UM-HSRI-78-45

MICHIGAN TRANSPORTATION RESEARCH PROGRAM

ANNUAL REPORT
SEPTEMBER, 1978

THE UNIVERSITY OF MICHIGAN
HIGHWAY SAFETY RESEARCH INSTITUTE

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UM-HSRI-78-45		

4. Title and Subtitle	5. Report Date
Michigan Transportation Research Program Annual Report for Fiscal Year 1977-1978	September 1978
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
L. E. Newland	UM-HSRI-78-45
9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Michigan Transportation Research Program Highway Safety Research Institute University of Michigan Ann Arbor, Michigan 48109	11. Contract or Grant No. 77-1656
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	Annual Report Oct.1, 1977 - Sept.30,1978
Michigan State Highway Commission Michigan Department of State Hwys. & Transportation Box 30050, State Highways Building Lansing, Michigan 48909	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This annual report of the second year (FY1978) of the Michigan Transportation Research Program (MTRP) describes committee and staff activities and MTRP projects. MTRP is an inter-university, inter-industry organization designed to support the research and demonstration program formulations and evaluations of the Michigan Department of State Highways and Transportation and other elements of state government.

17. Key Words	18. Distribution Statement

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
		92	

CONTENTS

CONTENTS (cont)

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Michigan State Highway Commission.

ACKNOWLEDGEMENT

The management and staff of the Michigan Transportation Research Program (MTRP) deeply appreciate the time and effort devoted to MTRP by its many participants. In particular, Michigan firms and universities have supported the voluntary participation of their members in committee activities, working sessions, and efforts directly contributing to the birth and progress of MTRP in assisting state government to develop innovative transportation research and analysis activities. Their contributed activities have extended to the national level as well, and their concepts and perspectives have served to shape the evolution, growth, and planned activities of this unique program for the future.

The sponsorship and support of the Michigan State Highway Commission: Chairman Mr. Peter Fletcher; Vice-Chairman Mr. Carl V. Pellonpaa; Commissioner Mr. Hannes Meyers, Jr.; and Commissioner Dr. Weston E. Vivian, has been essential to the existance and success of MTRP. Mr. John Woodford, Director of the Michigan Department of State Highways and Transportation (MDSH&T)and Mr. Charles Uray, Chief Deputy Director, have offered suggestions and advice on the scope of activities of MTRP.

Mr. James C. Kellogg, Deputy Director of the Bureau of Urban and Public Transportation (UPTRAN),and his many staff members have been especially helpful and supportive. In particular, acknowledgment is made to Mr. Ivan Bartha, Mr. Fred Lammert, Mr. Wolf Mueller, and Mr. Les Sinclair for their participation in MTRP committee and staff activities. Special acknowlegement is made to Mr. Thomas Lebovic who has worked closely and tirelessly with the MTRP staff and committees, performing valuable liaison and day-to-day support of MTRP activities.

Special mention should be made of the encouragement and support given to MTRP by Senator David Plawecki, Representative William Ryan, Representative Thomas Anderson, Representative Michael Conlin, and the Transportation Quadrant Committee and their staffs of the Michigan State Legislature.

To the many individuals, too numerous to identify, who have given their assistance, information, and support to MTRP in a multitude of ways, we express our appreciation. Without the help of all those mentioned here, the establishment of this new form of inter-governmental, inter-industry, inter-university activity would not have been possible. Because of the unique

cooperative spirit embodied in MTRP, a new model for state and local level technical and scientific activities and knowledge transfer is emerging which is benefitting Michigan, which may be transferrable to other states and regions, and which can support the thoughtful and efficient evolution of the national transportation system.

1.0 INTRODUCTION

This report is a review of the second year's activities of the Michigan Transportation Research Program (MTRP), October 1, 1977 to September 30, 1978. Detailed reviews of the first three quarters of FY77-78 are contained in the Quarterly Progress Reports issued previously.

The MTRP began operating in October, 1976, as a result of Governor Milliken's 1975 proposal to the Michigan State Legislature that academic and business resources in Michigan be organized to assist the state government in formulating transportation research, demonstration, and development programs. The MTRP is funded by the Michigan State Highway Commission through the Michigan Department of State Highways and Transportation (MDSH&T) and its Bureau of Urban and Public Transportation (UPTRAN). Members of the MDSH&T participate in MTRP on a coordinating basis. (See Appendix I for MTRP organization and membership.)

The MTRP is directed by Dr. Charles G. Overberger, Vice-President for Research at The University of Michigan, with the general program activities guided by the co-principal investigators, Dr. William C. Taylor, Chairman of the Department of Civil Engineering, Michigan State Univeristy, and Dr. Robert L. Hess, Director of the Highway Safety Research Institute, The University of Michigan. A state-wide Advisory Committee supports the Program Director and is co-chaired by principal investigators. It is composed of academic and business professionals noted for their contributions to transportation research and transportation-related endeavors. Ad hoc committees are formed by the Advisory Committee, using experts from the academic and business communities to prepare research projects and recommendations on specific transportation subjects.

The purposes of MTRP are to formulate, recommend, conduct, manage, and procure useful research and analysis activities that will achieve the following goals as approved by the Advisory Committee and Program Director in April, 1977.

(1) To identify and coordinate transportation research and analysis expertise in the academic and private sectors of Michigan to assist and support the Michigan Department of State Highways and Transportation and other elements of state government as appropriate in the planning, improvement, and continued development of the Michigan transportation system.

(2) To increase transportation research, analysis, demonstration, and educational activities in Michigan through increased federal and other non-state funding to provide a broader resource base to support state government activities, private sector development, and transportation systems operations.

(3) To develop an understanding of the relationship between transportation and economic development and to recommend or identify areas for initiatives and methods of stimulating economic development in Michigan through the improvement of existing transportation systems and the identification of innovative transportation systems, operations, and products.

