SOUTH CAROLINA STATE UNIVERSITY

2006 Semi-Annual Progress Report

January 2006

A. SUCCESS STORIES

Director's Introduction

South Carolina State University (SCSU) held a historic groundbreaking ceremony on October 28, 2005 for the James E. Clyburn Transportation Research and Conference Center. The Center, named in honor of Congressman James E. Clyburn, a 1961 graduate of SCSU, will include a research building, research library, a lab wing, an administrative wing, a conference center, executive guest suites and other amenities that support and foster optimal research capability in transportation and assistance to federal, state and local transportation agencies and the private sector while training the next generation of students to become transportation professionals in a highly skilled, diverse work force for transportation.

The James E. Clyburn University Transportation Center (JECUTC) continues to make progress in its efforts to secure additional resources and develop new programs. The Department of Energy/National Security Administration awarded a $2 million dollar grant [to the Center] to establish an Environmental Policy Institute (EPI) to conduct research on the transport of radiological sources and nuclear waste. The Environmental Policy Institute has an outreach component that will develop a one-hour made for television dialog which focuses on the transport of hazardous waste. Outreach activities also include community leaders meetings focusing on the transportation of hazardous waste to the Savannah River National Laboratory.

The 5th Annual Statewide Transportation Curriculum and Research Conference was a huge success in reaching its highest attendance of transportation representatives from federal, state, local agencies, colleges and universities and the public and private sectors to address transportation needs in South Carolina through research and interagency collaboration. The Technical Advisory Council (TAC) met to discuss transportation curriculum and research needs for the University Transportation Center.

The Master of Science degree in Transportation (MST) was awarded to the first graduates of the Program in December 2005. The Program is designated as a unique resource for South Carolina and one that will provide graduates with high quality preparation for understanding in the transportation field. Currently, 21 students are enrolled in the program.

The First VEX Challenge (2005-2006 pilot season), a technology transfer activity, is an inaugural event for South Carolina State University. On February 10, 2006, JECUTC will host this statewide event of 500 students and professionals for a multi-national competition aimed at solving engineering design problems in an intense and competitive way through the use of robotics.

STUDENT OF THE YEAR

SCSU/JECUTC Selects its 5th Student of the Year

Alex began his college year at Claflin University, Orangeburg, South Carolina. While attending Claflin, Alex majored in Civil Engineering and Applied Mathematics. Alex's dual degree is a major provided by Claflin University in collaboration with South Carolina State University (Orangeburg) and Clemson University, Clemson, South Carolina.

During his years at Claflin, Alex participated in several organizations and received numerous honors. These honors and activities included mentoring, tutoring and community service targeted towards the youth of the community; membership in Kappa Kappa Psi National Honorary Band Fraternity, Alpha Phi Alpha Fraternity, Incorporated, Alpha Kappa Mu National Honor Society, Who's Who Among America's Colleges and Universities, named to the Deans List, National Deans List, Honor Roll, and a recipient of the Presidential Scholar Award.

After completing his undergraduate tenure at South Carolina State University, he received a Bachelor of Science degree in Applied Mathematics from Claflin University and a Bachelor of Science degree in Civil Engineering Technology from South Carolina State University. Currently, he is enrolled in the Master of Science Degree in Transportation Program. During his studies here at SCSU he will concentrate in Transportation Planning. He has successfully completed two internships with Camp Dresser Mckee Engineering and Consulting firm and has completed an internship with Grice and Associates, Inc. in Atlanta, Georgia.

Alex has conducted research in Surface Transportation with the engineering firm of Geometrics of South Carolina. His research project was entitled: "Pavement Management Systems". This research was designed to test why some roads are not properly paved and to determine what are the techniques used by the government to test and rate pavement.

Mr. Geiger was selected because of his academic achievement and his contribution to research in the transportation arena. He anticipates having a successful career in transportation.

Conference of Minority Transportation Officials

The South Carolina Chapter of the Conference of Minority Transportation Officials (SCCOMTO) is a chapter of the National Conference of Minority Transportation Officials which was first founded at Howard University in Washington, DC in January, 1971. The organization now boasts membership of more than 3,000 through approximately thirty-six (36) chapters throughout the United States.

The South Carolina Chapter, with assistance from the James E. Clyburn University Transportation Center, continues to recruit and support minority transportation officials within the state. In conjunction with the National office, this chapter has made development and membership growth its primary goals in attracting graduate students to its membership. The chapter continues to be successful. There are 17 Master of Science in Transportation candidates at South Carolina State University who participate in COMTO activities. SCCOMTO has exceeded its goal in achieving the 25% growth in membership during the 2005 fiscal year.

While still placing emphasis on student scholarship, academic services, and professional development of all transportation professionals, COMTO continues to be the number one organization within the state to address the immediate needs of minority transportation officials. COMTO programs also support the James E. Clyburn University Transportation theme of "Professional Capacity Building".

TECHNOLOGY TRANSFER ACTIVITIES

Transportation Technology Transfer (T^3)

The T^3 program at the James E. Clyburn Transportation Center is a sub-grant recipient with Clemson University. This program serves to provide technical aid to local government transportation agencies in the operation of transportation technology transfer service in South Carolina.

The T^3 services are:

- Assist local government by responding to requests for publications, information and technical advice related to the implementation and operation of public transportation systems and facilities.
- Assist in the preparation of semi-annual progress reports to be provided to the South Carolina Department of Transportation.
- Maintain a current mailing list of individuals and organizations in South Carolina involved in operating public transportation programs.
- Assist in the development and implementation of an evaluation plan for the public transportation-related elements of the T^3.
- Assist in the planning and presentation of seminars and training programs related to public transportation systems as defined by the training needs of public transportation agencies in South Carolina.

Technical Advisory Council

The Technical Advisory Council (TAC) met on December 2, 2005. The purpose of TAC is to conduct business using a committee structure and review programs, recommend actions, and assist in recommending the annual research agenda. These activities include developing the Center's programmatic material, the annual plan, as well as, keep records of all activities and actions. Major objectives for the 2005-2006 TAC meeting were to identify new members to address the growing and changing needs of the center, and to nominate and elect executive officers to oversee the efficient running of the council. The meeting followed an agenda, consisting of orientation, presentation of programs and activities of the Center, the committee and administrative structure for the TAC and the election of officers. A preliminary discussion of the research agenda followed. Another meeting of TAC will be held in March 2006.

Members of the TAC:

Dr. Andrew Hugine
President
South Carolina State University

Congressman James E. Clyburn
6th Congressional District of South Carolina

Senator John W. Matthews, Jr.
District 39, State Senate

Dr. Arlene Prince
Deputy Director
Executive Support
SC Dept. of Transportation

Mr. Joel Washington
Acting Director
Washington Metropolitan Area Transit Authority

Dr. Judith Salley
Chair, Biological Sciences
South Carolina State University

Col. Anna J. Amos
Director
State Transport Police

Mr. David Rivers
Director, Public Info. & Community Outreach
MUSC

Dr. Shirley Seaborn
Associate Director
JECUTC

Dr. Leola Adams
Interim Executive Director
Center of Excellence in Transportation

Dr. Tom Whitney
Associate Professor
Civil & Mechanical Eng. Tech.

Dr. Reinhardt Brown
Interim Associate Director
Center of Excellence in Transportation

Dr. Saundra Glover
Vice President
Research and Economic Development
South Carolina State University

Mr. Lamar Tisdale
Technology Transfer Coordinator
JECUTC

Representative John L. Scott, Jr.
District 77, State Representative

Senator Kent M. Williams
District 30, State Senate

Senator J. Yancey Mc Gill
District 32, State Senate

Ms. Leslie Price
Manager
Westinghouse Savannah River Site

Dr. Robert Scott
Director Business Development Center
Benedict College

Mr. Curtis Thomas
Division Administrator
SC Federal Motor Carrier Safety

Representative Lonnie Hosey
District 91, House of Representatives

CONFERENCES AND WORKSHOPS

Fifth Annual Statewide Transportation Curriculum and Research Needs Conference

The South Carolina State University James E. Clyburn University Transportation Center (JECUTC) hosted its Fifth Annual Statewide Transportation Research and Curriculum Needs Conference on December 1-2, 2005 at the Embassy Suites Hotel in Columbia, SC. The Theme for the conference was "South Carolina's Rural Transportation Needs."

The conference accessed South Carolina's rural transit needs and focused on getting South Carolina Colleges and Universities involved in research and curriculum development for rural transportation. Conference attendees were given an opportunity to engage in discussions with transportation professionals from around the state and the nation.

In attendance were representatives from the US Federal Railroad Administration, Federal Transit Administration, Federal Highway Administration, South Carolina Department of Transportation, South Carolina Councils of Government, SCDOT-Mass Transit, Transportation Association of South Carolina, South Carolina State University, University of South Carolina, The Citadel, Benedict College, College of Charleston, Rural Transportation Authorities, Transit Providers and Transportation Consultants. The Conference was the largest ever with over 100 participants in attendance each day.

The Opening Speaker was Mr. Doug Frake, Community Planner with the Federal Transit Administration, Region IV, Atlanta, Ga. Mr. Frake addressed SAFETEA-LU: Safe, Accountable, Flexible, Efficient Transportation Equity Act, the re-authorization legislation and how it relates to rural transportation that will impact South Carolina.

Congressman James E. Clyburn, Sixth Dist., SC, was the luncheon speaker. He spoke on the need of transportation research to provide a basis for objective decision making in addressing statewide rural transportation needs.

