NATIONAL CENTER FOR
TRANSPORTATION AND
INDUSTRIAL PRODUCTIVITY
AT
NEW JERSEY INSTITUTE OF TECHNOLOGY

STRATEGIC PLAN
1999-2001

SUBMITTED TO
UNITED STATES DEPARTMENT OF TRANSPORTATION
RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION

AUGUST 20, 1999
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## SECTION I

### PROGRAM OVERVIEW

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<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AACSB</td>
<td>Association of American Collegiate Schools of Business</td>
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<tr>
<td>AAR</td>
<td>Association of American Railroads</td>
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<tr>
<td>BASE</td>
<td>Black Association of Student Engineers</td>
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<tr>
<td>CEE</td>
<td>Civil and Environmental Engineering</td>
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<tr>
<td>CEES</td>
<td>Center for Environmental Engineering and Science</td>
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<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
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<td>CHCP</td>
<td>Cargo Handling Cooperative Program</td>
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<td>CLM</td>
<td>Council of Logistics Management</td>
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<td>CMES</td>
<td>Center for Manufacturing Engineering Systems</td>
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<tr>
<td>CUNY</td>
<td>The City University of New York</td>
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<td>EOP</td>
<td>Equal Opportunity Program</td>
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<td>ET</td>
<td>Engineering Technology</td>
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<td>FHWA</td>
<td>Federal Highway Administration</td>
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<td>FRS</td>
<td>Financial Records System</td>
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<td>FTA</td>
<td>Federal Transit Administration</td>
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<tr>
<td>GEM</td>
<td>National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM)</td>
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<tr>
<td>GIS</td>
<td>Geographic Information Systems</td>
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<tr>
<td>HBCU</td>
<td>Historic Black Colleges and Universities</td>
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<td>HOST</td>
<td>Hispanic Organization for Students in Technology</td>
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<td>IANA</td>
<td>Intermodal Association of North America</td>
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<td>ISTEA</td>
<td>Intermodal Surface Transportation Efficiency Act</td>
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<tr>
<td>ITS</td>
<td>Intelligent Transport Systems</td>
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<tr>
<td>MIS</td>
<td>Management Information System</td>
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<td>MPO</td>
<td>Metropolitan Planning Organization</td>
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<td>NCTIP</td>
<td>National Center for Transportation and Industrial Productivity</td>
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<td>NJCST</td>
<td>New Jersey Commission on Science and Technology</td>
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<tr>
<td>NJDOT</td>
<td>New Jersey Department of Transportation</td>
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<tr>
<td>NJIT</td>
<td>New Jersey Institute of Technology</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>NJT</td>
<td>New Jersey Transit</td>
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<td>NJTPA</td>
<td>North Jersey Transportation Planning Authority</td>
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<td>NSBE</td>
<td>National Society of Black Engineers</td>
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<td>NTIS</td>
<td>National Technical Information Service</td>
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<td>NTST</td>
<td>National Transportation Science and Technology</td>
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<tr>
<td>PANY&amp;NJ</td>
<td>Port Authority of New York and New Jersey</td>
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<tr>
<td>PI</td>
<td>Principal Investigator</td>
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<tr>
<td>RFP</td>
<td>Request for Proposals</td>
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<td>RSPA</td>
<td>Research and Special Programs Administration</td>
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<tr>
<td>SHPE</td>
<td>Society of Hispanic Professional Engineers</td>
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<td>SOM</td>
<td>School of Management</td>
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<td>SWE</td>
<td>Society of Women Engineers</td>
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<tr>
<td>TEA-21</td>
<td>Transportation Equity Act for 21st Century</td>
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<tr>
<td>TELUS</td>
<td>Transportation Economic and Land Use System</td>
</tr>
<tr>
<td>TIDE</td>
<td>Transportation Information and Decision Engineering Center</td>
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<tr>
<td>TRAC</td>
<td>Transportation and Civil Engineering</td>
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<tr>
<td>TRANSCOM</td>
<td>Transportation Coordinating Committee</td>
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<td>TRB</td>
<td>Transportation Research Board</td>
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<tr>
<td>UPS</td>
<td>United Parcel Service</td>
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<td>USDOT</td>
<td>United States Department of Transportation</td>
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<tr>
<td>UTC</td>
<td>University Transportation Center</td>
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<td>UTCP</td>
<td>University Transportation Centers Program</td>
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<tr>
<td>WTS</td>
<td>Women's Transportation Seminar</td>
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<tr>
<td>WWW</td>
<td>World-Wide-Web/Internet</td>
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I.B CENTER THEME

1. STATEMENT OF THEME

The theme of the National Center for Transportation and Industrial Productivity (NCTIP) is "Increasing Productivity through Transportation Improvements." This theme was originally set forth in the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and affirmed by New Jersey Institute of Technology (NJIT) in August 1998.

The theme and mission of the Center support the United States Department of Transportation's (USDOT) strategic goals of Mobility\(^1\) and Economic Growth\(^2\), as well as the following outcomes of the National Transportation Science and Technology (NTST) strategy:

- Enhancing goods and freight movement at domestic and international gateways
- Increasing global competitiveness
- Optimizing intermodal passenger and freight transportation systems, and
- Modeling tools for transportation planning, design and operations.

2. SCOPE OF THEME

As embodied in its name, the Center ascribes relatively broad interpretations to the terms "industrial" and "productivity." For its purposes, industrial encompasses all economic sectors of our society that either use transportation as part of their production processes or provide transportation and transportation-related services. This includes manufacturing as well as service sector areas such as traditional retailing, electronic commerce, logistics, and public transit. In the same context, productivity relates to achieving both economic and social gains from the improvement of processes, applications of new technologies, and innovative changes in the operating practices of enterprises that provide transportation functions.

Examples of productivity are:

- Improvements in truck fleet operations through more accurate and less expensive freight transfer, routing and management strategies
- Improvements in transit system operations through enhancements in traveler behavior forecasting and resulting proficiency in scheduling and coordination of equipment
- Improvements in personal productivity by ensuring timely arrival at destinations through the implementation and evaluation of traveler information systems and the development of more accurate methods of collecting and delivering real-time information, and
- Improvements to institutional productivity by providing state DOTs and Metropolitan Planning Organizations (MPOs) with the necessary tools to support quantitative decision making and more efficient execution of their mandated functions.

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1. The NCTIP theme and mission support the objectives: a) Increase intermodal physical, information, and service connectivity; and b) Increase access to the transportation system for the movement of all people and freight.
2. They support objectives: a) Reduce the real economic cost of transportation, taking into account changes in the efficiency and quality of transportation services; b) Reduce the average time for delivery of people, goods, and services to their destinations; c) Accelerate desirable, sustainable, and cost-beneficial regional and local economic development through major transportation investments; d) Increase the education and public awareness of individuals in transportation-related fields.
I.C CENTER DIRECTOR'S SUMMARY

It is the Director’s vision that, by the year 2001, NCTIP will have established itself as the premier Center in the use of advanced concepts, information technologies and modeling tools to bring about increased productivity in the nation’s transportation systems, facilities, and public and private organizations.

1. MISSION

The Center is an academic - research entity of NJIT, a public research university, one of four higher education facilities located in the University Heights area in the heart of downtown Newark. The Center’s mission is to scientifically determine means of increasing the efficiency and productivity of private or public sector entities and industries through transportation improvements. This is accomplished by undertaking high quality, multi-disciplinary, innovative education and research activities that can withstand rigorous peer review in the areas of freight and passenger movement efficiency, and facility, institutional, and regulatory transportation efficiency.

The Center will be the leading force that will mobilize and unite faculty, students and staff in pursuit of cutting edge efforts designed to advance the state-of-the art of transportation education and research in the United States.

2. PURPOSE

The Center’s stakeholders are students, faculty, transportation companies, local, state and federal government agencies, the City of Newark and urban communities in the northeast United States and beyond. The Center’s commitment toward each of the stakeholders is as follows:

— Students are the Center’s main assets, an investment in the future of transportation. They will be offered an outstanding set of academic programs in transportation at the graduate level. The educational experience will give students the necessary skills to deal with complex transportation issues and enable them to fulfill their career goals and aspirations. The Center will be a vehicle for the students to involve themselves in basic and applied transportation research.

— The Center will give faculty a common purpose in pursuing innovative research in their areas of expertise focused on timely transportation productivity topics that could not have been carried out in absence of the Center. It will provide funding and mentoring, and support faculty development, so that faculty can reach their full potential and earn name recognition in the transportation field.

— The Center will provide transportation companies with a highly educated recruitment pool, while offering educational enhancement opportunities to existing professionals through continuing education courses and training in new and emerging technologies. The Center’s research efforts in operations planning and technology areas are designed to improve productivity, thus enabling the companies to excel in the competitive market.

— Governmental entities (e.g., DOTs, MPOs, and public transit properties) will be beneficiaries of the Center’s exceptional educational services. NCTIP's research function will help agencies
develop and utilize innovative approaches for predicting transportation, economic, and environmental impacts of proposed transportation investments as the basis for sound public policy.

NJIT’s predecessor, the Newark College of Engineering, was established over one hundred years ago by industry and the City of Newark to support the educational needs of the growing manufacturing industry. In subsequent partnership with the State of New Jersey, it provided an avenue for hardworking youth, often the first in their families to go to college, to obtain quality education at an affordable cost. They were that “middle generation” in an immigrant family’s quest to fulfill the American dream. The Center will continue this mission by providing advancement opportunities and successful career paths in transportation to this still multicultural and diverse urban community. The Center's "network of jobs" will provide upward mobility to the diverse groups in our community.

3. Core Values
The Center’s core values, consistent with those of NJIT, are:

- Pursuit of knowledge and scientific truth through basic and applied research in the broad field of transportation.
- Strong belief that the nurturing and mentoring of students who have chosen transportation careers, by educating them to plan, design and operate complex transportation systems, is paramount for securing the future of our transportation industry.
- Promotion of teamwork between faculty, industrial professionals, and students in the pursuit of higher societal goals.
- Promotion of academic integrity in conducting educational and research functions.

4. Strategy
The Center has a single overarching objective and that is “to excel in every facet of its activity.” To accomplish this the Center will provide outstanding academic and research programs.

4.A Education
The Center is cognizant of the impact of recent technological and organizational changes on transportation. Increases in intermodal travel that require a seamless interface between the modes, rethinking of the logistics function, increased global competitiveness, use of advanced technology in managing transportation systems, and environmental sustainability are some of the issues that are changing the skills required of future transportation professionals. The Center will enable students to obtain these skills by offering a set of high quality educational programs.

The Center’s graduate programs will support the nation’s need for extremely well educated and trained transportation professionals. The revised Interdisciplinary Program in Transportation will educate traditional civil and environmental engineers in concepts of communication protocols, systems integration, and computer networks. A new program in Logistics will provide students with the skills to optimize operations, manage inventories and
supply chains and increase the global competitiveness of transportation business enterprises. The MBA program will provide a broad management education and prepare students to deal with complex issues of managing technologically intense transportation organizations.

The Center’s programs will reach out to undergraduates and pre-college students and involve them in research activities. To ensure that the United States economy is supplied with bright minds, a process of vertical integration of educational activities will be developed to funnel students from community colleges, through undergraduate programs into the transportation profession. The Center will be the impetus for developing continuing education and professional courses.

NCTIP has recognized that the delivery of educational services has changed. The technological advances of the Internet and related WWW services, distance learning and multi-media technology and connectivity have provided the university community with an enormous opportunity to make quality education available to diverse audiences. These advances require rethinking of the ways in which the transportation lectures and labs are organized, presented and delivered. NCTIP will be the leader in utilizing these new methods to carry out a learner-centered educational function.

4.B RESEARCH
The Center’s research program will be driven by the multimodal and intermodal nature of transportation systems and travel behavior present in the New Jersey/New York metropolitan region. Particular emphasis will be placed on improving land access to regional port and airport facilities. It is expected that the optimization of modal interfaces will result in increased mobility as well as improved productivity of companies that are engaged in providing transportation and logistics services.

Extraordinary changes have been taking place in the way businesses provide service to their customers. Relocation of the nation's manufacturing capacity overseas has resulted in long transportation links required to bring semi-finished products to U.S.-based manufacturing facilities, and finished goods to markets. These supply chains have become activities that need to be optimized if companies are to achieve and maintain competitive advantage. The large freight volumes across the U.S. have required railroads and government agencies to begin rethinking what capacity investments are needed in the freight network. These changes are accompanied by increased customer demands for service. Rail and truck companies calling on intermodal ports demand decreased wait times at the gates and real time knowledge of their container status. This places tremendous pressure on terminal operators to introduce automated container truck processing, estimate weekly and daily truck volumes and ensure that sufficient labor and equipment resources are available to service customers.

The advent of the WWW has provided a surge in e-commerce with web sites providing companies access to the global market. This, in turn, will require changes in logistics distribution functions. The small time window within which a company can sell a product to a global customer necessitates the company having tools to detect changes in demand patterns, predict surges in demand for a particular product and ensure that the product is available in strategically placed warehouses. It is this focus on customer service that has enabled some of the hottest on-
line retailers to generate enormous market capitalization. Common to the above-mentioned examples of diverse industries is the fact that they need to apply new technology and tools to meeting customer expectations. A new decision technology must be developed that is capable of “mining” the enormous customer database for patterns and trends that can be then used to gain strategic advantage.

NJIT has a remarkable track record of introducing technology to the business environment with the purpose of improving service quality and productivity. The Center will leverage these strengths to become the leader in developing the tools for managing efficient and productive transportation enterprises in the new millennium. In pursuing its mission, the Center will develop and promote multi-disciplinary teams of civil and industrial engineers, operations researchers, and management and computer scientists to deal with complex transportation problems.

The Center’s showcase will be its state-of-the-art computer and experimental laboratory facility equipped with high performance computer workstations. The lab will support education and research on productivity issues ranging from operations planning for transportation and logistics companies to large scale modeling of the impact of transportation investments on job accessibility and transportation network performance. In addition to learning new concepts in transportation system design, the lab will enable students to simulate running their own virtual transportation companies, make independent decisions regarding the planning, marketing, financing and operation of transportation services, and compete with one another in a real-world situation without leaving the classroom setting.

The Center’s lab will bring together cross-disciplinary faculty interested in intensive data gathering, data mining and warehousing, and modeling. The Center will continue its research on a large, county-based commodity flows database. The North Jersey Transportation Planning Authority (NJTPA) and the New Jersey Department of Transportation (NJDOT) have used these data for studying the impact of the Conrail merger on the New York/New Jersey metropolitan region.

The Center will develop a multimodal and intermodal modeling framework that will ascertain the transportation, economic and environmental regional impacts of a myriad of public policies, ranging from those designed to induce mode shifts from truck to rail; use congestion pricing; and induce capital improvements.

The Center will develop expertise and become a national asset in leading the research in evaluating the impact of targeted transportation investments. It will become a national resource in developing tools and data that support the planning functions of DOTs and MPOs. To this end, the Center will add two faculty members and will aggressively seek to aid minority advancement by actively recruiting women and minorities into its research and educational programs.