(4) To obtain information, experience, and methods of information analysis to develop a better understanding of Michigan's needs to move people and freight and to show the impacts of alternative actions on the environment, energy, safety, fiscal costs, and equity.

2.0 PROGRAM ACTIVITIES

Activities in which the MTRP staff, Advisory Committee and the various ad hoc committees were involved this year are summarized below:

2.1 UPTRAN Demonstration and Development Program Recommendations.

The MTRP staff prepared evaluations of the demonstration and development programs on a project-by-project basis for the fiscal years 1977-78 and 1978-79. These evaluations produced suggestions for changes in existing programs as well as suggestions for new projects that could be useful to UPTRAN and strengthen the demonstration and development programs. These evaluations were placed before the MTRP Demonstration and Development Ad Hoc Committee for its review. Three projects were recommended by the ad hoc committee for inclusion in the FY1977-78 Demonstration and Development Program: (1) the development of a longer-term transportation energy contingency plan for Michigan that would relate transportation energy use to energy use in other energy consumption sectors; (2) an analysis of transportation demand, in terms of potential travel behavior, of mobility-limited persons in Michigan; and (3) the development of a methodology to analyze alternative uses and impacts of rail abandonments acquired by the Michigan Highway Commission. These recommendations were formally transmitted to MDSH&T by the MTRP program director.

Two projects were recommended for inclusion in the FY1978-79 program: (1) the development of a methodology for reviewing proposed demonstration projects in terms of their potential for increasing "level-of-service" and increased efficiency; and (2) the development of a methodology to to estimate future potential uses and impacts of rail abandonments procured by the Highway Commission. The latter project was recommended for inclusion in the FY1977-78 program, but was not included. The recommendation was submitted again for consideration in the next fiscal year. The MTRP Program Director agreed, and formally submitted these recommendations to MDSH&T.

During this year the Advisory Committee formed the MTRP Task Force on Transportation and Urban Demography to formulate recommendations for projects that would yield a better understanding of transportation impacts on Michigan society, and emerging transportation needs that would most likely result from changing demographic characteristics of Michigan's society. The task force suggested three projects: (1) research on the impact of demographic trends on transportation; (2) impacts of alternative subsidy patterns in transportation; and (3) research on the variations of the concept of level-of-service as viewed by different strata of society. The Adivsory Committee concurred, and the program director transmitted these recommendations to MDSH&T for possible inclusion in the FY79-80 Demonstration and Development Program.

All of the above recommendations are being considered by MDSH&T. (see Appendix II "MTRP Recommendations" for relevant correspondence and background information concerning all of the above recommendations.)

2.2 Transportation Energy

As a result of suggestions by the MTRP staff, the energy efficiency ad hoc committee and the Advisory Committee recommended that a short-term transportation energy contingency plan for Michigan be prepared. The MTRP program director submitted this recommendation to the Director of MDSH&T in FY1976-77. As a part of this it was recommended that funds allocated to the development of an energy efficiency analysis of various transportation modes be set aside to support the transportation energy "emergency preparedness" development. Literature research and inquiries determined that no other state was developing such a plan. The objective of the plan was to recommend ways in which state and local government, transportation agencies, private firms, and individuals could organize their activities in ways that would minimize economic dislocations in the face of a sudden cessation of petroleum supplies, comparable to the oil embargo of 1973-74, or worse. Changes in public transportation operations, the swift introduction of carpools and vanpools, and other

means would be explored. Subsequently, it was determined that the Department of Transportation had no activity addressing this problem.[1] Also, it was determined that during the summer of 1978, legislation was introduced into the Congress involving prospective federal funding for energy "emergency preparedness" planning at the state level.[2]

The MTRP staff, in conjunction with the Energy Efficiency Ad Hoc Committee, developed a scope of work and a request for proposal (RFP) to find a contractor for the development of the contingency plan. Proposals were evaluated by a review team selected by the Energy Efficiency Ad Hoc Committee. Wayne State University was selected as the most qualified bidder.

At this time, committed funds for this project (and other projects) were reallocated by MDSH&T to a higher-priority project.

The Energy Efficiency Ad Hoc Committee recommended, and the Advisory Committee concurred, that the MTRP staff be asked to seek federal funding for this unique project. Additional recommendations were made to MDSH&T to restore the funding for the proposed short-term transportation energy contingency plan by the MTRP Program Director (see Appendix II). MDSH&T indicated that funding was not available but that the recommendations would be taken under consideration. A letter proposal was prepared for submittal to the Intergovernmental Science, Engineering and Technology Advisory Panel (an advisory group to Dr. Frank Press, the President's Scientific Advisor). Previously, Representative Tom Anderson of the Michigan State Legislature, a member of the Advisory Panel, had informed Dr. Press and selected members of the panel of the existance of MTRP. He outlined MTRP projects the Advisory Panel and Dr. Press might want to recommend to the Secretary of Transportation

---

1. Interview with Richard S. Page in "Passenger Transport" Vol. 36, July 14, 1978
2. "Department of Energy Information" Vol. 2, No. 28 week ending July 14, 1978.

for federal funding in Michigan. Subsequently, Governor Milliken of Michigan was appointed to this Advisory Panel. It was decided that the proposal would be recast into the form of a multi-university proposal (Michigan State University, Wayne State University, and The University of Michigan) to the Advisory Panel for federal funding. The development of this proposal is now in process.

In another action, the Energy Efficiency Ad Hoc Committee recommended to the Advisory Committee that a "white paper" be commissioned that would present the MTRP position with regard to future, dwindling transport energy supplies. Recent independent Michigan State University[3] and Massachusetts Institute of Technology[4] studies indicate that a world petroleum short-fall with effects at least as severe as the oil embargo of 1973-74 will occur in the mid to late 1980's. The white paper would outline the implications of this for Michigan's transportation system and for Michigan's industries (automotive, tourism, and agriculture) that are transportation energy dependent. The white paper would be for state government, special interest groups, and public consumption. It would present the rationale for short-term and long-term transportation energy contingency planning.

