Cover Photos from NCTIP Research Projects

Left, top to bottom
1. Digital Map Requirements for Automatic Vehicle Location
2. Mobility and the Costs of Congestion in New Jersey
3. Container Port Operations

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1 Transportation Economic and Land Use System (TELUS)
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SUMMARY

SECTION II.A

The planned activities contained in Section II A of the NCTIP Strategic Plan, dated August 20, 1999, and authorized by the U.S. Department of Transportation on September 9, 1999, cover educational program activities. Considering that, of its nature, any changes to an academic program must complete a thoughtful and inclusive process involving many entities within the university, accomplishments thus far have been:

(a) Revise the Existing Graduate Program Curriculum of the Interdisciplinary Program in Transportation to Better Reflect the Center's Theme

As seen below in (b) and (c), two new areas of specialization are being added to the current three areas of specialization: Transportation Engineering, Transportation Planning and Advanced Transportation Systems and Technology. These will broaden the undergraduate disciplines from which students can be attracted into the transportation program and build in greater flexibility by providing a wider range of elective courses.

An assessment of what a well-educated transportation professional should know or be capable of doing is in process as a basis from which to evaluate existing course material and modernize the program to keep pace with technology advances. Where necessary, courses will be restructured, combined, deleted, or added so that the new curriculum can produce better educated professionals, become more interesting to a wider student population, and reinforce NJIT as a leader in training professionals in issues related to transportation and productivity.

Considered in this evaluation is the growth of PC-based information technology in solving transportation problems and the globalization of transportation functions, especially in the private sector, as well as the growing application of the fundamentals of electrical engineering and computer and information science in transportation. NCTIP research projects have already been in the forefront of designing or using this technology so that students participating in the research have an added benefit. Also, NJIT as a university supports advanced computer technology at all levels, and has been named the "most wired" public university in the United States by Yahoo! magazine for the second consecutive year.

(b) Design, develop and implement a new logistics engineering program within the department of Industrial and Manufacturing Engineering (IME);

A Master's degree in Logistics Engineering will be offered as of fall 2000. The process of introducing the new degree is quite complex. The program has been accepted by IME, and accepted by the faculty of the Newark College of Engineering in which the Department is housed. It has passed the NJIT Graduate Council and the Committee on Academic Affairs. The program description has been sent to all College and University Presidents in New Jersey and their opinions have been sought. A consultant has been engaged to evaluate the program. Upon a positive recommendation, the program will be voted on by the whole faculty body of NJIT and approved.
The catalog description of this program is as follows:

"As companies in this era of E-Commerce try to provide better customer service, become more efficient and coordinate the flow of goods produced in multiple facilities world-wide, logistics/supply chain management occupations have become very prominent and are growing in number. The new MS in Logistics program expects to enroll students in fall 2000. It aims to educate professionals to enter or advance in logistics positions in such industries as transportation carriers of all modes, manufacturers, distributors, and chain store retailers.

Individuals with undergraduate degrees in engineering, the sciences or business may apply. The busy water, air, rail, highway intermodal and distribution facilities in northern New Jersey provide an ideal laboratory for the program. This new program has an applied, quantitative and information technology-rich content and focuses not only on the technical aspects of operating the supply chain, but also on the managerial and coalition-building skills needed for partnerships, and the information systems that control the process. Qualified students may continue their studies for the Ph.D. in Transportation or Industrial Development."

(c) Design, develop and implement a transportation/supply chain management focus within the new MBA program in Management of Technology;

A Master's Degree in Management Technology with a transportation/logistics focus has been approved after a process similar to the one outlined above for the IME program in logistics. Courses for this area of concentration include:

Mrkt 632  Marketing Strategy for Technology Based Organizations
Mgmt 710  Business Forecasting Methods
Tran 603  Introduction to Urban Transportation Planning
Tran 740  Management of Transportation Carriers
Tran 765  Multi-Level Freight Transportation System Analysis

(d) Participate in the national UTC student award program;

Lida Mazaheri, who received an M.S. in Transportation in 1998, was named the NCTIP student of the year. Ms. Mazaheri, who will be returning for Ph.D. studies, is described under SUCCESS STORIES.

(e) Carry out the vertical integration of transportation education at NJIT;

NCTIP has begun a relationship with Albert Dorman Honors College. The Honors College exists to help the brightest students achieve their full potential. The current profile of the College is:

Honors Scholars
446 Honors Scholars
Average combined SAT score of over 1300
45% with a GPA over 3.5
25% women
10% from out of state

Honors Freshmen

120 Freshmen enrolled in Fall of 1998
70% ranked in top 10% of their high school class
Over 65% live in the residence halls
14% are enrolled in pre-med/pre-dental programs

If a student has a combined SAT score of 1250 or higher, is in the top fifth of his/her class, and is accepted in Honors, the student will receive a full scholarship package. Those who do not meet all of the criteria can be accepted into Honors if they present otherwise excellent credentials. All who are accepted into the Honors College receive at least a one-half tuition scholarship package at the in-state rate. Some exceptional candidates are eligible for a partial room grant and/or up to $5,000 in additional scholarships. Excellent students from out of state may be offered a presidential scholarship to reduce their tuition to the in-state amount.

Honors Students do significant research on campus and, through internships, at major corporations or medical institutions. With their professors they work on cutting edge projects such as high-speed algorithms, the development of wireless communications and the mathematical modeling of medical processes.

NCTIP has begun to recruit honors students in mostly engineering disciplines to work with faculty carrying out transportation research. The Center provides financial support in form of up to one half tuition and hourly employment. The Center uses the Honors College tuition awards as a match.

(h) Expand the undergraduate offerings in the Civil and Environmental Engineering Department:

A new undergraduate course, tentatively titled "Introduction to Transportation Problems," has been proposed by Drs. Steven Chien and Janice Daniel and is in process. The purpose of this offering is to expand the undergraduate transportation course offerings in the Civil and Environmental Engineering Department.

(h) Establish the Center's advisory board and select an education and training committee.

The NCTIP Advisory Board has been established, and convened for the first time in December 1999. The first meeting was heavily interactive, and therefore, because of time constraints, committee selection was deferred to the following meeting, which will be held in April 2000. Quarterly meetings are planned. Board members are:

Philip Beachem, President
New Jersey Alliance for Action

John F. Betak, President
Collaborative Solutions.
Athanassios K. Bladikas  
Chair, Department of Industrial and Manufacturing Engineering,  
Director, Interdisciplinary Program in Transportation  

Maria P. Boilé, Assistant Professor of Civil and Environmental Engineering  
Lafayette College  

Wayne Bradley, Director of Planning  
North Jersey Transportation Planning Authority  

Michael Brimmer, Regional Vice President  
CSX Corporation  

Lawrence F. Cullari, Jr., Director of Planning  
FHWA  

James C. Cunningham, President  
PTL Truck Lines  

Edward K. Morlok  
UPS Foundation Professor of Transportation and System Engineering  
University of Pennsylvania  

Roger Norittel, Executive Vice President  
Maher Terminals Inc.  

Naomi Rotter  
Professor of Management, NJIT  

John Schuring  
Acting Chair, Department of Civil and Environmental Engineering, NJIT  

Dr. William Van Buskirk, NJIT Provost, attended and gave a university overview at the first meeting. Lazar Spasovic gave an overview and history of NCTIP since its inception and elicited very thoughtful questions, participation and feedback from members.  

**SECTION II.B: HUMAN RESOURCES.**  

(a) Increase student participation.  

A program brochure aimed at part-time Master's students has been designed.  

An ad was placed in New Jersey Business News, a leading journal designed to appeal to professionals considering an MS degree in Transportation. Our enrollment at a satellite campus at NJDOT headquarters in Trenton (60 miles south of Newark) has been shored up and is on the upswing, despite the fact that the hiring rate at NJDOT has not increased, thus the pool of potential applicants in the graduate education is kept steady.  

The Center's web page includes information on courses, scholarships and assistantships as well as research activities and seminars, and points prospective students back to the university page for further information. The NCTIP site has attracted over 2500 hits since January 1999.
Participation is being organized for TransAction 2000, the New Jersey State Transportation Conference, in April 2000. This conference is considered to be a good source for potential Master’s students. A graduate student with past experience with this conference is organizing NCTIP’s involvement. Dr. Janice Daniels will be participating in a panel on women in transportation. See Section H.C.b.

Under the direction of Drs. Chien and Daniels, progress has been made on a nomination procedure for graduate and undergraduate fellowships to be offered by NCTIP to students interested in transportation research.

The NCTIP seminar series is advertised university-wide to both graduate and undergraduate students with encouragement to attend. To enable student participation, seminars are held within the framework of the academic semester. Descriptions of the seminars will be found in SUCCESS STORIES.

Efforts are made to include transportation-related material in each issue of the university’s various newsletters.

(b) Increase faculty participation

Janice Daniel, an Assistant Professor of Civil and Environmental Engineering, has joined the Transportation faculty. See SUCCESS STORIES.

Maria P. Boilé, who received the second Ph.D. in transportation granted at NJIT, has returned as a visiting professor for a year. See SUCCESS STORIES.

Professor One-Jang Jeng, who recently joined the Industrial and Manufacturing Engineering faculty is Principal Investigator for an NJDOT research project, “Reflectorized Delineators at Rail/Highway Grade Crossings.” This study will investigate the problem of train-vehicle collisions which occur at grade crossings where streets run parallel to railroad tracks and motorists make left turns across the tracks.

Professor Jay Meegoda, of the Department of Civil and Environmental Engineering, has been appointed Principal Investigator for another NJDOT project, "Data Research - Materials Laboratory and Information System." This research will design a computerized Laboratory Information System (LIMS), which will reduce paper-workloads significantly and provide the capability to organize relevant data rapidly.

Professor Xutli Chao of the Department of Industrial and Manufacturing Engineering has received an initiation grant "Design and Evaluation of Toll Plaza Systems." This project will study the evaluation of different designs of toll plazas and use it to search for the optimal design, including the number of each type of toll booths, relative position of the toll booths, and how to dynamically change them during the day and the week. It is our expectation that this work will result in a NSF proposal.

A detailed presentation of NCTIP and all of its resources was given to the School of Management Faculty by Dr. Lazar N. Spasovic in December 1999. As a direct result of this presentation, three
faculty members wrote grants for sponsored research. Drs. Hindy Schachter and Naomi Rotter have received awards from NJDOT to study "The Uses of NJDOT Research: Customer Use of Completed Products" and "The Mature Driver: Safety and Mobility Issues," respectively.