Over the next three years, it is the goal of the Center to increase its national visibility and be recognized as THE premier place for one to go to study or secure answers to questions involving the interaction of transportation and productivity.
II. A EDUCATION

Education Goal: A multidisciplinary program of coursework and experiential learning that reinforces the transportation theme of the Center.

1. BASELINE MEASURES

A list of undergraduate and graduate courses offered at NJIT which support the transportation curriculum, and enrollment data for these courses compiled for the last complete academic year - 1997-98, are shown in Appendix A.

2. EDUCATION PROGRAM OUTCOME

By the end of 2001, NCTIP supported educational activities will consist of a set of outstanding graduate academic programs and educational efforts involving undergraduate students. Three graduate programs will be offered to meet the educational needs of three distinctive market segments of transportation professionals:

— The Center’s flagship program will be the Interdisciplinary Program in Transportation leading toward designated M.S. and Ph.D. degrees in Transportation. This program will meet the needs of students with engineering and science backgrounds who desire to study planning, design and operations of highway and public transit systems. The academic program will be revised so that it will become THE place to study transportation and productivity in the United States. They will also reflect the trend in using advanced traffic management concepts and electrical and computer technology in transportation. Students will be given the opportunity to integrate this knowledge in a true systems sense. The success of the program will be manifested by a projected annual 5% increase in enrollment over the next three years. In this same time frame, the program will have graduated six Ph.D. students.

— A new graduate program in Logistics Engineering will be developed and offered in the Department of Industrial and Manufacturing Engineering. This program will supply shippers, manufacturers, importers/exporters, and movers of freight in this very active region with qualified and well-educated professionals capable of managing existing distribution systems and of contributing to operational improvements. By the fall of 2001, we project that the M.S. Degree with concentrations in operations research and information systems will be approved, and that its annual enrollment will be ten M.S. students. It is expected that at least two of these M.S. students will matriculate in one of the Ph.D. degree programs in Industrial Engineering or Transportation.

The Center recognizes that individuals working in public and private sector organizations have very diverse responsibilities and educational backgrounds, ranging from human resources to
operations research. As these professionals develop and move up within the organizational structure, and begin to carry out certain management functions, they need to acquire a specific set of skills that will enable them to execute their new roles successfully. A new MBA program in Management of Technology will be introduced to cater to their needs. The Program will provide mature students with an interdisciplinary graduate management education that is focused on current and emerging information technologies and their use in organizations.

— NCTIP will annually recognize excellence among its students by awarding an Outstanding Student Award in the amount of $1,000 to the student whose scholastic achievement and leadership contributions to the Center’s activity are deemed superb. The Center will pay expenses for the student to attend the award ceremony in Washington, D.C. during the Annual TRB meeting.

— The Center will vertically integrate transportation education at NJIT. Undergraduate transportation "majors," "concentrations," or "options" will exist in the departments of Civil and Environmental Engineering and Engineering Technology. Both programs will involve undergraduate students in transportation research and nurture them toward successful careers in transportation. This integration will eventually feed the enrollment in transportation-related graduate programs at NJIT.

— The Center’s aggressive efforts to recruit undergraduate students to pursue a joint BS/MS degree program will complement the above endeavor. It is expected that two students from the joint program will be involved in the Center's activities. The Center will work with NJIT's Albert Dorman Honors College to attract highly motivated students to the field of transportation. Course materials targeted to these students by the Center will combine lectures on theoretical principles and foundation with their hands-on application of real-world problems. These activities will also support UTC Goals B and C.

— Two efforts are being envisioned to attract high-school students toward transportation and engineering and science disciplines. A three-week summer transportation program will be introduced, which will be part of an ongoing six-week summer program for minority students. This will include science, math, civil engineering and transportation. The transportation segment of the program will include workshops, lectures, problem solving, and team presentations. The program will attract about 60 high school students, equally divided between male and female. The Center will participate in the Transportation and Civil Engineering (TRAC) program. These activities will also support UTC Goals B and C.

— The Center's transportation certificate program, offered through the Division of Continuing Education, will serve the needs of transportation professionals desiring to develop new skills. It is expected that a certificate in logistics/supply chain management will be offered.

— A fully-functioning Advisory Board will provide guidance in academic program development, industry needs, and research selection; and will take an active role in securing matches for federal funds. The Center's mentoring program will encourage successful business leaders to provide guidance and advice to those of our students interested in transportation careers.
3. PLANNED ACTIVITIES

The following are the activities that support the program outcomes identified in the preceding section.

3.A REVISE THE EXISTING GRADUATE PROGRAM CURRICULUM OF THE INTERDISCIPLINARY PROGRAM IN TRANSPORTATION TO BETTER REFLECT THE CENTER'S THEME.

Currently, the M.S. program is a 30 credit program and has three areas of specialization: Transportation Engineering, Transportation Planning and Advanced Transportation Systems and Technology. The Ph.D. program consists of 60 credits beyond the M.S. degree, 36 of which must be a doctoral dissertation. A successful Ph.D. student will have to pass the Ph.D. qualifying exam and defend a doctoral dissertation. To better reflect the Center's theme, the existing curriculum will be revised. The revisions are driven by recent trends:

1. The growth of the use of PC-based information technology in solving transportation problems;
2. The growing application of the fundamentals of electrical engineering and computer and information science in transportation; and
3. Globalization of transportation functions, especially in the private sector.

The fourfold focus of planned revisions is to:

1. Broaden the undergraduate disciplines from which graduate students can be attracted into the transportation program;
2. Modernize the program to keep pace with technology advances;
3. Build in greater flexibility by providing a wider range of elective courses; and
4. Ensure a closer reflection of the Center's theme within the program.

The revision will start with an assessment of what a well-educated transportation professional should know or be capable of doing and then see if, and to what extent, the necessary material is covered in existing courses. 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.

RESPONSIBLE INDIVIDUAL

Dr. Athanassios K. Bladikas, Acting Program Director, Interdisciplinary Program in Transportation, and Chair, Industrial and Manufacturing Engineering

3.B DESIGN, DEVELOP AND IMPLEMENT A NEW LOGISTICS ENGINEERING PROGRAM WITHIN THE DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

The existing Interdisciplinary Program in Transportation does not deal in depth with the area of distribution/logistics. The Department of Industrial and Manufacturing Engineering has made a strategic decision to develop a program in Logistics/Supply Chain management. A market survey and discussions with the regional CLM leadership have identified the need for training and education in the New Jersey/New York region. A survey of existing academic programs in the region indicates the absence of an academic program to serve these needs.
Preliminary contacts have been made and meetings held with representatives of the New Jersey Roundtable (the local chapter) of the Council of Logistics Management (CLM), which has about 400 members. CLM is the nation’s premier organization of logistics professionals and has an educational component in its mission.

The CLM New Jersey Roundtable will provide input to the program’s content; help advertise it among its members and their companies; assist with the identification of adjuncts who may teach some courses in the new program; and provide assistance in enriching courses with a practical perspective by identifying guest speakers and facilities for sight visits. Initially, the program will serve the needs of the transportation/distribution industry in the vicinity of NCTIP. Eventually, it will serve the nation and the world.

Recognizing the fact that the introduction of a new designated Master’s Degree is a lengthy process, requiring university-wide and state-level discussions and approvals, the new curriculum will be developed and offered in stages. This approach will maximize the potential student population, while at the same time, keeping it academically sound and compatible with NJIT’s disciplinary competencies. The program will start with a set of courses that will allow students to earn a certificate in logistics. The certificate will be directed toward professionals already in the logistics field desiring to acquire a specific set of skills.

RESPONSIBLE INDIVIDUAL
Dr. Athanassios K. Bladikas, Acting Program Director, Interdisciplinary Program in Transportation, and Chair, Industrial and Manufacturing Engineering

3.C DESIGN, DEVELOP AND IMPLEMENT A TRANSPORTATION/SUPPLY CHAIN MANAGEMENT FOCUS WITHIN THE NEW MBA PROGRAM IN MANAGEMENT OF TECHNOLOGY
The Association of American Collegiate Schools of Business (AACSB) recently accredited the School of Management (SOM) at NJIT. Only four universities in New Jersey have had this prestigious distinction bestowed upon them. SOM has begun the process of developing an MBA program that will focus on management of technology. Given the high concentration of transportation related businesses in the region, it is natural for the program to have a transportation/logistics component. Students enrolled in the MBA program, in addition to the technology-based courses, will study basic management courses thus strengthening their educational development. Understanding of technology and its relationship to business will be further strengthened by coursework in three technical specialization areas namely transportation/logistics, manufacturing, and management information systems. The transportation focus will be directed toward management of large-scale public systems (e.g., NJ Transit) and private systems (e.g., UPS).

RESPONSIBLE INDIVIDUAL
Dr. Naomi Rotter, School of Management

3.D. PARTICIPATE IN THE NATIONAL UTC STUDENT AWARD PROGRAM
The UTC Outstanding Student Award Program was initiated in 1992 to recognize the best student from each of the ten regional Centers that existed at that time. The Center will
participate in this excellent effort by establishing award program procedures, soliciting
nominations, selecting the student, and presenting the award at the annual ceremony at the
TRB meeting in Washington, DC.

RESPONSIBLE INDIVIDUAL
Dr. Steven Chien

3.E CARRY OUT THE VERTICAL INTEGRATION OF TRANSPORTATION EDUCATION AT NJIT
— NJIT’s current transportation program is overwhelmingly concentrated at the graduate
level. As a result, undergraduates are often unaware of transportation as a field of study
and area of professional growth. This lack of awareness inhibits achievement of Goals B
and C of the UTC Program, at least as far as student participation is concerned. To
increase student awareness and eventually generate greater student interest and
enrollment in the graduate transportation programs, an attempt will be made to offer
transportation education as an option for undergraduate students. Students enrolled in a
College (e.g., Honors College) or Department (e.g., Civil and Environmental
Engineering) at NJIT may choose transportation as an option or specialization while
majoring in a more traditional discipline such as civil engineering. In addition,
approximately half of NJIT’s undergraduate population consists of transfer students from
various community colleges. It is, therefore, desirable to expand the activities to be
undertaken under this objective to the community college level.

— NJIT has a very attractive joint BS/MS degree program. Undergraduate students in good
standing can register and take two graduate courses in a chosen field of study in their
senior year. These courses are counted toward both the BS and MS degrees. NJIT’s
policy is to pay tuition for one semester for students pursuing the joint degree. These
students will be aggressively targeted and provided an opportunity to work on
transportation research problems.

— NJIT’s Albert Dorman Honors College serves those students that are prepared to pursue a
more challenging course of study. The tuition for the students is paid by NJIT and the
students are provided with various financial grants. The Center will establish a
relationship with the Dean of the College and provide a set of educational exercises
designed to involve the best and the brightest students in transportation. The exercises
will involve an extensive use of case studies and problem solving in a teamwork setting.

RESPONSIBLE INDIVIDUAL
Dr. Lazar N. Spasovic

3.F EXPAND THE UNDERGRADUATE TRANSPORTATION OFFERINGS IN THE CIVIL AND ENVIRON-
MENTAL ENGINEERING DEPARTMENT
CEE has only one undergraduate course in transportation (CE350). The course emphasis is
“…on the planning, design and construction of facilities for modern transportation systems,”
as stated in the catalog. Recent advances in technology demand that the traditional civil
engineer be exposed to the concepts of communication protocols, systems integration, and
computer networks. It is obvious, therefore, that a need for the broadening of this course
exists, as well as for adding separate courses dealing with public transportation, urban planning, just to name a few.

**RESPONSIBLE INDIVIDUAL:**
Dr. Steven Chien, Civil and Environmental Engineering

**3.G DEVELOP AN UNDERGRADUATE TRANSPORTATION ACTIVITY IN THE ENGINEERING TECHNOLOGY DEPARTMENT**

These activities will involve the development of transportation case studies that will enable ET students to work with the Center faculty to apply their communication and systems integration skills to solving transportation problems. This department has shown leadership in offering its students the option of working on transportation projects for their senior thesis.

**RESPONSIBLE INDIVIDUAL**
Dr. William Barnes, Program Head, Electrical Engineering Technology; Department of Engineering Technology

**3.H ESTABLISH THE CENTER'S ADVISORY BOARD AND SELECT AN EDUCATION AND TRAINING COMMITTEE**

This activity will establish a formal relationship between industry, government, and the university, so that the transportation program faculty can receive inputs on the academic programs' structure and contents. The Center recognizes that academic programs in transportation, and all other academic programs of the university, serve the purpose of educating future professionals who will serve the needs of industry and government. Therefore, the contents and structure of an academic program should not only be of high academic quality and rigor, but they should also reflect current practice and educate individuals who can contribute meaningfully to their future employers' endeavors.

The Advisory Board is envisioned to be a working group that is interested in the activities of the Center and actively works to promote its goals. It will provide guidance to the Center's faculty and assist in the formulation and accomplishment of the Center's goals and objectives. Board members are expected to be willing to mentor students participating in the NCTIP program.

Since NCTIP has a national focus, individual Advisory Board members may be sought from within and outside New Jersey, USDOT, and Region II, and even from the northeast region of the country. Because of this national scope and the increasingly intermodal nature of transportation, in addition to transportation corporations and agencies, industrial associations such as the CLM, CHSA, IANA, AAR will also be approached to participate in the Advisory Board and provide matching funds for the Center. The Board will be convened on a semiannual basis for the purpose of reviewing the program.

The transportation program faculty, in cooperation with NJIT's administration, will select the Advisory Board keeping in mind that the group should be modally balanced and
representative of both government (at various levels) and industry (both providers and users of transportation services). The Advisory Board will appoint two committees at its first meeting: an Education and Training Committee, and a Research and Technology Transfer Committee. Academic Programs at NJIT are required to have Advisory Boards usually numbering five or seven members. The Center’s Education and Training Committee will also serve as the Advisory Board for the Interdisciplinary Program in Transportation. As the Center finds new sponsors or makes additional contacts, the solicitation of interest will continue so that the Advisory Board can be expanded. The Advisory Board’s Research and Technology Transfer Committee is described in Section II.D.3.c.

RESPONSIBLE INDIVIDUAL
Dr. Lazar Spasovic

4. PERFORMANCE INDICATORS
The Registrar's Office compiles active statistics for every academic program regarding the enrollment, data, demographics and financial information, and graduation dates. This office will be the primary source of Performance Indicators 1a and 1b. The academic programs keep files on each student as well as files on the source of financial support. The Alumni Office keeps data on graduates and their employers.

II.B. HUMAN RESOURCES

Human Resources Goal: an increased number of students, faculty and staff who are attracted to and substantively involved in the undergraduate, graduate and professional programs of the Center.

1. BASELINE MEASURES
The academic programs offering advanced degrees in transportation and transportation related fields and graduation data for academic year 1997-98 are shown in Appendix A.

2. HUMAN RESOURCE PROGRAM OUTCOME
Currently four faculty members devote full-time efforts to transportation activities. By 2001, two additional full time transportation faculty members will be hired, and another four full-time faculty equivalents from departments across NJIT will be involved with the Center's education, research and technology transfer activities.