Initial drafts of the white paper were prepared by MTRP staff and a group of consultants. Members of the Energy Efficiency Ad Hoc Committee prepared a first draft for submittal to the Advisory Committee during the summer of 1978. The authors were asked to prepare a second draft due to the divergence of technical opinion of Advisory Committee members concerning the hypotheses advanced by the authors in the paper. Work on the second draft was in process at the end of this year.

---

3. "Resource Management in a Changing Environment: with Applications to the Rural Sector" H. Koenig and T. Edens, et al. The Design and Management of Rural Ecosystems, Michigan State University, E. Lansing, Michigan, September, 1976.

4. Energy: Global Prospects 1985-2000. Report of the Workshop on Alternative Energy Strategies. Wilson, C.L., ed. Massachusetts Institute of Technology, Cambridge. McGraw-Hill Book Company, New York, N.Y., 1977.

2.3 Auto and Passenger Train Service to Northern Michigan and the Upper Great Lakes.

As a result of recommendations by the Advisory Committee and the program director during FY1976-77, MDSH&T/UPTRAN requested that MTRP prepare a proposal to conduct this project. The Advisory Committee created the Michigan Car-on-Trains Ad Hoc Committee to oversee the proposal preparation by the staff, and to direct the subsequent study effort. The purpose of the study was to conduct a preliminary evaluation of the operational and economical feasibility of providing train service for passengers and their automobiles to the Northern Michigan resort area. The service would be similar to that provided by a private corporation from Alexandria, Virginia, to Orlando, Florida, and from Louisville, Kentucky, to Orlando, Florida. If the Michigan segment of the service appeared feasible, then an in-depth study would be recommended for other alignments with trip destinations in the upper peninsula and other regions of the upper Great Lakes. The rationale for the system was two-fold: (1) to provide a back-up to Michigan and Great Lakes tourism in the event of prolonged transportation energy shortages, and(2) regardless of shortages, provide a means of expanding the "catchment," or market area, for Michigan and Great Lakes tourism. In anticipation of the proposal, funds were set aside by the Upper Great Lakes Regional Commission to finance the preliminary analysis.

Prior to submittal of the proposal, the ad hoc committee requested the MTRP staff to examine the data base of existing tourism travel patterns to determine if it was comprehensive enough to support the study. The MTRP staff contracted with the MDSH&T Bureau of Planning for computer printouts of trip origins and destinations within the State of Michigan and from outside the state. After a lengthy period the origin and destination data were provided, and appeared sufficient to support the study. After submittal, the proposal was rejected by the UPTRAN Executive Committee.

2.4 Small Bus Safety Proposal

A proposal was received by the Advisory Committee from the Keweenaw Research Center (KRC), Michigan Technological University, to provide MTRP "seed money" to KRC for development of a proposal to MDSH&T to study the safety attributes and risks of Michigan's small bus fleet, particularly with regard to the elderly and handicapped. Funds were provided for this purpose. Subsequently, MDSH&T requested that MTRP review the proposal, and after neogtiations and revisions the MTRP co-principal investigators concurred with the proposed scope of work. The proposal is now in the hands of MDSH&T.

2.5 Life-Cycle Cost (LCC) Procurement of Small Buses

The concept of life-cycle cost procurement is to base purchasing decisions on the total lifetime cost (operating and maintenance, depreciation, etc.) rather than on the lowest capital cost, which is the current practice. By this means, it is hoped that small bus manufacturers would be encouraged to produce a more durable vehicle. The MTRP Bus Evaluation Ad Hoc Committee recommended that studies be undertaken to test this hypothesis. MTRP staff was directed to work with the U.S. Army Tank Automotive Research and Development Command (TARADCOM) Warren, Michigan to translate the existing TARDACOM large military bus life-cycle costing procurement methodology into a small bus methodology. A proposal to TARDACOM to conduct this study was submitted to MDSH&T/ UPTRAN with the recommendation that TARDACOM be funded directly by the Department. The MTRP Bus Evaluation Ad Hoc Committee would be available to perform technical oversight on the TARDACOM work and findings for the Department, if requested.

In parallel with this effort, the Urban Mass Transportation Administration has been developing its own life-cycle cost methodology for small buses. The Bus Evaluation Ad Hoc Committee met with representatives from UMTA to discuss differences and similarities in the two approaches. In coordination with UPTRAN staff, MTRP staff submitted a concept proposal to UMTA to develop a management plan for gathering data on the cradle-to-grave costs of small bus ownership in Michigan. This plan

would be used to guide collection of data concerning new-replacement of small busses procurred in Michigan during FY1978-79. The management plan activity would conclude with a proposal to UMTA to gather the data and to analyze and evaluate the UMTA LCC methodology and the UPTRAN (TARDACOM) methodology.

2.6 City of Battle Creek Rail Relocation and Downtown Revitalization

MTRP staff has provided information and consultation to the city manager's office, Battle Creek, Michigan, to assist in its development of proposals for federal and state grants. These funds will be used to relocate and consolidate rail tracks that surround the city's central business district and greatly reduce its accessibility and growth potential. This consolidation project, which would eliminate many grade crossings in the downtown area, will cost approximately $8.5 million dollars. The federal share is approximately $2.5 million dollars. State funds would be used for a new intermodal terminal. This is the first phase of a larger plan for commercial redevelopment of the downtown area.

2.7 Airports Development Management System (ADMS)

At the request of Mr. James Ramsey, Deputy Director, Michigan Bureau of Aeronautics, the MTRP staff assisted the bureau staff in developing a request for proposal to design a data system for the management of airport facilities planning. ADMS will function as an aid to the Bureau of Aeronautics in determining airport needs and implementing airport projects in Michigan.