Dr. Joseph Wen of the School of Management has started negotiations with the North Jersey Transportation Planning Authority, a local MPO, to help them in the development of an MIS system for capital management.

Dr. Sandra Moore of the New Jersey School of Architecture at NJIT, who has been directing the Abingdon School Program, see SUCCESS STORIES, is now working in conjunction with NCTIP faculty to connect her program to the Garrett A. Morgan guidelines. In what will be a jointly sponsored seminar by NCTIP and the School of Architecture, Dr. Moore has arranged for a nationally prominent architect, Carol R. Johnson, to speak on the topic of 'Landscape Value and Transportation.'

(d) Increase professional community awareness

In support of the Center's continuous visibility, a brochure has been designed to advertise NCTIP's annual National Student Paper Competition, an annual event which solicits papers consistent with the Center's theme of transportation and productivity and awards $1,000 to the winner - see SUCCESS STORIES. This brochure has been mailed to transportation and civil engineering faculty personnel at 800 colleges and universities nationwide. Current information about the competition is featured on the web page, which also lists the names of previous winners. Selection procedures are in place. Information about winners is included in the semi-annual newsletter, as well, and they are invited to suggest local media where information will be sent on request.

One of this year's UTC Student of the Year award winners, Caroline Rodier of the University of California at Davis, won the Student Paper Competition in 1996 for her paper, "A Method of Obtaining Consumer Welfare from Regional Travel Demand Models." She was singled out by NCTIP personnel at the TRB conference and congratulated for both awards.

A 40-page glossy brochure, "Research at NCTIP," has been published. Featuring abstracts of all current and completed research funded by NCTIP since its inception, the brochure also gives 11 pages of representative publications and presentations relating to the research, and lists all participating faculty/principal investigators with title, terminal degree, and areas of interest. Research at NCTIP has been widely distributed since its November 1999 publication, timed to coincide with the NJDOT Research Showcase - See SUCCESS STORIES. It is also being sent to university contacts nationwide, specifically HCB universities.

A presentation was made to the Morris County Leadership program in November 1999 by Dr. Lazar N. Spasovic. Entitled "Critical Transportation Issues and Vision - 2000 to 2020," the presentation's goal was to challenge new leaders in one of New Jersey's most populous county with a variety of modes and pressing public policy issues on the kind of trends and challenges that the program attendees will be facing in their professional careers. The presentation dealt with 1. congestion and its impacts, 2. locational and travel choices of the baby and post-baby boomers, 3. the impact of information technology on transportation, and 4. stable sources of funding for state transportation improvements.
SECTION II. C. DIVERSITY

(a) Expand minority high school students' awareness and interest in transportation careers.

Newark is an urban area with a significant minority population, primarily African American and Latino. In addition to NJIT's many pre-college programs, two programs have provided important transportation-related outreach to local area students:

The 1999 Summer Transportation Institute for High School Students - Greater Newark Area is a continuation of a program that has been directed by Dr. Hal Deutschman of the Department of Civil and Environmental Engineering for many years. (Dr. Deutschman taught some of the original transportation courses at NJIT). The 10th and 11th grade students, equal numbers of boys and girls, are from predominantly African-American and Hispanic backgrounds - See SUCCESS STORIES. Fifty area students completed the 1999 Institute. The program will be continued during the summer 2000.

Dr. Hal Deutschman was recognized by the President of the United States for his many years of mentoring (See SUCCESS STORIES.)

The Gifted and Talented Program - Abington School, Newark, has been an ongoing program for students from one particular school in Newark - see SUCCESS STORIES. Directed by Dr. Sandra Moore of the New Jersey School of Architecture at NJIT, the program will be expanded to include other area schools.

Dr. Athanassios K. Bladikas, director of the Interdisciplinary Program in Transportation and Chair of the Department of Industrial and Mechanical Engineering, has visited high schools in Glen Rock, Mahwah, Bayonne, Union Hill and Plainfield, New Jersey, areas with a wide ethnic mix, including a significant percentage of African-Americans and Hispanics, and differing income levels. With the exception of the first school where individual students came to the guidance office, presentations were made in classrooms. These consisted of briefings about NJIT and what engineering in general is all about, with particular emphasis on transportation and industrial engineering. Three more high schools are scheduled to be visited in April and May of this year, and the program is expected to continue during the next academic year.

Dr. Janice Daniel joined Professor Bladikas in the presentation to students at Plainfield High School, which has a predominantly minority student population and is in an area from which students can easily travel to NJIT by train. Speaking to successive grouped science classes, they presented engineering as a career choice, discussing the field of transportation and other options.

(b) Conduct outreach programs for women

On behalf of NCTIP, Cecilia Kelhofer-Feeley, a graduate of the Master's program in Transportation, who has returned for Ph.D. studies, has been using her experience with transportation professional organizations, both from the student's and the professional's perspective, to reach out to women in transportation. She has discussed the Master's program with individuals and written articles for potential inclusion in organization newsletters.
A article on women’s choice of transportation careers has been published in the Winter 2000 issue of the NCTIP/NJTPA (North Jersey Transportation Planning Authority) “InTransition” magazine. The article gives a positive picture of the challenge and rewards of a transportation career through several life stories of well known and accomplished professionals as well as an up-and-coming NJIT Ph.D. student who is trying to keep motherhood and graduate school in a delicate balance (Ms. Kelnhofer-Feeley). A separate article showcases careers of women professors and students at NJIT. An ad provides additional instructions for students willing to inquire further about the educational programs at NJIT.

Building on the above feature article, NJTPA is hosting a panel at the April 2000 TransAction conference in Atlantic City, NJ on Women in Transportation. Professor Janice Daniel of the Transportation faculty will be a panelist (see Section II.B.a).

Dr. Hindy Lauer Schachter has proposed researching “Gender and Professional Worklife at NJDOT,” with the goal of learning how gender affects the NJDOT workplace, including how professionals perceive gender in the workplace and how these perceptions influence workplace opportunities.

(c) **Conduct outreach programs for African-Americans and Hispanics**

As mentioned above, the greater Newark area has a large African-American and Hispanic population, and members of the faculty have been involved with these students on several levels. Nationwide, HCBUs are specifically targeted in all NCTIP mailings. A proposal is being made to NCTIP by Dr. Sandra Moore to initiate a reciprocal relationship with North Carolina A&T University.

Outreach at the elementary and high school levels is discussed in section II.C.a., above.

An NCTIP logo design contest (see Section II.F.a) was held university-wide, requiring participating students to study the NCTIP web site. Several of the undergraduates that responded were African-American and Hispanic. The runner-up in this contest was an African-American woman from the School of Architecture.

**II. D. RESEARCH SELECTION**

(a) **Establish research topic selection procedures**

Dr. Naomi Rotter has undertaken an effort to design a Research Topic Selection Procedure. The first task in this process involved a survey of UTC Center directors via e-mail to investigate procedures that exist at other sister institutions/Centers. The effort is continuing. A procedure should be in place in time for the final report.

(b) **Establish faculty outreach procedures**

See II.B (b) for the December 1999 presentation to the School of Management faculty.
(c) Establish a research and technology transfer subcommittee of the Advisory Board

Because of time limitations, establishment of this committee was briefly discussed at the December 1999 initial meeting of the Advisory Board and tabled until the April 2000 meeting.

(d) Prepare plans for the formal association of the Center with private and public sector entities

Dr. Spasovic has had several meetings with Mike Brimmer, Regional Vice President of CSX, to explore a future relationship between CSX and NJIT. The relationship is developing in a two pronged approach. In the first, CSX will try to match the level of corporate support to NJIT that was established by Conrail, CSX’s predecessor in this region. (CSX and Norfolk Southern purchased Conrail in 1998.)

The second approach is to bring CSX senior level management in various disciplines to explore sponsored research with NCTIP. This effort will start with a visit by Mr. John Orison, VP Network Planning, in April.

NCTIP and NJIT have worked closely with the New Jersey Alliance for Action, a statewide coalition of business and labor organizations, on mobility and the costs of congestion issues as well as public policy issues dealing with securing stable funding for statewide transportation projects.

II.E RESEARCH PERFORMANCE

(a) Conduct research in the freight movement efficiency area

New, ongoing and completed freight movement efficiency research projects are included in the Research Projects section of this report. Two of these projects are featured under Success Stories.

"Container Port Operations," a two-phase research project funded by NCTIP and Maher Terminals, Inc., has produced a technological tool, currently under evaluation, that promises to increase productive use of port facilities to help meet the demands of continued growth in maritime freight volumes. The project has identified advanced algorithms to further enhance the system for scheduling freight handling, transportation, and distribution services to add "virtual capacity" to terminal operations.

"Rail-Track Intermodal Research" was featured in an article that appeared in the January 21 issue of the Journal of Commerce, dealing with the planned consolidation of the drayage industry to unite seven firms with $160 million in total revenue.

(b) Conduct research in the passenger movement efficiency area

New, ongoing and completed passenger movement efficiency research projects are included in the Research Projects section of this report. Two of these projects are featured under Success Stories.
"Mobility and the Costs of Congestion in New Jersey," funded by NCTIP and the Foundation of the New Jersey Alliance for Action, has produced highly significant information in a manner easily interpretable to the general public. Since its release at a mid-March 2000 press conference, this study has been generating wide interest in the media and with state, county and local officials.

"Digital Map Requirements for Automatic Vehicle Location (AVL)" was selected by the USDOT for potential inclusion in its Research and Education Plan. This project, funded by NCTIP and NJ Transit, developed a methodology for testing and evaluating the accuracies of an AVL system and supporting digital maps.

(c) Conduct research in the facility, institutional and regulatory efficiency area

New, ongoing and completed facility, institutional and regulatory efficiency research projects are included in the Research Projects section of this report. One of these projects is featured under Success Stories.

"ProMPTS - The Research Project Management and Progress Tracking System," funded by NCTIP and NJDOT, has created a user-friendly data management and tracking environment for NJDOT's Division of Research and Technology. It provides a well-organized relational database that includes processed research project information which can be incorporated into the NJDOT internet information system and be viewed by the public.

(e) Implement a research program monitoring system

The first phase in a monitoring system has been designed and is in place for in-house tracking of all NCTIP research projects. Project reports may be e-mailed to appropriate monitors directly from the database and saved as HTML documents for web use.

(f) Implement a research program impact evaluation system

Among the several research ideas that have been submitted to NJDOT by Hindy L. Schachter in the last month is one in which she proposes to extend her project, "The Uses of State DOT Research: Customer Use of Completed Projects from NJDOT's Research Bureau," to studying a comparison of how other state transportation agencies handle similar issues.