The Center recognizes that students are the most precious resource and most important product of any university, the UTCP, and NJIT in particular. Upon graduation, these students will enter the workforce and spend their productive lives shaping the future of the transportation profession. NCTIP will meet industry needs for a highly educated workforce by graduating students who, in addition to being well-trained in theoretical foundation and problem solving, will be capable of using the latest information technology in transportation practice. As a result of aggressive recruiting efforts, the fall 2001 enrollment in the combined transportation academic programs supported by the Center will increase by 15% compared to the baseline.
The Center will support the goal of the UTCP program to increase the number of Americans who are prepared to design, deploy and operate the complex transportation systems that will enhance the country's economic competitiveness in the 21st century by offering scholarships and fellowships. Scholarships will be offered to U.S. citizens and residents who, in the opinion of the Center faculty and the Director, have an outstanding academic record or highly relevant work experience. The scholarship will pay a competitive stipend and tuition. Recipients will not be required to work in exchange for the scholarship. However, they will be encouraged to participate in the research activities and meetings of the Center’s faculty and staff.

Funds allocated for NCTIP-sponsored research projects, whether federal or from matching sources, will be used to offer fellowships. These fellowships will pay for tuition and stipend in exchange for a student’s work on a project. Students receiving fellowships will have the title of research assistant. Competition for financial aid will be very keen and the best-qualified students will be selected based on the credentials accompanying their application package.

Undergraduate Scholars Program will provide 8 awards of $2,000 each to students who successfully complete at least two transportation courses and either an independent study, mentored research/development transportation project or faculty supervised agency/industry internship of at least one semester's duration.

NCTIP will award an Outstanding Student Award. The award is described in Section II.A.3.d.

An active partnership program between the transportation industry and the Center will result in a mentoring program. The main feature of this program will involve the mentoring of transportation students by successful industry captains. It is expected that by the end of the grant 8 students will have been involved in this program.

The Center’s programs will help students in grades K-12 to attain literacy in math, science and technology. The Center recognizes that math and science require progressive acquisition of knowledge and will start these activities with the students at an early age. NJIT programs will support the mission of the USDOT Garrett A. Morgan Technology and Transportation Futures program. The Center’s programs will use transportation examples and applications to demonstrate scientific concepts. The successful outcome is not only to attract the students to careers in transportation but also to stimulate, encourage and guide students toward the goal of choosing careers in engineering and science.

The Center's visibility and its national reputation in the academic and professional community will increase. NCTIP’s active mentoring of both newly hired faculty and faculty internally recruited to carry out the Center’s activities will result in a professionally awarding career development and increased peer-recognition of the faculty in their respective fields of inquiry. The Center’s successful sabbatical program will allow research-oriented faculty from universities throughout the country, whose interests are in transportation and transportation-related disciplines consistent with the Center's theme, to spend one semester or academic year at NJIT working on a sponsored project. The $1,000 national student paper competition will reward independent research and induce young students to pursue their careers in transportation.
The Center’s transportation cooperative program will integrate academic study with the practical expertise obtained at the participating transportation companies. The program will involve academic advisement by the Center’s faculty, reports, presentations, assessment, and interaction between the Center’s adviser and the supervisor at the company to ensure that the learning process is occurring. It has an immediate payback for companies involved by producing an early feedback on potential employees.

The Center will participate in the University Research Experience (URE) program. The program is designed to expose EOP and minority undergraduate students to the research environment by working in partnership with faculty/research experts in a variety of rapidly growing and significantly important engineering and scientific fields. The program provides students with a supportive, challenging and motivational environment that encourages the pursuit of graduate study.

The Center will participate, together with NJIT’s Division of Career Development Services, in the design, engineering and construction industry symposia and career fairs. These events are intended to provide career information and employment opportunities for majors whose career tracks typically, or often, lead to employment within the design, engineering and construction, and facilities and management occupations.

3. PLANNED ACTIVITIES

3.A INCREASE STUDENT PARTICIPATION

This activity will attract additional students to the Center’s transportation and related academic programs. This objective is of critical importance. Hiring freezes and retirements have significantly reduced the middle- and upper-level management staffs of many DOTs and transportation agencies. Even if entry-level professionals are aggressively hired, adequate technical and managerial training will have to be provided for those individuals who are new to the transportation profession. Technological innovations and competitive pressures are generating substantial training needs in the private sector as well. Total quality management, strategic alliances, the intermodal nature of transportation, global competitiveness, ITS, computer modeling and applications, are but a few of the changes or techniques that private carriers and shippers are or will have to get involved with in the near future.

Both the private and public transportation sectors are in need of new employees as well as in need of re-training a substantial portion of their existing workforce. Although everyone uses transportation services, the discipline suffers from lack of recognition. While traditional majors in engineering (e.g., electrical or civil) and management (e.g., accounting or finance) are well known to college and even high school students, very few young men or women know that there are rewarding careers in transportation, and that they can formally study to prepare for them. The Center’s activities will increase the awareness of potential students about the transportation field, and offer them incentives to pursue transportation study and careers. The climate may be right, judging by a recent review in *U.S. World and News* which indicated that demand for transportation engineers with ITS skills is on the rise.
The Center will develop promotional material (e.g., brochures, pamphlets, posters) to attract prospective students and entice employers to encourage their employees to pursue graduate degrees and participate in continuing education training. A comprehensive and highly interactive Home Page on the web, with transportation puzzles and other tools for capturing the attention of web-surfers will be designed and implemented. The Home Page will maintain up-to-date brochure material, and information on scholarships and assistantships. Information on research activities and seminars that may support the outcome of increased student recruitment and participation will be also maintained on the Home Page.

The Center will recruit aggressively and offer graduate student fellowships to qualified applicants to the graduate transportation programs. In addition, the Center will offer undergraduate student fellowships to individuals completing their junior year in a transportation-related discipline (e.g., industrial, manufacturing, and civil engineering). These fellowships will enable students to receive a stipend during their senior year and require them to take two transportation courses and/or work as interns in a private company or public agency that is involved in the field of transportation. The Center will assist NJIT’s Office of Cooperative Programs to develop a partnership with the transportation companies whose officers will sit on the Center's Advisory Board.

Some of the above activities may also partially support UTCP Goal C.

RESPONSIBLE INDIVIDUALS
Dr. Lazar N. Spasovic – promotional material
Dr. Athanassios K. Bladikas – graduate student recruitment
Dr. Harold Deutschman – undergraduate student recruitment
Mr. Greg Mass – cooperative programs

3.B INCREASE FACULTY PARTICIPATION
Additional faculty members will be needed for the supervision of students and the execution of activities necessary to meet the Center's goals. Requirements for additional faculty will be met by: 1. New hiring, and 2. Re-orienting the activities of existing NJIT faculty interested in transportation.

Two additional faculty members, whose areas of expertise coincide with the Center's theme, will be hired. This activity may also accomplish UTCP Goal C.

An active recruiting effort will be initiated by the Director aimed at involving NJIT faculty in the research, education, and technology transfer activities of the Center. Meetings will be arranged and research proposals promoted to facilitate successful merging of faculty with the educational and research needs of the public and private sectors. Faculty will be kept informed of the Center’s activities and opportunities via the Home Page, and will subscribe to the electronic mail groups that match their interests. NCTIP will actively promote mentoring of faculty and staff and assist them in obtaining research funding in the transportation area. The Center’s concept of incentive awards, further described in Section II.D.2, will be designed to help build up the new faculty’s specific research capability so that it can be applied to NCTIP-related transportation problems.

An incentive program will be initiated to encourage faculty to carry out technology transfer
activities by presenting the results of their research in seminars, workshops, and guest lectures, as well as in presentations to professional clients and participation in professional conferences.

**RESPONSIBLE INDIVIDUAL**
Dr. Lazar N. Spasovic

3.C **HIRE CENTER SUPPORT STAFF**
The Center will generate sufficient procedural and administrative tasks to occupy full-time, and therefore justify, the dedicated use of non-faculty individuals. Occasionally, research projects require significant and relatively high-skilled labor. Depending on the nature of the research projects to be undertaken, one or more research associates will be added to the staff. This objective may also accomplish UTCP Goal C.

**RESPONSIBLE INDIVIDUAL**
Dr. Lazar N. Spasovic

3.D. **INCREASE PROFESSIONAL COMMUNITY AWARENESS**
Solidifying a national reputation for the Center in the academic and professional community will take a dedicated long-term effort and require the Center's continuous visibility. To provide such visibility and simultaneously promote the Center's theme, faculty sabbaticals and a national student competition will be carried out.

Brochures that publicize these activities will be developed, and selection procedures will be established. Industry sponsorship will be sought to increase the visibility of the awards and provide the sabbatical participant with the real-world problems that deal with productivity issues. Maximum effort will be made to publicize winners, and thereby the Center, in all appropriate internal and external media.

**RESPONSIBLE INDIVIDUAL**
Dr. Lazar N. Spasovic

4. **PERFORMANCE INDICATORS**
Performance Indicator 2.a will be obtained from the graduate catalog by the Center staff. The Registrar's Office will be used to compile enrollment and graduation statistics that are required for Performance Indicators 2.b1 and 2.b.2. The function of this Office is detailed in Section II.A.4.

**II.C. DIVERSITY**

Diversity Goal: students, faculty and staff who reflect the growing diversity of the workforce and are substantively involved in the undergraduate, graduate and professional programs of the Center.
1 **BASELINE MEASURES**

The diversity data complied for the last academic year (97-98) is shown in Appendix A.

2 **DIVERSITY PROGRAM OUTCOME**

NJIT has been actively working on a set of comprehensive programs for attracting underrepresented groups to the broad field of transportation. By the end of the year 2001, we project that more of these programs will have been successfully developed and implemented, and that they will have increased awareness of transportation careers, and how to acquire formal preparatory education, among the general high school and college student populations as well as the general public.

As Web searches become more and more the primary tool for exploring educational opportunities, the NCTIP Home Page will be prepared with the attractions the transportation field holds for all interested graduate and undergraduate students, including women and minorities. The university site will also direct transportation-related inquiries to NCTIP.

The Center recognizes that transportation as a discipline is relatively new in comparison with traditional engineering and management majors. As the nation's engineering and planning workforce becomes increasingly diversified, more women and minorities are exploring careers in transportation. These underrepresented groups have few role models to identify with, seek advice from, or emulate. The Center's programs will continue to promote the transportation field and the opportunities for employment that exist in it to groups that are under-represented in the workforce. The outcome of these programs will be an increased number of women, African-Americans and Hispanics in transportation educational and research programs at NJIT.

University-wide, women comprise 21% of the overall undergraduate population, 28% of the graduate population, and 15% of the full time instructional staff. Very active women's programs exist on campus, bringing together students, faculty and staff. Creation of the Constance A. Murray Women's Center has been a successful initiative designed to increase the representation of women in the technological professions. The Murray Center provides a central home for a variety of professional and support groups who work to increase the visibility of women at NJIT and recognize their accomplishments. These groups include the Committee On Women's Issues, established in 1994 to help promote a more welcoming campus environment for all women at NJIT; and Big Sister/Little Sister, a mentoring program which matches upper-class women with freshman women. The Murray Center works closely with various student organizations and clubs, such as the Society of Women Engineers, the Student Senate, the Inter-Fraternity/Sorority Council, and the Graduate Student Association. NCTIP's Technology Transfer Specialist will continue her role as Center liaison with the university's women's programs, and will participate in available sub-committees on the subject of recruiting women as students and faculty.

The Center will build on NJIT’s excellent record in attracting minority students, staff and faculty. Measurable success in the recruitment of African-American and Hispanic students can be seen in the university's rating in publications specific to these populations. *Hispanic Outlook in Higher Education: 1998 Best Colleges for Hispanics*, ranked NJIT among the top ten universities nationally in awarding bachelor's degrees to Hispanics in Engineering and
Engineering Technologies. *Black Issues in Higher Education: 1998 Top 100 Degree Producers*, ranked NJIT in the top ten universities nationwide granting Baccalaureate Engineering Degrees to African-Americans. This publication also ranked NJIT 14th in granting Hispanic-Americans Baccalaureate Engineering Degrees. The Center will build on the university's 10.7% Hispanic and 9.5% African-American population in its efforts to increase diversity among its students.

The program will have a strong emphasis on high school students. The Summer Transportation Institute, a pre-college program at NJIT, will continue to attract high school students to study math, engineering and science, and include three weeks of transportation study in its curriculum. In addition, the relationship developed with TRAC will further broaden the Center’s outreach. The transportation segment will include workshops, lectures, problem solving, and team presentations. The program will attract about 60 high school students, equally divided between male and female. It will include presentations by local transportation professionals on the rewarding careers in transportation, as well as field trips.

3. **PLANNED ACTIVITIES**

3.A **EXPAND MINORITY HIGH SCHOOL STUDENTS' AWARENESS AND INTEREST IN TRANSPORTATION CAREERS.**

In part of NJIT's target recruitment area (Newark and its surrounding cities of Jersey City, Paterson, East Orange, and Elizabeth), the mix of population, according to the 1990 census, is 72% African American and Latinos, on a base of over 230,000 residents. NJIT has one of largest pre-college programs in the nation, serving more than 3,000 students and teachers annually. Most of these students are from Newark and its environs and are minorities. The focal point of NJIT's activities in this area is the Pre-College Center. Integrating the Pre-College Center's activities with NCTIP will serve as a strong magnet to attract and recruit minorities and women to the field of transportation. Since it is well known that to influence and motivate an individual, intervention will have to take place at the youngest possible age, this task will focus on high school students. As part of this effort, for example, in December, 1998, the university's Education Opportunity Program and the Consortium of Pre-College Education in Greater Newark hosted 350 students from the Greater Newark area for a day of 'hands-on' experience of state-of-the-technology and what it can mean for their careers.

The program will be six weeks, five hours a day in duration. Three weeks will be devoted to transportation planning, engineering, logistics, and systems and will include field trips. The remaining three weeks will include Math and Science, Environmental Engineering, Introduction to Architecture, Urban Planning and Computer Science.

Career counseling will be an integral part of the program, which will contain presentations from transportation professionals working in the private and public sectors.

The Center will produce promotional material (brochure and flyers), advertise the program, and contact all science/math teachers within the target areas -- greater Newark metropolitan area. The Program coordinator will evaluate applications, interview students, and select about 25 students with an appropriate waiting list. Participating faculty will develop the program module, course materials, and a program text/notebook. To gain the feedback and determine the program's effectiveness in terms of the number of students who go on to
college and choose transportation as a major, a program evaluation methodology that includes a pre and post survey will be devised and implemented.

RESPONSIBLE INDIVIDUAL
Dr. Harold Deutschman, Civil and Environmental Engineering

3.B CONDUCT OUTREACH PROGRAMS FOR WOMEN
This activity will be aimed at reaching out to a specifically targeted, under-represented group by enticing the college-aged population to chose transportation as a career, assisting women professionals in their efforts to recruit women, and getting assistance from women professionals in NCTIP's efforts to recruit.

This activity will be carried out by establishing working relationships and devising an action plan for the recruitment of women in cooperation with the Society of Women Engineers (SWE) at NJIT and the Women's Transportation Seminar (WTS), a professional society. The action plan will be similar to the one devised in the above item II.B.3.A and will most likely include scholarships, awards, presentations on transportation at society meetings, and NJIT's participation in society outreach activities.

