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RESEARCH PROBLEM STATEMENTS: TRANSPORTATION SYSTEM MANAGEMENT

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OPERATION AND MAINTENANCE OF TRANSPORTATION FACILITIES

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FOREWORD

The Group 3 Committee on Transportation System Management was formed in 1981 by the merger of the existing Committee on Urban System Operations with the earlier TSM Committee which had been positioned under the Division A Council. At the time of the merger, the Urban System Operations Committee had prepared and was completing its ranking of sixteen problem statements.

The Committee had originally drawn up, discussed, and made its initial rankings during 1980 by the following process. Each member ranked the statements by assigning a total of 100 points over the sixteen statements. The only ground rule was that 100 points must be assigned; any one statement could thus receive from zero up to the total of 100 points.

After discussion of the summed scores at the January, 1981 meeting, the statements were revised, some were combined, and a final ranking was agreed upon. Various committee members then prepared final versions of the selected seven statements. These were further considered by the Transportation System Management Committee at its mid-year meeting in July 1981, where it was recommended that they be published.

Members of the Committee on Urban System Operations during the preparation of the statements are listed below:

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RESEARCH PROBLEM STATEMENTS

PROBLEM NO. 1

1.1 TITLE: IMPROVING THE RELIABILITY OF ALL-BUS TRANSIT SYSTEMS

1.2 PROBLEM: Most American cities are going to make do with all-bus systems for a long time to come. The transit industry has within its means the ability to provide fast comfortable bus transportation. Many systems are already doing so. Would advances in on-time performance, customer relations programs to lessen malfunction impacts and aggressive marketing of on-time performance win new customers and build public support? There is a need to develop a better understanding of the underlying causes which degrade bus transit reliability and to develop workable recommendations for bringing about improvements.

1.3 OBJECTIVES: To improve the reliability of all-bus transit systems by the identification of factors causing unreliability and the development, demonstration and implementation of strategies to improve reliability.

1.4 KEY WORDS: Malfunction frequency and severity, performance monitoring, bus delay, incident response mechanisms, person-hours measurements, recurring delay, non-recurring delay.

1.5. RELATED WORK: The report, "Transit Service Reliability," UMTA MA-06-0049-78-1, gives a good overview of the subject of transit service reliability and can serve as a good starting point of this research.

1.6 URGENCY/PRIORITY: Increasing fuel prices and decreasing Federal operating subsidies make it imperative that bus transit become more efficient. The Urban Systems Operations committee ranked this problem as number one out of a group of sixteen statements proposed by committee members.

1.7 COST: Phase I - Identify Problem and Design Demonstration Scenarios $150,000

Phase II - Demonstration (other than research funding)

Phase III - Evaluate Demonstration $400,000.

1.8. USER COMMUNITY: UMTA, FHWA, APTA, AASHTO, CITIES, COUNTIES

1.9 IMPLEMENTATION: Implementation of this research will require a broad program of dissemination of results through Federal, State and local government channels; through industry channels, e.g., APTA, and will probably require the development of training courses, workshops, etc.

1.10 EFFECTIVENESS: Improved transit reliability should help to maximize transit usage which can be measured by more information requests, more passenger-miles of travel, more transit passengers, etc. Transit productivity should also improve as measured by active revenue vehicles, operating cost per passenger trips, the ratio of operating revenues to operating cost, etc.

PROBLEM NO. 2

2.1 TITLE: FACILITATING ENERGY SAVINGS THROUGH TSM PROGRAMS

2.2 PROBLEM: Due to both energy vulnerability and rising energy costs, a number of low-cost and quickly implementable strategies have been proposed 1) to reduce general energy consumption and 2) to retain mobility during periods of energy shortfalls. Some recent studies (most notably "Energy Impacts of Urban Transportation Improvements" by F.A. Wagner for ITE) have provided an initial data base. However a need remains to expand the scope of these studies, test and validate assumptions, synthesize research findings, as well as resolve many of the conflicts between individual studies. Moreover, the implementation of these measures within the context of institutional and fiscal realities needs to be examined. In this manner, future efforts can be based on sound data and analysis.