II.F TECHNOLOGY TRANSFER

(a) Establish the framework and supporting procedures needed to carry out the Center's Technology Transfer Activities

To support the extensive use of media for technology transfer, including web site abilities and state-of-the-art desk top publishing, a new Micron computer system has been ordered and is in process. Details will be completed in the Annual Report.

Software packages have been updated for web interface and for adaptability to the Windows NT
A project database has been designed and is recently in place for all research projects. Information on each project, as required by USDOT and NJDOT is being entered. The program will allow reports to be published on the web site and to be e-mailed as appropriate. The newly initiated projects included in the Appendix are the first products of this database. In the near future, Quarterly reports will be able to be entered university-wide by project PIs.

A new mailing list database (currently over 5000 names) is being designed to be accessible through the web for updating and input.

(b) Initiate a series of seminars

As noted in Section II.B., NCTIP’s longstanding series of seminars has continued. Following is a list of presentors and brief descriptions of the featured topics during this reporting period:

November 18, 1999
Modeling and Solving Real-World Truck Routing Problems
Zhi-Long Chen, Department of Systems Engineering, University of Pennsylvania
On-time delivery of orders to customers is critical for customer satisfaction and vehicle routing plays a central role in achieving this. In the past four decades, an enormous amount of research has been done in the vehicle routing area, but, unfortunately, most of the routing models studied oversimplify what occurs in the real world. In an example, the U.S. Department of Transportation has specific rules for drivers of commercial carriers to follow when making a trip, but no existing models explicitly incorporate these rules in constructing vehicle trips. Also, in practical distribution operations, some orders (e.g., food) must not be shipped together with other orders (e.g., chemical products), and most locations have multiple time windows (e.g., Monday 9 a.m.-5 p.m - Friday 9 a.m.-5 p.m). However, almost no existing models consider such compatibility and multiple time windows. In this talk Dr. Chen presented a practical routing model which is motivated by the actual problems encountered in the distribution operations of several companies he is currently working with. He highlighted several key realistic issues that have not been addressed in the vehicle routing literature. The resulting problem is far more difficult than all existing routing problems. To solve this complex problem, a hybrid solution approach which combines the column generation framework with fast heuristics was proposed.

December 9, 1999
Quantifying The Bullwhip Effect in Simple Supply Chain: The Impact of Forecasting Lead Times and Information
David Simchi-Levi, Department of Industrial Engineering and Management Sciences, Northwestern University
In recent years many suppliers and retailers have observed that while customer demand for specific products may remain relatively consistent, distributor orders placed to factories fluctuated more than retail sales. In addition, manufacturer orders to suppliers fluctuated even more. This increase in demand variability as one moves up in the supply chain is referred to as the bullwhip effect. Identifying techniques and tools that allow for control of the bullwhip effect, that is, for control of the increase in variability in the supply chain, is important. Quantifying this effect would
be useful not only to demonstrate the magnitude of the increase in variability, but also to show the relationship between the forecasting technique, the lead time, and the increase in variability. In this seminar, the effect for simple, two-stage supply, consisting of a single retailer and a single manufacturer, was be quantified. The model presented included two of the factors commonly assumed to cause the bullwhip effect: demand forecasting and order lead times. Dr. Simchi-Levi extended these results to multiple stage supply chains with and without centralized customer demand information and demonstrated that the bullwhip effect can be reduced, but not completely eliminated, by centralizing demand information. Finally, he demonstrated how these results have been applied to reduce cost and improve the service level in real world supply chains.

January 28, 2000
CORSIM: A State-of-the-Best Practice for Traffic Analysis
Dr. Henry Lieu, Highway Research Engineer, Federal Highway Administration
Recognizing a strong demand for powerful tools to address complex issues on traffic operations and roadway design, the Federal Highway Administration has developed CORSIM (Corridor Simulation) by integrating the existing NETSIM (Network Simulation) and FRESIM (Freeway Simulation) models. CORSIM is a microscopic, stochastic traffic simulation model that can realistically represent the real world dynamic traffic environment. It has the most sophisticated car-following and lane-changing logic to simulate vehicle movements on a second-by-second basis. Each vehicle is moved based on dynamic interactions among roadway conditions, traffic control, positions of adjacent vehicles, etc. CORSIM produces a variety of measures of effectiveness for engineers to quantify the traffic network performance, and produces animated graphics allowing the user to "look-and-feel" the simulation results and perform significantly more reviews of outputs in far less time. In turn, this enables effective and efficient application of this powerful tool to a wider range of traffic engineering problems. With these powerful features, CORSIM is capable of providing comprehensive simulation capabilities in the areas of (1) geometric design evaluation, (2) transit operation, (3) sign and signal control at intersections, (4) ramp metering control for freeways, (5) site impact analysis, (6) incident detection, management and control, and (7) assessment of traffic system management strategies. CORSIM brings the real world into the office so that engineers can study problems, try new ideas, evaluate them quantitatively, and identify the best solutions prior to implementation in a cost effective manner.

Two seminars are scheduled for April 2000.

Two seminars are scheduled during April. Seminar information is available on the web at:

(c) Prepare and Distribute newsletters

The current issue of OnRoute is in process. It's lead article will feature the AVL research project (See II.E.b). The previous issue of OnRoute was increased from four to eight pages to more extensively showcase NCTIP research projects. Previous Newsletters are available on the web at http://www.transportation.njit.edu/nctip/newsletters.
(e) Publish InTransition magazine

The two latest issues of this publication are included with this report.

(f) Maintain the Center's home page on WWW.

The Center's home page is continuously being updated and is designed to follow UTC requirements. Several final research reports have been included in PDF format in their entirety, and inquiries are directed to the web page. All possible reports will be added to this site. Project reports as extracted from the new monitoring system will update the current material in the near future.

The "Mobility and the Costs of Congestion in New Jersey" report is currently being featured both on the university's main page (http://www.njit.edu) and the NCTIP site. More than 50 hits were counted on the NCTIP site alone the day after this study was released. As mentioned earlier, over 2500 hits have been counted since January 1999.

(h) Annual report

As noted in section II.B (d), "Research at NCTIP," published in November 1999, features abstracts of all current and completed research funded by NCTIP since its inception, as well as representative publications and presentations relating to the research, and lists all participating faculty/principal investigators. This magazine is intended as an annual report to the transportation industry. A copy of this publication is included with this report.

A second publication, featuring NCTIP/NJDOT research projects, is in process and will be published in time for NJDOT’s designation of October as Research Showcase Month.

(j) Increased visibility

The public issuance of the final report on "Mobility and the Costs of Congestion in New Jersey" by the Foundation for the New Jersey Alliance for Action at a press conference at NJDOT headquarters in Trenton, NJ has produced significant visibility in all media and with state and local officials. As this took place after the end of the reporting period, it will be covered in detail in the final report. See Section II.E. b. and SUCCESS STORIES.

Numerous faculty, students and staff represented NCTIP and NJIT in various capacities at the 79th Annual Transportation Research Board January meeting in Washington, D.C. During the conference, Drs. Spasovic and Daniel met with U.S. Secretary of Transportation Rodney E. Slater - See SUCCESS STORIES.

NCTIP was prominently featured at the New Jersey Department of Transportation's first annual Research Showcase Day held at Rutgers University in Piscataway. The major emphasis of the showcase was to familiarize NJDOT’S customers with the broad range of ongoing research, and to explain the research potential of the universities and their associated groups. It is expected that the 2000 Research Showcase Day will be held at NJIT. See SUCCESS STORIES.
In an issue devoted to transportation, New Jersey Business Magazine featured two articles highlighting NCTIP research projects after lengthy interviews with Dr. Lazar N. Spasovic. The first article was on the Alliance for Action mobility and the costs of congestion study; the second discussed intermodal freight issues - See SUCCESS STORIES.

Combining the Center's desire for an identifying logo with the opportunity to bring transportation as a career to the attention of the undergraduate and graduate student bodies, a university-wide logo design contest was launched in December. The contest, which offered a $500 prize, was advertised on pamphlets throughout the campus, in the two university in-house newsletters, and as a bulletin on all e-mail accounts. Students were referred to the NCTIP web page to study what NCTIP/transportation was all about. All but two entries and inquiries were from non-transportation students, most of them undergraduates. Judgement on winning designs is in process.

In November 1999, the Morris County Leadership forum invited Lazar N. Spasovic to present to its membership. The goal of this presentation was to challenge new leaders in one of New Jersey's most populous counties with a variety of modes and pressing public policy issues - See SUCCESS STORIES.

As noted in section II.B.a., participation is being organized for TransAction 2000, the New Jersey State Transportation Conference, in April 2000. Charts and graphs illustrating the advantages of Masters education and programs available at NJIT will be featured, and a Powerpoint presentation will showcase NCTIP. Brochures on the Interdisciplinary Program in Transportation will be available. Dr. Janice Daniel will participate in a panel on women in transportation, chaired by Arlene Horowitz, editor of InTransition. Ms. Horowitz, of NJTPA, has organized a number of the women featured in the Winter 2000 issue of the magazine.
SUCCESS STORIES

Janice Daniel Joins Transportation Faculty

NCTIP Graduate Returns as Visiting Professor

Greenfeld AVL Research selected for USDOT Research and Education Plan

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Making Room for Even More Precious Cargo
Janice Daniel Joins Transportation Faculty

Dr. Janice Daniel, an Assistant Professor in the Department of Civil and Environmental Engineering, has joined the core transportation faculty at the New Jersey Institute of Technology.

Since her fall, 1999 appointment, Dr. Daniel has been involved in research on Mobility and the Costs of Congestion in New Jersey, and is Principal Investigator for a study on Congestion Strategies for Adaptive Signal Systems. She teaches classes on Highway Characteristics and Capacity and Traffic Control.

Daniel's research interests are traffic engineering and operations, adaptive traffic control systems, and transportation safety. She has been involved with a project on work zone safety and congestion strategies, and has also performed research for the Georgia Department of Transportation on the development of a multimodal transportation planning tool, assessing the air quality impacts of ramp metering and developing speed reduction strategies for highway work zones.

Prior to coming to NJIT, Dr. Daniel was on the faculty at Georgia Institute of Technology in the School of Civil and Environmental Engineering. At Georgia Tech, she was involved in teaching graduate courses in Traffic Engineering, Traffic Flow Theory and Highway Capacity Methods. She has worked for the Port Authority of New York and New Jersey in the Traffic Engineering Division and as a transportation engineer for Philip Habib and Associates, a consulting firm located in New York City. Daniel is a member of the Transportation Research Board's Operational Effects of Geometrics Committee and serves on the arterial and interchange subcommittee for the Highway Capacity and Quality of Service Committee.