RESPONSIBLE INDIVIDUAL
Sally O'Malley, Technology Transfer Specialist

3.C CONDUCT OUTREACH PROGRAMS FOR AFRICAN-AMERICANS AND HISPANICS
This activity is aimed at increasing participation of African-Americans and Hispanics. It will require that working relationships be established and an action plan developed for the recruitment of students in cooperation with the BASE, NSBE, SHPE, and the HOST at NJIT. The action plan will most likely include scholarships, awards, presentations on transportation at society meetings, and NJIT's participation in society outreach activities. In addition, programs will be devised to attract targeted students to the transportation field, particularly through the GEM. The GEM Engineering Fellowship Program provides opportunities for underrepresented minority students (U.S. citizens) to obtain MS and Ph.D. degrees in engineering at the participating universities through a program of paid summer internship and financial assistance. Finally, HBCUs will be targeted in Center mailings.

RESPONSIBLE INDIVIDUAL
Dr. Athanassios K. Bladikas

4. PERFORMANCE INDICATORS
The Registrar's Office will be used to compile the statistics required for Performance Indicators 3.1 to 3.10.
II.D RESEARCH SELECTION

Research Selection Goal: An objective process for selecting and reviewing research that balances multiple objectives of the program.

1. BASELINE MEASURES
   The baseline measures for the research selection goal are shown in Appendix A.

2. RESEARCH SELECTION PROGRAM OUTCOME
   The Center research effort will be a peer-reviewed multi-disciplinary program of cutting edge research on topics grouped in the rather broad areas of freight and passenger movement efficiency, and facility, institutional and regulatory efficiency.

   The first area will deal exclusively with freight, and cover what might first come to mind when the Center's title is mentioned. The Center recognizes that goods are moved over increasingly complex transportation networks of shippers, terminal facilities, carriers, distributors and receivers. The movement is increasingly intermodal and involves the transfer of containers between modes. Incidental to goods movement is the flow of information on the shipment that is used for tracking and operations planning. This supply chain needs to be managed to be seamless, and optimized in order for the transportation company to be competitive. Efficient management of information flows is a prerequisite for efficient management of related cargo flows. To this end, the Center's research will focus on maximizing productivity gains in the management of supply links by introducing new processes, information technology, and simulation tools.

   The second area is the passenger counterpart of the first. Most of the Center's public transportation work will be carried out under this category. Its focus will be on the operations planning solutions for transit properties that were designed to stimulate productivity growth. It will also deal with productivity improvements from unimpeded access to jobs, services, etc.

   The third area deals with the physical and regulatory environment in which transportation vehicles operate. This separate category was created because inefficiencies in this area affect all modes. For example, a congested roadway renders trucks, automobiles and transit buses unproductive at the same time. Although the operating and regulatory environment may affect more than one mode in general, there are cases such as rail transit and freight railroads, that have dedicated rights of way or specialized regulations and institutional arrangements under which they are operating. Problems that affect productivity in such cases will also be investigated under this area.

   To support the statement of the Research Goal, and the research effort, in the general research areas outlined above, the Center will establish peer review procedures designed to satisfy and balance a number of concerns and objectives. The procedures will ensure that the research effort overall, as well as individual projects to be undertaken, will have thematic relevance, will be scholarly, and will be chosen in a manner that is collegial and fair, in addition to being rigorous.
The Center’s peer-reviewed process, developed with input from the USDOT, will include NCTIP faculty, peers and other technical experts in the field in the proposal review process. In addition to seeking the USDOT counsel in designing the process, the Center will reach toward the regional and state USDOT representatives for the technical review of the projects. The Center will continually seek the USDOT’s input in the peer-review process and the USDOT’s representatives will be offered a seat at the meetings of the Research and Technology Transfer Committee of the Advisory Board. The Committee will be a conduit through which the faculty and the Center will receive inputs on the research programs' contents from the Advisory Board. Selection criteria will be clearly stated reflective of the Center theme and consistent with the priorities set forth in the USDOT Strategic Plan and the NTST Strategy.

The number of faculty involved in the Center’s activities is one of the measures of the success of the Center. A substantial effort will be undertaken in order to involve faculty members who have the necessary skills and are willing to get involved with the Center. To this end, a two-stage procedure will be used to attract the faculty across NJIT to involve themselves in the Center’s research activities.

It has been recognized that the faculty, especially at the junior level, needs to be mentored in order to reach their full potential. Limited seed money will be made available to faculty to induce the appropriate disciplines and expertise to participate in the research program. NCTIP will initiate the concept of incentive awards of up to $15,000 for faculty to apply specific research capability to transportation applications.

NJIT’s mission statement includes the sentence "The University seeks to expand knowledge through research and scholarly activities with a strong applications orientation." This orientation to the undertaking of applied research is consistent with the UTCP mission.

Crucial to the Center's success will be its ability to generate private and public sector matching funds to carry out its activities. The Center recognizes that, while it may be difficult to secure cash commitments in times when private sector industries may be operating on modest profit margins, a carefully considered plan of action may ensure sponsors' interest by convincing them of the concrete benefits that will accrue to them if they underwrite particular research. There is, therefore, a need to formalize plans for the association of the Center with contributing corporations. It is envisioned that at least three partnerships will be established with private corporations.

3. **PLANNED ACTIVITIES**

3.A **ESTABLISH RESEARCH TOPIC SELECTION PROCEDURES**

This activity will develop in the first year, and then each year thereafter implement a peer-review research selection procedure that supports the program outcomes cited above. The procedure will consist of the following steps:

1. Develop an NCTIP Annual Research Program which will contain potential research topics/projects consistent with the Center’s theme, as well as their tentative budgets.
2. Notify NJIT faculty about the Research Program and available funding by issuing a requests for proposals (RFPs).
3. Peer review proposals received in response to the RFPs using internal, (i.e., NJIT faculty) and external (e.g., academics at other UTCs, USDOT, NJDOT and industry) technical personnel.

4. Compile reviews, tabulate results, and rank the proposals.

5. Finalize proposal budgets and available funding.

6. Make presentations and recommendations by the Director to the Research and Technology Transfer sub-committee of the Center’s Advisory Board.

7. Obtain approval from the Research and Technology Transfer sub-committee.

8. Award contracts.

Should the total budget of proposed projects which have gone through the peer-review process exceed the Center’s research budget (e.g., insufficient funds at the sponsor agency providing the match), the NCTIP Director will work with the sponsor to prioritize the projects and resolve conflicts. The NCTIP director may secure additional funding, move the peer-reviewed project to the following year’s funding cycle, or notify the PI that the sponsor is no longer interested in the project.

Before being adopted, the above procedure will be collegially discussed among the Center’s faculty as well as with faculty and staff participating in other major and similar centers at NJIT (CEES, CMES, etc.). It will be shared with the Center's industry sponsors, and then presented to the Center's Advisory Board for feedback. Upon adoption, the necessary forms, templates and databases needed to support the procedure will be developed. All research program participants (i.e., faculty, sponsors, and RSPA) will be informed of the final procedure, and the procedure will be posted on the Center’s Home Page. The procedure will be evaluated and revised as needed.

3.B ESTABLISH FACULTY OUTREACH PROCEDURES
This activity will develop in the first year, and then each year thereafter implement a two-stage procedure designed to increase faculty participation in the Center’s research activities. In the first stage, a faculty member will be informed via an outreach seminar or an invitation to visit the Center’s web page. The faculty member will then be invited to submit a statement of his/her qualifications and research interests. The on-line submission will be reviewed by a Research committee, consisting of senior faculty who have been involved in prior sponsored research for the Center, to determine if there is a match between the Center’s mission and the faculty member’s interests. If there is a match, faculty would be invited to electronically submit a short proposal. The electronic submission of the proposal will facilitate review, promote interaction among faculty, and allow for mentoring through extensive commenting and annotating of the proposal. In the second stage, faculty whose interest and enthusiasm is matched with the Center’s theme will be mentored by the Center Director and the Center’s faculty while they are developing a full proposal to the Center.

3.C ESTABLISH A RESEARCH AND TECHNOLOGY TRANSFER SUBCOMMITTEE OF THE ADVISORY BOARD
This activity will formalize the role and involvement of the Advisory Board, the formation of which is described in Section II.A.3.h. The Research and Technology Transfer Subcommittee of the Advisory Board will be established to contribute to the research selection process for the funding of research projects. This subcommittee will be
representative of disciplines and departments covered by the NCTIP theme, as well as
government (USDOT) and industry, and will effectively assist in guiding the direction of
NCTIP’s research. The subcommittee will do this by voting to approve research projects for
funding, after the peer review process has been completed and the candidate projects have
been presented to the Committee by the Center Director. Subcommittee members would
include:

- Athanassios K. Bladikas, Chair, Industrial and Manufacturing Engineering, NJIT
- Roger Nortillo, Executive Vice-President, Maher Terminals, Inc.
- A USDOT representative from either Washigton D.C., or the Trenton field office,
- William Hoffman, Director of Research and Technology, NJDOT
- Edward K. Morlok, UPS Foundation Professor of Transportation, University of
  Pennsylvania
- Maria P. Boile, Assistant Professor of Civil Engineering Lafayette College
- Naomi Rotter, Professor, School of Management, NJIT

In addition to approving projects for funding, the Research and Technology Transfer sub-
committee will have input to the selection of suitable research topics/projects to be included
in the NCTIP Annual Research Plan. It is conceivable that Advisory Board members may
either fund directly or assist in securing the funding for some of the projects. To avoid
conflicts of interests, Research and Technology Transfer Committee members will abstain
from voting on funding decisions for such projects where they have either proposed or
championed inclusion.

3.D PREPARE PLANS FOR THE FORMAL ASSOCIATION OF THE CENTER WITH PRIVATE AND PUBLIC
SECTORS ENTITIES
This activity will develop in the first year, and then each year thereafter
implement the process of securing matches for the federal funds, and develop business or
program plans with the sponsor agencies from the public and private sectors. These plans
will formalize the Center’s relationships with the agencies and help the agencies identify
their transportation needs and problems. The Plans will be tailored for a number of corporate
partners in order to address their specific needs.

RESPONSIBLE INDIVIDUALS
Dr. Athanassios K. Bladikas - II.D.3.a
Dr. Naomi Rotter - II.D.3.b
Dr. Lazar N. Spasovic - II.D.3.c-d

4. PERFORMANCE INDICATORS
The information for Performance Indicator 4 is available through the FRS system described in
Section III. It will be extracted and summarized by the Administrative Assistant to the Director.
In addition, the Center Director will develop an MIS system that will collect Performance
Indicator 4 and additional information on project profiles as required by the UTC reporting
guidelines. This information will be posted on the Center’s Home Page.
II.E RESEARCH PERFORMANCE

Research Performance Goal: An ongoing program of basic and applied research, the products of which are judged by peers or other experts in the field to advance the body of knowledge in transportation.

1  BASELINE MEASURES

The information called for as Baseline 5 is shown in Appendix A.

2.  RESEARCH PERFORMANCE PROGRAM OUTCOME

It is the Director’s vision that, by the year 2001, NCTIP’s comprehensive and active research program of basic and applied research will have contributed to improving productivity of public and private sector transportation organizations. The project selection in the research program will be subject to the peer review process described in the previous section.

The multimodal and intermodal scope of the Center’s research program will be driven by the nature of transportation systems and travel behavior found in the NJ/NY metropolitan region. The region is a very active hub of freight and passenger activities. It is home to the Port of New York and New Jersey, the third largest port in the U.S. and the largest on the eastern seaboard. The Port contains several large rail intermodal terminals and a busy international airport, and also encompasses a large number of warehousing/distribution facilities and transportation carriers. These serve not only the population and commercial needs of New Jersey (the most densely populated state in the nation), but also those of the neighboring City of New York and its metropolitan area.

The region has an extensive highway and transit network that serves millions of commuters every day. The transportation problems facing the region symbolize the problems facing urban metropolitan areas in the U.S. The metropolitan areas were identified earlier as the primary foci of the Center’s interests and educational and research activities.

The Center’s research efforts will bring together engineering, planning and economics disciplines for the study of passenger and freight multi-modal transportation systems. The common thread in these diverse efforts is the systems engineering view of transportation in which a transportation system consists of a set of layers. These are:

1. Travel desires in terms of origin-destination trip tables and time of departure
2. Vehicles or containers that transport people and freight
3. Physical links and terminal facilities over which the vehicles move
4. Operating plans which determine the manner in which the vehicles move over the network of links and facilities
5. Information technology, detectors and probes that monitor location of the vehicles and how the system performs
6. An institutional layer of organizations that promotes and regulates transportation and programs funds for capital and operating improvements.
The primary focus of the Center’s research efforts is on optimizing the performance of layers 4, 5 and 6 with the objective of improving mobility, increasing the competitiveness of U.S. transportation companies in the global market, and developing tools for ascertaining the impacts of capital investments. To this end, the Center will develop research teams with expertise in systems analysis, data management, optimization, large-scale transportation modeling, and spatial economics and network analysis.

The Center’s research will be data intensive and will require a state-of-the-art computer and experimental laboratory facility equipped with the high performance computer workstations that will support extensive data management, mining and warehousing. The Center’s lab will contain a large GIS database on a multi-modal regional transportation network as well as the battery of modeling tools. These will be used for assessing impacts of various policies for improving productivity. The tools will enable researchers to optimize operations of transportation companies. They will assist agencies in making capital investment decisions and help decision-makers determine the impact of transportation improvements on the local and regional economy.

The Center will continue research on a large commodity flows database. NJTPA and NJDOT used the county-based freight data for a study of the impact of Conrail merger on the NY/NJ metropolitan region. The Center will develop a multimodal and intermodal modeling framework that will ascertain the transportation, economic and environmental regional impacts of a myriad of policies ranging from those designed to induce mode shifts from truck to rail, set congestion tolls, and stimulate capital investments. The Center will develop expertise and become THE national asset in leading the research in evaluating the impact of targeted transportation investments. The Center will become THE national resource in developing the tools and data to support the planning functions of DOTs and MPOs.

The Center recognizes that scientific advances are made when the research results are transferred to the classroom. Thus, in addition to research, the lab will support educational activities.

The Center’s research program monitoring system will ensure not only the quality of the its research products but also the timeliness and within-budget completion of each research task. The purpose of the UTCP is to generate an incremental and noticeable impact on transportation education and research that would not have been possible in the program's absence. A system will be designed to quantify to the maximum degree possible, the impact of the Center's research program.

3. **Planned Activities**

3.A **Conduct Research in the Freight Movement Efficiency Area**

This activity will focus on research efforts dealing with productivity improvements stemming from more efficient movement of freight. In particular, the Center research agenda in freight will be redesigned to increase productivity through improved management of a company's transportation resources. Research will be directed to finding the best solutions for vehicle routing and scheduling, inventory management, supply chain issues, and information technology problems. Particular emphasis will be on studying ways of improving the seamless intermodal interface. The Center is also expected to make a significant
NCTIP STRATEGIC PLAN

contribution to the integration of truck-rail, and surface-maritime modes in intermodal transport chains. This improvement, from which increases in efficiency and decreases in energy consumption are expected to result, will lead to economic benefits.