2.3 OBJECTIVES: a. Develop a comprehensive, concise and easy-to-use reference manual for potential energy savings associated with various strategies. The manual should consider both emergency and non-emergency based strategies. Strategies should include but not be limited to the following:

EMERGENCY
De-mothball buses
Ridesharing
School bus use
Multiple use of shopping centers, churches, etc. for park and ride

NON-EMERGENCY
Signal timing optimization
Flashing operation at night
Removal of unwarranted stop signs
Removal of unwarranted signals
Bus stop frequencies
Signal modernizations
Railroad grade separations
HOV programs
Ridesharing

b. Make recommendations for the optimal application of the more promising strategies under varying circumstances. c. Investigate the institutional and fiscal impediments limiting the application of these strategies and make recommendations for minimizing their inherent negative impacts.

2.4 KEY WORDS: energy conservation, contingency planning, transportation systems management, urban systems

2.5 RELATED WORK: Research by Wagner and miscellaneous small studies.

2.6 URGENCY/PRIORITY: Currently implementation of various strategies are proceeding with limited knowledge of energy impacts. An expanded research base is needed to maximize the results of future energy contingency planning and general TSM actions, thereby minimizing the Nation's energy vulnerability.

2.7 COST: $350,000

2.8 USER COMMUNITY: FHWA, DOE, UMTA, State DOT's, MPO's, cities/counties.

2.9 IMPLEMENTATION: As with most TSM actions, the implementation of the recommended strategies involves a great deal of multiagency coordination. Any study would be remiss if it did not forward suggestions of institutional influences which facilitate implementation.

2.10 EFFECTIVENESS: The manual would provide handy reference influencing transportation professionals in the selection and design of energy strategies. Moreover, it would provide these professionals with the data and institutional awareness useful in "selling" these programs. Societal results could be a significant decrease in auto-related energy consumption, delays and travel times.

PROBLEM NO. 3

3.1 TITLE: INTEGRATED TRAFFIC MANAGEMENT SYSTEM

3.2 PROBLEM: Computer controlled traffic signal systems have become commonplace during the 70's. During the next decade there will be a need to expand the scope of computer controlled systems to include the elements of bus priority, reversible lane control, alternate routing, and possibly parking advisory functions. To guide expansion of the technology into these new areas there is a need for a feasibility study of the technological, economic and institutional factors which must be considered.

3.3 OBJECTIVE: To investigate the feasibility and implementation potential of an integrated traffic management system for the CBD's of medium and large urban areas, and to recommend further research and development needed to retrofit existing systems or to specify new systems.

3.4 KEY WORDS: Integrated system, traffic signals, alternate routing, bus priority, reversible lane control, parking advisory feasibility.

3.5 RELATED WORK: The Federal Republic of Germany is working on the development of an integrated system as described in a paper, "Integrated Traffic Control in Urban Road Networks," by Rudolf Lapierre. The Japanese Ministry of International Trade and Industry has developed and tested a "Comprehensive Automobile Control System" with many of the features of the integrated systems being proposed by this problem statement.

3.6 URGENCY/PRIORITY: The committee ranked this problem statement number three. The study was included in FHWA's FY 81 R & D contract research plan but was not funded due to budget cutbacks.

3.7 COST: $100,000

3.8 USER COMMUNITY: States and cities having or planning computer controlled traffic systems.

3.9 IMPLEMENTATION: Should the study recommended here indicate the feasibility of an integrated system, implementation would require the cooperation of Federal, State, and local governments for planning, design and funding. System contractors would become involved in the development.

3.10 EFFECTIVENESS: An integrated system would have as its main objectives the improvement in travel time, the reduction of air pollution and the conservation of energy. Achievement of these objectives could be measured by point-to-point travel time, concentration of pollutants and annual energy consumption for vehicular travel within the project limits.

PROBLEM NO. 4

4.1 TITLE: THE LONG RANGE EFFECT OF ARTERIAL STREET OPERATIONS IN RESIDENTIAL AREAS

4.2 PROBLEM: An acceptable method of accommodating traffic in residential areas has always been difficult for traffic engineers. Problems that usually occur are:

a. Objections to residential displacement if existing street is widened or an alignment on new right-of-way required;

b. Circulation and access limitations to abutting properties imposed by one-way streets;

c. Negative impacts of parking restrictions; and

d. Traffic signal timing which has the undesirable characteristic of expediting and increasing traffic through a residential area.