2.8 Public Transportation for Mobility-Limited Persons

The MTRP Ad Hoc Committee on Transportation for the Mobility-Limited recommended that MTRP staff prepare a proposal for federal funding to develop urgently needed training materials for public transport drivers and elderly and handicapped transit users. The proposal has been submitted to MDSH&T/UPTRAN for its review and submittal to UMTA for a demonstration grant to the Michigan Highway Commission. It is proposed that MTRP will conduct the project under contract from the Commission. Severan Ann Arbor area social service groups have pledged

support to the project and will serve as "focus groups" in determining the scope and content of the training materials. The full spectrum of media materials will be examined (from film and/or video tape to braille and printed brochures).

The training package will be composed of three segments:

1. A gerontology empathy and orientation segment intended for bus driver training programs.
2. A handicapped empathy and orientation segment intended for bus driver training programs.
3. A training package on bus use intended for mobility-limited users and potential users.

The driver training materials will be developed and tested in actual job orientation programs under the supervision of the Southeastern Michigan Transportation Authority (SEMTA) and the Ann Arbor Transportation Authority (AATA).

The project methodology will determine and assess effectiveness criteria for the training material package. The evaluation of the driver training materials will be carried out at the end of the orientation programs, using structured and open discussion formats. Evaluations of the driver training materials will also be solicited from the individuals who run the orientation program and from transit authority management.

The evaluation of the user package will take place in the selected service agencies after the panel groups have participated in a training session. The panel "pre-test" will be followed at a later date by a panel "post test" after the materials have appeared on local television programs. On-board structured personal contacts will also be used within the Ann Arbor Transit Authority bus system.

Finally, although the project will be developed at a local level, a larger objective is to identify and outline suitable mechanisms to disseminate the material at the state and national levels. The results of the project evaluation will thus be used to determine the most costeffective means of disseminating the training curriculum to transit authorities, state departments of transportation, and local service agencies.

2.9 Federal Matching Funds for MTRP

The FY1979-80 Appropriation Bill for the U.S. Department of Transportation is in the U.S. Congress and is expected to pass in October 1979. The House version of this legislation contains $10 million per year for four years to the Office of the Secretary of Transportation to be given to state universities that have ongoing state-government-sponsored transportation research programs. These grants would be in the form of matching funds. The language of the legislation fits MTRP almost perfectly.

There is every indication that this section of the legislation will be included in the Senate version and that the state universities grant program will be underway when the President signs the legislation into law.

3.0 MTRP STUDY PROJECTS AND FINDINGS

3.1 Models for Projecting Future Small Bus Fleet Requirements in Michigan

Optimization in Dial-a-Ride Systems Analysis,
N. Wallace, MTRP staff, The University of
Michigan, Highway Safety Research Institute,
Ann Arbor, Michigan, August 1978,
UM-HSRI-78-32.

This report stemed from a request by the MDSH&T to the MTRP for identification and description of models the Department staff could use estimating small bus fleet requirements for future dial-a-ride system operations. Identification of these models showed that they differ significantly in their structure, input variables, and general approaches, and that they were designed for different users (e.g. academic, transportation authority planner, etc.)

Rough gross projections of fleet requirements can be made manually by using such factors as population density and area size to be served. However, if more precision in the estimates is desired, then operational characteristics and levels-of-service, among other things, must be taken into account. Therefore, systems must be "designed" at least on a preliminary basis. For the purpose of this study the models reviewed were dial-a-ride system design models.

The study also addressed the question of what would be the most practical model government planners could use for development of system designs and reasonably accurate fleet size projections.

---

1. Letter to Dr. Charles G. Overberger, Vice-President for Research, The University of Michigan, Ann Arbor, Michigan, from Mr. Charles Uray, Jr., Chief Deupty Director, Michigan Department of State Highways & Transportation, Lansing, Michigan, December 14, 1977.

3.1.1 Summary

Despite the growing interest in demand-responsive (dial-a-ride) bus systems, the debate over optimal design structures for such systems remains largely unsettled. Generally the existing models rely on a network problem or allocation problem formulation of the system dynamic. However, the models vary considerably because of differing emphases in the demand, supply or cost-modeling frameworks. There are also enormous differences in the problem formulation as defined by the academic or market development researchers and the transportation system planners within the local transit authorities. These differences stem partly from variable computer capabilities, but also reflect different spatial and scale orientations. The state-of-the-art researcher tends to concentrate on models driven by stochastic estimations of demands, whereas the planner in the local authority tends to concentrate on rule-of-thumb relationships between sector divisions and demand rates as a function of known residential density.

This analysis was an attempt to speak to the disparity between modeling methodologies in academia and the methods most commonly used by bus system planners. The initial question asked in the study was what kind of problem is a dial-a-ride system analysis? A literature review attempted a partial response to that question as well as a consideration of the various linear optimization techniques used to model dial-a-ride design. The literature critique considered a simpler and more usable model, again using linear techniques, which provides a more manageable middle ground between the complicated optimization models that currently exist in academia and the general lack of similar techniques in the actual planning environment.

A proposed middle ground dial-a-ride system design model was the mean value model recently adapted for interactive use on the Michigan Terminal System. The model was initially developed in the early 1970's by Mr. J. R. Mumford and Mr. F.J. Mason in the Transportation Analysis Department, Ford Motor Company. The mean value model is a second-generation response to a previous generation of stochastic models that used network flow algorithms and the

traveling salesman algorithm to determine optimal service characteristics of dial-a-ride system design. As Mumford and Mason suggest, "the fundamental concept of this model was the elimination of all randomness from the problem.... all random variables are replaced by their expected values."[1]

3.1.2 Conclusions

Although the mean value model provides only expected values of dial-a-ride service, sensitivity analyses of the model parameters indicated that the model gives quite accurate indications about policy trade-offs among dial-a-ride service characteristics. The model provides good guideline information about the effects of policy-determined service sector characteristics. From the service sector characteristics, productivity and the level of service measures can be derived, so that the system design could be translated into cost and supply terms.

