard, this summer’s program was very “problem oriented.” Students, using knowledge gained from lectures and experiments, attempted to solve a number of transportation problems. Civil engineering professors from UAH and local professional engineers were instructors, and they used real-world examples and new technologies in their lectures and activities.

Dr. Leonard will continue working with local school districts to incorporate transportation engineering-related topics into the science curriculum. By providing in-school mentoring and a week-long summer program, planners hope to encourage underrepresented students to consider a career in transportation engineering. These activities were funded by UTCA Project #09306.
On April 7, 2009 the Department of Civil, Construction, and Environmental Engineering at UA held its annual Honors and Awards Banquet. Dr. Daniel S. Turner, founding Executive Director of UTCA, was the banquet speaker and honoree. Described as a special friend, educator, mentor, and colleague, Dr. Turner was honored several times during the evening. First, Chi Epsilon Chapter President Drew Waldrop welcomed Dr. Turner as a chapter honor member. Dr. Turner’s talents as an educator and mentor were again recognized when the UA Student Chapter of ASCE presented him with the Donald H. McLean Civil Engineering Professor of the Year Award. The highlight of the evening was the presentation of The Daniel S. and Linda C. Turner Endowed Scholarship. The scholarship award plaque states that Dr. Turner has positively influenced the lives of countless students, and through this endowed scholarship, Daniel and Linda Turner will continue to help students achieve their individual life, academic, and professional aspirations.

Dr. Turner officially retired at the end of the Fall 2009 semester. His retirement party in December was a wonderful occasion as friends, family, and colleagues turned out to wish him continued happiness and good health. We are very grateful for his years of service to The University of Alabama and UTCA. (Highlights from Dr. Turner’s retirement party are on page 28.)

The University Transportation Center for Alabama is proud to recognize Ms. Mary Beth Wilkes as its 2009 Student of the Year. Ms. Wilkes, a native of Andalusia, AL, earned a bachelor’s degree in civil engineering in 2008 from The University of Alabama. Mary Beth is currently pursuing a master’s degree in civil engineering at UA.

During her undergraduate years she was involved in the student chapter of ASCE in which she held an officer’s position for two years and was a team leader in the Steel Bridge and Concrete Canoe competitions. During her last semester as an undergraduate, Ms. Wilkes was nominated by peers and faculty to be a Senior Design Project Team Leader. Her team earned the First Place Overall Award for their completed project.

As a graduate student, she is a teaching assistant for the undergraduate course on highway design and construction. During the past two summers Ms. Wilkes served as the Co-Director of the Advanced Transportation Institute (ATI) with Dr. Daniel Turner. She is currently working with the Alabama Department of Transportation to update rules and regulations for oversize/overweight loads, create a permit information handbook for truckers, and develop a pilot car driver certification program.

The formal presentation of the Student of the Year award occurred in Washington, DC during the Transportation Research Board’s Annual Meeting. Accompanying Ms. Wilkes to the Awards Banquet were her parents, Mr. and Mrs. Guy Wilkes, and Dr. Jay K. Lindly, UTCA’s Executive Director.
Instructional Program

Transportation faculty members have instituted a rotating two-year program of courses shared between the three campuses. Each campus teaches its required undergraduate classes, and each semester there are one or two other transportation courses offered via IITS (Intercampus Interactive Television System). This ensures that undergraduates can be exposed to three or four transportation electives during their junior and senior years and that graduate students have a continuous choice of courses in their specialty areas.

Each individual campus cannot offer such a variety of courses. The IITS arrangement promotes unity and spirit among transportation students and also provides students access to transportation expertise on the other two UA System campuses.

Typically in an IITS course, students from all three campuses meet jointly at least once a semester. This meeting is usually in the form of a field trip, a design session, or a professional conference.

Student Enrollment and Research Participation

Since its inception in 1999, UTCA has promoted student participation in transportation research projects. At least 252 undergraduate and 343 graduate students have worked on research projects funded by UTCA.

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<th>TABLE 5-1. Multi-campus Courses Since 2006</th>
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<tr>
<td>SP 06 Turner UA Transp. Safety &amp; Security</td>
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<td>FA 06 Anderson UAH Urban Transp. Planning</td>
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<td>FA 06 Sisiopiku UAB Intelligent Transp. Systems</td>
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<td>SP 07 Sisiopiku UAB Non-Motorized Transp. Design &amp; Planning</td>
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<td>FA 07 Sisiopiku UAB Traffic Flow Theory</td>
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<td>FA 07 Anderson UAH Urban Transp. Planning</td>
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<td>SP 08 Turner UA Transp. Safety &amp; Security</td>
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<td>FA 08 Lindly UA Pavement Rehabilitation</td>
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<td>FA 08 Anderson UAH Urban Transp. Planning</td>
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<td>FA 08 Sisiopiku UAB Intelligent Transp. Systems</td>
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<td>SP 09 Turner UA Geometric Design of Roadways</td>
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<td>SP 09 Anderson UAH Traffic Engineering Operations &amp; Design</td>
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<td>SP 09 Sisiopiku UAB Non-Motorized Transp. Design &amp; Planning</td>
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<th>TABLE 5-2. Student Enrollment, 1999-Present</th>
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<td>Master's Level</td>
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<td>PhD Level</td>
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<td>Total Graduate Level</td>
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EXHIBIT A: Performance Indicators for University Transportation Centers

The following Performance Indicators will be reported to RITA as part of the reporting requirement that all UTCs must perform. Where Baseline Measures are cited, they come from UTCA’s Title III Center Strategic Plan accepted by RITA on February 15, 2007.

Research Selection

1. Number of transportation research projects selected for funding using your UTC grant funding (Federal and/or match.) 10

   1a. Number of those projects that you consider to be basic research 1, advanced research 2, and applied research 7. Projects may be included in more than one category if applicable.

2. Total budgeted costs for the projects reported in #1 above. $625,711.00

Research Performance

3. Number of reports issued that resulted from transportation research projects funded by the UTC grant. 15

4. Number of transportation research papers presented at academic/professional meetings that resulted from projects funded by the UTC grant. 25

Education

5. Cumulative number of transportation-related courses that have been added since the beginning of the grant to the number of courses you reported in Baseline Measure 1 in your UTC Strategic Plan. Include courses added to the university course catalog whether or not they were conducted during a particular grant year.

   Undergraduate: 0  Graduate: 0

6. Number of student participating in transportation research projects. Count individual students (one student participating in two research projects counts as one student.)

   Undergraduate: 15  Graduate: 27

Human Resources

7. Cumulative number of transportation-related advanced degree programs that have been added since the beginning of the grant to the number of degree programs you reported in Baseline Measure 3 in your UTC Strategic Plan.

   Undergraduate: 0  Graduate: 0

8. Number of students enrolled in transportation-related advanced degree programs (the baseline programs and any added since the beginning of the grant).

   Master’s Level: 23  Doctoral Level: 14

9. Number of students who received degrees through the baseline and any added transportation-related advanced degree programs.

   Master’s Level: 18  Doctoral Level: 1

Technology Transfer

10. Number of transportation seminars, symposia, distance learning, classes, etc. conducted by your UTC for transportation professionals. 9

11. Number of transportation professionals participating in those events. 527
Please join us as we honor

Dr. Daniel Shelton Turner

On the occasion of his retirement after
30 years of dedicated service

Tuesday, December 1, 2009
1:30 p.m. - 3:30 p.m.

101 Bevill Building
The University of Alabama
Tuscaloosa, Alabama

Hosted by the College of Engineering
R3VF (205) 348-9925