Many studies have been made of techniques that can be employed to decrease the negative effects of arterials in residential neighborhoods, but there is very little back-up research concerning the effects on existing conditions. The effects are frequently perceived by the residents to be detrimental but there is little data to demonstrate the facts one way or the other. In the absence of evidence of the damage that can be done, traffic engineers tend to feel justified in using and designing such streets for as much traffic as they can handle.

4.3 OBJECTIVES: To determine the long range effect on abutting land uses of arterial operations on residential streets. Prepare "before" and "after" case histories of arterial street operations in residential areas. Long range land use impacts of new construction of thoroughfares as well as conversion of existing streets to accommodate significant volumes of traffic in residential areas will be assessed. Other influencing factors such as zoning, development trends, neighborhood amenities, and market conditions will be considered and conclusions developed concerning the degree of impact created by all influencing factors.

4.4 KEY WORDS: Major thoroughfares, one-way couplets, traffic signal timing, parking restrictions, abutting property, residential neighborhoods, safety, speed, displacements, zoning, development trends, case studies, innercity.

4.5 RELATED WORK: Previous investigations by the

former Highway Research Board entitled "Getting the Most From City Streets," a book entitled "Livable Streets" by Donald Appleyard, and the Cities of Charlotte, N.C. and Dallas have identified certain aspects of this problem.

4.6 URGENCY/PRIORITY: City planners and traffic engineers are facing ever increasing pressure to delete or abandon the use of streets located within inner-city residential neighborhoods to accommodate major volumes of traffic. Without these facilities, other segments of the thoroughfare system are required to accommodate a disproportionate share of traffic and undesirable "filtration" of traffic through the residential neighborhoods on minor streets will likely occur. Therefore, the urgency for identifying the real problems and solutions is great.

4.7 COST: $150,000

4.8 USER COMMUNITY: AASHTO, FHWA, APTA, Urban Consortium, local governments

4.9 IMPLEMENTATION: The results of these studies could be used as a credible basis for obtaining approval of proposed improvements and/or in identifying potential solutions to remedy any negative impacts which might be created.

4.10 EFFECTIVENESS: Implementation of study recommendations could result in the attainment of traffic operations goals of safety and efficiency while minimizing the negative impacts of traffic in residential areas.

PROBLEM NO. 5

5.1 TITLE: REGIONAL TRAFFIC AUTHORITIES

5.2 PROBLEM: In most urban areas, traffic operations are the responsibility of a large number of single-jurisdiction agencies. Most of these agencies are small and in many smaller jurisdictions, simply do not exist. This results in an uneven application of new, innovative and potentially very effective traffic operational measures. One approach to addressing this problem would be through the designation of a single agency at the regional level to manage traffic operations. Such an agency would also be better able to deal effectively with other region-wide transportation agencies such as regional transit operators, Metropolitan Planning Organizations and State DOT's. There is a need to estimate the institutional factors which constrain the development of such agencies and in a broader sense to judge their feasibility.

5.3 OBJECTIVES: To investigate the institutional factors involved in the concept of regional traffic authorities. This would include identification of typical current institutional arrangements, effectiveness of current structures, potential areas for improvement and current examples of existing regional integration of traffic management responsibilities. The research could suggest possible demonstration strategies for this concept as well as model enabling legislation. The benefits of such a structure should be clearly identified as well as possible costs and disadvantages.

5.4 KEY WORDS: Traffic Operations, Metropolitan Planning Organizations, Transportation System Management, Institutional Factors, Regional Planning, Traffic Engineering Management.

5.5 RELATED WORK: Previous work on institutional issues in the development of regional transit authorities, metropolitan planning organizations and other regional entities (park authorities, water supply authorities, etc.) may be applicable to this area.

5.6 URGENCY/PRIORITY: Institutional arrangements sometimes negatively impact implementation of regionally significant traffic management strategies. Where this has occurred, or may continue to occur, setting up a regional traffic authority may have significant positive impacts.

5.7 COST: $100,000

5.8 USER COMMUNITY: FHWA, UMTA, AASHTO, APTA, NARC, NACO, NCM/NLC, STATE DOT's & CITIES

5.9 IMPLEMENTATION: Once this study has been completed, localities facing regional traffic operation problems could more easily opt for improved institutional structures. Such a study would make the choice of the structure more clear and also identify whether a real problem exists at all.

5.10 EFFECTIVENESS: In order for some areas to introduce significantly effective traffic operations measures, difficult institutional problems must often be addressed. Areas implementing a regional traffic operations authority would have in place a structure which would make these strategies much more easy to implement. Thus it is likely that major improvements in traffic performance could be achieved more quickly where institutional barriers are removed. Significant travel time and cost savings can result from these strategies.