The mean value model thus offers a viable alternative to the costly stochastic models. In its current form the model costs approximately $.30 per run and requires simply formatted input data. The model appears particularly well suited to use by transit planning authorities where limited computer facilities and lack of highly specialized personnel make a complex modelling procedure impractical.

---

1. F.J. Mason and J.R. Mumford, "Computer Models for Designing Dial-a-Ride Systems," SAE Automotive Engineering Congress, Detroit, 1972, p.8.

3.2 BUS TIRE PROCUREMENT ALTERNATIVES

An Informal Study of Transit Bus Tire Procurement in Michigan, J. Dries, MTRP staff, The University of Michigan, Highway Safety Research Institute, Ann Arbor, Michigan, August 1978, UM-HSRI-78-35.

This study was conducted in response to a request from Mr. Charles Uray, Jr., Deputy Director of the Michigan Department of State Highways and Transportation, for information on an evaluation of large-bus tire procurement. and recycling practices. Information on bus tire procurment practices and tire recycling was gathered through a search of available literature and through informal telephone interviews with selected Michigan public transit operators, bus tire lessors, bus tire recappers, and tire transit trade associations. In the course of the study, it was discovered that an in-depth study of bus tire leasing costs in a cross-section of U.S. public transit agencies is currently being conducted by the American Public Transit Association for the Chicago Transit Authority. The APTA study is expected to be complete by the end of 1979 , according to APTA sources.

3.2.1 Summary

The study was conducted in three phases. First, a review of available literature was conducted to provide background and specific information on the types of tires generally used by transit bus operators and the performance characteristics of those tires. Another literature review was conducted to determine the scope of acceptable tire maintenance practices and to examine the range of possible tire recycling methods currently available.

Next, informal telephone interviews were conducted with selected Michigan public transit authorities, tire manufacturers, trade associations, and tire recappers to obtain information on tire procurement practices and tire procurement costs experienced by the various transit authorities

interviewed and the range of services provided in the various lease contracts encountered. In all telephone interviews, an effort was made to procure cost and service information from source documentation (i.e., lease contracts and most recent tire mileage billings). In all cases, the necessary information was requested through management personnel of the several Michigan public transit authorities.

Finally, several cost analyses were performed. A comparison of tire leasing vs. tire purchasing costs was performed for the four Michigan public transit authorities that have lease contracts which do not include maintenance service in the basic rates of their tire lease contracts. An estimate was made of the annual dollar savings which public transit authorities could release by switching to purchased tires. Tire use costs for all new tires vs. a mix of new and recapped tires were compared, and an estimate was made of annual savings accruing from maximized recapped tire use.

3.2.2 Conclusions

(1) Significant annual operating cost savings appear possible for the four Michigan public transit authorities analyzed if their bus tire procurement practices are switched from leasing to purchasing. Further, in-depth analyses of bus tire leasing costs appear to be warranted.

(2) An immediate switch from tire leasing to tire purchasing would require the purchase of all tires currently on buses and in spare inventory. Such a purchase could cause cash flow problems for Michigan public transit authorities.
Outside funding, from state or federal sources, for initial tire purchases could facilitate the changeover from tire leasing to tire purchasing.

(3) Rigorous tire inspection and maintenance programs are necessary to maximize tire tread and carcass life. Maintenance and inspection provisions in tire lease contracts may contribute to extended tire life.

(4) Significant annual tire use cost savings appear possible through maximizing the use of recapped tires on bus traction axles. However, some Michigan public transit operators resist using recapped tires on grounds of safety and operating concerns. A detailed evaluation of the safety and performance experience of Michigan public transit authorities currently using recapped tires would help provide information the various transit authorities need for making decisions on uses of recapped tires.

(5) Recapping of worn bus tires is the most cost-effective and energy-efficient means of recycling bus tires. Other available recycling technologies include use of worn tires as boiler fuel, as a source of rubber for new tires, as a source of petroleum fuels and high BTU gas, as landfill, as a component of paving asphalt, and as material for breakwaters or artificial reefs.

3.3 Legal Implications of Van and Car Pooling

A Preliminary Analysis of the Potential Legal Issues Associated with Car and Van Pooling in Michigan, M. Greyson and L. Rosenstock, The University of Michigan, Highway Safety Research Institute, Policy Analysis Division, Ann Arbor, Michigan, September 1978, UM-HSRI-78-39.

This study was conducted at the request of and under the sponsorship of the Michigan Transportation Research Program (MTRP).

3.3.1 Summary

Another project underway by the MTRP Energy Efficiency Ad Hoc Committee is the proposed development of a Michigan transportation energy contingency plan that could be put into operation in case of sudden and significant reductions in petroleum supplies. The plan will recommend changes in the operations of public transit systems and initiatives that can be taken by state government for the rapid formation of car and van pools, with possible integration of such pools with the public transportation systems. Thus, it is important that the present situation in Michigan with respect to the liability, insurance requirements, and legal implications of car and van pooling in Michigan be understood. Public reaction to sudden petroleum energy shortages will inevitably spawn informal shared-ride travel behavior, and planning in both the public and private sectors for car pools is likely to make them even more widespread.

The purpose of this study was to provide a preliminary assessment of the implications and relationships of legal factors that can affect car and van pooling. The study was also intended to provide a frame of reference for development of alternative state government initiatives that would encourage the proliferation of ridesharing activities. The analysis was undertaken in conjunction with the MTRP activities on the Michigan Transportation Energy Contingency Plan, but the findings are also applicable to car and van pools currently in operation.

3.3.2 Conclusions

The preliminary analysis of potential legal issues associated with the types of car and van pools specified by the MTRP uncovered no significant legal barriers to the organization and operation of such arrangements. It was not possible, however, within the effort allocated for this study, to answer several legal questions that arose. Answers to those questions would be of great interest to potential pool organizers and operators. Accordingly, a more comprehensive analysis should be performed to learn the following:

(1) The legal requirements that would have to be satisfied (under both current law and bills currently being considered) by a car or van pool that is classified as a common or contract motor vehicle carrier of passengers.