ADA Driver Training Workshop / Transporting Disabled Passengers

The Americans with Disabilities Act (ADA) Driver Training Certification Workshop for Transit Providers was held on August 13, and 20, 2005; September 20, 22 and 23, 2005; and October 20 and 21, 2005, at the James E. Clyburn University Transportation Center on the campus of South Carolina State University. Consisting of special needs drivers and supervisors, the conference hosted some 48 participants. With special emphasis on safe and courteous techniques for transporting people with disabilities or special needs, the workshop provided necessary information on Passenger Assistance Techniques and Safe Transport of individuals in concurrence with ADA. Successful completion of the workshop was recognized by awarding participants ADA certificate from James E. Clyburn University Transportation Center (JECUTC) and Community Transportation Association of America (CTAA).

In 2005, the JECUTC offered monthly ADA driver training workshops from February to December. Starting in February of 2006, such training will continue and will be conducted at the transit agency locations. By relocating to the agency, the number of participants at each training session will be increased.

EDUCATION

Fellowships, Scholarships and Research Assistantships

The following students attended the Dwight David Eisenhower Transportation Fellowship Program Research Showcase, which was held on January 23, 2006, at the Transportation Research Board 85th Annual Meeting. The Showcase focused on education, the training of new transportation professionals, the work of past fellowship recipients in academia, and the transportation education pipeline.

Bryanta C. Booker
Political Science/Pre-Law

Richard C. Garner, Jr.
Business Management

Erica Hailey
Civil Engineering Technology

Erinn D. McCullough
Accounting

Charanor Marcano
Accounting

Andrew Thompson
Computer Science

Assistantships were offered in the following categories:

Graduate Research Assistant

A graduate research assistant is a full-time student who receives a research assistantship in transportation-related research areas and performs research-related tasks under the supervision of a researcher or faculty/fellow. Nine (9) graduate research assistantships were awarded to students in the Master of Science Degree in Transportation Program who worked with the following faculty researchers:

Dr. Hasanul Basher, Professor, Industrial & Electrical Engineering Technology
Dr. Nasrollah Hamidi, Professor, Department of Biological & Physical Sciences
Dr. Jae Hong, Professor, Industrial & Electrical Engineering Technology
Dr. Abdul Miah, Assistant Professor, Industrial & Electrical Engineering Technology
Dr. Tom Whitney, Associate Professor, Industrial & Electrical Engineering Technology

Graduate Assistant

A graduate assistant is a full-time student enrolled in the MST Degree Program performing general work tasks under the supervision of the JECUTC staff or researchers. Nine (9) students were awarded graduate assistantships in the MST Degree Programs.

Undergraduate Assistant

An undergraduate assistant performs work tasks under the supervision of JECUTC staff or researchers. One undergraduate student was awarded an assistanship.

Transportation Research Board 85th Annual Meeting

The 85th Annual Meeting for the Transportation Research Board was held in Washington, D.C from January 22-26, 2006. Five professional staff and six (6) SCSU students attended the conference. The students were recipients of the Dwight David Eisenhower Transportation Fellowship Program Research Showcase for 2005-2006. The focus of the Showcase was education and training new transportation professionals, work of past fellowship recipients in academia, and the transportation education pipeline.

B. RESEARCH PROJECT STATUS

New Research

New Research projects have been delayed due to the revision of the Call for Proposals document. This delay ensures that this document clearly states the necessary requirements for the granting of funds for new programs and projects.

Ongoing Research

Automated Traffic Surveillance Using Low-Angle Cameras

R-05-UTC-Automated Traffic-CAMET-01

Principal Investigator: Dr. Stanley Birchfield, Department of Electrical and Computer Engineering, Clemson University; Dr. Wayne Sarasua, Department of Civil Engineering, Clemson University

Co-Principal Investigator: Dr. Tom Whitney, Civil and Mechanical Engineering Technology, SCSU

Project Abstract: This research will result in the development of a novel method to conduct machine vision monitoring of vehicle activity using low-angle cameras. A major achievement of this research will be to overcome poor perspective effects that cannot be currently overcome by commercially available machine vision based traffic monitoring systems such as Autoscope. The approach will be to track feature points throughout a block of frames from a video image sequence. The researchers have recently developed a system capable of tracking vehicles in highway video from a low angle. The proposed project will build on this earlier success by significantly enhancing the algorithms to work at traffic intersections, and by validating their effectiveness through field testing. The resulting system will be able to conduct automated turn movement counts that are vital inputs to a number of transportation applications. It is anticipated that this work will lead to a series of scholarly papers.

Integration of Vehicle Detection Systems and Variable Message Signs for Traffic Management

R-05-UTC-Integration of Vehicle-IEE-01

Principal Investigator: Dr. Hasanul A. Basher, Department of Industrial

Project Abstract: Various traffic problems present safety hazards as well as result in extensive delays for motorists. The integration of a VDS system using video sensor technology and a VMS system offers the possibility to warn motorists automatically, in real-time, of impending problems and to suggest alternatives routes . The proposed project consists of extending the capability of a VDS System through integration with a VMS System and evaluating the performance of the integrated unit so that the traffic data from the VDS System will automatically activate the VMS System for display in real-time. The project also includes studying existing video sensor- based VDS and VMS Systems and conducting tests for validation and performance evaluation of these systems under different operating conditions.

The project will be broken into four tasks. In the first task, the performance indices of different video sensor systems (such as AUTOSCOPE, CCATS) will be studied with special focus on their performances in inclement weather, detection accuracy, false alarm rate or missed incidents, and video quality. In the second phase, a VDS and a VMS System will be procured, the operating principles of the systems will be studied and the systems' performances will be evaluated thoroughly for the proposed integration. The third phase will include studying the formats of data transmission from and into the VDS and VMS Systems, integrating the two systems, and evaluating the performance of the integrated system under various scenarios. The fourth task will consist of transferring the results of the project to the transportation community through presentations at industry meetings, participation in seminars, and publication in appropriate journals.

Synthesis and Characterization of High Temperature, Lightweight, and Chemically Resistant Aromatic Cyanates

R-05-UTC-Synthesis and Chara-BIO-01

Principal Investigator: Dr. Nasrollah Hamidi, Department of Biological and Physical Sciences, SCSU

Co-Principal Investigator: Dr. Ruhullah Massoudi, Department of Biological and Physical Sciences

Project Abstract: Development of new lightweight, thermally resistance, chemically inactive, mechanically strong and tough materials suitable to produce parts of vehicles, ships and aircrafts and containers for transportation including transportation of hydrogen fuel is the task that this project will undertake. Because some of the composites obtained from the existing aromatic cynate ester resins have exceptionally good mechanical property, and very high char-yield, the design and experimentation will be limited to new esters and pre-polymers of this type. New resins with a number of active cyanate ester (- O-CN) end groups on an aromatic (C6H5, Ar) ring Ar(-O-CN)n will be synthesized and characterized. The monomers and pre-polymers will be characterized by GC-MS, IR, NMR and viscometry techniques. The curing and post-curing processes of these resins will be studied by differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). The equipment exists in the Department of Biological and Physical Sciences at South Carolina State University and is available to conduct these studies. The resin transfer molding (RTM) suitability conditions will be studied by viscometric and other techniques.

Powered Non-Destructive Evaluation of Transportation Infrastructures using Wireless Embedded Sensors

R-05-UTC-Powered Non-Destru-IEE-01

Principal Investigator: Dr. Abdul Malek Miah, Department of Industrial & Electrical Engineering Technology, SCSU

Co-Principal Investigator: Dr. Mohammod Ali, Department of Electrical Engineering, University of South Carolina

Project Abstract: Routine evaluation and prediction of the health of infrastructures, such as bridges and overpasses is crucial to transportation safety. Currently this is done by expensive and labor-intensive procedures such as spot checking and ground penetrating radar (GPR). Researchers have proposed the use of wireless embeddable sensors for infrastructure health monitoring. Unquestionably, to drive the electronics of the wireless transceiver, an inexhaustible supply of power will be needed; which must be supplied to the sensors wirelessly because once the sensors are embedded within the concrete they cannot be accessed physically. The topic of powering embedded sensors within bridges or other infrastructures will play a tremendous role in the future development, deployment and possible breakthrough in cost savings in wireless infrastructure health monitoring technology. Recently we have introduced a novel multifunctional sensor antenna module which can be used to receive wireless power at one frequency (5.8 GHz) and high-speed data at another (2.4 GHz). Based on our preliminary results on this topic, we propose to investigate the feasibility of beaming microwave energy to power an embedded sensor within concrete. Full-wave electromagnetic simulations will be conducted on our newly developed multifunctional antenna module inside an air- hole of a realistic model of concrete slab.

A Web-Based Transportation Network Optimization Model in South Carolina

R-05-UTC-Web Based-IEE-01

Principal Investigator: Dr. Jae-Dong Hong, Department of Industrial & Electrical Technology, SCSU

Co-Principal Investigator: Dr. Young G. Kim, Department of Mathematic and Computer Sciences, SCSU

Project Abstract: This research will consider a problem, where the logistics network consists of supplies, warehouses, distribution centers, and retail outlets. It will develop a network model using Microsoft Excel with VBA to find the optimal way to transport products from suppliers to customers through various transshipment points in the State of South Carolina. We shall use VBA codes to retrieve data from the database, develop a flexible network flow model, and run the Solver to find the optimal transporting routes, the amount of flow, and the corresponding total transportation costs. We shall perform sensitivity analysis to examine the influence of various factors on the optimal solution. There will be three phases to the study. Phase I will comprise the accumulation of a pilot database. Phase II will be the development of the Excel Model. Phase III will develop the design for the web site; the results of which will allow the users to provide their inputs to run the program.