Dr. Daniel received her Ph.D. in Civil Engineering from Texas A&M University in 1995, where her dissertation work involved modeling delays for arterial signal systems. She received her M.S. in Transportation Planning and Engineering from Polytechnic University in 1989 and her B.S.E. in Civil Engineering from Princeton University in 1985.

Dr. Daniel has worked aggressively to secure financial support for students, especially women and minorities. Since arriving at NJIT she submitted proposals to the National Science Foundation (NSF) and the Transportation Research Board (TRB). The NSF proposal entitled "Dynamic Flow Control For Urban Freight Movement" deals with the development of a control system for intermodal freight transportation. The TRB's National Cooperative Highway Research Program's proposal entitled "Assessment of Variable Speed Limit Implementation Issues" provides an approach to facilitate the deployment and use of variable speed limits in the United States.
NCTIP Graduate Returns as Visiting Professor

Professor Maria P. Boilé, (Ph.D. 95 Tran.) has joined NJIT as a visiting assistant professor with the department of Industrial and Manufacturing Engineering and the National Center for Transportation and Industrial Productivity as of Spring 00. Prof. Boilé, who is currently on junior faculty leave from Lafayette College where she is an assistant professor of transportation engineering, plans to stay with the Center until the end of year.

Dr. Boilé joined Lafayette College in June of 1995, after receiving her Ph.D. in transportation engineering from NJIT. She holds a Masters Degree in civil and environmental engineering from Rutgers University and a diploma in civil engineering from the National Technical University of Athens.

Prof. Boilé’s major areas of interest are in network optimization, intermodal and multi-modal systems analysis for both passenger and freight transport, public transportation, Intelligent Transportation Systems, Geographic Information Systems applications in transportation, economic and environmental impacts of transportation policies. Her work has been published in leading academic journals and in conference proceedings.

Boilé is a member of the Institute of Transportation Engineers (ITE), Transportation Research Forum (TRF), Women’s Transportation Seminar (WTS), Institute for Operations Research and the Management Sciences (INFORMS), American Society for Engineering Education (ASEE) and American Society of Civil Engineers (ASCE). Over the past few years, she has been involved with the committee on freight transportation planning and marketing of the Transportation Research Board (TRB), the ASCE national committee on environmental quality, the ITS America intermodal task force and the steering committee developing Pennsylvania’s ITS/CVO business plan. She has received several honors and awards, including the U.S. Department of Transportation University Transportation Centers (UTC) Program’s Student of the Year award, ITS America and Women’s Transportation Seminar scholarship awards and Eno Transportation fellowship. She is co-founder of the first (Alpha) student chapter of ITS America. She has been appointed to the advisory board of the National Center for Transportation and Industrial Productivity.

At NCTIP, Boilé will carry out several projects dealing with modeling of intermodal freight flows in Northern New Jersey, port optimization and berth planning at Port Newark. Her most recent educational interest is in transportation ethics. She is planning to work with Prof. Joseph Szylowicz of the University of Denver, and the TRB Committee on Transportation Education, to put together a brief proposal for a paper or conference session to expand on the topic for next year’s annual TRB meeting.

Dr. Boilé’s professional development in the past 8 years, 3 while a Ph.D. student at NJIT, and five as professor and educator at Lafayette College is a success story for NCTIP and the UTC Program. A 1995 UTC Student-of-the-Year from NCTIP, an now Assistant Professor in her own right, her story epitomizes the UTC program’s success in attracting talented young people to transportation. Furthermore, Prof. Boilé’s educational path toward a Ph.D. degree in transportation is now being followed by two exceptional young Lafayette graduates: Mike Haynes (see p. 26) and Jakub Rowinski (see p. 25). Mike joined the University of Texas at Austin, a member of the Southwest Transportation Center headquartered at Texas A&M, while Jakub stayed closer to his native Massachusetts and is now with us at NJIT.
Greenfeld AVL Research selected for USDOT Research and Education Plan

Digital Map Requirements for Automatic Vehicle Location (AVL), a recent research project that evaluated AVL performance under standard operating conditions for New Jersey Transit, has been selected as an example of academic efforts in support of Federal enabling research, and is slated for potential inclusion in the DOT University Transportation Research and Education Plan. The featured projects are those that have been supported by the UTC program. This research supports the NCTIP theme of Passenger Movement Efficiency.

The project was recently completed by Dr. Joshua Greenfeld, of the Department of Civil and Environmental Engineering, whose primary areas of expertise are in geographical information systems and global positioning systems. The final report for the project can be viewed on the web at http://transportation.njit.edu/nctip/Research%20Report.

New Jersey Transit (NJT) was investigating acquisition of an automated vehicle locator (AVL) system, the purpose of which would be to monitor the location of its buses. This knowledge would enable the agency to manage the bus fleet more efficiently and provide its customers with up-to-the-minute information on bus arrivals and departures.

To monitor bus location, positional information (as determined by the AVL) is displayed on a digital map such as a GIS. To ensure accurate information, the location (coordinates) of the bus must be consistent (or within a small tolerance) with those of the digital map. If this is not the case, the system may yield incorrect information. This problem may become especially critical in an urban area where the system would be most valuable.

In this project, a methodology was developed for testing and evaluating the accuracies of an AVL system and supporting digital maps. The AVL system analyzed in this project was the Continuous Positioning System (CPS) by Andrew Corporation. Digital mapping products evaluated were TIGER/LINE, NAVTECH and Digital Orthophotos. The above data sets were evaluated with an accurate network of control points measured by Global Positioning System (GPS). Following the analysis of this study, some recommendations on the appropriateness of the tested AVL system and NJT’s digital mapping data were made.
Dr. Deutschman wins (U.S.) Presidential Award Honoring Science, Mathematics and Engineering Mentors

Among the ten individuals (and five institutions) who received the 1999 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring was Dr. Harold Deutschman, Professor of Civil and Environmental Engineering at NJIT. Professor Deutschman is being honored for:

"......a distinguished record over the past 29 years initiating, directing and teaching pre-college programs, and mentoring students to enter college and pursue careers in science, mathematics and engineering. His summer engineering program for 9th and 10th graders, started in 1970, has run continuously for 29 years. He has mentored over 2,500 students, averaging 100 per year, who are predominately underrepresented minority students from the Greater Newark area. More than 95% of Deutschman's mentees have enrolled in college and 70% have majored in science, mathematics, or engineering.

The award is administered and funded through the National Science Foundation (NSF). Dr. Deutschman's program has been supported by NCTIP for several years.

President Clinton honored individuals and groups that have been exemplary in their encouragement of minorities, women and persons with disabilities to pursue careers in scientific, engineering and technical fields. In presenting the award, the president said that they would "serve as examples to their colleagues and will be leaders in the national effort to train the next century of scientists, mathematicians and engineers."

"No personal influence is as powerful, long-lasting, and positive as that of a superlative mentor. The mentors receiving this award today are a true national resource who play a key role in defining the quality of our nation's future human resources in science, mathematics, technology and engineering," said NSF director Rita Colwell.

Up to 10 individuals and 10 institutions annually may qualify for the national award, which includes a $10,000-grant and a commemorative presidential certificate. The mentoring awards recognize a long-term commitment to providing opportunities for greater participation in science and engineering by all Americans. The awards do this by honoring those whose personal and organizational activities have increased participation of underrepresented groups in mathematics, engineering and science from kindergarten through graduate level.

On March 16, 2000 Dr. Deutschman also received the Educator of the Year award from the Consulting Engineering Council of New Jersey.

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1999 Summer Transportation Institute for High School Students - Greater Newark Area

Director: Dr. Harold Deutschman

In a program that pre-dates the Garrett A. Morgan Technology and Transportation Futures Program, but which most certainly encompasses GAM criteria, NCTIP has been supporting a remarkable effort on the parts of NJIT and Dr. Harold Deutschman to involve Greater Newark area students in the world of transportation. Following is a report on the 1999 program.

For three weeks during the summer of 1999, five days a week from 9:30 a.m. to 4:00 p.m., 50 high school students commuted to NJIT's Transportation Institute. The students were rising 10th and 11th graders, about 50% boys and 50% girls from predominantly African-American and Hispanic backgrounds. They were introduced to the world of transportation, including highways and public transportation, and problems and potential solutions were emphasized. The potentials of new technology and the interrelationship of transportation with the environment, land use, the economy, jobs and safety were discussed.

The students worked on and completed a Ramp Metering problem for a 10 mile highway, optimizing the flow without congestion, and computing the signal timing for each entrance ramp light. Their results were given in oral and written presentations. A timetable for a 10-station trolley system, similar to the Newark City Subway was designed. Given acceleration and deceleration rates, and distances between stations, the students optimized the number of trolleys needed for a two-hour morning peak period, and also produced a trolley time schedule with a minimum of one local trolley per hour and one express per hour, per station.

For Design, the students were given a number of plot plans with contours, and zoning requirements, and they designed, to scale, a development, including a residential complex, a fast food restaurant, and a shopping center, complete with internal road systems and parking. They also had sessions in communications and computer science.

The program was directed by Dr. Harold Deutschman, Professor of Civil and Environmental Engineering, who taught the Transportation Planning section of the program. Mr. Joseph Staiger, Traffic and Transportation Consultant and Adjunct Professor of Civil Engineering, taught the Design section of the program. Plans are underway for the 2000 Summer Transportation Institute.
Gifted and Talented Program - Abington Avenue School  
Newark, N.J.

Director: Dr. Sandra Moore

Recognizing that math and science require progressive acquisition of knowledge from an early age, NCTIP is supporting a program to enable gifted and talented students in grades K-8 at the Abington School in Newark to attain literacy in math, science and technology. As it strives to increase student interest in transportation through specialized programs, this outreach meets the criteria suggested by the Garrett A. Morgan Technology and Transportation Futures Program.

The initial Gifted and Talented program was established at New Jersey Institute of Technology (NJIT) in 1994 as part of the Pre-College Consortium. Under the guidance of Dr. Sandra Moore, Professor, School of Architecture and Program Coordinator, students have been introduced to a variety of career options. The program has evolved to include a significant transportation component, and students from the transportation-intensive Newark area have become acquainted with the virtual laboratory in which they live, including the local seaport and airport.