(2) To the extent possible under existing case law, the probability that a pooling arrangement involving individual, privately owned vehicles would be legally construed as a joint venture.

(3) The extent to which a vehicle pool employing a corporate form of organization could protect individual shareholder-pool participants from personal liability for injuries arising out of negligent pool-vehicle operations.

(4) To the extent possible under existing case-law decisions, the conditions under which a court would determine that car pooling to and from work in a vehicle owned by the state or an employer falls within the scope of employment of an employee.

(5) The extent to which public policy will not permit named insureds to be excluded from residual liability protection under the no-fault law when such individuals undertake litigation against one another.

(6) The case-law developments concerned with determination of the constitutionality of the set-off provisions of the no-fault insurance law.

3.4 An Assessment of Alternative Fuels Use by Michigan Public Transit

The Potential for Alternative Fuels in Michigan Public Transit Systems, H. Bunch, for MTRP, The University of Michigan, Highway Safety Research Institute, Ann Arbor, Michigan, August 1978, UM-HSRI-78-33.

Petroleum-derived motor fuels are expected to become more scarce and expensive. As this occurs, some consumers will shift from private vehicles to use of public transportation. Thus public transit systems will be confronted by increasing motor fuel costs stemming from both increased fuel prices and increased passenger demands. It is important that they position themselves to minimize the effects of cost increases and shortage difficulties that seem likely for petroleum fuels.

The State of Michigan Department of State Highways and Transportation (MDSH&T) sensed the overall need and asked the MTRP to investigate the possibility of obtaining a demonstration grant to support an evaluation of alternative fuels in the public transit environment.

3.4.1 .Summary

The Department's request indicated that "a determination....be made as to the availability of alternative fuels which may be used in public transportation. Such fuels as the following should be examined:

a. hydrogen (liquid and gaseous)
b. alcohols (methanol, ethanol, and blends)
c. broad-cut fuels
d. gasoline/alcohol blends
e. electricity via storage battery"

It was requested that the study report list the advantages and disadvantages of each fuel and recommend which fuels appear to be candidates for use in public transit demonstration programs. The problems of cost, availability of resources, applicability to current propulsion technology, and safety and health would be considered.

Because other projects are examining the electric vehicle demonstration opportunities in more detail, it was subsequently decided to eliminate this type of propulsion system from study consideration. As finally constituted, then, the fuels that were considered in the study are those described in the first four categories listed on the preceding page.

3.4.2 Conclusions

The first conclusion of the study was that the only alternative fuels that appear to be likely candidates for a demonstration in the near term are alcohol and synthetic fuels. But if synthetic fuels are used in a demonstration, the main demonstration criteria will be an evaluation of the production process, not the merit of the fuel itself. Alcohol, however, would benefit from a demonstration that would include either the production process or the actual use of the fuel in the field. The major demonstration fuel contender,therefore, is alcohol, either straight or in a gasoline blend. Ideally, the demonstration should include an evaluation of the production process and the field application.

The only likely supporter of a demonstration project is the U.S. Department of Energy, Division of Transportation Energy Conservation. There are tentative plans for supporting some demonstration programs of alcohol/gasoline blends in the near future.[1] The most likely funding dates will be during FY1980, with the possibility that the funding would not occur until FY1981 or FY1982. The presentation by a serious commercial or governmental entity of a demonstration concept to the Department of Energy would accelerate the funding date. This would be especially true if the organization indicated a willingness to perform the demonstration on a shared-cost basis.

It was recommended that there be a plan for a public transit demonstration project using alcohol. The preferred alcohol would be methanol. The demonstration, hopefully, would include the construction and operation

---

1. Personal interview with Chief, Alternative Fuels Branch, DOE, April, 1978.

of a methanol pilot plant utilizing:

- forest products biomass, available in large quantities in the upper peninsula, or
- solid waste, available in Southeastern Michigan.

Both concepts have appeal, but for different reasons. A project developed on the utilization of forest products biomass also has the benefits of being operated in an isolated area (the upper peninsula). The effects (costs and benefits) could therefore be more easily measured. A project using solid waste biomass from Southeastern Michigan has the benefit of being a demonstration that would have results more potentially extrapolatable to heavily urban areas.

In developing the demonstration proposal the following concepts should be used as a guide:

> ...The production of new technology regarding the characteristics of a technology in a real-world setting. This new information is aimed at potential adopters and manufacturers to stimulate the use of the technology, and at regulatory agencies to provide the basis for decisions that might require use of the technology.
>
> ...The exemplification of a technology, by disseminating existing information to provide potential adopters with opportunities for first-hand assessment of its usefulness and applicability.
>
> ...The encouragement of institutional and organizational changes in an industry and related organizations to facilitate adoption of the technological change.
>
> ...The fulfillment of high-level national policy goals,[2] such as reducing the U.S. dependency on imported foreign oil.

The proposed demonstration should contribute to achieving all four categories of goals. A demonstration that would accomplish this would consist of the following:

(1. Construction and operation of a methanol pilot plant, utilizing local materials input. Such a plant should be totally self-con-

---

2. Foster, R.W., Alternative Fuels and Intercity Trucking, University of Miami and Escher Technology Associates, ETA Report PR-82. April, 1978. Pp. 302 plus Appendicies.

tained, and should supply all of the demonstration fuel utilized by the transit property. Any extra methanol produced would be sold in the open market to help defray pilot plant operating costs.

2. A transit property that would have both alternative-fuels, demonstration vehicles and regular-fueled vehicles in operation. The demonstration fleet would then be evaluated against the regular-fueled "base" fleet.

3. The project should operate for at least three full seasons, hopefully for at least five years. In this way, the aberrations caused by operator and mechanic training would be neutralized.

4. The State of Michigan and/or the local transit property should agree to participate in the project on a shared-cost basis.