ONGOING RESEARCH
2004-2005

Pedal Force Analysis for Bicycling at the Onset of Fatigue

R-03-UTC-PEDAL FORCE-PE-01

Principal Investigator: Dr. Barry Frishberg, Department of Health and Physical Education, SCSU

Co-Principal Investigators: Dr. Leon Cohen, Department of Physics and Graduate Center, Hunter College and Dr. Lorenzo Galleani, Politecnico di Torino, Corso Duca degli, Abruzzi,

Project Abstract: Bicycles are a major means of transportation and many programs throughout the country are encouraging their use for many reasons. Fatigue is a cause of injury and its understanding and characterization are crucial. We propose a new method, time-frequency analysis, to study fatigue by characterizing it by new time-series methods, which have been shown to be very effective in other biomedical non-stationary time series data sets. An experimental apparatus will be set up that will measure foot pedal force, rotation rates, among other features, and all of which will be measured as a function of time. These time-series will be analyzed using these new methods and will be used to characterize the time series with the onset of fatigue. The combination of apparatus and analysis will produce a state of the art facility and produce results, which are important to the field. Results will be submitted for publication in standard refereed journals and presented at professional conferences. The combination of experiments, computer analysis, and the study of biomedical time-series is ideally suited for student involvement. Potential benefits are addressed, the main one being that a measure and understanding of fatigue could prevent injuries and could also help in the design of better bicycles to encourage their use. In addition, simple time-frequency measure such as time dependent standard deviations will be ascertained for the suitability of a simple measure of fatigue.

A Safer Driving Under Poor Atmospheric Conditions by Improving the Visibility Measurements Based on Wave List Analysis

R-03-UTC-WAVELET-MAT-01

Principal Investigator: Dr. Kuzman Adzievski, Department of Mathematics and Computer Science, SCSU

Co-Principal Investigator: Dr. Zlatkop Zografski, Dept. of Mathematics and Computer Science, SCSU

Project Abstract: It is estimated that one-third of all fatalities and two-thirds of rural are facilities involve run-off-the-road type crashes. Poor visibility of road markings in the dark, fog, and rainy weather is one of the main causes for these fatalities. Visibility reduction, due to inclement weather conditions, is one of the main causes of traffic accidents; therefore, accurate visibility measurement is an important area of research in transportation.

The overall objective is to improve the safety of rural roads in South Carolina by providing real time information and risk warnings for driving under poor visibility conditions.

Intelligent Transportation Systems (ITS) for Automated Pavement-Distress Feature Extraction and Characterization Using Machine Learning

R-04-UTC-ITS-UTC-01

Principal Investigator: Dr. Nikunja K. Swain, Department of Industrial/Electrical Engineering Technology, SCSU

Co-Principal Investigator: Mr. Andrew R. Tolleson, President, Geometrics, Inc.

Project Abstract: The proposed technique will significantly enhance the automated pavement condition by coupling state-of-the-art computer vision, pattern recognition and machine learning with downward looking roadway mages used for pavement management systems. The objective of this research utilizes Intelligent Transportation System (ITS) technology coupled with feature recognition to develop an automated digital image pavement condition rating system that will utilize existing state-of-the-art feature extraction technology to extract quantitative pavement distress data from pavement surface images.

This effort will help advance the current pavement management system into real time response by reducing the time lag in reporting the state of repair in the transportation highway system (s).

COMPLETED RESEARCH

2003-2004

An Assessment of Emergency Transportation Management Centers for Rural Populations in South Carolina

R-03-UTC-EMGMGT-SW-02

Principal Investigator: Dr. Eva Njoku, Department of Social Work, SCSU

Co-Principal Investigator: Dr. Innocent Nkwocha,, Visiting Assistant Professor, School of Business

Project Abstract: This was an exploratory study to determine how knowledgeable persons 65 and older are about emergency preparedness and transportation evacuation procedures in times of environmental disasters. The study focused on five key factors related emergency evacuation. They were: (1) use and frequency of emergency services, (2) knowledge of emergency situations, (3) awareness of emergency services, (4) accessibility of emergency management services, and (5) demographic information describing location of elderly residents. Student interns were used to conduct face-to-face interviews with a sample of elderly persons who resided in the rural areas of selected counties in South Carolina.

The study found that the elderly were very limited in their understanding of emergency preparedness and may be vulnerable during disasters. They depended very heavily on others

within their family and community to alert and get them to safety when disasters occurred. This dependence on family and the community does not suggest lack of interest information about emergency evacuation and safety in times of disaster. On the contrary, most of the respondents indicate a need for more information about emergency preparedness programs and how to get to safety in times of disaster. The study suggests the need for more technologies geared to increase communication, education, and links between emergency management centers and the local communities. The study also suggests the need for emergency management centers to review their current strategies to assure that they can identify, locate and assist all special needs populations in times of disaster.

Inlet/Outlet Manifold Design Improvements for PEM Fuel Cell Performance

R-03UTC-FUEL4-IET-04

Principal Investigator: Dr. Hamid Naseri-Neshat, Department of Civil and Mechanical Engineering, SCSU

Project Abstract: A three-dimensional triple pass PEMFC model will be developed with different inlet and outlet configurations for a 25-cm^2 membrane area. The model will include the anode and cathode flow channels, diffusion layers, and the membrane. A 4.472-cm by 4.472-cm sub-gasket will be included on the membrane for case I, which reduces the active membrane area to 20-cm^2. Cell performance and without the sub-gasket will be investigated. Numerical prediction of PEMFC behavior will show the effects of different inlet and outlet manifold designs in its performance (total current produced) when the cell is operating under several loading conditions. The numerical results for four inlet and outlet design configurations will include polarization curves that show the relationship between cell voltage and current for four loading conditions. The predictions will be compared to the available data to verify and test the model parameters and the model itself. In the cell, the reacting gases (water vapor and hydrogen gas in the anode side and water vapor along with air in the cathode side) are supplied into serpentine channels and gas diffusion layers on both sides of the membrane. Interaction of Hydrogen and Oxygen gases across the membrane, and also the conversion of water vapor into liquid, and vise versa, is also modeled within the cell. The numerical model will incorporate all previous experimental parameters available for the diffusion layers on the anode and cathodes sides of the membrane. It is anticipated that the results of this investigation will give guidance in the design of fuel cells built for transportation applications.

South Carolina's Rural Labor Market and its Dependence on Public Transportation

R-03-UTC-RURAL-MAT-01

Principal Investigator: Mr. Sam McDonald, Department of Mathematics and Computer Science, SCSU

Co-Principal Investigators: Dr. Jochen Albrecht, Department of Geology, University of Maryland and Vinesh Gupta, Department of Geology, University of Maryland

Project Abstract: Rural South Carolina is undergoing significant demographic and economic changes, which, in concert with new transportation technologies, give potential rise to new opportunities for rural transportation systems. The research proposed here will identify those areas that have the highest likelihood for viable rural public transport. This is seen as a key determinant for promoting sustainable economic growth in South Carolina, beyond traditional

tourist and metropolitan areas. Building upon the expertise of three complementary researchers, this project combines transportation geography, economics, statistics, and the latest geo-spatial information technology to inform local and regional decision makers throughout rural South Carolina. In the course of this project, UTC research students will acquire a range of new skills, while the center itself will become the host of a GIS-based repository of raw data and derived analyses.

Investigation of Bridge Abutment Scour

R-03-UTC-BRIDGE-Abutment-SETS-01

Principal Investigator: Dr. Abdul Malek Miah, Department of Industrial and Electrical Engineering Tech., SCSU

Co-Principal Investigator: Dr. Jasim Imran, Environmental Engineering, University of South Carolina

Project Abstract: During the last 30 years, more than 1,000 bridges have failed and 60% of those failures are due to scour around abutments and piers. The existing guideline for predicting abutment scour gives an unrealistic estimate of scour depth especially for bridges founded on cohesive soil. A significant number of bridge crossings in South Carolina are founded on cohesive soil. Yet very little 0 research has been done on pier or abutment scour in cohesive soils.

Current research efforts at the University of South Carolina (USC) have led to the successful development of a new methodology for scour prediction around bridge piers in cohesive soil. The proposed research will extend the methodology to abutment scour. This research will allow bridge engineers to properly estimate scour depth around abutments and develop cost effective and safe designs of new bridges. The study will combine advanced numerical modeling, experimental study, and traditional scour evaluation techniques. This is a joint project between USC and South Carolina State University (SCSU). It involves one PT and one female graduate student from USC, and one P1 and one female African American undergraduate student from SCSU. The methodology developed will be made available to SCDOT and FHWA engineers. The results will be presented at the Transportation Research Board Annual Meeting. The proposed research will improve passenger safety on the existing South Carolina bridge crossings by providing advanced warning on potential degradation of bridge alignment and bridge failure due to abutment scour.

Risk Management of Hazardous Materials Transportation in South Carolina: An Action Plan

R-02-UTC-HAZMAT-CET-02

Principal Investigator: Dr. Clarence Hill, Director JECUTC

Co-Principal Investigator: Dr. Tom Whitney, Interim-Chair, Department of Civil and Mechanical Engineering Technology, SCSU

Project Abstract: The purpose of this study is: 1) to identify the underserved segment of the population in Orangeburg County; 2) to determine the level of transportation services needed as a result of sprawl development. Survey results, U. S. census data, state statistical records and local county records clearly indicated that Orangeburg County has increased its population by

21.5% between 1970 and 1990. Further review of local county documents indicates that the number of building, residential, commercial, and industrial permits has nearly doubled in the last ten years. As a result of these factors, an increased number of residents are settling in suburban areas that create significant distances between home, work, and basic human service centers. The distances directly impact transportation, individual mobility, as well as access to transportation services in any given location.