The Center's recognition that access to the global market via e-commerce has placed different demands on the logistics system will lead to innovative research in the processes and tools required by transportation carriers operating in this global environment. Such tools will include prediction of trends, marketing reactions, and supporting transportation and logistics decisions. Research could be organized on a base of innovative technologies to achieve optimized operation procedures, which, in turn, would offer better service to the customers. This will lead to a new direction of logistical concepts, e.g. with respect to the reliability of transport processes.

To achieve the above, the Center will solicit research needs from the public and private sectors and from faculty, and develop proposals on appropriate problems in the freight movement efficiency area. Project proposals will be peer reviewed before being initiated.

3.B CONDUCT RESEARCH IN THE PASSENGER MOVEMENT EFFICIENCY AREA.

This activity is identical with the previous one, except that it concentrates on research efforts dealing with productivity improvements stemming from the more efficient movement of people.

In large metropolitan regions, providing access to intermodal facilities such as airports and transit hubs is key to reducing congestion and improving mobility. To achieve smooth access and transfer between the modes, the research agenda will focus on introducing advanced information technology, planning techniques and innovative facility designs.

In particular, public transit provides basic mobility for millions of people, usually with extensive transfers within a system and among various systems. Providing the quality transit service necessary to attract new riders requires more than innovations in technology. Advanced public transportation systems can improve mobility and accessibility for passengers by providing demand-responsive service, timed transfer transit networks, and accurate multi-modal traveler information. Specific studies for promoting the mobility and accessibility of transit systems will be conducted in the following areas: (a) responsive service planning methods, (b) dynamic vehicle routing algorithms, (c) arrival time prediction models, (d) advanced vehicle control systems, (e) innovative service strategies, and, finally, (f) integrated coordination systems. It is expected that some of the research results will be transferable across modes.

To support this research area, the Center will solicit research needs from the public and private sectors and from faculty; finalize the number and content of research projects to be undertaken in the area of passenger movement efficiency; and develop proposals on appropriate problems. The proposals will be peer reviewed before being initiated.

3.C CONDUCT RESEARCH IN THE FACILITY, INSTITUTIONAL AND REGULATORY EFFICIENCY AREA.
Also identical in scope with 3.a, this activity concentrates on research efforts dealing with productivity improvements stemming from more efficient transportation facilities, a more rational regulatory climate, and better inter- and intra-institutional interactions. Gains realized in freight and passenger efficiencies cannot be easily sustained without concomitant efficiencies in facilities, institutions and regulations. A systems approach to transportation planning, design and operations is essential for economic and productivity effectiveness.

Facility research will include the physical methods of transport, which encompass highways, rails, stations, interchanges, walkways, etc. It will include access, egress, throughput, and information techniques, etc. Institutional research will include the organizational, administrative, managerial, legal and procedural aspects of governing and operating the facilities. Institutions and their interactions with each other are viewed as necessary to maintain efficiency in the movement of people and goods.

Regulations necessarily maintain order and improve the efficiency of the operations. Regulatory research will include an analysis of the effects of particular regulations on the productivity of the systems. The Center is particularly cognizant that public agencies, state DOTs, and MPOs are faced with major capital investment decisions to reduce the cost of transporting people and goods, improve access to the urban core, and improve the quality of life. These include a myriad of what are essentially land use decisions. Such decisions range from what kind of land access to provide to existing port and terminal facilities, to where to locate a new terminal, and how to reuse brownfields — the remnants of an earlier industrial era. With the advent of mega containerships and the concurrent urgency for deeper channel depths, the land access issue is particularly amplified in the New Jersey/New York region because of increased competition among the intermodal ports of the eastern seaboard of North America, namely, New York/New Jersey, Baltimore, Maryland, Virginia, and Halifax, Canada.

The Center will investigate policies designed to improve the port land access via dedicated freightways connecting spatially disjointed terminal facilities. The impact of these links on regional productivity and competitiveness will be ascertained and investigated. Alternative land use policies designed to reduce congestion on the highways in urban areas involving the concept of satellite “land ports” will also be investigated. In this particular concept, rail connection provides access to the port from truck freight staging and consolidation areas up to 100 miles away.

The Center will develop efforts to help DOTs and MPOs understand the nature and magnitude of the commodity flows that are moving over regional freight rail and highway networks, and of the main freight routes. This knowledge can be used to assess the significance of economic activity along the freight corridors and to ascertain government intervention that may be needed to ensure the unimpeded flow of goods.

Commodity flows reflect underlying economic activity. The Center will assemble information on the location and descriptors/indicators of the generators of economic activity. These data will be obtained from the states’ Departments of Commerce, or the State Business Patterns of the U.S. Bureau of Commerce. Overlaying this data on a GIS network will help
portray the relationship between land use, economic activity and transportation networks. This will be compounded by data on manufacturing, retail, and warehousing activity, and used to develop trip generators/attractors of commodity flows and predict routing of containers over the regional highway or rail links. The model will then be able to predict changes in network flows as a result of the change in land use and economic activity.

The Center will solicit research needs from the public and private sectors and faculty, and develop proposals on appropriate problems in the facility, institutional and regulatory efficiency areas. These will be peer-reviewed before initiated.

3.D DEVELOP RESEARCH LABORATORY
To support research efforts, a lab needs to be established and staffed that is capable of supporting data-intensive modeling efforts. A GIS database will be developed that will include the data on geometric characteristics (lane width, number of lanes or rail tracks, etc), operations (control strategies, capacities, speeds, etc.) and flows (volume, percent trucks, etc.) of the regional multimodal networks. The majority of this information is presently stored in the various congestion management systems that NJDOT is required to maintain, and at private railroads and terminals. It will require the Center to understand the operating strategies that are used to move the vehicles that are moving people and goods over the transportation networks. The data will include TRANSCOM data on origin-destination trip tables in the region.

Given shipper locations and patterns, significant freight corridors and their transportation, economic, environmental, and land use and infrastructure impacts will be determined. The models will be used to understand relationships between land use and transportation; such as to ascertain impacts of alternative land use patterns, and help decision-makers build where sustainable capacity exists.

3.E IMPLEMENT A RESEARCH PROGRAM MONITORING SYSTEM
In consultation with transportation faculty, Center researchers, the Advisory Board, and NJIT’s Sponsored Programs and Grants and Contracts Offices, monitoring and reporting procedures will be established for the Center’s peer-reviewed research projects. They will include:

a. Technical and financial progress reports;
b. Approvals of deviations from schedules, budgets or tasks;
c. Reminders for forthcoming deliverables;
d. Penalties for non-compliance; and
e. Termination of the grant.

Databases, forms, templates, etc. to implement the procedures established above will be designed. Quarterly and final reports will be collected and distributed according to the UTCP guidelines.

3.F IMPLEMENT A RESEARCH PROGRAM IMPACT EVALUATION SYSTEM
The system will quantify to the maximum degree possible, the impact of the research component of the Center. In consultation with the Center's faculty and Advisory Committee, measures of effectiveness for the Center's research efforts will be established. In addition to the data required by RSPA for Performance Index 5, the measures may include:

a. Number of requests for papers
b. Actual implementations of results
c. Number of peer-reviewed transportation research reports published
d. Number of transportation research papers accepted for presentation at academic/professional meetings
e. Number of external awards received for transportation research

The industry/agency sponsors will be surveyed to ascertain implementation of research results. The survey will include cost savings and other productivity improvements/cost efficiencies derived from such implementation. Finally, a data collection and reporting MIS system for the measures listed above and those mandated by RSPA as Performance Indicator 5 will be implemented. The MIS system will allow for querying of data and facilitating the generation of reports.

RESPONSIBLE INDIVIDUALS
Dr. Lazar N. Spasovic -- Items II.E.3.a & II.E.3.d
Dr. Steven Chien -- Item II.E.3.b
Dr. Athanassios K. Bladikas -- Items II.E.3.c & II-E.3.e-f.

4. PERFORMANCE INDICATORS
The required information for Performance Indicator 5 is readily available in the progress reports on the Center’s research projects. Principal investigators will submit progress reports electronically, and the information will be extracted and summarized by the Center staff.

II.F. TECHNOLOGY TRANSFER

Technology Transfer Goal: Availability of research results to potential users in a form that can be directly implemented, utilized or otherwise applied.

1. BASELINE MEASURES
The information is provided in Appendix A.

2. TECHNOLOGY TRANSFER PROGRAM OUTCOME
At the end of 2001, it is envisioned that the Center will have a comprehensive technology transfer program that will address the need of transportation professionals for an advanced knowledge base in the field of transportation and industrial productivity. The program will be a natural extension of the Center’s research efforts and will disseminate cutting edge research results to the users and providers of transportation services using a learning-inducing environment and sophisticated information delivery tools. The Center’s Research and Instructional Lab will be a setting that will bring professionals for the presentation and
information exchange on latest research products and for showcasing new approaches and advances in transportation.

The Center’s principal investigators will be supported to publish and present their research findings in papers at conferences (e.g., Annual Meeting of the TRB), seminars and workshops. The Center will distribute final technical reports on its research projects through the NTIS. The faculty will be stimulated to publish research results in the Transportation Research Record of the TRB and other professional journals. The Center’s use of Internet-based technologies will make research findings and databases accessible to potential users in forms that can be directly implemented. The University and Center-sponsored conferences will be held to report research results, in addition to transportation industry workshops and other focal points of information exchange.

3. PLANNED ACTIVITIES
3.A. ESTABLISH THE FRAMEWORK AND SUPPORTING PROCEDURES NEEDED TO CARRY OUT THE CENTER’S TECHNOLOGY TRANSFER ACTIVITIES
To carry out a successful technology transfer program, the Center must have at its disposal a number of tangible and intangible assets, not least of which would include state-of-the-art desktop publishing capabilities and broad categories of continuously updated mailing lists. To sustain and promote professional community awareness of its existence, mission and capabilities, a series of actions will be undertaken to build the required technology transfer infrastructure for the Center. They will include:
1. Select appropriate hardware and software necessary to carry out the Center's mission.
2. Continuously update and solicit mailing and other distribution and contact lists.
3. Develop the forms and other documentation required to facilitate collection and dissemination of information.

3.B INITIATE A SERIES OF SEMINARS
The seminars will allow for information exchange through questioning and discussion, and will provide "networking" opportunities for professionals as well as students. This is the most interactive of the Center's technology transfer techniques. Knowledgeable and interested professionals can take advantage of this forum to discuss the issues presented. Students will have opportunities to hear and question viewpoints of experienced professionals; academics will be able to expose their ideas to the thinking of the public and private sectors; and the public and private sectors will have opportunities to explore the visions expressed by the academics. There will be a minimum of four seminars per year.

To achieve the seminar outcome, the Center will:
1. Select seminar subjects and speakers in consultation with the transportation program and associated faculty, and the Advisory Board.
2. Gather the necessary materials and make arrangements for the seminars.
3. Publicize the seminar series. Prepare and distribute brochures to potential external attendees, and feature the seminars on the Center’s and University's Home Pages and in various internal newsletters. Advise the university community of the seminars through e-mail and flyers, and in the bi-weekly university newsletter.
4. Hold the seminars.
5. Make the seminar content (lecture and discussion) available in paper or video format.

3.C PREPARE AND DISTRIBUTE NEWSLETTERS
The newsletter will disseminate news, views and commentary on developments in the field of transportation that come within the purview of the Center's theme. OnRoute will serve as the widest possible outlet of Center activities. An excellent means of informally apprising the transportation community of the educational, research, technology transfer and staff activities of the Center, it will be written in an unassuming style of communication that will invite reader comment and suggestions. The newsletter’s distribution will include persons and entities from all levels of government and academia, to regional to national venues of the private sector, and Transportation alumni.

This activity will consist of monitoring developments, collecting information and soliciting contributions for the newsletter. The newsletter will then be written, produced and distributed.

3.D INITIATE A SERIES OF WORKING PAPERS/TECHNICAL REPORTS
Publication of working papers and technical reports and their circulation to the professional community is a critical aspect of the Center’s technology transfer program. They are the vehicle for presenting a more detailed technical information on a specific project and for showcasing scholarship exhibited by the faculty and staff in the process of carrying out research. The papers/report will have a richer technical content and be distributed to a much smaller more specific audience or be available on request. To this end the Center will:

1. Establish new procedures for the creation of a working paper/report series, and inform all Center principal investigators, faculty and research staff.
2. Assemble technical reports after a grant has been completed.
3. Contact Center’s faculty to provide papers/reports of their most recent research.
4. Print working papers and reports, and prepare them for the posting on the Center’s Home Page.
5. Announce the availability of papers and reports on the Home Page and in the newsletter.
6. Distribute working papers via mail or web page.

3.E PUBLISH “IN TRANSITION” MAGAZINE
In Transition will feature articles that are either commissioned from or submitted by professionals in the field. These will include both national and international authors. The magazine will be written for the broadest possible audience, and include in its range of subjects multi-modal transportation, productivity improvements, legislative and policy issues, etc. The ultimate purpose of this magazine will be to stimulate dialogue that will advance the latest concepts for the enhancement of all aspects of transportation. In Transition will be published in the spring and autumn of each year.

This activity will involve the restructuring of the current In Transition Advisory Board. The Managing Editor will solicit papers to be featured, finalize copy for each article and arrange
the publication. The magazine will be distributed to over 7,000 recipients.

3.F MAINTAIN THE CENTER’S HOME PAGE ON WWW
The advantages of a Home Page as a technology transfer activity are obvious. It allows for an almost instantaneous global dissemination of information. To facilitate the maintenance of the home page, the Center will use processes developed for collecting performance indicators to gather information and necessary materials. The page will be designed and a hit counter added. The Center will solicit feedback from users, and seek ranking for its web site from internal and external web communities.

3.G ELECTRONIC USER GROUP ON MODELING ISSUES
This will be a forum for planners from regional MPOs, state DOTs, private and public sector entities, and academia to exchange ideas about the future direction and scope of the planning process. This forum will include discussions on technical aspects of planning, federally mandated conformity plans, and the role of academia in meeting industry needs.

3.H ANNUAL REPORT
An annual publication containing all projects undertaken under the auspices of NCTIP since its inception will include project abstracts and list publications/presentations emanating from the research. This publication will be distributed and used to represent the Center to the public and private arenas with the intention of forming partnerships for research purposes.

3.I SYMPOSIUM ON PRODUCTIVITY AND TRANSPORTATION SYSTEMS
The Center will be involved in a major symposium on timely issues involving productivity of transportation systems and facility. An example of this is the conference on ports as economic engines in the 21st Century.

3.J INCREASED VISIBILITY
NCTIP will have a strong presence at selective transportation conferences, including multi-media presentations, student participation, and printed materials. In addition, internal and external presentations showcasing the Center and its role in transportation research will be conducted both to attract wider faculty participation and interpret the Center's activities for potential funding from the public and private sectors.