3.5 The Use of Digital Data Systems in Public Transit

A Study of Digital Data Communication Features in Public Transit Systems, T. Datta, B. Bowman, M. Cynecki, for MTRP, Wayne State University, Detroit, Michigan, September 1978, UM-HSRI- 78-44-1 & 2.

This report stems from a request by MDSH&T to the MTRP to carry out a technology assessment on specific transit features of Automatic Vehicle Monitoring Systems (AVM).

In recent years, digital data communication techniques have been combined with mobile radio communication systems to provide an expeditious and expansive information transfer between vehicles and control centers. Numerous systems are currently operative and planned for installation in the United States for operations involving law enforcement, transit operations, and to a lesser degree taxi operations.

3.5.1 Summary

Digital data communication systems provide real-time vehicle identification and location which, when coupled with passenger counting, allows the transit manager to apply more accurate fleet deployment and control strategies. The digital data communication system components have been utilized, either fully or partially, in various systems to date, including emergency response systems and police units with recent applications in public transit systems. Optimal application of control strategies, based on real-time vehicle-location data, provides a potential for reducing cost as well as increasing the level of service. Thus it offers promise of increased operating efficiency. While hardware elements necessary for digital data communication systems have been in practical use for quite some time, the application of an AVM (Automated Vehicle Monitoring) system in public transit is fairly new. Therefore, a careful investigation is required to determine features that should be included in a comprehensive AVM system for a public transit application. The feasibility of the application of a digital data

communication system in the public transit industry was addressed in this study with specific emphasis on the following questions:

1. Is this system operationally feasible for public transit operation as it exists today?
2. Is it financially feasible to implement a digital data communication system to improve the management capability of public transit operators as well as the level-of-service of the riders?
3. Is the system and components generally used in an AVM system maintainable by the operating agencies? Are system components and spare parts necessary to keep such a system in good working condition easily available on a timely basis?
4. Has the "track record" of such system applications, and the realiability of the individual hardware components, been established?
5. Is an AVM system cost-effective, and, if so, under what circumstances?

All of these questions need to be addressed on the basis of the past experience of the operating agencies in the area of public transit and digital data communication systems. While the above questions can be addressed by a controlled experiment (using digital data communication systems and all their components for a public transit application), for the sake of this report the authors addressed these questions by utilizing state-of-the-art information as available through technical papers, journals, magazines, and published reports of projects implemented across the country. The authors also questioned persons actively engaged in AVM systems.

To fulfill the objective of this study, various management functions related to AVM systems were critically reviewed. These included vehicle location, vehicle identification, vehicle monitoring, computer scheduling, computer dispatch, silent alarms, security alarms, mechanical alarms, on-board readout, real-time display, passenger counting, management reporting, and digital data hardware.

3.5.2 Conclusions

A review of the state-of-the-art of the AVM system and its various elements resulted in the following general conclusions:

(1) Past experience has demonstrated that electronic vehicle monitoring can improve the service and efficiency of transportation systems.

(2) The transit operating process includes the following basic tasks.
   a. Planning
   b. Operations and control
   c. Providing data for management decisions
   d. Marketing and promotion.

   All of these tasks can be performed more efficiently if a well designed AVM system is implemented in an area where there is need and scope for improvement in the public transportation system.

(3) The current generation of AVM systems that utilize digital data communication hardware provide the most potential for improving efficiency of the operating agencies, as well as providing direct and indirect benefits to the system users.

(4) The use of two-way digital communication allows a greater degree of driver self-regulation and more effective control actions by the dispatchers.

(5) AVM systems have been applied in police and other para-transit applications, such as taxi cabs, in various communities in this country in addition to public transit applications.

(6) A cost-benefit analysis of application of AVM systems in various functions (police, public transit and taxi) was performed by the Department of Transportation, Urban Mass Transportation Administration. The data indicated that application of digital data communications systems can provide significant cost savings

for police operations. This is primarily because of the high cost of the patrolmen's labor. Even a small reduction in the required number of vehicles can account for large overall savings.

(7) According to the UMTA study, AVM systems offer direct cost savings for public transit applications. Significant savings can be achieved by using AVM systems that replace manual schedule checkers. The study also concluded that realizeable savings varied widely between communities because of large differences in such operating costs as insurance, administrative and maintenance costs, number of personnel, payscales, and characteristics of the transit systems.

(8) Another conclusion of the UMTA study is that often only limited immediate payroll savings can be expected by installing a digital data communication system. This is because personnel are often unionized and their positions are relatively secure. Any manpower reductions brought about by an AVM system must occur by attrition.

(9) The same study also concluded that overall costs and benefits are highly dependent upon the numerical magnitude of the bus fleet in specific public transit applications.

(10) Benefits derivable from installation of silent alarm systems are important but it is difficult to estimate tangible benefits that can be attributed to such items. The resultant increase in passenger/driver safety and state-of-well-being can be considered an extremely important by-product of AVM systems.

(11) The capability of AVM systems to collect data, process this data by use of electronic processing equipment, and produce data summaries can be considered as extremely important. This data collection and retrieving capability provides management with information vital to increasing operational efficiency.

(12) Several studies have concluded that the capability of AVM systems to provide real-time information about bus schedules to passengers increases the perceived level of service. While it is difficult to attach any tangible benefit to this capability of AVM, it does provide a potential for increasing transit ridership by allowing riders the opportunity to better plan their trip.

(13) Various hardware components of AVM systems have been used in many diverse applications, such as computerized traffic control systems, banking systems, inventory control, toll collection, security procedures, etc. There is an adequate supply of hardware components that have been tested under actual field conditions and found to be acceptable.

(14) The maintenance record of existing AVM systems is not available in a form that would allow an analyst to perform an effective cost-benefit analysis. There are private companies that can perform the maintenance activities necessary to keep an AVM system in good operating condition, on a continuing basis, at reasonable cost. Such an approach for continuing system maintenance is presently being used in computerized traffic signal systems.