A Feasibility Study to Determine the Effective Deployment of Simulation Training to Enhance CDL Class A Training and Re-Certification in Order to Reduce Accidents and Improve Highway Safety

R-04-UTC-A Feasibility Study-UTC-01

Principal Investigator: Mr. Lamar Tisdale, JECUTC

Co-Principal Investigator: Dr. Jack Selter, Center for Advanced Transportation System Simulation, and Mr. Ron Tarr, Center for Advanced Transportation System Simulation, University of Central Florida

Project Abstract: The U.S. Department of Transportation, Federal Motor Carrier Safety Administration (FMCSA), South Carolina Department of Public Safety, State Transport Police, and the South Carolina Department of Transportation have all identified safety and enhanced operator performance of heavy trucks as major goals in addressing intermodal transportation requirements of the State and nation. State FMCSA representatives and the South Carolina Department of Motor Vehicles are working diligently to address the issues of safety on South Carolina roads through better practices of strengthening and enforcing standards and certification of CDL training. Likewise, the American Trucking Association, Truckload Carriers Association and the South Carolina Trucking Association are equally concerned with issues of safety and driver training and the operational performance of drivers. Clearly, driver selection and training, recertification, safety, security, and accident reduction are priority concerns in the entire trucking community. These concerns have also been expressed by the transit and motor coach industry as well. The objective of this project is to develop a feasibility study to determine the effective deployment of simulation-based training, evaluation and re-certification model project in enhancing training effectiveness, and continuing education for the Class A Certified Driver License (CDL). This project is designed to decrease accidents, improve highway safety and enhance training effectiveness, and improve re-certification activities.

Rapid-Setting Controlled Low-Strength Material for Routine and Emergency Rehabilitation of Transportation Facilities

R-03-UTC-Material-USC-01

Principal Investigator: Dr. Charles Pierce, Civil and Environmental Engineering, University of South Carolina

Co-Principal Investigator: Dr. Stanley Ihekweazu, Department of Civil and Mechanical Engineering Technology, SCSU

Project Abstract: This project is entitled "A Rapid-Setting Controlled Low-Strength Material

for Routine and Emergency Rehabilitation of Transportation Facilities." Dr. Charles Pierce of the University of South Carolina and Dr. Stanley lhekweazu of South Carolina State University are the principal investigators. Two students, one from USC and one from SCSU, will be integral to the success of the project because the work is highly experimental. In this study, a series of laboratory experiments will be conducted to investigate the influence of different accelerating admixtures on controlled low-strength materials. Such materials are commonly referred to as flowable fills and are often mixtures of cement, fly ash, sand, and water. The proportions of these ingredients are designed in such a way to produce a very flowable material that sets and hardens to strengths higher than compacted earth but lower than concrete. The high flowability and low-strength make this a unique building material that is rapidly gaining more attention and use in transportation construction and maintenance. By adding chemical admixtures, it is proposed that the setting time can be reduced to two hours or less, and that the early strengths (at 24 hours, for example) can be substantially increased. Development of this material would lead to a significant change in how controlled low-strength materials are applied in civil works. To initiate such a change, the investigators intend to publish their findings in research journals, present at American Concrete Institute and Transportation Research Board meetings, and arrange for a special meeting with the South Carolina Department of Transportation. All research started in prior grant years are completed.

An Assessment of Emergency Transportation Management for the Rural Elderly

R-03-UTC-EMGMGT-SW-02

Principal Investigator: Dr. Eva Njoku, Department of Social Work, SCSU

Co-Principal Investigator: Dr. Innocent Nkwocha, Visiting Assistant Professor, School of Business

Project Abstract: The proposal is to identify what emergency transportation management system (s) exist to assist in the evacuation of special needs groups in the rural areas should an environmental disaster or terrorist act occur in South Carolina. The special needs groups include the elderly (65 and over), persons living alone, and persons unable to drive or those without personal transportation. The study will target a sample of ten counties in the state that have an elderly special needs population of 40% or more. The study will use secondary data on statistics and demographic information; other methods include survey and face-to-face interviews for data collection.

The data analysis will use standard quantitative methods with demographic data and descriptive statistics, frequency distributions, and some correlation analysis of qualitative and survey data.

Inlet/Outlet Manifold Design Improvements for PEM Fuel Cell Performance

R-03-UTC-FUEL4-IET-04

Principal Investigator: Dr. Hamid Naseri-Neshat, Department of Civil and Mechanical Engineering, SCSU

Project Abstract: A three-dimensional triple pass PEMFC model will be developed with different inlet and outlet configurations for a 25-cm^2 membrane area. The model will include the anode and cathode flow channels, diffusion layers, and the membrane. A 4.472-cm by 4.472-cm sub-gasket will be included on the membrane for case I, which reduces the active membrane area to 20-cm^2. Cell performance with and without the sub-gasket will be

investigated. Numerical prediction of PEMFC behavior will show the effects of different inlet and outlet manifold designs in its performance (total current produced) when the cell is operating under several loading conditions. The numerical results for four inlet and outlet design configurations will include polarization curves that show the relationship between cell voltage and current for four loading conditions. The predictions will be compared to the available data to verify and test the model parameters and the model itself. In the cell, the reacting gases (water vapor and hydrogen gas in the anode side and water vapor along with air in the cathode side) are supplied into serpentine channels and gas diffusion layers on both sides of the membrane. Interaction of Hydrogen and Oxygen gases across the membrane, and also the conversion of water vapor into liquid, and vise versa, is also modeled within the cell. The numerical model will incorporate all previous experimental parameters available for the diffusion layers on the anode and cathodes sides of the membrane. It is anticipated that the results of this investigation will give guidance in the design of fuel cells built for transportation applications.

Isolating and Managing the Urban Island Effects for Selected Southeastern Cities

R-03-UTC-HeatIsland-MAT-01

Principal Investigator: Mrs. Cynthia T. Davis, Department of Math and Computer Science, SCSU

Co-Principal Investigator: Dr. Vereda King, North Carolina A & T University

Project Abstract: It has been known for some time that cities are generally warmer than the surrounding, more rural areas. Because of this relative warmth, a city may be referred to as an urban heat island. Journal and newspaper articles have highlighted the interaction between air quality, energy, toxic issues, and transportation infrastructures. Heat islands are formed when pavement, buildings, transportation infrastructure, and other structures necessary to accommodate growing populations replace vegetation. These surfaces absorb, rather than reflect, the sun's heat, causing surface temperatures and overall ambient temperatures rise. As temperatures increase due to the heat island effect, more electricity is required for indoor air conditioning and other cooling purposes. Greenhouse gases increase as fossil fuels are burned to produce this cooling energy ozone. By implementing heat island reduction measures, we can have more efficient and sustainable highway management as well as a reduction in the electricity demand and climate-altering emissions.

The specific objectives of this study are to: (1) analyze the highway infrastructure in selected urban southeastern states; (2) isolate the role of the highway infrastructure in the heat island effect; (3) create proactive solutions for these urban areas, which will lead to improved management for new and existing highways; and (4) use the findings of this study as the foundation for an interdisciplinary senior seminar course for related majors including transportation, economics, and engineering.

South Carolina's Rural Labor Market and its Dependence on Public Transportation

R-03-UTC-RURAL-MAT-01

Principal Investigator: Mr. Sam McDonald, Department of Math and Computer Science, SCSU

Co-Principal Investigators: Dr. Jochen Albrecht, Department of Geology, University of Maryland and Vinesh Gupta, Department of Geology, University of Maryland

Project Abstract: Rural South Carolina is undergoing significant demographic and economic changes, which, in concert with new transportation technologies, give potential rise to new opportunities for rural transportation systems. The research proposed here will identify those areas that have the highest likelihood for viable rural public transport. This is seen as a key determinant for promoting sustainable economic growth in South Carolina, beyond traditional tourist and metropolitan areas. Building upon the expertise of three complementary researchers, this project combines transportation geography, economics, statistics, and the latest geo-spatial information technology to inform local and regional decision makers throughout rural South Carolina. In the course of this project, UTC research students will acquire a range of new skills, while the center itself will become the host of a GIS-based repository of raw data and derived analyses.

Investigation of Bridge Abutment Scour

R-03-UTC-BRIDGE-Abutment-SETS-01

Principal Investigator: Dr. Abdul Malek Miah, Department of Industrial and Electrical Engineering Tech., SCSU

Co-Principal Investigator: Dr. Jasim Imran, Environmental Engineering, University of South Carolina

Project Abstract: During the last 30 years, more than 1,000 bridges have failed and 60% of those failures are due to scour around abutments and piers. The existing guideline for predicting abutment scour gives an
unrealistic estimate of scour depth especially for bridges founded on cohesive soil. A significant number of bridge crossings in South Carolina are founded on cohesive soil. Yet very little 0 research has been done on pier or abutment scour in cohesive soils.

Current research efforts at the University of South Carolina (USC) have led to the successful development of a new methodology for scour prediction around bridge piers in cohesive soil. The proposed research will extend the methodology to abutment scour. This research will allow bridge engineers to properly estimate scour depth around abutments and develop cost effective and safe designs of new bridges. The study will combine advanced numerical modeling, experimental study, and traditional scour evaluation techniques. This is a joint
project between USC and South Carolina State University (SCSU). It involves one PT and one female graduate student from USC, and one P1 and one female African American undergraduate student from SCSU. The methodology developed will be made available to SCDOT and FHWA engineers. The results will be presented at the Transportation Research Board Annual Meeting. The proposed research will improve passenger safety on the existing South Carolina bridge crossings by providing advanced warning on potential degradation of bridge alignment and bridge failure due to abutment scour.

Risk Management of Hazardous Materials Transportation in South Carolina: An Action Plan

R-02-UTC-HAZMAT-CET-02

Principal Investigator: Dr. Clarence Hill, Director JECUTC

Co-Principal Investigator: Dr. Tom Whitney, Interim-Chair, Department of Civil and Mechanical Engineering Technology, SCSU

Project Abstract: The purpose of this study is: 1) to identify the underserved segment of the population in Orangeburg County; 2) to determine the level of transportation services needed as a result of sprawl development.