The Abington students and their teachers are brought to NJIT one day a week to participate in lectures, hands-on labs, and studios. They are formed into small groups, and mentored by an undergraduate and graduate program in Architecture and Infrastructure. Their program includes field trips to to local and regional transportation centers.

An elective class within the architecture department has been designed to provide college students with the opportunity to engage the K-8 students in becoming more aware of architecture, transportation, engineering, technology, etc. as fields of study. The graduate students serve as role models, and participate in the field trips In this way, both college and elementary students are exposed to basic architectural forms through hands-on experiments, i.e., drawing, and model-making exercises, and photographic/electronic documentation.

Dr. Lazar Spasovic, director, NCTIP, and Dr. Janice Daniel, assistant professor of civil and environmental engineering, are assisting Dr. Moore in providing the students with exposure to the transportation and architectural careers for the Spring 2000 semester. During the initial class, Drs. Daniel and Spasovic provided a brief ‘show and tell’ on transportation, interesting transportation facilities in the region, and the historical development of transportation modes in the New York New Jersey metropolitan region.
Lida Mazaheri, currently a traffic engineer with the Port Authority of New York and New Jersey (PANYNJ), has been designated 1999 Student of the Year by the National Center for Transportation and Industrial Productivity (NCTIP). Ms. Mazaheri received an M.S. degree in Transportation Engineering from the New Jersey Institute of Technology in 1998, and has since been preparing for Ph.D. studies which she plans to pursue in 2000. A member of Alpha Epsilon Lambda, NJIT’s Graduate Honor Society, she has also served on its Executive Board.

At PANYNJ since January 1999, Ms. Mazaheri has recently been appointed traffic engineer in charge of New York’s LaGuardia Airport. There her responsibility is to ensure the safe and orderly flow of the vehicular and non-vehicular traffic throughout the airport on a daily basis by implementing the latest traffic engineering techniques.

Her many projects for PANYNJ have included roadway and bridge signage improvements, and projects for both John F. Kennedy International Airport and LaGuardia: an airport vehicular traffic study, a traffic impact study for a new air terminal; an airport roadway network/frontage analysis; an assessment of future airport traffic flow conditions; design of pedestrian wayfinding signs within an airport; and pedestrian safety at the airports.

Active in professional organizations, Ms. Mazaheri is newsletter editor for the Institute for Transportation Engineers (ITE) Metropolitan Section of New York and New Jersey, where she has also organized and assisted with the ITE Met Section’s monthly meetings and represented ITE at National Engineers week. During her graduate studies she was an active member of the Intelligent Transportation Society of America; Institute of Transportation Engineers and the Women’s Transportation Seminar.

Ms. Mazaheri received her bachelor’s degree in electrical Engineering from University of Texas at Austin. She presented a paper, “Evaluation of Maintenance Approaches at Lincoln Tunnel,” at the Transportation Research Board’s 79th Annual Meeting. She is a resident of Wayne, New Jersey.
NJDOT Research Showcase

On November 5, 1999, NCTIP participated in the First Annual Research Showcase sponsored by the New Jersey Department of Transportation. Timed to include the dedication of the CAIT Center at Rutgers University, the goal of the Showcase was to network NJDOT Research Customers, NJDOT Research Managers and University Principal Investigators and Staff.

The major emphasis of the Showcase was to familiarize NJDOT's customers with the broad scope of ongoing research, and to explain the research potential of the universities and their associated groups. In addition to Rutgers and NJIT, The University Transportation Research Center was represented by several of its constituent members.

NCTIP was strongly partnered in this Showcase by the Civil and Environmental Engineering (CEE) Department at NJIT whose faculty have participated in numerous NCTIP-funded projects.

Two profile presentations, each showcasing NCTIP-supported projects, were offered by NJIT research leaders. Dr. Lazar N. Spasovic gave an overview of NCTIP, its history, its place within the university, and its relationship with the interdisciplinary program in transportation. He emphasized the scope of NCTIP research projects, specifying the many that have been partially funded by NJDOT. Dr. John Schuring, Acting Chair of CEE, highlighted those NJDOT/NCTIP projects which the CEE faculty has worked on, as well as those not within the NCTIP mandate.

Poster presentations of 17 projects, 10 of which were funded by NCTIP, were displayed. Throughout the program, a Powerpoint presentation of research projects was displayed. A booklet containing all display materials was prepared and distributed afterwards.

NJDOT has plans for this to be an annual event. It is expected that the 2000 Showcase will be hosted by NJIT.

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79th Annual TRB Meeting

All core transportation faculty members and staff, and several affiliated faculty from other departments who have participated in transportation research projects attended the January 2000 79th Annual Meeting of the Transportation Research Board (TRB) in Washington D.C.

During the conference, Drs. Spasovic and Daniel met with U.S. Secretary of Transportation Rodney E. Slater to discuss innovations and ideas relating to the 21st century transportation workforce. Among topics covered were thoughts about the major challenges in educating and training the next generation of transportation professionals; examples of innovative partnerships and how to build on their success; and ways in which the USDOT can support the learning process that involves formal education, ongoing training, research and technology transfer.

Drs. Chen, Chien, Daniel, Mouskos and Sun presented papers and/or participated in workshops. Approximately 15 transportation graduate students attended, organizing their trip for the fourth consecutive year. Their participation was made possible by funds allocated from the three active GSA-sponsored Transportation clubs, in addition to NCTIP's financial support and encouragement from the Director and the transportation faculty.

For the second year in a row, students organized and hosted a hospitality suite, designed to enhance the visibility of the academic and research programs available at NCTIP and the Interdisciplinary Program in Transportation. The hospitality suite provided a casual forum for students and their academic advisors to interact with faculty members and fellow students from academic institutions around the country.

NJIT's banner was prominently displayed as a PowerPoint presentation ran in the background featuring the university transportation program and current research projects, and accenting student participation. Literature was available for casual reading or the taking. The numerous attendees talked transportation, shared their views, discussed career objectives and identified common goals in a friendly environment. Once again, the success of the evening virtually assures its repetition in 2001.

Jakub Rowinski (second left) one of the student organizers of the NCTIP Hospitality Suite, with (left to right) Research Associate Mei Chen, who received her Ph.D. in transportation in 1999, and core transportation faculty members Lazar N. Spasovic, Kyriacos C. Mouskos, Janice Daniel and Steven I. Chien.

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NCTIP Awards Student Paper Competition Winner $1,000.

Entries for NCTIP's Annual Student Paper Competition were judged in September 1999, and a $1,000 award was granted to Michael Haynes, a 1999 graduate of Lafayette College in Easton, Pennsylvania. Mr. Haynes' interest in transportation was fostered by Professor Maria P. Boilé, an assistant professor of transportation engineering at Lafayette, who received her Ph.D. in Transportation from NJIT in 1995.

The winning paper, Integration of an Intermodal Transportation Planning Model with a Geographic Information System, also the subject of Haynes' graduation thesis, was chosen unanimously by a committee of transportation faculty at NJIT from among the numerous papers that were submitted from across the United States.

Mr. Haynes graduated with honors from Lafayette with a B.S. in Civil Engineering and is currently attending the University of Texas at Austin where he is in the Transportation Engineering Masters Program. He attended UT-Austin in the summer of 1998 as an undergraduate transportation research intern.

Haynes' current research interests include incident/accident detection using automatic vehicle identification technology in conjunction with traditional detectors, in San Antonio, Texas. He also has an interest in the role dynamic traffic assignment systems will play in the Traffic Management Centers of the future. Some of his other interests include geographic information systems and airline logistics. He plans to graduate in May 2001.

The Student Paper Competition is held each year at the end of the Spring semester. It is advertised nationwide, and featured prominently on the NCTIP web site. This year's brochure has been mailed to 800 college and university transportation and civil engineering faculty. Deadline for paper submission is May 31, 2000.

Among the previous winners of the competition is Francis Vanek, who earned a Ph.D. in Systems Engineering in 1998. His doctoral research focused on the environmental impact of freight transport and logistics activities, using the breakdown of freight flows by commodity and by spatial pattern in the Untied States. Caroline Rodier, who was one of the 1999 UTC Student of the Year Winners, one the competition in 1996.
NJIT and Maher Terminals Team Up to Develop Advanced Freight Logistics System

An on-going research project conducted jointly by the New Jersey Institute of Technology (NJIT) and Maher Terminals, Inc. has produced a technological tool, currently under evaluation, that promises to increase productive use of port facilities to help meet the demands of the continued growth in maritime freight volumes. The National Center for Transportation and Industrial Productivity (NCTIP) at NJIT, working with the state-of-the-art logistics system currently in use at Maher Terminals, has identified advanced algorithms to further enhance the system for scheduling freight handling, transportation, and distribution services to add "virtual capacity" to terminal operations.

In the past decade, there has been a remarkable growth in the volume of containerized cargo, and the trend is expected to continue. This increase has been fueled by strong U.S. and, until recently, Asian economies, elimination of international trade barriers, and shifting patterns in global manufacturing and consumption. Growth has also been facilitated by the substantial technological developments in maritime intermodal transportation.

On average, the volume grew 6% annually in the United States, 1.5% in Canada, and 10% worldwide, a trend likely to continue through the next decade. Experts estimate that by the year 2010, 90% of the world's liner freight will move in containers (USDOT 1998). Recognizing the critical role of port operations in the U.S. economy, on-going research conducted by the NCTIP and Maher Terminals is focusing on the interface between land and water modes at ports, to improve the productivity of the terminal container-handling operation and customer service quality.

Maher Terminals is the largest container terminal operator in the Port of New York and New Jersey, operating 14 container cranes in two terminals over a land area exceeding 500 acres. The Jersey City-based company operates two container terminals and an intermodal rail terminal in New Jersey. Approximately 600,000 of the containers that pass through the port each year are handled by Maher Terminals. A technology subsidiary, Maher Terminal Logistics Systems, provides computerized container systems in the Port of Miami, Mexico, and Poland.

"This type of research is absolutely necessary as the worldwide intermodal marketplace continues to grow and demand heightened services," Dr. Roger E. Nortillo, Executive Vice President of Maher Terminals, Inc. and President of Maher Terminals Logistics Systems, Inc.
Efficient assignment of container-handling equipment requires port operators to predict the level of activity at the terminal on a daily basis. Ship arrivals change from day-to-day, resulting in changing demands for equipment and services. Using data from Maher Terminals, the NCTIP designed a logistics tool to assist terminal operators in planning for ship arrivals and departures by applying probability models based on past experience.