RESPONSIBLE INDIVIDUALS
Sally O’Malley, Technology Transfer Specialist for objectives II.F.3.a, c-d
Dr. Lazar N. Spasovic for objectives II.F.3.b, f-j
In Transition Advisory Board for objective II.F.3.e

4. PERFORMANCE INDICATORS
The information required for Performance Indicator 6 is readily available in the principal investigators' progress reports, and will be extracted and summarized. To facilitate this process, principal investigators will be required to submit progress reports electronically.
SECTION III

MANAGEMENT APPROACH

III.A INSTITUTIONAL RESOURCES

NJIT has the institutional resources required to provide technical and administrative support for the activities to be undertaken under NCTIP.

— The library and computing facilities needed for the research component of NCTIP activities are excellent, and are continuously brought current as new technologies emerge. A brief description of computer and library facilities is included in Appendix B. NJIT’s Media Services department and its department of Communications, Publications, Advertising and Special Events can provide substantial technical assistance and support for the Center's recruitment, outreach and technology transfer activities.

— Administrative support for research activities at NJIT is provided through the Office of Sponsored Programs under the Associate Vice Provost for Research and Development, and the Office of Grants and Contracts Services in the Finance and Budget office under the Vice President for Administration and Treasurer. Initial awards, extensions, and the technical progress of grants are under the jurisdiction of Sponsored Programs, while Grants and Contracts perform fiscal management, record keeping, and billing. The services of both offices will be used extensively by the NCTIP director and principal investigators. NJIT manages approximately $35 million of funded activities annually. Section III.B contains some additional details about the Center's financial management.

— NJIT’s Center for Environmental Engineering and Science (CEES) is nationally known for its Hazardous Substance Management Research Center, Emissions Reduction Research Center, the EPA Northeast Hazardous Substance Research Center, and the New Jersey Technical Assistance Program for Industrial Pollution. The NCTIP will leverage the CEES expertise and resources in carrying out research efforts in environmental research. The CEES will be a resource for modeling air pollution and estimating environmental impacts of transportation improvement projects. Potential research areas include particulate and vapor phase pollutants, pollution source apportioning between mobile (transportation-related) and stationary sources pollution. Additional potential research areas include an industry-university collaborative research in engineering management of hazardous waste, impact of recycling on the demand for transportation service, environmental and economic revitalization of brownfields. The purpose of the last effort would be to create better jobs, increase the local tax base, improve neighborhood environments, and enhance the overall quality of life.

— In addition to the NCTIP, there are two other major research efforts in transportation at NJIT:
  • New Jersey Transportation Information and Decision Engineering (TIDE) Center, a $700,000 per year grant from the New Jersey Commission on Science and Technology
(NJCST) to NJIT, Princeton and Rutgers University.

- The Transportation Economic and Land Use System (TELUS), a six-year, $1,000,000 per year FHWA project mandated under TEA-21.

- The objective of the TIDE Center is to develop technologies that will help individuals and commercial enterprises make better transportation-related decisions. TIDE will collaborate with private industries in New Jersey for the commercialization of research products and the establishment of a viable traveler information industry in New Jersey. Its research activities will involve both graduate and undergraduate students from a variety of departments at the three universities.

- The objective of the TELUS grant is to further develop and deploy a computer-based information system designed to help MPOs nationwide meet their legislative mandates under TEA-21. Each year MPOs must decide what projects to include in their six-year Transportation Improvement Programs. These decisions are based upon a variety of factors, including travel demand, need for facility maintenance and repair, impacts of projects on local and regional economies, land-use, the environment, and other areas. Additionally, MPOs must track these projects as they pass through various stages toward actual construction; such stages include federal and state reviews, improvement design and costing, construction scheduling, and actual construction. At the heart of TELUS is an MIS system that tracks projects, showing the interrelationship with other projects, estimating economic and land use effects, and providing a user-friendly display of the information. The initial TELUS module was developed as a cooperative venture by NCTIP, Rutgers University, and NJTPA.

The Directors of the NCTIP and TIDE Centers, as well as the TELUS project, report directly to the Provost. NJIT’s organizational chart is shown in Appendix C. NJIT is in the process of searching for Executive Director of the Institute for Transportation. It is envisioned that the Executive Director will “direct an interdisciplinary academic transportation program; coordinate activities in two major transportation centers; provide strong leadership for identifying and marketing new opportunities; and monitor all its transportation programs to assure timeliness and quality of outcomes and deliverables.” The USDOT will be briefed of any organizational change in the structure and management of the overall transportation activity at NJIT.

Financial management of the above projects is carried out separately and independently. NCTIP will partner with TIDE and TELUS activities when this is deemed to be of mutual interest. The purpose of TIDE is to improve travel and traffic flow and to increase the productivity of commercial fleet and public transportation operations. Obviously, TIDE can support the NCTIP's objective of enhancing productivity through transportation system improvements. Therefore, it is expected that the NCTIP will provide additional opportunities for interaction with and enhancement of the efforts to be undertaken under TIDE. Such partnering may involve pursuing joint research projects, sharing some of the resources, and jointly contributing to the transportation research facilities. It is also possible that an industrial partner to NCTIP may decide to participate in a TIDE research project or demonstration and vice versa.
III.B CENTER DIRECTOR

Dr. Lazar N. Spasovic will be the Center's Director. He is a full-time faculty member appointed as Associate Professor in the School of Management, with a joint appointment in the Interdisciplinary Program in Transportation. As Center Director, Dr. Spasovic will be responsible for all aspects of NCTIP's operations. He will be devoting at least 50 percent of his time to the Center's administration, with the remainder divided equally between teaching and participation in the Center's or other research activities. Dr. Spasovic’s resume is included in Appendix D.

Dr. Spasovic is the Principal Investigator of the UTCP grant and will have the overall technical and fiscal responsibility and supervision for all NCTIP activities. He will be NJIT's point of contact for USDOT representatives responsible for UTCP management, and will be responsible for the preparation of the Center's program plans and progress and annual reports. He will approve all expenditures of NCTIP funds and lead the Center's efforts to raise matching funds. He will be available to represent the Center and/or the UTC Program at external meetings and participate in all annual meetings held by USDOT with other UTC directors.

The Center's accounting and financial management functions will be performed primarily through NJIT's Office of Grants and Contracts Services, using NJIT’s FRS. FRS is a computerized, on-line financial transaction recording and reporting system. Budgets, purchase requisitions, etc. are entered into the system, approved by authorized individuals according to pre-established procedures, and converted into the appropriate hard copy (e.g., check, purchase order, etc), while keeping records of the transactions for reporting purposes. The system provides real time budget balances and expenditures to date by line item. This system will be used to track and report on the Federal funds and non-Federal cash matching contributions. Non-Federal in-kind contributions, if any, will be accounted for separately and documented through certifications made to the Center by the contributors.

An overall Center account will be subdivided to subsidiary accounts as activities are initiated. After negotiations with non-Federal sponsors are finalized, a sub-contract will be issued. This means that each research project will have a subsidiary account controlled by its Principal Investigator. The Center Director will have the approval privileges over the subsidiary account and will actively oversee all transactions. This account will contain approximately 80 percent of the budget funds. Transfers of funds between line item categories will require the approval of the Center Director. The final 20 percent of the funds will be released when the Principal Investigator certifies that a substantial progress has been made, and there is reasonable probability of completion in time and within the allocated budget.

NJIT's Cognizant Federal Agency and auditor of the overhead rates used on sponsored activities is the Department of Health and Human Services.

III.C CENTER FACULTY AND STAFF

All Principal Investigators and professional researchers associated with NCTIP activities will be full-
time faculty members of an NJIT academic Department or School, or will be full-time faculty at another academic institution. At this point, NJIT faculty associated with the Center's activities, and their departmental affiliations are:

- Dr. Athanassios K. Bladikas, Industrial and Manufacturing Engineering
- Dr. Xiuli Chao, Industrial and Manufacturing Engineering
- Dr. Steven Chien, Civil & Environmental Engineering
- Dr. Sanchoy Das, Industrial and Manufacturing Engineering
- Dr. Harold Deutschman, Civil & Environmental Engineering
- Dr. Kyriakos Mouskos, Civil & Environmental Engineering
- Dr. Naomi Rotter, School of Management
- Dr. Lazar N. Spasovic, School of Management

The above faculty were mentioned in Section II as being responsible for various objectives, and they are expected to devote up to 50 percent of their time on NCTIP activities. In addition to the above NJIT faculty, and depending on matching fund contributor interests, faculty from the School of Management, Departments of Industrial and Manufacturing Engineering, Engineering Technology, Civil and Environmental Engineering, and Computer and Information Sciences, will also participate in research projects.

There are potential resources outside the university that the Center may use to supplement those that exist within. The need for facilities and equipment not available at NJIT is often easily accommodated at any of several organizations in the region. In addition, joint research may be undertaken with specialists in academia at the Universities of Pennsylvania, Maryland, Princeton, Rutgers, and Lafayette College, as well as the resource universities comprising the Region II UTC. Any and all research to be supported will be subject of the peer review process described in Section II.D.3.a.

There are two other UTCs located in our region: Region II University Transportation Research Center, a consortium of 12 Universities based at CUNY, and the Center for Advanced Transportation Infrastructure at Rutgers University. The NCTIP will work with these institutions to organize joint seminars and lectures and raise awareness of the UTCP among area schools and universities, as well as public and private sector entities, thus furthering the goals of the UTCP. The Center will participate in Region II’s Advanced Institute for Transportation Education. The objective of this program is to provide tuition scholarship to qualified transportation professionals working for a public agency (e.g., NJDOT) to pursue an M.S. degree in transportation at a participating university.

An administrative assistant will be the Center's main support staff, assisting the Director and other faculty with the Center's technology transfer, student recruitment, communications and publications, and research program monitoring activities. The administrative assistant’s salary is provided by the University. Technology Transfer activities will be performed by Ms. Sally O’Malley. Ms. O’Malley’s resume is included in Appendix D.
III.D MULTIPARTY ARRANGEMENTS

NJIT is the sole grantee for NCTIP through UTCP. NJIT does not have formal consortium arrangements with other academic institutions for any activities associated with NCTIP. However, as stated in Section III.C, NJIT will reach out to other universities throughout the country. Collaborative arrangements will take place to accomplish specific research and educational projects. This is consistent with the national orientation of the Center. NCTIP funds programmed for the collaborating schools will be less than 20% of the total NCTIP budget. Subcontracts will be issued to carry out these activities.

III.E MATCHING FUNDS

Non-Federal funds, required to match Federal funds dollar-for-dollar, are expected to come from both the private and public sectors and be in cash as well as in kind.

The Center will enter into a basic agreement with the NJDOT for the purpose of conducting mutually acceptable research efforts. Initially, this agreement will provide $250,000 per year to match the federal funds. It is expected that this amount will increase to $300,000 per year by the year 2001. Dr. Spasovic will be NJIT’s point of contact for NJDOT representatives responsible for the management of the basic agreement. He will approve all expenditures of NJDOT matching funds. Funding opportunities are not constrained by the basic agreement; NJDOT Trust Fund resources will be tapped as well. Other sources of matching funds include:

— SAP Corporation has developed a battery of software programs for managing profit and non-profit enterprises. The software modules range from payroll functions to operations planning and manufacturing. SAP America has estimated the cost of software at $750,000. NJIT will be one of 20 universities in the U.S. that will receive a site license.

— Maher Terminals Inc., the operator of the largest intermodal terminal in the Port of New York and New Jersey, has agreed to provide substantial match to the Center’s freight movement efficiency research. Maher has demonstrated an unwavering commitment to NJIT by providing NJIT faculty with access to its intermodal terminal facility with truck and on-dock rail service, which is, in essence, a real world transportation and production lab. The level of match will be $50,000 annually. In addition, Mr. M. Brian Maher, the owner of the company, who is also a member of NJIT’s Board of Overseers, recently donated $100,000 to NJIT for scholarships to inner city youths pursuing studies toward engineering, science and management degrees.

— NJTPA, the local MPO, will provide a combination of in-kind and cash contribution to the Center for the development of large-scale freight transportation network models. The models, which will be intermodal in nature, will be able to predict the impact of modal shifts of freight between truck and rail on the network flows and performance (e.g., travel times) and congestion as well as to carry out various policy analyses.
In addition, a number of public agencies and private corporations some of whom supported research in the past will be approached for funding. They include:

- August Design
- CSX Inc.
- Johnson and Johnson
- New Jersey Alliance for Action
- Norfolk Southern Corporation
- NJ Transit
- Parsons-Brinkerhoff
- Pennsylvania Truck Lines
- PSE&G
- The Port Authority of New York & New Jersey (PANYNJ)
- TRANSCOM
- UPS

— NJIT will also provide cash and in-kind matches to NCTIP through faculty release time, student fellowships, tuition matches, equipment, etc. More specifically, NJIT will provide dollar-to-dollar match for release time for the faculty member that works on the educational, research and technology transfer activities of the Center throughout the academic year and is charged to the Center. In addition, NJIT will provide tuition support for each NCTIP-provided student stipend.
## SECTION IV

### BUDGET DETAILS

**University Transportation Center (UTC) Budget Plan**

**NATIONAL CENTER FOR TRANSPORTATION AND INDUSTRIAL PRODUCTIVITY**

**Grant Year: July 1, 1999 through June 30, 2000**

<table>
<thead>
<tr>
<th>BUDGET CATEGORIES</th>
<th>AMOUNT ($)</th>
<th>Explanatory Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center Director Salary</td>
<td>47,500</td>
<td>50% of Academic Year</td>
</tr>
<tr>
<td>Faculty Salaries</td>
<td>373,333</td>
<td>4 full time equivalent faculty members @ $70,000 for Acad. Year &amp; 3 months summer each</td>
</tr>
<tr>
<td>Administrative Staff Salaries</td>
<td>50,000</td>
<td>Technology Transfer Specialist</td>
</tr>
<tr>
<td>Other Staff Salaries</td>
<td>50,000</td>
<td>Administrative Assistant</td>
</tr>
<tr>
<td>Student Salaries</td>
<td>101,500</td>
<td>7 students @ $1,200 per month during AY and $3,700 over summer.</td>
</tr>
<tr>
<td>Staff Benefits</td>
<td>116,402</td>
<td>24% of all full-time salaries and wages, 5% for faculty during summer, and 9% for students.</td>
</tr>
<tr>
<td><strong>Total Salary and Benefits</strong></td>
<td>738,735</td>
<td></td>
</tr>
<tr>
<td>Undergraduate Student Fellowships</td>
<td>16,000</td>
<td>8 awards of $2,000 each.</td>
</tr>
<tr>
<td>Permanent Equipment</td>
<td>28,000</td>
<td></td>
</tr>
<tr>
<td>Expendable Equipment and Supplies</td>
<td>72,995</td>
<td>Office and computer supplies, printing and duplicating, assemble and distribute report material</td>
</tr>
<tr>
<td>Domestic Travel</td>
<td>25,000</td>
<td>For raising match, Center directors' meetings, PI's attendance at professional conferences, and meetings for carrying out research projects.</td>
</tr>
<tr>
<td>Other Direct Cost: Education</td>
<td>70,000</td>
<td>Tuition for 7 students(^1)</td>
</tr>
<tr>
<td><strong>Total Direct Costs</strong></td>
<td>950,730</td>
<td></td>
</tr>
<tr>
<td>Indirect Costs</td>
<td>380,709</td>
<td>45.5% of total salary and benefits, expendable supplies, travel and services</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>1,331,439</td>
<td></td>
</tr>
<tr>
<td>Federal Share</td>
<td>655,500</td>
<td></td>
</tr>
<tr>
<td>Matching Share</td>
<td>675,939</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) It is the policy of the university, when it makes graduate assistant awards, that the award package include a stipend and tuition remission. Both portions of the award require performance in a sponsored agreement or academic function. The stipend portion of the award is taxable, and, in accordance with federal tax law, is reported as part of an individual’s income. The entire award package is reported as part of the student financial aid package to the Department of Education.
APPENDIX A