Survey results, U. S. census data, state statistical records and local county records clearly indicated that Orangeburg County has increased its population by 21.5% between 1970 and 1990. Further review of local county documents indicates that the number of building, residential, commercial, and industrial permits has nearly doubled in the last ten years. As a result of these factors, an increased number of residents are settling in
suburban areas that create significant distances between home, work, and basic human service centers. The distances directly impact transportation, individual mobility, as well as access to transportation services in any given location.

A Feasibility Study to Determine the Effective Deployment of Simulation Training to Enhance CDL Class A Training and Re-Certification in Order to Reduce Accidents and Improve Highway Safety

R-04-UTC-A Feasibility Study-UTC-01

Principal Investigator: Mr. Lamar Tisdale, JECUTC

Co-Principal Investigator: Dr. Jack Selter, Center for Advanced Transportation System Simulation, and Mr. Ron Tarr, Center for Advanced Transportation System Simulation, University of Central Florida

Project Abstract: The U.S. Department of Transportation, Federal Motor Carrier Safety Administration (FMCSA), South Carolina Department of Public Safety, State Transport Police, and the South Carolina Department of Transportation have all identified safety and enhanced operator performance of heavy trucks as major goals in addressing intermodal transportation requirements of the State and nation. State FMCSA representatives and the South Carolina Department of Motor Vehicles are working diligently to address the issues of safety on South Carolina roads through better practices of strengthening and enforcing standards and certification of CDL training. Likewise, the American Trucking Association, Truckload Carriers Association and the South Carolina Trucking Association are equally concerned with issues of safety and driver training and the operational performance of drivers. Clearly, driver selection and training, recertification, safety, security, and accident reduction are priority concerns in the entire trucking community. These concerns have also been expressed by the transit and motor coach industry as well. The objective of this project is to develop a feasibility study to determine the effective deployment of simulation-based training, evaluation and re-certification model project in enhancing training effectiveness, and continuing education for the Class A Certified Driver License (CDL). This project is designed to decrease accidents, improve highway safety and enhance training effectiveness, and improve re-certification activities.

Rapid-Setting Controlled Low-Strength Material for Routine and Emergency Rehabilitation of Transportation Facilities

R-03-UTC-Material-USC-01

Principal Investigator: Dr. Charles Pierce, Civil and Environmental Engineering, University of South Carolina

Co-Principal Investigator: Dr. Stanley Ihekweazu, Department of Civil and Mechanical Engineering Technology, SCSU

Project Abstract: This project is entitled "A Rapid-Setting Controlled Low-Strength Material for Routine and Emergency Rehabilitation of Transportation Facilities." Dr. Charles Pierce of the University of South Carolina and Dr. Stanley lhekweazu of South Carolina State University are the principal investigators. Two students, one from USC and one from SCSU, will be integral to the success of the project because the work is highly experimental. In this study, a series of laboratory experiments will be conducted to investigate the influence of different accelerating admixtures on controlled low-strength materials. Such materials are commonly referred to as flowable fills and are often mixtures of cement, fly ash, sand, and water. The proportions of these ingredients are designed in such a way to produce a very flowable material that sets and hardens to strengths higher than compacted earth but lower than concrete. The high flowability and low-strength make this a unique building material that is rapidly gaining more attention and use in transportation construction and maintenance. By adding chemical admixtures, it is proposed that the setting time can be reduced to two hours or less, and that the early strengths (at 24 hours, for example) can be substantially increased. Development of this material would lead to a significant change in how controlled low-strength materials are applied in civil works. To initiate such a change, the investigators intend to publish their findings in research journals, present at American Concrete Institute and Transportation Research Board meetings, and arrange for a special meeting with the South Carolina Department of Transportation. All research started in prior grant years are completed.

An Assessment of Emergency Transportation Management for the Rural Elderly

R-03-UTC-EMGMGT-SW-02

Principal Investigator: Dr. Eva Njoku, Department of Social Work, SCSU

Co-Principal Investigator: Dr. Innocent Nkwocha, Visiting Assistant Professor, School of Business

Project Abstract: The proposal is to identify what emergency transportation management system (s) exist to assist in the evacuation of special needs groups in the rural areas should an environmental disaster or terrorist act occur in South Carolina. The special needs groups include the elderly (65 and over), persons living alone, and persons unable to drive or those without personal transportation. The study will target a sample of ten counties in the state that have an elderly special needs population of 40% or more. The study will use secondary data on statistics and demographic information; other methods include survey and face-to-face interviews for data collection.

The data analysis will use standard quantitative methods with demographic data and descriptive statistics, frequency distributions, and some correlation analysis of qualitative and survey data.

Inlet/Outlet Manifold Design Improvements for PEM Fuel Cell Performance

R-03-UTC-FUEL4-IET-04

Principal Investigator: Dr. Hamid Naseri-Neshat, Department of Civil and Mechanical Engineering, SCSU

Project Abstract: A three-dimensional triple pass PEMFC model will be developed with different inlet and outlet configurations for a 25-cm^2 membrane area. The model will include the anode and cathode flow channels, diffusion layers, and the membrane. A 4.472-cm by 4.472-cm sub-gasket will be included on the membrane for case I, which reduces the active membrane area to 20-cm^2. Cell performance with and without the sub-gasket will be investigated. Numerical prediction of PEMFC behavior will show the effects of different inlet and outlet manifold designs in its performance (total current produced) when the cell is operating under several loading conditions. The numerical results for four inlet and outlet design configurations will include polarization curves that show the relationship between cell voltage and current for four loading conditions. The predictions will be compared to the available data to verify and test the model parameters and the model itself. In the cell, the reacting gases (water vapor and hydrogen gas in the anode side and water vapor along with air in the cathode side) are supplied into serpentine channels and gas diffusion layers on both sides of the membrane. Interaction of Hydrogen and Oxygen gases across the membrane, and also the conversion of water vapor into liquid, and vise versa, is also modeled within the cell. The numerical model will incorporate all previous experimental parameters available for the diffusion layers on the anode and cathodes sides of the membrane. It is anticipated that the results of this investigation will give guidance in the design of fuel cells built for transportation applications.

Isolating and Managing the Urban Island Effects for Selected Southeastern Cities

R-03-UTC-HeatIsland-MAT-01

Principal Investigator: Mrs. Cynthia T. Davis, Department of Math and Computer Science, SCSU

Co-Principal Investigator: Dr. Vereda King, North Carolina A & T University

Project Abstract: It has been known for some time that cities are generally warmer than the surrounding, more rural areas. Because of this relative warmth, a city may be referred to as an urban heat island. Journal and newspaper articles have highlighted the interaction between air quality, energy, toxic issues, and transportation infrastructures. Heat islands are formed when pavement, buildings, transportation infrastructure, and other structures necessary to accommodate growing populations replace vegetation. These surfaces absorb, rather than reflect, the sun's heat, causing surface temperatures and overall ambient temperatures rise. As temperatures increase due to the heat island effect, more electricity is required for indoor air conditioning and other cooling purposes. Greenhouse gases increase as fossil fuels are burned to produce this cooling energy ozone. By implementing heat island reduction measures, we can have more efficient and sustainable highway management as well as a reduction in the electricity demand and climate-altering emissions.

The specific objectives of this study are to: (1) analyze the highway infrastructure in selected urban southeastern states; (2) isolate the role of the highway infrastructure in the heat island effect; (3) create proactive solutions for these urban areas, which will lead to improved management for new and existing highways; and (4) use the findings of this study as the foundation for an interdisciplinary senior seminar course for related majors including transportation, economics, and engineering.

South Carolina's Rural Labor Market and its Dependence on Public Transportation

R-03-UTC-RURAL-MAT-01

Principal Investigator: Mr. Sam McDonald, Department of Math and Computer Science, SCSU

Co-Principal Investigators: Dr. Jochen Albrecht, Department of Geology, University of Maryland and Vinesh Gupta, Department of Geology, University of Maryland

Project Abstract: Rural South Carolina is undergoing significant demographic and economic changes, which, in concert with new transportation technologies, give potential rise to new opportunities for rural transportation systems. The research proposed here will identify those areas that have the highest likelihood for viable rural public transport. This is seen as a key determinant for promoting sustainable economic growth in South Carolina, beyond traditional tourist and metropolitan areas. Building upon the expertise of three complementary researchers, this project combines transportation geography, economics, statistics, and the latest geo-spatial information technology to inform local and regional decision makers throughout rural South Carolina. In the course of this project, UTC research students will acquire a range of new skills, while the center itself will become the host of a GIS-based repository of raw data and derived analyses.

Investigation of Bridge Abutment Scour

R-03-UTC-BRIDGE-Abutment-SETS-01

Principal Investigator: Dr. Abdul Malek Miah, Department of Industrial and Electrical Engineering Tech., SCSU

Co-Principal Investigator: Dr. Jasim Imran, Environmental Engineering, University of South Carolina

Project Abstract: During the last 30 years, more than 1,000 bridges have failed and 60% of those failures are due to scour around abutments and piers. The existing guideline for predicting abutment scour gives an unrealistic estimate of scour depth especially for bridges founded on cohesive soil. A significant number of bridge crossings in South Carolina are founded on cohesive soil. Yet very little research has been done on pier or abutment scour in cohesive soils. Current research efforts at the University of South Carolina (USC) have led to the successful development of a new methodology for scour prediction around bridge piers in cohesive soil. The proposed research will extend the methodology to abutment scour. This research will allow bridge engineers to properly estimate scour depth around abutments and develop cost effective and safe designs of new bridges. The study will combine advanced numerical modeling, experimental study, and traditional scour evaluation techniques. This is a joint project between USC and South Carolina State University (SCSU). It involves one PT and one female graduate student from USC, and one P1 and one female African American undergraduate student from SCSU. The methodology developed will be made available to SCDOT and FHWA engineers.