The NCTIP and Maher Terminals project, currently in the evaluation stage, is expected to produce a continuously updated database of logistics information to create a forecasting tool that incorporates real-time information. A management information system (MIS) will report the expected truck arrivals for a given set of scheduled voyages based on a unique arrival/departure pattern developed for any containership scheduled to call at the port.

According to NJIT President Saul K. Fenster, "sponsored research programs such as the NCTIP/Maher Terminals project complement the university's economic development mission." Fenster added, "NJIT remains committed to working with the business community, government, and local communities in other ways to support economic growth and improvement in the quality of life."
NCTIP Intermodal Freight Transport Research Impacts Business Decisions

From its initiation, the National Center for Transportation and Industrial Productivity (NCTIP) has been engaged in research topics that would yield improvements in the productivity of transportation operations. One of the indications that the UTC Program's Center is dealing with topics that are of a great importance to the motor carrier industry is an article by Lawrence H. Kauffman that appeared in January 21, 2000 issue of the Journal of Commerce. It deals with the planned consolidation of the drayage industry, with a national company, RoadLink, to unite 7 firms with $160 million in total revenue. Drayage is the highway portion of rail-truck intermodal transport wherein truck tractors move truck-trailers and containers on chassis between a rail head and local customers. The new company, RoadLink USA, is backed by General Electric Capital Co.

RoadLink founders believe the time is right for consolidation. As the NCTIP research indicated, this consolidation was long in coming in an intermodal marketplace that required a seamless intermodal chain. A truck executive said "consolidation will enable drayage companies to afford the cost of technology because they will achieve scale." Furthermore, "By consolidating, we could improve operating efficiency 10% to 25%, and improve operating margins by building scale strategically in key loading ports and rail points around the country." In his view, consolidation will improve vessel schedules, reduce the driver shortage, increase equipment turns and serve all of a steamship line's ports. RoadLink sees three futures for the company: an initial public offering in a few years; a strategic sale to another company, or a very broad merger.

NCTIP Rail Truck Intermodal Research

The research, initially supported by the Mid-Atlantic UTC and Consolidate Rail corporation via grant to University of Pennsylvania, identified approaches for improving service quality and cost of domestic intermodal service. In intermodal transport, a load is moved between the origin and the destination in the same container in a coordinated manner using two or more transportation modes. In rail-truck intermodal service in the United States, highway trailers or containers loaded on rail flat cars are hauled by train in line-haul service between the origin and the destination intermodal terminals, and locally picked up and delivered by truck between the terminals and shippers and terminals and receivers.

Economy of Intermodal Transport

Rail-truck intermodal was primarily designed to compete with over-the-road trucking. It combines the best of two modes; economies of rail line haul wherein a large number of containers is moved at a lower average cost compared to the parallel over-the-highway movement, with flexibility of truck in local drayage -- this flexibility enabling pick-up or delivery at the customer's convenience rather then when a local freight train happens by, and enabling service to points not on rail lines, among other advantages. The cost characteristics of intermodal and trucking are quite different, as illustrated in Figure 1, which portrays the full (or long run) cost of the two modes on a pre shipment basis as a function of distance. For trucking, there is a small fixed or threshold cost that is independent of distance, representing the cost of transactions associated with the movement (documentation, billing) and of the loading and unloading activity (including truck time). The cost of operating a truck (including ownership, maintenance) is
essentially proportional to distance. Typical values for the threshold cost are about $80 to $120 per load and the cost per unit distance is typically in the vicinity of $1 to $1.50 per loaded truck-mile, assuming that about 80% or more of the total miles are loaded.

Intermodal transport incurs a much higher threshold cost, including, in addition to the transaction and loading costs, the costs of providing the terminal facility, of loading the trailer on the rail car, the corresponding unloading operation, and of drayage at each end. Typical values for the threshold cost are $300 to $500. The rail line haul cost per unit distance is in the vicinity of $0.60 to $0.80 per mile. The net effect of the different cost structures results in a break-even distance below which trucking is less costly and above which intermodal is less costly, as indicated in Figure 1. Generally this is thought to be in the vicinity of 500 to 700 miles. Of course, local conditions, particularly the extent of adverse distance for drayage (i.e. drayage opposite to the direction of the destination), and the degree to which equipment is fully utilized in both directions, will influence the break-even distance. Using mid-range values for the above costs of over-the-road and intermodal movements results in a break-even distance of 546 miles. Adding 15% penalty to represent shipper costs associated with the movement (inventory while in transit, safety stock inventory, packaging costs) results in a break-even distance of 809 miles.

**Potential of Intermodal**

While intermodal was envisioned to be competitive with inter city trucking in the sense that it would offer a similar service at a lower cost, the actual cost structure and inferior service quality result in a high break-even distance. This precludes intermodal service from being a competitive alternative to truck in short haul markets for which it was originally intended. Given that over 75% of all cargo moves over distances of 500 miles or less, and 90% moves 900 miles and less, intermodal's competitive position is thus limited to a rather small segment of the inter city freight market.

Many analysts have concluded that intermodal has been characterized by low profit margins, describing it as "a great revenue business but poor net revenue business". It is argued that the low profit margins do not yield acceptable returns on investment and in turn do not justify the railroads' further investments in intermodal equipment. The lack of investment has resulted in a serious equipment shortage and terminal capacity problem, and is threatening to slow the intermodal growth. In addition, the intermodal was unsuccessful in making inroads into shorter haul markets of high value merchandise freight.

Since significant technological improvement were already made in the line haul (new articulated cars, efficient operating practice with unit trains, the attention naturally turned to drayage. It was commonly perceived that serious problems in both productivity and service quality of drayage effectively limits intermodal to longer distance hauls -- generally greater than 600 miles.

**Figure 1: Costs of Current Rail-Truck Intermodal and High-tech Truck Services**
Proposed Centralized Drayage Operation

The research proposed that the drayage associated with an entire terminal must be viewed as a system, and the operation planned so as to meet the demands and service requirements at a minimum cost. Daily demands to be met in the form of loaded trailers/containers to be moved, either to the terminal from shippers or from the terminal to consignees, and of empty trailers to be spotted for loading or to be removed after unloading must be ascertained each day and tractors and drivers would be assigned to these tasks considering the totality of work to be done, so as to minimize total cost. Draymen would then follow this master plan in executing the movements. The savings, in terms of reduction of tractor-trailer deadheading miles would come from the repositioning of equipment, over the independent operation.

Research was undertaken to evaluate the use of centralized drayage operations planning to both reduce cost (and hence price) and improve service quality of drayage. The central part of the research was the development of a detailed mathematical model of drayage that was used to evaluate cost savings of an operation in which the movements of trailers and containers are centrally planned, compared to the current decentralized drayage operation. The research revealed that substantial cost savings in the range of 43-65% reduction of cost of centralized operation compared to the current operation.

To conclude, fragmented drayage prevents an efficient operation. Current prices are set assuming that each trailer delivery is undertaken independently of other deliveries. In practice, costs (prices) could deviate, as load density changes and economies and diseconomies appear. The natural question is: Why not take advantage of these economies of density? Figure 2 indicates that increasing load density could result in decreasing non-revenue truck mileage and thus costs. For example, with coordination and information sharing, cases of two round trip movements, each loaded in only one direction, could be replaced with one round trip movement with loads in both directions. The cost of a round trip would then be assigned over the two loads, thus decreasing the cost per load by almost half compared to the independent operation. It is this economy of density that finally yields the consolidation that was discussed in the Journal of Commerce Article.

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ProMPTS
The Research Project Management and Progress Tracking System
Drs. H. Joseph Wen and Chi Tang

ProMPTS is a research project information management program which enables the staff of the Division of Research & Technology at the New Jersey Department of Transportation (NJDOT) to manage and track research projects throughout the development process, from entering problem statements to distributing the products and project close-out documentation. The goal of ProMPTS is to create a user-friendly data management environment that lets users quickly and easily access, search, and summarize relevant financial and business information for research projects so that detailed and summarized up-to-date reports can be efficiently generated.

ProMPTS was developed by the National Center for Transportation and Industrial Productivity at The New Jersey Institute of Technology, and NJDOT’s Bureau of Research, with an Access relational database and interactive graphical interfaces to fulfill a variety of functionalities in data entry, retrieval, updating, and summarizing. This project complies with NCTIP’s theme of facility, institutional and regulatory efficiency. The Major functionality groups of ProMPTS are:

- The Problem Statement Group which creates initial documents, starting the monitoring process;
- The Administration Group which includes functions carried out by the database manager and system administrator, such as generating new project and job numbers, entering personnel information, and downloading and uploading financial and business data from other systems of NJDOT to ProMPTS;
- The Project Data Input Group which consists of customized data entry forms for document registration and tracking, job scheduling, work-hours assignments, etc.
- The Project Information Group which provides a variety of different query criteria that will lead user to relevant detailed and summarized information about research projects. This is the main display screen of the system. From it, the user can survey most of the database and review the information from multiple aspects.
The Program Information Group which generates summary information based on program year, funding source, and budget types, and also, provides interfaces for reviewing personnel and staffing information;

The Report Group. This is the report preview/print center that allows the user to pick up reports to review, print to machines, or send as an email directly to relevant parties.

Currently, ProMPTS is undergoing evaluation by the NJDOT staff which will be the system's users. Upon evaluation, should the need arise, ProMPTS further improvements will be made to meet users' expectations.

Potential benefits of the developed Information ProMPTS are:

1. It will significantly reduce the searching time for finding relevant re-search project data from existing NJDOT databases and significantly lower paperwork costs.

2. It is very user friendly. The operation of the system is simple and self-explanatory, and many data manipulation tasks have been streamlined.

3. It is not only a data management system, but also a operational process monitoring system. It provides both detailed and summarized up-to-date reports on project current status, finance, and business situations (e.g., person's working hours assignment and salary costs; total budgets of certain funding source in a program year; and budget/cost comparison charts of a research project). These reports can be quickly generated daily, weekly, monthly, and annually. Therefore, management can watch the entire process of the projects under going and take responsive actions immediately.

ProMPTS provides a well-organized relational database that includes processed research project information. This information can be incorporated into NJDOT internet information system and be viewed by public. Thus, ProMPTS has the potential to help NJDOT research projects go on-line in the near future. It is envisioned that the system will be transferred to other state DOTs.
Mobility and the Costs of Congestion in New Jersey
Lazar N. Spasovic, Kenneth J. Hausman, Athanassios K. Bladikas, Janice Daniel, Alexios Sideris, Jakub Rowinski

A significant study on mobility and the costs of congestion in New Jersey has recently been completed by a team from the National Center for Transportation and Industrial Productivity, headed by Lazar N. Spasovic. Funded in part by the Foundation for the New Jersey Alliance for Action and NCTIP, the final report is expected to be released to the public during a press conference in late March 2000.