1. EDUCATION

1.A UNDERGRADUATE AND GRADUATE COURSES OFFERED BY THE ACADEMIC PROGRAMS/DEPARTMENTS/SCHOOLS COMPRISING NCTIP THAT ARE CONSIDERED PART OF THE TRANSPORTATION CURRICULUM ARE:

1. CE 350 Transportation Engineering 3 credits
2. CE/TRAN 552 Geometric Design of Transportation Facilities 3 credits
3. *CE/TRAN 553 Design and Construction of Asphalt Pavements 3 credits
4. CE/TRAN 602 Geographic Information Systems 3 credits
5. CE/TRAN 603 Introduction to Urban Transportation Planning 3 credits
6. FIN618/TRAN 604 Public and Private Financing of Urban Areas, 3 credits
7. HRM/TRAN 608 Behavioral Issues in Transportation Studies 3 credits
8. TRAN/IE 610 Transportation Economics 3 credits.
9. TRAN 615/CE 660 Traffic Studies and Capacity 3 credits
10. TRAN/CE/IE 625 Public Transportation Operations and Technology 3 credits
11. TRAN/EM 640 Distribution Logistics 3 credits
12. TRAN/IE 643 Transportation Finance 3 credits
13. TRAN/CE 650 Urban Systems Engineering 3 credits.
15. TRAN/CE 655 Land Use Planning 3 credits.
17. TRAN 700 Master’s Project 3 credits
18. TRAN 701 Master’s Thesis 6 credits
19. TRAN 702 Selected Topics in Transportation 3 credits
20. TRAN/CE 705 Mass Transportation Systems 3 credits
21. *TRAN/EPS 720 Discrete Choice Modeling for Travel Demand Forecasting 3 credits
22. *TRAN/EM 740 Management of Transportation Carriers 3 credits
23. *TRAN 751/CE 751 Transportation Design 3 credits
24. TRAN/CE 752 Traffic Control 3 credits
25. *TRAN/CE/IE 753 Airport Design and Planning 3 credits
26. *TRAN/CE/IE 754 Port Design and Planning 3 credits
27. TRAN 755 Intelligent Transportation Systems 3 credits
28. TRAN 760 Urban Transportation Networks 3 credits
29. TRAN/EM/CE 765 Multi-Modal Freight Transportation Systems Analysis 3 credits
30. TRAN 790 Doctoral Dissertation Research Credits as designated
31. TRAN 791 Doctoral Seminar Non-credit
32. TRAN 792 Seminar Non-credit

*Although these courses appear in the Graduate Catalog, they have not been offered in the last two years.
1.B. BASELINE DATA FOR THE 1997-98 ACADEMIC YEAR:

<table>
<thead>
<tr>
<th>Transportation Education</th>
<th>Undergraduate</th>
<th>Graduate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1b.1 Number of Courses Offered</td>
<td>1</td>
<td>31</td>
<td>32</td>
</tr>
<tr>
<td>1.b.2 Number of Academic Departments Offering Them</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>1b.3 Number of Students Completing Above Courses*</td>
<td>30</td>
<td>268</td>
<td>298</td>
</tr>
<tr>
<td>1.b.4 Number of Students Involved in Transportation Research Projects*</td>
<td>2</td>
<td>20</td>
<td>22</td>
</tr>
</tbody>
</table>

* One student completing three courses or involved in three research projects counts as three students.

2. HUMAN RESOURCES

2A. LIST OF THE ADVANCED DEGREES THAT ARE TRANSPORTATION-RELATED AWARDED BY NJIT.

<table>
<thead>
<tr>
<th>M.S. Program</th>
<th>Ph.D. Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdisciplinary Program in Transportation</td>
<td>Interdisciplinary Program in Transportation</td>
</tr>
<tr>
<td>Management (also an MBA Program)</td>
<td>Civil Engineering</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>Industrial Engineering</td>
</tr>
<tr>
<td>Industrial Engineering, Engineering Management</td>
<td></td>
</tr>
</tbody>
</table>

2B. BASELINE DATA FOR 1997-98 ACADEMIC YEAR:

<table>
<thead>
<tr>
<th>Advanced Transportation Students</th>
<th>Transportation-Related Degree Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Masters</td>
</tr>
<tr>
<td>2b.1 Number of Students* Enrolled</td>
<td>37</td>
</tr>
<tr>
<td>2b.2 Number of Students* Receiving Degrees</td>
<td>22</td>
</tr>
</tbody>
</table>

*One student pursuing or receiving a dual degree counts as one student.
3. DIVERSITY

Provide the following baseline data for the students receiving transportation-related advanced degrees (Baseline 2b.2) and for all students receiving any advanced degree awarded by NJIT.

<table>
<thead>
<tr>
<th>Diversity of Students Receiving Advanced Degrees</th>
<th>Transportation-Related Advanced Degrees Only</th>
<th>All Advanced Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>3.1 Non-Hispanic White</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>3.2 Hispanic</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>3.3 African-American</td>
<td>5</td>
<td>20.8</td>
</tr>
<tr>
<td>3.4 Asian/Pacific Islander</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3.5 Native American</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3.6 Other</td>
<td>6*</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

| 3.7 Male                                      | 13   | 54.2   | 559  | 68.8   |
| 3.8 Female                                    | 11   | 45.8   | 253  | 31.2   |
| **Total**                                     | **24** | **100%** | **812** | **100%** |

| 3.9 Citizens and Permanent Residents          | 18   | 75     | 530  | 65.3   |
| 3.10 Non-Citizens                             | 6    | 25     | 282  | 34.7   |
| **Total**                                     | **24** | **100%** | **812** | **100%** |

* foreign national on a student visa

4. RESEARCH SELECTION

Provide the following information about transportation research at the institutions comprising your Center for the most recently completed academic year:

<table>
<thead>
<tr>
<th>Transportation Research Selection</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Number of Transportation Research Projects Conducted</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4.2 Total Budgeted Costs for Those Projects</td>
<td>$600,000</td>
<td></td>
</tr>
<tr>
<td>4.3 Number of Individuals Listed as Principal Investigators* in Those Projects</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>
5. RESEARCH PERFORMANCE

Provide the following information about transportation research performance at the institution(s) comprising your Center for the most recently completed academic year:

<table>
<thead>
<tr>
<th>Transportation Research Performance</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 Number of Peer-Reviewed Transportation Research Reports Published</td>
<td>8</td>
</tr>
<tr>
<td>5.2 Number of Transportation Research Papers Accepted for Presentation at Academic/Professional Meetings</td>
<td>24</td>
</tr>
<tr>
<td>5.3 Number of External Awards Received for Transportation Research</td>
<td>0</td>
</tr>
</tbody>
</table>

6. TECHNOLOGY TRANSFER.

Provide the following information about technology transfer and outreach activities at the institution(s) comprising your Center for the most recently completed academic year:

<table>
<thead>
<tr>
<th>Transportation Technology Transfer and Outreach</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Number of Visitors to Transportation Center Website.</td>
<td>950*</td>
</tr>
<tr>
<td>6.2 Number of Peer-Reviewed Transportation Research Publications Available on Website (if you do not have a transportation website, show &quot;0&quot;)</td>
<td>1</td>
</tr>
<tr>
<td>6.3 Number of Transportation Outreach Events Conducted for Pre-College Students</td>
<td>1</td>
</tr>
<tr>
<td>6.4 Number of Pre-College Students Participating in Those Events</td>
<td>30</td>
</tr>
<tr>
<td>6.5 Number of Transportation Seminars, Symposia, Distance Learning Classes, etc. conducted for Practicing Professionals</td>
<td>4</td>
</tr>
<tr>
<td>6.6 Number of Practicing Professionals Participating in Those Events</td>
<td>180</td>
</tr>
<tr>
<td>6.7 Number of Transportation Center Newsletters and Other Transportation Periodicals Published</td>
<td>2</td>
</tr>
<tr>
<td>6.8 Number of Issues Produced</td>
<td>3</td>
</tr>
<tr>
<td>6.9 Total Circulation:</td>
<td>12,300</td>
</tr>
<tr>
<td>6.10 Number of Transportation Technology Products Deployed</td>
<td>0</td>
</tr>
</tbody>
</table>

*As of January 1999, the counter for the NCTIP Website was set in place.
APPENDIX B

LIBRARY AND COMPUTING RESOURCES

LIBRARY RESOURCES

The university's Robert W. Van Houten Library collection comprises 160,000 volumes of books, conference proceedings, reports, dissertations, and theses. In addition, the library receives approximately 1,000 current technical journal titles and provides customized electronic access to over 16,000 journal tables-of-contents and article-copying service. Access to journal literature in engineering, science, management, architecture, and other subject areas is provided by a variety of indexing and abstracting publications—including the ENGINEERING INDEX COMPENDEX*PLUS database on the campus computer network and INSPEC (a.k.a. SCIENCE ABSTRACTS--COMPUTER AND CONTROL ABSTRACTS, ELECTRICAL AND ELECTRONICS ABSTRACTS, and PHYSICS ABSTRACTS on CD-ROM.

In Fall 1997 the Van Houten Library opened the Information Commons which has many workstations with access to the Internet. CompendexWeb, Proquest Direct, EbscoHost, the ACM Digital Library and Medline are among the many databases that students, faculty and staff may search. These services may also be accessed remotely. The library provides individualized reference services, literature searches, and instruction on the use of information resources. In addition, students may supplement NJIT library resources by borrowing material from the Newark Public Library and the libraries of Rutgers University--Newark Campus, the University of Medicine and Dentistry of New Jersey, and the eight state colleges of New Jersey. Interlibrary loan arrangements with more distant institutions are also available. The Architecture Library, a department of the university's Van Houten Library, located in the School of Architecture, maintains a core collection of architecture information materials including books, journals, maps, drawings, models, and over 70,000 slides.

COMPUTING RESOURCES

NJIT features one of the most computerized campuses in the nation. The campus-wide network connects more than 500 computing nodes consisting of a combination of mainframes, massively parallel computers, high-end graphics processors, UNIX workstations, client-server nodes, and personal computers. These extensive and powerful computing facilities support academic study, research and all administrative functions and are accessible from more than 3,000 locations across the campus. Primary academic computing is supported by two powerful time sharing computers. For both computing and design applications there are more than 400 UNIX workstations and a similar number of PCs in locations across the campus. There is unrestricted access to all computers on campus with the exception of a few located in sponsored research laboratories. The university is a home to the Electronic Information Exchange System (EIES) international network. EIES, a pioneer in the field of computerized conferencing, has specially designed education features including question-response and exam activities, an electronic grade book and binary file attachments. The
EIES ‘Virtual Classroom’ is used in conjunction with televised and videotaped lectures to provide feedback among students and instructors. NJIT has Internet, ADPNet and a modem pool for off campus connectivity. NJIT’s Internet connection services are provided by the John von Neumann Computer Network at T1 speed (1.5 Megabits per second). The Internet enables the NJIT community to reach any Internet service in the world 24 hours a day. ADP Corporation, through its ADPNet Service, provides nationwide direct dial capability from over 200 locations into its network and then to a direct connection to NJIT. For local off-campus access, NJIT maintains a pool of 128 modems operating at 28,800 baud. These modems enable users to gain access to all university computer systems and full Internet access including WWW and Mosaic/Netscape. All students and faculty are encouraged to make full use of the computing facilities including E-mail. Students may obtain accounts by simply following an on-line tutorial in one of the many computer labs. Once a student has an account, he/she may take advantage of an on-line, self-registration system to enroll in courses for subsequent semesters.
APPENDIX C

NJIT ORGANIZATIONAL CHART

RESEARCH ADMINISTRATION
APPENDIX D
CURRICULUM VITAE
CURRICULUM VITAE

LAZAR N. SPASOVIC

Home Address: 1 Greene Street, 109 Office Address: National Center for
Jersey City, NJ 07302 Transportation and Industrial
School of Management

Home Phone: (201) 946-2850 Office Phone: (973) 596-6420
NJIT Office Fax: (973) 596-6454
NJIT e-mail: spasovic@megahertz.njit.edu

I. EDUCATION

A. Formal

Ph.D., Systems Engineering 1990 University of Pennsylvania
M.S., Civil Engineering (Transportation) 1986 University of Maryland
Diploma, Transportation Engineering 1985 Belgrade University

II. RESEARCH INTERESTS

Transportation Systems Analysis, Multi-Modal Freight Transportation Systems,
Operations and Service Planning, Transportation Network Modeling, Intelligent
Transportation Systems, Service Pricing, Transportation Carrier Management.

III. EXPERIENCE

A. Academic Appointments

Director, National Center for Transportation and Industrial Productivity
Associate Professor of Management
NJIT October, 1998 - Date

Assistant Professor of Industrial Management
NJIT Sept. 1995 - Date.