The results will be presented at the Transportation Research Board Annual Meeting. The proposed research will improve passenger safety on the existing South Carolina bridge crossings by providing advanced warning on potential degradation of bridge alignment and bridge failure due to abutment scour.

2002-2003

An Evaluation of Strength Change on Subgrade Soils Stabilized with an Enzyme Catalyst Solution Using CBR and SSG Comparisons

R-03-UTC-ALTERPAVE-GEO-01

Principal Investigator: Andrew Tolleson, ME, PE

Co-Principal Investigators: Elahe Mahdavian, Ph.D.

Project Abstract: A laboratory bench scale testing program was conducted to evaluate the effectiveness of enzyme treatment on subgrade soil. The objective of this testing program was to study the potential applicability of the tested enzyme for unpaved road in-situ stabilization. The effectiveness of enzyme treatment was evaluated on the basis of statistical measurement of change in CBR strength, soil stiffness, and soil modulus. Sample preparation was achieved by a controlled mixture of a liquid/aqueous enzyme solution with a series of selected subgrade samples exhibiting a wide range of grain size distributions and plasticity characteristics. The laboratory mixing process was conducted in a manner to simulate field paving operations. Standard density and optimum moisture content was established for each sample via AASHTO T-99 criteria. All laboratory work was performed under controlled conditions in an AASHTO certified laboratory. The soil specimens were subjected to the California Bearing Ratio (i.e. CBR per AASHTO T-193) test, and the stiffness and modulus of the specimen were measured by means of the Humboldt Soil Stiffness GeoGauge (Humboldt model H-4140). Analysis of the test results for the treated and control specimens for each soil sample were conducted and a comparison of the test results was correlated. Based on a population size of 5, the strength change under the soaked condition ranged from negligible change for the samples with high fines content up to 140% strength gain for the soil sample with approximately 30% fines. The average strength gain was approximately 52% with a standard deviation of 58%. The test results for the subgrade soil samples tested under both dry and soaked CBR conditions indicated a greater average strength gain as a result of enzyme treatment under the dry condition compared to the average strength gain under the soaked condition. However, based on the combined strength indices (i.e. CBR, and SSG) only 30% of the dry samples gained more than 20% strength while 80% of the soaked samples gained more than 20% strength as a result of treatment. Nearly 45% of the CBR tests conducted failed to give conclusive results on the effectiveness of enzyme treatment largely due to surface disturbance inherent in the soaked CBR procedure. It was concluded that the CBR test appeared to be a relatively poor indicator of direct soil strength for the testing conditions in this research. Notwithstanding, the test results showed CBR strength gain, and to a lesser degree strength gain measured by means of the SSG equipment resulting from the application of the enzyme solution on most soils tested, indicating a promising potential for subgrade stabilization using the enzyme solution. However, additional testing to determine the effectiveness of the enzyme solution should be conducted using field non-destructive techniques such as FWD or other direct strength methods.

Designing Fuel Cells for Improved Transportation Safety and Security

R-02-UTC-FUEL-CET-04

Principal Investigator: Dr. Hamid Naseri-Neshat

Project Abstract: Proton exchange membrane fuel cell (PEMFC) is one of the most promising candidates as a power source for electric vehicles and on-site power plants, because of its high power densities and energy conversion efficiencies at relatively low temperatures. The hydrogen rich fuel, approximately 40% H_2, 43% N_2, and 17% CO_2, contains anywhere from 5 ppm to 1% CO in the stream. Although Pt has been proven to be the most effective catalyst for the hydrogen oxidation, even fewer parts per million of CO produces a substantial degradation of the fuel cell performance with this catalyst. This performance degradation is associated with a CO adsorption on the Pt catalyst. Fuel cell companies are actively researching the effects of reformate on fuel cell performance. The focus of this study is to develop design techniques, mathematical models, and experimental data that aid in the proper design of PEMFCs. Experimental and numerical investigations of effects of reformate on the performance of the PEMFCs should be of assistance to fuel cell manufacturers, and in particular the transportation applications.

Both the experimental and numerical results corroborate decreased current density production of about 20% to 30% due to the presence of reformate. In general, higher current density regions are attributed to the migration of water vapor from the anode to cathode side. In the inlet region of the membrane, the effect of electro-osmotic drag is more predominant; however, the back diffusion becomes more important in the
outlet region of the membrane. Decreasing concentration of hydrogen in anode stream reduces the PEMFC performance due to kinetic over potential changes and increased anode flooding.

Feasibility Study of an On-Board Traffic Problem Notification System

R-02-UTC-ONBOARD-IET-01

Principal Investigator: Dr. Hasanul Basher

Co-Principal Investigators: Dr. Stéphane Guillard

The purpose of the project was to determine the feasibility of developing an Intelligent Traffic System (ITS) capable of delivering en-route guidance to drivers through on-board navigation units. Such en-route traffic information relay systems provide dynamic route guidance and advice based on general warnings about traffic incidents, inclement weather patterns, and traffic congestion problems.

Relaying traffic information to driver's en-route is part of a larger body of research and development known as Intelligent Transportation Systems (ITS). ITS brings together Emergency Management Services (EMS), Information Service Providers (ISPs), Electronic Toll and Traffic Management (ETTM) systems, roadside beacons, communication systems, and "wired" vehicles to manage vehicle fleets, avoid collisions, automate vehicle control, track the transportation of weapons and hazardous materials, collect tolls, coordinate transit schedules, and provide driver/traveler information.[1] In a short paper summarizing a global vision for ITS

entitled *Intelligent Transport Systems and the Future*, leading ITS organizations state, "ITS integrates users, transport systems, and vehicles through state-of-the-art information and communications systems . . .[that] deliver fast, accurate, and complete travel information . . .both prior to a trip and as the trip proceeds."[2]

Intelligent Transportation Systems for the Rural Highway System of South Carolina

R-02-ITS-ABSS-01

Principal Investigator: Dr. Clarence W. Hill

Project Abstract: The National Intelligent Transportation Systems (ITS) Architecture was developed for the US Department of Transportation (USDOT) as the framework for implementing modern transportation operations systems.

The National ITS Architecture provides a common structure for the design of intelligent transportation systems. It defines the framework around which different design approaches can be developed, each one specifically tailored to meet specific regional requirements, while maintaining the benefits of a common architecture within current (legacy) and planned systems.

The National Architecture can provide short-term benefits by saving time and money in the development of a project from its inception through its implementation, since it:

1. Correlates requirements and problems to services that must be performed, thus providing trace ability for a
project to overall transportation needs.

2. Illustrates efficiencies that can be gained by eliminating redundant implementations of similar functions.

3. Provides a view into the future to identify services and functionality that may not have been initially considered,
currently needed, or even feasible. This provides a checklist of future capabilities that could be planned for
now in anticipation of future requirements.

This document is used to specify the understanding of requirements between the Stakeholders and SCSU Research Principal Investigators for the purpose of implementing a Rural ITS Solution for the Lower Savannah Region to meet the following objectives: Improve transportation safety and to Improve transportation security. The document is divided into three parts: 1.) Project Objects, 2.) General requirements and constraints, and 3.) Specific requirements and constraints. The National ITS Architecture was developed for the US Department of Transportation (USDOT) as the framework for implementing modern transportation operations systems

Rapid-Setting Controlled Low-Strength Material for Routine and Emergency Rehabilitation of Transportation Facilities

R-03-UTC-Material-USC-01

Principal Investigator: Dr. Charles Pierce, Civil and Environmental Engineering, University of South Carolina

Co-Principal Investigator: Dr. Stanley Ihekweazu, Department of Civil and Mechanical Engineering Technology, SCSU

Project Abstract: In this study, a series of laboratory experiments was conducted to investigate the influence of different accelerating admixtures on controlled low-strength materials. Such materials are commonly referred to as flowable fills and are often mixtures of cement, fly ash, sand, and water. The proportions of these ingredients were designed in such a way to produce a very flowable material that sets and hardens to strengths higher than compacted earth but lower than concrete. The high flowability and low-strength make this a unique building material that was rapidly gaining more attention and use in transportation construction and maintenance. By adding chemical admixtures, it was proposed that the setting time could reduce to two hours or less, and that the early strengths (at 24 hours, for example) can be substantially increased. Development of this material would lead to a significant change in how controlled low-strength materials are applied in civil works. To initiate such a change, the investigators intend to publish their findings in research journals, present at American Concrete Institute and Transportation Research Board meetings, and arrange for a special meeting with the South Carolina Department of Transportation.

Risk Management of Hazardous Materials Transportation in South Carolina: An Action Plan

R-02-UTC-HAZMAT-CET-02

Principal Investigator: Dr. Clarence W. Hill

Co-Principal Investigators: Dr. Tom Whitney

Project Abstract: The Nation has entered a new era of security awareness since September 11, 2001, and nowhere is that felt more strongly than in the field of transportation, from aviation to railways, highways, pipelines, and waterways. Efforts are currently underway to address hazardous materials transportation safety and security. In the wrong hands, hazardous materials can pose a significant security threat, and the security of hazardous materials in the transportation environment poses unique challenges as compared to security at fixed facilities.

The purpose of this project was to assist the South Carolina State University Transport Police to initiate the development of a statewide Hazardous Materials Transportation Risk Management Plan. An operational framework was needed within which hazardous materials (HAZMAT) transportation risks could be assessed, management of these risks could be evaluated, and resources could be focused on the most serious potential problems. A means to monitor the process and measure its effectiveness was also required.