PROBLEM NO. 6

6.1 TITLE: THE EFFECTS OF REGULATORY POLICIES ON TRANSPORTATION SYSTEM OPERATIONS

6.2 PROBLEM: Many city building regulations have significant secondary impacts on the urban transportation system. Research is needed to identify which building codes have transportation impacts and to assess the nature and extent of these impacts. Examples of such codes are:

Regulations governing parking spaces: The cost and availability of parking is a primary determinant of transportation demand. Several cities have building codes which require a minimum number of parking spaces per building for zoning purposes. Currently some cities are looking at setting maximum limits on parking spaces, or tying allowable parking spaces to availability of park and ride lots or shuttle buses. Study is needed to identify these and other regulations governing parking spaces and to assess their impact on the urban transportation system.

Regulations governing urban goods movement:

Vehicles used for the pickup and delivery of goods are a major presence in the CBD. Variances in delivery bays, and availability of off-street loading facilities versus curbside loading facilities are among the building ordinances affecting the flow of goods movement. Some recommendations have been made for building standards for off-street loading (Christensen) but more analysis remains to be done.

6.3 OBJECTIVE: To identify, analyze and assess the impacts of city building ordinances on urban transportation.

6.4 KEY WORDS: Building Codes, urban regulations
Urban goods movement ordinances
Parking regulations

6.5 RELATED WORK: Not known

6.6 URGENCY/PRIORITY: Given the current fever of regulatory reform, it is important that the secondary impacts of regulations be identified and understood, so that changes can be made advisedly.

6.7 COST: $150,000

6.8 USER Community: FHWA, State DOT's, MPO's, UMTA, AASHTO, ATA, Nat. Parking Assoc., International Downtown Executive Assoc.

6.9 IMPLEMENTATION: The findings of this research would assist in the decision-making process of agencies charged with developing local ordinances.

6.10 EFFECTIVENESS: The true potential for this research will not be known until it is completed; however, positive impacts are anticipated from improving traffic flow, and also from energy and environmental benefits.

PROBLEM NO. 7

7.1 TITLE: PRIVATE SECTOR INVOLVEMENT IN TRANSPORTATION PROBLEMS AT NON-CBD HIGH ACTIVITY CENTERS

7.2 PROBLEM: As cities grow outward many activity centers sprout around beltways and along radial corridors. The transportation problems of these centers need to be defined and alternative management schemes proposed. Up until now one of the main contributions of the private sector has been the implementation of ridesharing at the employer end of the work trip. There is a need to explore and define other ways in which the private sector can contribute further toward transportation improvements at high activity centers.

7.3 OBJECTIVE: To characterize transportation problems at non-CBD activity centers and develop recommendations for ways in which the private sector can contribute to the solution or minimization of these problems.

7.4 KEY WORDS: Shopping centers, industrial parks, office complexes, hospitals, college campus, business associations, traffic congestion, transit terminals, paratransit strategies, zoning innovations.

7.5 RELATED WORK: As urban areas become more involved in the development of TSM plans they are finding it necessary to increasingly involve the private sector. In one major urban area, large institutions such as hospitals and colleges are required to develop their own employer-based TSM plans. The city requires these plans as a condition for any permits the institution may need to expand their facilities.

7.6 URGENCY/PRIORITY: Considering the fact that the home-to-work trip is the major peaking problem for urban transportation systems, and considering that the concentrated work end of the trip is easier to focus on than the diffused home end, research in this area should have a high pay-off potential.

7.7 COST: A study to characterize the problems, to document successful private sector solutions and to provide guidelines for further implementation could be done for about $150,000.

7.8 USER COMMUNITY: FHWA, UMTA, MPO's, AASHTO, CITIES, COUNTIES, business organizations, shopping center associations, etc.

7.9 IMPLEMENTATION: The findings of the research should be disseminated to the user community with a request for feedback as to whether further study and/or implementation is desirable.

7.10 EFFECTIVENESS: The primary transportation problem of these high-activity centers is the dominant use of the automobile, therefore, schemes which minimize auto usage and maximize carpooling and transit should be the most effective. The success of such schemes can be measured by the number of carpools, person trips, traffic volume, transit passengers, etc.