Congestion negatively affects the movement of people and goods, translating into increased travel time and fuel consumption. People traveling longer times to and from their jobs experience higher levels of stress which in turn leads to decreased labor productivity. Congestion translates into higher costs of truck freight operation through driver wages, and also has a negative impact on manufacturing industry and the service sector. It decreases the productivity of just-in-time manufacturing processes by forcing businesses to keep larger inventory than necessary in order to accommodate unreliable delivery schedules.

Two recent studies have dealt with the issue of urban mobility and the cost of transportation. One, by the Texas Transportation Institute (TTI), "The 1999 Annual Mobility Report," presents a summary of the fifteen-year research effort that quantifies urban mobility. TTI’s primary product is the Roadway Congestion Index (RCI) that is calculated for fifty urban areas in the United States. Portions of New Jersey are included in the New York City (NYC) and Philadelphia urban areas. The NYC area is the eighth most congested while Philadelphia is the third fastest growing congested area. The secondary product of this study is the estimated congestion cost due to increased travel delay and fuel consumption. The study found that congestion cost U.S. travelers 4.3 billion hours of delay, 6.6 billion gallons of wasted fuel consumed, and $72 billion of time and fuel cost in 1997.

The second study, by The Road Information Program, "New Jersey’s Roads and Bridges: A Report on Conditions, Current Use and Ability to Meet Future Travel Needs, 1998," indicated that the state lags behind the national average in the quality of its roadways and bridges. New Jersey motorists are driving on substandard roads, which results in additional operating costs. In addition, New Jersey motorists are experiencing increased congestion. The impact of such increased costs and congestion is reduced productivity, reduced air quality, and increased accidents. Substantial funds, beyond what is currently programmed, are required for improving...
the transportation infrastructure in New Jersey. This study received wide coverage in newspapers throughout the state.

The above studies provide critical information on both the costs of congestion on the national level, and the relationship between the transportation infrastructure and cost of transportation. However, they neither address the significant impacts of congestion on a particular roadway and county level, nor evaluate the benefits of transportation improvements in reducing the cost of congestion. Only by analyzing the cost of congestion on the state, county and roadway levels could the full benefits of congestion mitigation strategies be determined.

The objective of this very complex study has been to measure quantifiable and qualitative impacts of congestion in New Jersey on mobility, the cost of transportation, and economic productivity. The study has addressed the impacts of congestion on both an individual level (impacts on an average traveler), as well as on an area-wide levels (impacts on an entire county). Consequently, the costs of congestion are estimated on a per county basis as well as on a per driver basis. The cost combines not only the direct impact of travel delay and excess fuel costs, but also the added cost due to congestion of providing goods and services.

The results of the study are products that may be used to inform the general public as well as to develop information that will be used in developing public policy on issues dealing with improving mobility, alleviating congestion, and securing stable funding sources for transportation improvements. The development of clear and concise summary information including graphics and tables to convey the results of the study is a key element.

The final report presents the results and summarizes the methodology used for analysis. The results focus on the cost of transportation, i.e., the costs borne by auto and truck users in terms of increased travel time and additional operating costs due to travel delay.

Following release of this study at a press conference at the NJDOT's Trenton offices on March 22, 2000, major news media have responded with interest. As this report goes to press results so far include Dr. Spasovic's presentation being carried at least twice on morning radio. He was interviewed by Channel 4 News and ABC (Channel 7) carried a segment as well. Requests for the report, which is on both the university's and NCTIP's web sites, have come in from state and municipal government figures. This will be more fully reported on in the Annual Report.
International Intermodal Transportation Center

Lazar N. Spasovic, Director

NJIT is working closely with the New Jersey Department of Transportation to establish and implement the International Intermodal Transportation Center which will provide opportunities to leverage, integrate and sequence private and public infrastructure investments key to sustaining economic growth in a targeted corridor and throughout the entire State.

The Center's purpose is to work closely with state, bi-state and federal agencies, as well as the private sector transportation stakeholders to facilitate local economic development and quality of life improvement efforts. This effort will be tied to intermodal transportation corridor systems improvements planned through Portway (described as series of freight system improvement projects that will strengthen access to and between the Newark-Elizabeth Air/Seaport Complex, intermodal rail facilities, trucking and warehousing/transfer facilities, and the regional surface transportation system), the North Jersey Transportation Planning Authority-NJIT Brownfields Study and other systems related projects in the target areas of Bayonne, Elizabeth and Newark, N.J., and contiguous communities. A primary aim for the Center is to encourage close cooperation with and input from local and regional public officials, community leaders, and intermodal business leaders within the target area.

To carry out its purpose, the Center will identify public and private-sector investments being made in the corridor communities to support mobility and advance intermodal corridor related economic development — and evaluate the impact of these improvements or additional opportunities on improving mobility, economic opportunity and the quality of the environment in the target region. It will provide data, identify successful cooperative processes and provide models for corridor related development in the target area and elsewhere, and advance the critical need for facilitation by organizing and convening a Steering Committee composed of expert staff from NJDOT and the Office of Maritime Resources, NJ Turnpike, PANYNJ, Office of State Planning, the Economic Development Commission, and NJTPA, as well as transportation firms and businesses (New York and New Jersey) that use the regional port, and passenger and freight terminal facilities.

The Center's program will be driven by the multimodal and intermodal nature of transportation systems within the target area and elsewhere within the intermodal international service corridor in the Northern New Jersey - Greater New York metropolitan region. Particular emphasis will be placed on creating environmentally sustainable economic development related to corridor access to regional port, rail and airport facilities.

While the primary focus will be the Northern New Jersey target communities, the Center can also serve to advance the international, intermodal, bistate 'circumferential' corridor as work progresses, and the Steering Committee directs. The goal is to identify common and complementary needs within the region, ensuring that a cooperative agenda can be created to further positive community growth from the powerful global trade assets we share as a region.

Lazar N. Spasovic, Director of NCTIP, will serve also as Director of IITC.
NCTIP Featured in New Jersey Business Transportation Issue

Following lengthy interviews with NCTIP Director Lazar N. Spasovic, New Jersey Business magazine, in two separate articles, featured research activities of the National Center for Transportation and Industrial Productivity.

The first article highlighted the significant study on ‘Mobility and the Costs of Congestion in New Jersey,’ which is to be released to the public the week of March 22, 2000. The second article discussed the many crucial transportation efforts currently taking place in New Jersey in which NCTIP and NJIT feature prominently.

In the same issue, NCTIP ran a quarter page ad for the Masters Program in Transportation.

Congestion: What is the Cost?

The Alliance for Action commissions a study on the impact of traffic jams on businesses.

For most New Jersey residents, getting stuck in a morning traffic jam has become as routine as grabbing a bagel and coffee for breakfast. As the traffic situation worsens in the Garden State, which has the country’s highest population density, consumers have simply reconciled to leaving home a little earlier.

Apart from increasing road rage and stress levels, congestion leads to a significant financial loss to the economy. What is that cost? Many of the components that determine that number are loss of productivity due to stress and late arrivals at work. Leaders in the transportation industry believe that unless the cost of congestion is studied and quantified the decision-makers won’t recognize the urgency for remediation of the state’s highways and roads – many of which are in a state of disrepair.

With these goals in mind, the Foundation of the New Jersey Alliance for Action has commissioned the New Jersey Institute of Technology (NJIT) in Newark to conduct a study on congestion and its costs to the state. The foundation is the research and public education arm of Edison-based Alliance for Action, a coalition of 600 odd business, labor, and government organizations. The study is expected to be completed by November.

According to Phil Beechem, president of the Alliance, business polls found that traffic congestion was affecting employers as well as motorists. "Increasingly businesses find that employment decisions are based on how easy it is for the employee to commute to and from work," he says. "That is why we decided to look at the issue of congestion, and what it means in terms of business and opportunities.”

Lazar N. Spasovic, who as director of the National Center for Transportation and Industrial Productivity at NJIT is in charge of the study, cites the results of a Texas University study. It found that nationwide traffic congestion costs nearly 4.6 billion hours, 6.7 billion gallons of fuel, and $74 billion in lost time and fuel expenses a year. While traffic congestion has become a nationwide problem, New Jersey’s situation is worse than most because of its location and population density. According to a 1998 report by the Road Information Program, a nonprofit national transportation research organization, New Jersey motorists spend $732 million annually – an average of $133 per driver - in additional vehicle operating costs caused by driving on substandard roads. New Jersey ranks 42nd nationally among states in the condition of the pavement on most major roadways, and its roads are the most heavily traveled in the nation, with a single-lane mile carrying 2.6 million vehicles annually.

Highway travel in the state is expected to increase 19% by 2010. Spasovic says the number of trips a vehicle takes in the state is increasing twice as much as the number of employees, which is among the highest in the nation. This, he adds, is indicative of the magnitude of the problem in the state. "Once we find out how much congestion costs the state, we can find ways to alleviate the problem.” Spasovic plans to look at the problem very closely, studying county-by-county, road-by-road, pothole-by-pothole.

Interested In a Career in Transportation or Planning?

Consider New Jersey Institute of Technology's M.S. in Transportation

Join N.J. Institute of Technology in a program designed to teach students planning, engineering, and management skills and concepts that will allow them to compete in the job market. The Master of Science in Transportation studies is designed to lead to professional engineering certification. The program provides a basic foundation for those who wish to pursue careers in transportation or planning. The program is designed to provide a professional education for students who have completed the requirements for a B.S. degree in a transportation-related field or for those who have completed the requirements for a degree in a related field. The program offers a broad range of courses in transportation planning, engineering, and management. The program is designed to provide a broad range of courses in transportation planning, engineering, and management. The program is designed to provide a broad range of courses in transportation planning, engineering, and management. The program is designed to provide a broad range of courses in transportation planning, engineering, and management. The program is designed to provide a broad range of courses in transportation planning, engineering, and management.

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Making Room for Even More Precious Cargo
Geeta Sundaramoorthy

An efficient integrated system is crucial if the region is to grab a big share of global trade.

For those involved with the freight industry - the business of moving cargo from one destination to another - New Jersey presents opportunities like no other. Within a day of affluent metropolitan markets such as NYC in the north and Philadelphia in the south, and with one of the largest seaports in the country, the Garden State is a distribution center. But with opportunities come challenges that must be tackled before they become impediments to growth. New Jersey’s port region is staring those challenges in the face.