Long before September 11, 2001, the South Carolina Department of Public Safety's Transport Police had recognized the necessity for improved efforts to promote safety and limit the risks resulting from the increasing flow of hazardous materials within and throughout the state.

Increased regulatory demands coupled with limited resources dictated that more efficient and effective methods were necessary. In the wake of September 11th and with a national concern about terrorist threats, attention also had to be directed at hazardous materials ***security*** as well as safety. South Carolina, like most states, has many organizations and agencies involved in these issues. Improving coordination among them had been an important objective from the outset, but became an imperative after September 11, 2001. The intent of this project was to devise a system or process that would incorporate all affected parties in an effort to better identify HAZMAT transportation risks, develop strategies for risk reduction, and promote broad coordination and cooperation in prevention and protection efforts.

South Carolina East Coast Greenway -Transportation Safety, Route Location and Facility Needs Study

R-02-UTC-GREENWAY-UTC-01

Principal Investigator: Wayne A. Sarasua

Co-Principal Investigators: David B. Clarke, William J. Davis, and James Gordon

Project Abstract: The East Coast Greenway is a multi-modal transportation corridor for cyclists, hikers, and other non-motorized users extending from Maine to Florida. The 230-mile section of greenway extending through the coastal areas of South Carolina is currently under various stages of development and the exact route location is still being determined. The greenway will use a variety of linkages including off-road paths, utility easements, and existing roadways. In creating a continuously linked facility, the greenway will pass through cities, cross existing bridges, and coexist along coastal highways. When non-motorized and motor vehicle traffic operate within the same right-of-way in close proximity to one another, safety is a key concern. This project identifies and addresses concerns of this nature through an evaluation of walk ability and bicycle suitability issues. Project tasks include the collection of transportation data along the length of the
corridor, the analysis of non-motorized mode suitability on a segment by segment basis, the solicitation of stakeholder input and the development of a detailed master plan document useful in facilitating greenway
development, and prioritizing needed improvements and obtaining transportation funding. These efforts should help establish a firm foundation for developing the integrated facilities and linkages needed to showcase the historic and pristine areas of our beautiful state by successfully accommodating the East Coast Greenway within the coastal regions of South Carolina.

Validating and Modifying Highway Accident Prevention System, and Integrating Transportation Safety in Mathematics Program

R-02-UTC-Prevention-MAT-01

Principal Investigator: Dr. Harun K. Adongo

Project Abstract: South Carolina's per mileage death rate in 2000 was 47% higher than the national average, and ranked among the worst 3 states according to the National Highway Traffic Safety Administration and South Carolina Department of Public Safety. Nationally, there were 41,821 deaths while in South Carolina there were 1,065 deaths with 39.6% alcohol related.

The study released this February by the National Center on Addiction and Substance Abuse at

Columbia University indicates that alcohol kills 1,400 college students, injures 500,000, and 2.1 million drive while under the influence of alcohol.

The highway incident management systems currently focus on detecting accidents after they occur, and attempt to minimize response and clearing times. The RiskHAPS attempts to predict, in real time, the potential for an accident occurring using probabilistic models, thus suggesting a preventive measure to avoid the occurrence of the accident. However, as noted by Dr. Veretta Sabb on the quick response travel forecasting techniques, these models are questionable for rural counties in South Carolina.

Our project will attempt to validate and improve the RiskHAPS using data from selected rural areas, and integrate transportation models in advanced mathematics courses. The models are expected to make college students more aware of the connections between theprobabilities of accident occurrence, driver's reaction time, and alcohol impairment, and also expose them to advanced study and career opportunities in the transportation field. This research has two objectives. The first is to validate and modify the Real-Time-Risk-Based Highway Accident Prevention System (RiskHAPS) being developed by the Universities of Connecticut and Vermont, using data from rural areas in South Carolina. The second is to integrate transportation safety models in two mathematics courses; Mathematical models (M407), or Operations Research (M412).

Vehicle Seat Belt Use Among AFDC Families and Their Children in South Carolina

R-02-UTC-SEATBELT-SW-01

Principal Investigator: Dr. Eva M. Njoku LMS

Project Abstract: The purpose of the study was to determine how knowledgeable parents were about the importance of using safety seats for their infants and children and if visual instruction about the dangers of unrestrained children in auto crashes would have any significant impact on the mothers about passenger safety for themselves and their children.

The target population for the study was Aid to Families with Dependent Children (AFDC) mothers in parenting classes in six counties in South Carolina. The parents were attending the classes through the county Department of Social Services. Three counties served as the experimental group who received instruction and saw a videotape regarding crashes with unrestrained passengers including children. The control group was only given instruction without viewing the tape. Both groups were given a survey that provided; (1) demographic information about the participant, (2) the knowledge level of the participants about passenger safety, and (3) their feelings, in general, about using child restraints when traveling.

A total of fifty-three parents were surveyed. The result of the study showed that 95% of the parents who participated in the survey were aware of the importance of safety seat belt use and they use infant and child safety seats for their children. However, some discrepancies occurred when traveling short distances from home and traveling with more than two children. Short distances were defined as traveling one mile or less from home. Parents in the survey were more likely to take risks and not use safety seat belts when traveling "down the road" or "to the store". Also, if they were traveling with more than two children, seating arrangements became difficult and parents had to determine which children, would be restrained. Usually the younger children under two years were most likely to be buckled up; however, very young infants under six months when traveling short distances were preferably held by an adult. Also the study

suggested that most parents found the cost of infant safety seats affordable however, a significant 5% found them unaffordable and difficult to install correctly. Ninety percent (90%) of the parents surveyed identified the most difficult problem for them with infant seats were trying to attend to an infant in the back seat while driving.

2001 – 2002

Calibration and Validation of Quick Response Forecasting Parameters for Cities in Rural Counties in South Carolina

R-01-UTC-CVSC-CU-01

Principal Investigator: Dr. Veretta J. Sabb

Project Abstract: Quick response travel forecasting techniques have been applied extensively since they became prevalent in the late 1970s. These techniques involve using transferable parameters developed from survey and other empirical data to assist transportation planners to model small urban areas greater than 50,000 in population. The usefulness of the quick response techniques and parameters that are currently in wide application are questionable for cities in rural counties because they were not originally designed for use in areas with populations less than 50,000 people. The research described addresses a critical need for planning tools oriented to smaller cities. This project focused on developing transferable travel demand forecasting parameters that target areas of the State of South Carolina having diverse populations and per capita incomes lower than the national average. The findings of this project should allow planners throughout rural areas of South Carolina and similar states to make more reliable estimates of future traffic identified in long range plans. The calibrated parameters should also be useful for cities in other states that have less than a 50,000 population and have similar demographic and socioeconomic characteristics to the cities that were be modeled as part of this research.

The Impact of Public Transit in Curbing Urban Sprawl

R-01-UTC-SPRAWL-CET-01

Principal Investigator: Dr. Thomas Whitney

Co-Principal Investigators: Mr. James Gordon, Orangeburg County Planner

Project Abstract: The State of South Carolina and Orangeburg County have experienced a substantial amount of growth during the past decade from 1990-2000. The State grew in population by 15% from 3,486,703 in 1990 to 4,012,012 in 2000 (US Census 2000)[1]. The county grew by 8% in population from 84,803 in 1990 to 91,582 in 2000 (US Census 2000)[2]. This growth trend has been consistent for both jurisdictions since the early 1900s. The state population was 1,340,316 in 1900 and in 2000 it reached 4,012,012 (US Census 1999-2000)[3]. The same observation can be made about the growth in the county's population. It grew from 59,663 in 1900 to 91,582 in the year 2000 (US Census 2000)[4].

Even though the state and county have shown positive growth over the years, there are two underlying concerns that will be examined through this research project: (1) land use policies (sprawl development) and (2) public transportation needs in Orangeburg County. The primary focus of the research is to review current land use policy in South Carolina and Orangeburg

County and further examine the impact these policies have on the public transportation needs for the county.

A similar research study on "An Investigation of Sprawl Development and Its Effects On Transportation Planning: The Lower Savannah Region" was done by Tom Whitney and James L. Gordon in 2000. However, Land-Use Policy and Sprawl Development will be linked directly to Orangeburg County. The research is designed to prove or reject the null hypothesis that there is a correlation between sprawl development in Orangeburg County and the need for public transportation.

The research methodology for this project allows the research effort to incorporate theoretical and practical techniques into the final analysis. The primary objective is to produce a research project that is accurate and gives a portrait of Orangeburg County and an overview of the public transportation need in Orangeburg County.

Orangeburg County, South Carolina is a rural county according to the United States Census definition. Orangeburg, like other rural counties throughout South Carolina and the nation has not been given ample consideration by the United States or the state of South Carolina for public transportation. Until recently, federal and state transportation policies have revolved around serving the transportation needs of residents in urbanized metropolitan areas. With the US government passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA)[4] and the Transportation Equity Act of the 21st Century (TEA-21)[5], rural public transportation planning was mandated to state and local governments that received federal funds.

Development of a Statewide Hazardous Materials Transportation Management Plan

R-00-UTC-HAZMAT-CET-01

Principal Investigator: Dr. Tom C. Whitney

Co-Principal Investigators: Dr. Clarence W. Hill

Project Abstract: The Nation has entered a new era of security awareness since September 11, 2001, and nowhere is that felt more strongly than in the field of transportation, from aviation to railways, highways, pipelines, and waterways. Efforts are currently underway to address hazardous materials transportation safety and security. In the wrong hands, hazardous materials can pose a significant security threat, and the security of hazardous materials in the transportation environment poses unique challenges as compared to security at fixed facilities. The purpose of this project was to assist the South Carolina State University Transport Police to initiate the development of a statewide Hazardous Materials Transportation Risk Management Plan. An operational framework was needed within which hazardous materials (HAZMAT) transportation risks could be assessed, management of these risks could be evaluated, and resources could be focused on the most serious potential problems. A means to monitor the process and measure its effectiveness was also required.