Member of the Management Faculty
Rutgers - Newark Sept. 1990-Sept. 1995
Research Fellow
Teaching Assistant
Teaching Assistant
Research Assistant
Research Assistant
U of Maryland Sept. 1985 - Aug. 86.
B. Non-Academic Employment

Research Associate  Consolidated Rail Corporation (CONRAIL)  June -- Nov. 1988
Corporate Headquarters
Philadelphia, PA

C. Consulting
None

IV. TEACHING ACTIVITIES

A. Classroom Evaluations
While at NJIT, my teaching, master's project and thesis advisement, and doctoral dissertation advisement activities were as follows:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 1990</td>
<td>TRAN/CE 650</td>
<td>Urban Systems Engineering</td>
</tr>
<tr>
<td></td>
<td>TRAN/CE 654</td>
<td>Mass Transportation Systems</td>
</tr>
<tr>
<td>Spring 1991</td>
<td>TRAN/CE 658</td>
<td>Travel Demand Forecasting</td>
</tr>
<tr>
<td></td>
<td>TRAN/IE/SS 742</td>
<td>Regulatory Issues in Transportation</td>
</tr>
<tr>
<td></td>
<td>Advisor for 1 MS thesis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 1 MS project</td>
<td></td>
</tr>
<tr>
<td>Summer 1991</td>
<td>TRAN 702</td>
<td>Selected Topics</td>
</tr>
<tr>
<td></td>
<td>Advisor for 1 MS project</td>
<td></td>
</tr>
<tr>
<td>Fall 1991</td>
<td>TRAN/CE 650</td>
<td>Urban Systems Engineering</td>
</tr>
<tr>
<td></td>
<td>TRAN/IE 643</td>
<td>Transportation Finance</td>
</tr>
<tr>
<td></td>
<td>TRAN 702</td>
<td>Selected Topics</td>
</tr>
<tr>
<td>Spring 1992</td>
<td>MGMT 580 Managerial Science</td>
<td>Travel Demand Forecasting</td>
</tr>
<tr>
<td></td>
<td>TRAN/CE 658</td>
<td>Regulatory Issues in Transportation</td>
</tr>
<tr>
<td></td>
<td>TRAN/IE/SS 742</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 4 MS thesis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 2 MS projects</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 1 Doctoral Dissertation</td>
<td></td>
</tr>
<tr>
<td>Summer 1992</td>
<td>Advisor for 3 MS theses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 2 MS projects</td>
<td></td>
</tr>
<tr>
<td>Fall 1992</td>
<td>TRAN/CE 650</td>
<td>Urban Systems Engineering</td>
</tr>
<tr>
<td></td>
<td>TRAN 702</td>
<td>Selected Topics</td>
</tr>
<tr>
<td></td>
<td>Advisor for 4 MS theses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 2 MS projects</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 1 Doctoral Dissertation</td>
<td></td>
</tr>
<tr>
<td>Term</td>
<td>Courses</td>
<td>Advising Activities</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>Spring 1993</td>
<td>TRAN/CE 658, TRAN 702</td>
<td>Travel Demand Forecasting</td>
</tr>
<tr>
<td></td>
<td>Advisor for 2 MS theses</td>
<td>Selected Topics</td>
</tr>
<tr>
<td></td>
<td>Advisor for 1 MS project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 1 Doctoral Dissertation</td>
<td></td>
</tr>
<tr>
<td>Fall 1993</td>
<td>TRAN/CE 650, TRAN 702</td>
<td>Urban Systems Engineering</td>
</tr>
<tr>
<td></td>
<td>Advisor for 2 Doctoral Dissertations</td>
<td>Selected Topics</td>
</tr>
<tr>
<td></td>
<td>Advisor for 1 MS project</td>
<td></td>
</tr>
<tr>
<td>Spring 1994</td>
<td>TRAN/CE 658, TRAN 702</td>
<td>Travel Demand Forecasting</td>
</tr>
<tr>
<td></td>
<td>Advisor for 2 MS theses</td>
<td>Selected Topics</td>
</tr>
<tr>
<td></td>
<td>Advisor for 1 MS project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 3 Doctoral Dissertations</td>
<td></td>
</tr>
<tr>
<td>Fall 1994</td>
<td>TRAN/CE 650</td>
<td>Urban Systems Engineering</td>
</tr>
<tr>
<td></td>
<td>Advisor for 2 MS theses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 1 MS project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 3 Doctoral Dissertations</td>
<td></td>
</tr>
<tr>
<td>Spring 1995</td>
<td>TRAN/CE 658, TRAN 702</td>
<td>Travel Demand Forecasting</td>
</tr>
<tr>
<td></td>
<td>Advisor for 2 MS theses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advisor for 2 Doctoral Dissertations</td>
<td></td>
</tr>
<tr>
<td>Fall 1995</td>
<td>TRAN/CE 650, MGMT 580</td>
<td>Urban Systems Engineering</td>
</tr>
<tr>
<td></td>
<td>Advisor for 2 Doctoral Dissertations</td>
<td>Quantitative Methods in Business</td>
</tr>
<tr>
<td>Spring 1996</td>
<td>MGMT 580, TRAN/CE 603</td>
<td>Quantitative Methods in Business</td>
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Advisor for 1 MS Thesis
Advisor for 1 Doctoral Dissertation

Fall 1998
TRAN/CE 650
Urban Systems Engineering
Advisor for 2 Doctoral Dissertations

Spring 1999
TRAN/CE 603
Introduction to Urban Transportation Planning
Advisor for 2 MS projects
Advisor for 2 Doctoral Dissertations

B. New Courses Developed

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<td>TRAN/CE/IE 765</td>
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<td>TRAN/CE/IE 740</td>
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<td>TRAN/CE/IE 625</td>
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<td>Spring 96</td>
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C. Manuals Developed and Course or Laboratory Notes

D. Teaching Related Publications
None

E. Other Pertinent Materials
Course Supervisor for courses:
TRAN/CE 650 Urban Systems Engineering
and for the courses listed under item IV.B above both under the TRAN and CE designations.

V. SCHOLARLY ACTIVITIES

A. Published Books and Book Chapters
None

B. 1. Published Refereed Journal Papers


B. 1a. Refereed Journal Papers Under Review


C. Published Refereed Proceedings Papers


D. Published Reports


XVI. Morlok, Edward, K., Nozick, Linda, K., and Lazar N. Spasovic (1992) "Redesigning Rail-Truck Service for Improved Quality and Reduced Cost", Department of Systems Engineering, University of Pennsylvania and US DOT Mid-Atlantic University Research Transportation center (MAUTC), IMSP WP92-3.1, 8 pages.


E. Published Reviews

None

F. Professional Presentations


XXV. Morlok, Edward, K., and Spasovic, Lazar, N., "Redesigning Rail-Truck Intermodal Drayage
Operation and Market Share Implications". ORSA/TIMS Joint National Meeting, Nashville,

Pick Up, Repositioning and Delivery Systems: Algorithms and Computational Experiences".

Location, Navigation and Telecommunication Systems". 66th Annual Meeting of the

XXVIII. Morlok, Edward, K., and Spasovic, Lazar, N. "Satellite-based Land Mobile Location,
Navigation and Telecommunication Systems". 28th Annual Transportation Research Forum

VI. PROPOSALS AND GRANTS

Awarded

1. CPI. Maher Terminals, Inc. and National Center for Transportation and Industrial Productivity,
"Container Port Operations Phase II: Straddle Carrier Decision Algorithm Refinements",
$172,547, 09/97 - 06/98.

2. PI. New Jersey Department of Transportation and National Center for Transportation and
Industrial Productivity, "Multimodal Freight Transportation: Data Development and Analysis",
Tasks 5-7, $340,000, 06/01/97-06/30/98.

3. PI. New Jersey Department of Transportation and National Center for Transportation and
Industrial Productivity, "Multimodal Freight Transportation: Data Development and Analysis",
$210,000, 01/01/96 - 06/30/97.

4. CPI. Maher Terminals, Inc. and National Center for Transportation and Industrial Productivity,
"Container Port Operations Phase I: Straddle Carrier Decision Algorithm", $143,000, 01/01/96 -
06/30/96.

5. PI. Consolidated Rail Corporation (CONRAIL). "Planning Rail Freight Service in Metropolitan
Areas: Year II", $25,000, 11/01/95 - 11/01/96.

6. PI. North Jersey Transportation Planning Authority, "Regional Goods Movement: Data
Development and Analysis", $55,000, 07/31/95 - 06/30/96.

7. PI. Consolidated Rail Corporation (CONRAIL). "Planning Rail Freight Service in Metropolitan
Areas", $25,000, 01/01/94 - 01/01/95. The funds provided a fellowship for David Moy, Jr., a
SIM graduate.

8. I. US Department of Transportation (US DOT) -- Federal Highway Administration (FHWA)
Regions 1 and 3, "Intelligent Vehicle-Highway Systems: What, Why and How", $18,000,
02/018/93 - 02/18/94.
9. I. AT&T Foundation. "Enhancing the IVHS Content in the Transportation Program", $25,000, 08/01/93 - 04/01/94.

10. CPI. National Center for Transportation and Industrial Productivity, UTC, US DOT "A Methodological Framework for Optimizing Bus Transit Service Coverage", $60,000, 01/1/93 - 08/31/93.

11. PI. National Center for Transportation and Industrial Productivity, UTC, US DOT "A Methodological Framework for Modeling Auto-Commuter Rail Intermodal Networks", $60,000, 01/1/93 - 08/31/93.

12. PI. National Center for Transportation and Industrial Productivity, UTC, US DOT "A Model for Scheduling Tractors and Trailers in Rail-Truck Intermodal Transport", $60,000, 01/1/93 - 08/31/93.


14. CPI. New Jersey Department of Transportation (NJDOT). "ATIS Study Pre-Implementation Market Analysis", $60,298, 08/01/92-10/31/92


17. I. The World Bank, "Training of PRC Professional on Highway Planning, Economics and Engineering", $140,000, 12/16/91 - 01/25/92

18. CPI. Region II Transportation Research Consortium. "Intelligent Transport Systems", $100,000, 09/01/91 - 11/30/92.


Submitted


4. I. Commission on Science and Technology, “Personal Decision Technologies for Travelers”, $500,000, 01/97.


7. PI. US Department of Transportation (US DOT)-- Federal Highway Administration (FHWA), "Multi-Modal Access and Payment System (MAPS)", $3,465,000, 10/19/92.


9. PI. US Department of Transportation (US DOT) -- Federal Highway Administration (FHWA). "Advanced Traffic Management System", $4,000,000, 06/30/92.

10. CP. The World Bank and Min-Chernobyl (Ukraine), "Technical and Preliminary Training for Ukrainians", $400,000, 05/28/92.

11. I. New Jersey Department of Transportation (NJDOT). "Statewide Traffic and Incident Management Plan", $2,000,000, 02/21/92.


13. PI. Region II University Transportation Research Consortium. "Dedicated Commercial Route", $200,000, 12/09/91.

14. I. TRANSCOM, "IVHS Demonstration based on ETTM Technology in the New Jersey and Staten Island Corridor", $150,000, 06/91


VII. PATENTS AWARDED
None

VIII. PROFESSIONAL LICENSES
None

IX. SERVICE ACTIVITIES

A. Institute
2. Vice Chair of the NJIT Faculty Council – 1996-97.
3. Member of the Newark College of Engineering (NCE) Dean Search Committee
4. Adviser - Mentor at the Alliance for Minority Participation (AMP) Program.
5. Member of the Committee for the Protection of Human Subjects
6. Worked in support of the Federal legislative efforts to designate NJIT the National Center for Transportation and Industrial Productivity.
8. Lectured in the NJIT Pre-College Program, Summer 1993.

B. Department/Program
1. Member, Newark College of Engineering, Strategic Planning Committee. Dec. 1994 - date.
2. Chair of the School of Industrial Management (SIM) Committee on Software and Hardware Needs for the Association of American Collegiate Schools of Business (AACSB) accreditation, 1993 - 1995.
5. Developed the Main Brochure on Graduate Studies and Research in Transportation at NJIT.
6. Developed the 4 page brochure on Graduate Studies and Research in Transportation at NJIT.
7. Developed the poster for Graduate Studies in Transportation at NJIT.
8. Developed the listing for the Logistics Program of the School of Industrial Management for the College and University Directory of the Transportation and Distribution Magazine, published by Penton Publishing.
9. Advisor to the graduate students in Transportation within the SIM's MS in Management.
10. Represented the SIM, and the Transportation Program on a number of Open Houses, Dean's Days and Octobertechs.
11. Member of the task Force on Undergraduate Marketing Program.

C. Peer Reviewing Activity
1. Pergamon Press, the publisher of Transportation Research
2. Operations Research Society of America (ORSA), the publisher of Transportation Science
3. Transportation Research Board, the publisher of Transportation Research Record.

D. Editorial Activity
None

E. Community/Government
1. Chaired a session “Freight Transportation Planning at MPO, State and National Levels” at the 77th Annual Meeting of the Transportation Research Board in Washington, DC, in January 98.
2. Member of the Technical Advisory Board for the Conrail-CSX Norfolk Southern Merger study, 1997.
3. NJIT Representative on the Region II University Transportation Center Board of the US Department of Transportation, 1994 - date.
4. Member, Freight Transportation Planning and Marketing Committee, Transportation Research Board, 1994 - date.


7. Member of the Patron Advisory Board of the Port Authority Trans-Hudson (PATH) Commuter Rail System.

8. Member of the Management Faculty, Rutgers - Newark, Oct. 1991 - Date.

F. Professional Societies
Membership in:
- INFORMS - Institute for Operations Research and Management Science
- Transportation Research Forum

X. HONORS, AWARDS AND LISTINGS
- Nominated by the SIM for the Excellence in Teaching Award for Graduate Instruction for Tenured/tenure-Track Faculty, 1993-94.
- Best Intermodal Research Paper Award -- Transportation Research Forum (1992)
- Student of the Year Award (1990) -- Mid-Atlantic University Transportation Center, UTC Program, US Department of Transportation
- George Krembels Transit Scholarship (1988)

XII. MISCELLANEOUS

A. Selected Master Theses
1. Alexios Sideris (1998) "Forecasting Container Arrivals at Marine Terminals".
2. Wen Zhang (1995) "Optimizing Rail-Truck Intermodal Drayage Operations"
6. Dan Disario (1992) "A Planning Model for Intermodal Auto-Rail Transportation Assignment".
B. Doctoral Dissertations
EDUCATION
The Cooper Union, New York City, 1956-58 - Commercial Art
The School of Visual Arts, New York City, 1958-60 - Fine Arts
Web site management course, NJIT, May 1998
NJIT STARS program, Current - Tutoring in Web Site Design and Management
Thomas Edison College, Trenton, NJ, Current - History

COMPUTER SKILLS
Facility with Windows and MAC operations; Quark XPress; Adobe: Illustrator, Photoshop, Streamline, Acrobat, Pagemaker, Dimensions and LetraStudio; Microsoft: Front Page, Access, Excel, PowerPoint, Word; Caere, OmniPage and Photoshop scanning programs; Freelance, Harvard Graphics; Word Perfect; ACT!, MediaStudio Pro, CorelDraw, Persuasion, etc.

EXPERIENCE
TECHNOLOGY TRANSFER SPECIALIST, NCTIP - 1995-PRESENT
Responsible for:
- Writing, design, layout and production of program materials, including newsletters, brochures, descriptive materials, etc.
- Design, input, maintenance and management of NCTIP web site
- Preparation, design and production of an annual publication to feature NCTIP projects and publications/presentations emanating therefrom
- Coordination, follow-up and publicizing of all NCTIP research project reports and published materials
- Design and production of graphics presentations
- Compilation and production of technical study reports to government agencies
- Establishing, managing and publicizing the working paper series
- Assisting the director in planning and preparation for and during selective transportation conferences, producing multi-media presentations and printed materials
- Assisting the director in planning and production of an electronic user group on transportation modeling issues
- Assisting the director in planning and production of symposia
- Providing NCTIP-related material to other university publications
- Accumulation and maintenance of transportation photo collection
- Distribution of public relations announcements to appropriate publications
- Amassing, input and maintenance of computer-based data banks
- Selection and learning of appropriate software programs to enhance NCTIP's mission
- Participation in appropriate university committees.

JACOBS ENGINEERING GROUP, INC., SOMERSET, NEW JERSEY - 1988-95
Business Development
Responsibilities in all areas of proposal and presentation document production and computer graphics. Completed TQM training.

BLANTON-PEALE GRADUATE INSTITUTE, NEW YORK CITY - 1975-88

SARAH CURTIN O'MALLEY
National Center for Transportation and Industrial Productivity
Training Administrator and Registrar
Responsibilities in administration of post-graduate psychotherapy residency training program. Duties included recruiting activities, initial candidate interviews; schedule preparation; program requirement monitoring; writing and production of catalogues, brochures, advertising and reaccreditation materials. Member of management team and faculty executive committee; honorary member of alumni/ae association.