Transportation experts agree that if immediate steps are not taken to provide for efficient movement of cargo in and out of the port region, the state’s infrastructure will be unable to support a cargo increase. That is a daunting task, as Ports Newark and Elizabeth alone expect the cargo throughput to double from 2.5 million TEUs (20 foot equivalent units, a standard measure for marine containers) to 5 million TEUs by 2010 and increase six-fold by 2040. Also, the new rail system with the takeover of Conrail by CSX and Norfolk Southern is expected to bring in more cargo. The two railroads expect Northern New Jersey’s intermodal volumes to grow by 18% in 2000, 10% in 2001, and 3.5% through 2020.

According to the Newark-based North Jersey Transportation Planning Authority (NJTPA) some 350 million tons of freight move through New Jersey each year, and as much as 90% of it moves by truck for all or part of the journey. As a result of congestion and other factors, it now costs about twice as much to move an intermodal container within the New York-Northern New Jersey region as it does, on average, elsewhere in the country, says a NJTPA report published on its Web site (http://njtpa.njit.edu). The problem is worsened by lack of warehousing and distribution centers around the port area, forcing trucks to haul the goods to warehouses as far away as Bethlehem, Pa. They must then bring them back packaged and ready for distribution in the New York metropolitan area. This not only causes congestion on the roads and leads to deterioration of the state’s infrastructure, it also increases shippers’ costs.

John V. Hummer, special project manager for freight services and new initiatives at NJTPA, says to alleviate the problem they must figure out how to maximize the usage of land around the port. He believes the state’s brownfields in Northern New Jersey, properties that are often polluted, can be cleaned up to provide much needed space for freight-related activities. Along with New Jersey Institute of Technology, NJTPA received a federal grant of $700,000 to conduct a study of brownfields and other redevelopable sites. The proposal involves a market analysis to establish the necessary criteria for locating freight businesses, an inventory of brownfield and other redevelopable sites in and around the port district as well as along freight routes, and identification of candidate properties for freight operators.

Proponents of the brownfield project hope to not only ease congestion and increase efficient movement of cargo, but also to create an entire economic system around the port. In addition to warehouses and distribution centers, the system would include light manufacturing and value-added services to spur the region’s economy. Hummer says the result will be an interdependent economy with lower costs and lots of synergies. Says he: “We are working on an incentive program to attract entrepreneurs to the area by offering aid to clean up the brownfields sites, and we are keeping the land cost competitive.”

But revitalizing brownfields is only one way to maximize the economic development from increased trade. The region also needs to integrate the port facilities with the truck and rail systems to create seamless transportation, says Lazar N. Spasovic, director of the National Center for Transportation and Industrial Productivity at NJIT. The state government seems to be heading in that direction. James Weinstein, New Jersey’s Transportation Commissioner, says the state Department of Transportation and other agencies have identified $4 billion worth of projects over the next 10 years.

A project high on the department’s agenda and a key element in Governor Whitman’s New Jersey First Program is the Portway Project under the “Transportation Vision for the 21st Century.” Estimated at around $700 million, the project includes a dedicated freight corridor extending northward from the Newark/Elizabeth seaport to rail facilities in Essex, Hudson and Bergen counties and eastward to port facilities on the Bayonne Peninsula.

Another crucial part of the freight transportation system is the development of rail terminals and expanded facilities for Norfolk Southern and CSX, which split Conrail’s business earlier this year. The two railroads hope to divert an additional 1 million domestic containers now being trucked into the Northeast on main road networks. Much of this traffic heads for the New York metropolitan area, where it will be transferred from rail terminals to other distribution centers for final truck delivery.

Hummer expects a significant capacity crunch to develop as the Hudson-Bergen Light Rail Transit, a passenger line between Bayonne and Ridgefield, via Jersey City, Hoboken, Weehawken and North Bergen, goes into its second phase of construction. This would occupy two tracks used by the railroads to serve the Northern freight and marine terminals. Railroads expect the task of finding an alternative to cost about $20 million. This is just one of more than a dozen projects, which are estimated to cost $250 million, that the railroads say are essential to secure adequate service over the next decade.

Ultimately, says Spasovic, it is all a question of public policy. “In Europe, they have taken trucks off the road. But the railroads there are public entities. Here, the railroads are private companies that need to make money, like the trucking companies. What we need is a multidisciplinary, multimodal approach to solving these issues. Clearly, the only way is to come up with a win-win strategy for all involved.” Easier said than done.
RESEARCH PROJECTS
## New Projects

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<td>Analysis and Evaluation of Intermodal Commuter Corridors in New Jersey</td>
<td>Maria P. Boilé</td>
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<td>Causes and Control of Transverse Cracking in Concrete Bridges</td>
<td>M. Ala Saadeghvaziri</td>
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<tr>
<td>992501/421030</td>
<td>Congestion Strategies for Adaptive Traffic Signal Systems</td>
<td>Janice Daniel</td>
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<td>Data Research - Materials Laboratory Information System</td>
<td>Jay Meegoda</td>
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<td>Design and Evaluation of Toll Plaza Systems</td>
<td>Xuili Chao</td>
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<td>Establishing Safe Driveway Grades for New Jersey State Highways</td>
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<td>Integrated Signals - A Cost Benefits Analysis for the New Jersey Department of Transportation</td>
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<td>Mobility and the Costs of Congestion in New Jersey</td>
<td>LAZAR N. SPASOVIC</td>
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# New Projects

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<td>Seismic Retrofitting &amp; Design of Highway Bridges in New Jersey - Phase II</td>
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<td>To Advance the Concept of the Aesthetic Design of Noise Barrier Walls Through the Detailed Design of Models, Prototypes and Plans</td>
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### Completed Projects

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<td>An Approach for Modeling and Analyzing the Impact of Telecommuting Strategies on Traffic Flow</td>
<td>Layek Abdel-Malek</td>
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<td>990940/993981</td>
<td>Analysis of Accident Reports of Trucks in Work Zones</td>
<td>Louis Pignataro</td>
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<td>Communication and Productivity</td>
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<tr>
<td>990957</td>
<td>Container Port Landside Operations. Phase I: Optimization of Straddle Carrier Operations</td>
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<td>990905</td>
<td>Developing a Freight Data Executive MIS for New Jersey Using Hypertext</td>
<td>Michael Bieber</td>
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<td>Digital Map Requirements for Automatic Vehicle Location</td>
<td>Joshua Greenfeld</td>
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<td>Efficiency and Equity Issues in an ITS-Driven Urban Transportation Planning Project</td>
<td>John Tavantzis</td>
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<td>990938</td>
<td>Estimation and Prediction of National and Regional Freight Flows in the United States: An Analysis from Origin to Destination by Modality of Transportation</td>
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<td>Estimation of Freight Flow: Data Analysis and Gravity Modeling</td>
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<td>Fault Tolerant Traffic Control Systems</td>
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<td>Heuristic Search Strategies to Solve Discrete Transportation Network Design Problems</td>
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<td>990952/993988</td>
<td>Moving Telecommuting Forward</td>
<td>Naomi Rotter</td>
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<tr>
<td>990906/993973</td>
<td>Multi-Modal Freight Transportation: Regional Data Development and Analysis Task 1-4</td>
<td>Lazar N. Spasovic</td>
</tr>
<tr>
<td>990966/993801</td>
<td>Seismic Retrofitting &amp; Design of Highway Bridges in New Jersey</td>
<td>M. Ala Saadeghvaziri</td>
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</tbody>
</table>
### Completed Projects

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Project Title</th>
<th>Principal Investigator</th>
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<tbody>
<tr>
<td>990955</td>
<td>Sensitivity Analysis of the New FHWA Sketch Planning Analysis Spread Sheet Model (SPASM)</td>
<td>Harold Deutschman</td>
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<tr>
<td>991996</td>
<td>Smart Sensors for Freight Movement</td>
<td>Haim Grebel</td>
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<tr>
<td>990952</td>
<td>Telecommuting: Organizational and Individual Considerations</td>
<td>Naomi Rotter</td>
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<tr>
<td>990909/993970</td>
<td>Transportation Economic and Land Use Systems (TELUS) 1.0</td>
<td>Louis J. Pignataro</td>
</tr>
<tr>
<td>990909/992987</td>
<td>Transportation Economic and Land Use Systems (TELUS) 2.0</td>
<td>Louis J. Pignataro</td>
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FINANCIAL DATA
## Financial Report

**Period:** September 9, 1999 to March 9, 2000

<table>
<thead>
<tr>
<th>BUDGET CATEGORIES</th>
<th>Budgeted ($)</th>
<th>Programmed ($)</th>
<th>Note</th>
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<tbody>
<tr>
<td>Center Director Salary</td>
<td>47,500</td>
<td>28,908</td>
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<tr>
<td>Faculty Salaries</td>
<td>373,333</td>
<td>190,448</td>
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<tr>
<td>Administrative Staff Salaries</td>
<td>50,000</td>
<td>4,000</td>
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<tr>
<td>Other Staff Salaries</td>
<td>50,000</td>
<td>33,333</td>
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<tr>
<td>Student Salaries</td>
<td>101,500</td>
<td>76,000</td>
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<tr>
<td>Staff Benefits</td>
<td>116,402</td>
<td>46,594</td>
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<tr>
<td><strong>Total Salary and Benefits</strong></td>
<td><strong>738,735</strong></td>
<td><strong>368,783</strong></td>
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<tr>
<td>Undergraduate Student Fellowships</td>
<td>16,000</td>
<td>0</td>
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<tr>
<td>Permanent Equipment</td>
<td>28,000</td>
<td>44,780</td>
<td>NJIT overmatch</td>
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<tr>
<td>Expendable Equipment and Supplies</td>
<td>72,995</td>
<td>39,595</td>
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<tr>
<td>Domestic Travel</td>
<td>25,000</td>
<td>14,405</td>
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<tr>
<td>Other Direct Cost: Education</td>
<td>70,000</td>
<td>31,232</td>
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<tr>
<td><strong>Total Direct Costs</strong></td>
<td><strong>950,730</strong></td>
<td><strong>498,795</strong></td>
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<tr>
<td>Indirect Costs</td>
<td>380,709</td>
<td>188,404</td>
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<tr>
<td><strong>Total Costs</strong></td>
<td><strong>1,331,439</strong></td>
<td><strong>687,200</strong></td>
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<tr>
<td>Federal Share</td>
<td>655,500</td>
<td>342,574</td>
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<tr>
<td>Matching Share</td>
<td>675,939</td>
<td>342,626</td>
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</tr>
</tbody>
</table>

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