Long before September 11, 2001, the South Carolina Department of Public Safety's Transport Police had recognized the necessity for improved efforts to promote safety and limit the risks resulting from the increasing flow of hazardous materials within and throughout the state. Increased regulatory demands coupled with limited resources dictated that more efficient and effective methods were necessary. In the wake of September 11th and with a national concern

about terrorist threats, attention also had to be directed to hazardous materials security as well as safety. South Carolina, like most states, has many organizations and agencies involved in these issues. Improving coordination among them had been an important objective from the outset, but became an imperative after September 11, 2001. The intent of this project was to devise a system or process that would incorporate all affected parties in an effort to better identify HAZMAT transportation risks, develop strategies for risk reduction, and promote broad coordination and cooperation in prevention and protection efforts.

2004-2005

Bamberg Community Transportation Initiative

R-05-UTC-Bamberg-UTC-01

Principal Investigator: James Gordon, James E. Clyburn University Transportation Center, SCSU

Co-Principal Investigator: J. Wilbur Cave

Project Abstract: There is a true circle for the problems caused by a lack of transportation. Adults are unable to find work or medical care. Their children are forced to remain at the poverty level and often fail to attain educational achievement. Jobs will not come to the area and residents are forced to leave. The younger generation is not staying in Bamberg County. In fact, Bamberg County lost population in the 2000 Census – not an attractive selling point for industry or for persons locating in Bamberg County. A number of studies have focused on ways to help rebuild economic health and growth in the area. One major need identified is a transportation system for the public and a group of committed local citizens representatives of local service agencies, medical providers, elected officials, and others - began exploring possibilities for meeting community transportation needs. This group has come to be known, informally, as the Bamberg County Community Transportation Committee. It has been determined that two major areas are impacted by the lack of transportation – employment/ economic development and health. Both are major issues in quality of life, both significantly impact the impoverished situation in Bamberg County, and both are costly to the individual and to the public. The county's income level, medical care, and quality of life can increase with a coordinated public transportation system in place. Having a public transit system developed and overseen by local citizens, whose primary purpose is to serve people locally is the next important step to increase the quality of life in Bamberg County.

Lee County Transportation System For Adult Educational Development and Community Services

R-05-UTC-Lee County Transportation

Principal Investigator: James Gordon, James E. Clyburn University Transportation Center, SCSU

Co-Principal Investigator: Frank Garcia, Community Solution; Robin Chisolm, Rural Crossroads Institute

Project Abstract: The Lee County transportation project is designed to assist the rural community in designing a creative and customized community development strategy that will address the workforce and basic skills training needs and provide transportation to the population in need of services. Almost half of the Lee County adult population is at the lowest educational level. There is a high incidence of illness and death in the adult population that is related to preventable health problems. A Community Workforce Center has been established

that offers workforce training, basic education skills, health screening and business development assistance. Lack of public transportation is a major barrier for residents of the County to take advantage of services offered by the Center. An analysis of the adult population will provide information on individuals in need of basic educational level training, workforce training, workforce skills enhancement, and transportation to the Center. Economic development agencies and faith-based groups will cooperate in marketing the Center opportunities to those in need of services. The Santee-Wateree Regional Transit Authority that now serves Lee County will be contracted to provide transportation for Center activities. The project can provide a model for other distressed, least developed and underdeveloped rural counties in SC in identifying workforce and basic skills training, transportation and resources for economic growth.

Lower Savannah Regional Transit Coordination Center Project

R-05-UTC-Lower Savannah-UTC-01

Principal Investigator: James Gordon, James E. Clyburn University Transportation Center, SCSU

Co-Principal Investigator: Ronald G. Humphrey

Project Abstract: The last four years, LSCOG RTMA has steadily progressed towards increasing coordination of transportation services among the autonomous health, human services and public transit systems serving the region. Although we have made many quality of life improvements for our citizens we want to continue towards our vision to be the model for rural transportation for the State of SC and the US. To make our vision a reality LSCOG would like to participate, in coordination with the Southern Rural Transportation Center at South Carolina State University, in the development of a comprehensive research project. The project will focus on three major areas and will lead to the design and implementation of a coordinated transit system for the Lower Savannah Region. The project will be conducted in three phases as follows: Phase 1: Assessment of current transit functions and capabilities in the Lower Savannah Region, Phase 2: Development of a detailed implementation plan for a transit coordination center operated by the Lower Savannah Council of Governments, Phase 3: Project implementation.

2003-2004

Allendale Community Transportation Initiative

R-04-UTC-Allendale-UTC-01

Principal Investigator: James Gordon, James E. Clyburn University Transportation Center, SCSU

Co-Principal Investigator: J. Wilbur Cave.

Project Abstract: It has been determined that two major areas are impacted by the lack of transportation: 1) employment/economic development, and 2) health. Both are major issues in the quality of life, both significantly impact the impoverished situation in Allendale County, South Carolina and both are costly to the individual and to the public. The county's income

level, medical care, and quality of life can increase with a coordinated public transportation system in place. Having a public transit system developed and overseen by local citizens, whose primary purpose is to serve people locally, is the next important step to increase the quality of life in Allendale County. It is envisioned that this project could serve as a model for other small counties in South Carolina. The mission of the project is to demonstrate effective coordination of existing resources from public, not-for-profit, and private service providers. Currently multiple service providers transport their respective riders over the same roads. The project will identify current service routes and place general public customers on existing vehicles. The new coordinated program will find the most efficient way to get riders to their destinations in a safe and timely manner and expand services without increasing costs proportionately. More residents of Allendale County will be able to access transit services. Many of these persons are low income, but may not qualify for agency services. By providing transit through existing vehicles, customers traveling between counties could transfer from one van to another, allowing a local van to better serve its own area. By bringing providers of transportation in an extremely rural area together as partners with technical support and oversight, negative aspects of competition in ridership will be reduced, and the quality and cost-effectiveness of service will be increased.

National Environmental Policy Commission Final Report to the Congressional Black Caucus September 2003 Authored by: The National Environmental Policy Commission

R-03-UTC-MUSC-SC

Principal Investigator: Dr. Clarence W. Hill, Director, JECUTC

Co-Principal Investigator: Mr. David Rivers, Director Public Information and Community Outreach Library Sciences and Informatics, Medical University of South Carolina.

Project Abstract: In order to achieve the identified objectives, the Commission will hold five Listening Sessions in strategic geographic locations around the country participate in a made-for-television dialogue based upon the Commission's findings and develop a final report for submission to the Congressional Black Caucus and other policy makers.

Advanced Learning Technology for School Bus Training Program: Design of a Multi-Level Systematic Program of Training and Certification for Instructors and Managers to Enhance Performance and Safety

R-03-UTC-Advanced Learning-CET-01

Principal Investigator: Mr. Lamar Tisdale, JECUTC

Co-Principal Investigator: Mr. James Gordon, JECUTC

Project Abstract: The South Carolina Department of Transportation and the U.S. Department of Transportation have identified safety as one of the major objectives in addressing the transportation needs across the state and nation. Paramount to this concern is the [challenge of School Bus Programs across the state for which there is neither standardized training nor certification of drivers.

In addition, there is no program for professional development and certification of the supervisors or managers of the various School Bus Programs. The SC Department of Public

Safety and South Carolina Division of Motor Vehicles are working diligently to address the issue of safety on South Carolina's roads by developing and enforcing standards and certification for Commercial Driving Programs. Clearly the issue of safety and the proper training of persons who will be operating a school bus deserve no less emphasis and standardization. The research will establish a multi-level advanced learning technology program, using the latest techniques of instructional design and alternative instructional settings, advanced training program material where possible, and various target audiences to determine the best blend of training techniques. The project will result in a new level of quality training, enhanced performance, and certification resulting in a better understanding across the community, equating to more efficient and safer operators and managers of this critical and complex program. The program will be designed so that a common thread of safety and high quality performance will be integrated throughout, and make use of the latest proven aspects of various training methods, to include workshops, computer based and internet based training, project based learning, and interactive situational training. The program will look for innovative methods of offering non-traditional methods of instruction to accommodate various schedules of different employees as well as candidates for positions. Consideration for identification of mentors will be explored to allow new managers and drivers to have experienced personnel available to assist them as they learn new techniques to improve the way they do their jobs. In all cases, the program objective will be consistently focused on the goals of the overall School Bus Program; to ensure the safest possible environment for children during transit from home to school and back.

A Study to Determine Available Financial Resources for Safety and Transportation Enhancement Grant for Buckley Street at South Carolina State University

R-04-UTC-Buckley Street-UTC-01

Principal Investigator: James Gordon, James E. Clyburn University Transportation Center, SCSU

Co-Principal Investigator: J. William Clark, Orangeburg County Administration.

Project Abstract: Buckley Street is a busy and sometimes congested main artery through the width and breadth of the South Carolina State University campus. This study will seek funding to change the nature of the right-of-way from a typical urban roadway to a safe and usable travel way for all types of transportation use, including pedestrians. On the day of special events, such as football games, conditions are extremely hazardous. The tasks will include: Survey existing infrastructure to show an as-built condition; Prepare schematic design and cost estimate to enable decision makers to reach informed conclusions; prepare and submit application for funding to SC Department of Transportation. An example of this specific study will be used in other studies to show how design can influence safety and beautification on similar thorough-fares. Students and government leaders will be involved to review the schematic designs and give input for the final design. A final report will discuss the safety issues addressed and also a look at the use and convenience provided by this project. This project will build infrastructure at SCSU and provide a safe and attractive environment that will promote intermodalization.

Part C
FINANCIAL STATUS