(15) While the costs of electronic hardware have been decreasing the associated software costs have been escalating. Therefore, any future cost reductions for the central processing equipments or micro-electronic technology would probably be offset by the increased labor cost involved in developing, implementing, and maintaining sophisticated software systems, as well as increases in AVM labor costs. Thus, future cost reductions of the central processing equipment and micro-electronic technology may not have any signific cost-saving potential on an overall spectrum.

(16) Most researchers and system operators agree that careful planning and management is necessary to utilize the vast amounts of data the digital data communication capabilities can offer to public transit systems.

(17) A review of the available literature did not indicate any specific criteria pertaining to when a comprehensive digital communication system becomes cost-effective. Therefore, a set of feasibility criteria need to be established to determine when a digital communication system will be desirable. This criteria would be beneficial in determining the appropriate size and characteristics of a public transit system that would warrant digital communication facilities.

(18) While mechanical alarms are an effective means of reducing road service calls and major repairs, it is not practical to install all of the necessary sensors on existing transit fleets. Experience in Chicago, for example, has demonstrated that the cost of installing certain fuel-level sensors on existing fleet vehicles was prohibitive. The necessary on-board and central control equipment have the add-on capability for monitoring fuel levels, and mechanical sensors were installed only on new vehicles. This strategy allowed the eventual placement of fuel sensors on all vehicles without excessive initial cost.

(19) The wealth of information received from an AVM system may not improve the level of service if adequate planning and personnel training is not conducted prior to system implementation. For example, a system installed in Paris developed problems because the controllers did not know how to use real-time information to control the schedule performance of the buses on the route. They had traditionally been accustomed to controlling only the route through departure regulation at the route terminal. With the new information, the controllers were unable to visualize, well enough in advance, the corrective strategy required to maintain a high level of operating performance.

(20) Due to labor restrictions, employee unions, and policy procedures, often no immediate savings are realized from reduced manpower requirements of AVM systems. In fact, the converse may be true. If existing personnel are not able to adapt to the new job requirements, then additional personnel, shifts, and training might be in order.

(21) More experimental work is needed to demonstrate, quantify, and/or measure the degree of improvements that can be expected from an AVM system.

(22) Quite a few systems under implementation and/or operation may provide additional evaluative data in a comprehensive study to establish parametric criteria of the feasibility of AVM systems.

3.6 Intercity Bus Industry Study

An Analysis of the Intercity Bus Industry and the Michigan Bus Subsidy Program, Dr. R. Kaufman,(Western Michigan University) and Dr. W. Taylor (Michigan State University) et al. for the National Transportation Policy Study Commission (NTPSC) and MTRP. UM-HSRI-78-60.

The study was funded on a cost sharing basis by NTPSC and MTRP.

3.6.1 Summary

This study resulted from discussions held by members of the MTRP Advisory Committee (R. Shackson, Ford Motor Company; Dr. W. Taylor, Michigan State University) and MTRP staff, with the staff of the National Transportation Policy Study Commission, U.S. Congress. The charge to the Commission from the Congress is to develop recommendations for legislative initiatives in the general field of transportation. The Commission will report recommendations to the Congress by the end of this year. A report based upon this study will be submitted to NTPSC for its consideration and will be included in a compilation of reports and recommendations to be sent to the Congress.

Continuation of the existing trends in costs and revenues in the intercity bus industry in the United States will result in serious economic problems. Costs, both capital and operating, are accelerating more rapidly than revenues, and projection of the present trend indicates that the industry as a whole will reach the break-even point in 1981.[1]

Since the industry is composed of many individual operating companies, there is some disagreement as to how imminent the financial crisis may be, but it is generally conceded to be inevitable unless changes in its financial structure are instituted. The purpose of this study is to identify options for the operation of intercity bus transportation, through a study of the existing operation and the subsidy program presently in effect in Michigan.

---

1. American Bus Association, Americas Number 1 Passenger Service: ABA, 1978 Hereafter cited as Passenger Service.

In evaluating alternatives for intercity bus transportation, several important issues must be addressed.

1. Short-term versus long-term perspectives.

It is important in reviewing policies to retain a long-term perspective as opposed to short-term expediency. If the future supply of energy can be expected to alter the competitive position of the bus versus air, rail and automobile travel, this should be recognized as policies are considered and implemented. One of the arguments for retaining the rail system on non-profitable routes is to avoid the loss of a system that may someday be required. While the bus industry is not as capital-intensive as the rail industry, and does not have major equity in rights-of-way, there would still be significant costs associated with entry and exit from the market. Unless terminals and rolling stock are retained and maintained, the capital costs of restructuring a system that is allowed to vanish could be significant.

2. Questions of equity.

Several types of equity must be considered when reviewing policy options. First, there should be equity among the different carriers. Should a few carriers be allowed to monopolize the profitable markets by tight market entry restrictions? Should existing operators be given preference in either the profitable markets or on contract routes? Should there be "two levels of service," (a subsidized level and a competitive level), and should a single carrier be allowed in both the profitable and the subsidized market?

There should also be equity across various public transportation modes if they are expected to compete for the same market. Is it equitable to subsidize AMTRAK in the same corridor that the bus carrier is expected to operate without subsidy? Or, are the buses subsidized by virtue of being able to operate on a public right-of-way?

Finally there is the question of equity between the carriers and the public. The bus industry has enjoyed the benefits of franchised service routes,which are intended to guarantee them a market free from competition with other bus carriers. While these markets were profitable, the industry gained. Now that some of the lines are not profitable, what obligation exists to maintain service? What questions of equity arise concerning those businesses and individuals who are fully or partially dependent on the bus service?

3. The public good and the public necessity.

Some definition of the public necessity for mobility and the public good provided by continuing public bus transportation must be made. This is particularly true for smaller communities where alternative modes are not available. If there is a public necessity, then perhaps the public should support the bus system up to this level, and the private industry only operate in markets where the demand is sufficient to pay the costs. The same argument could be made for assessing the public good (presumably a higher level than the public necessity) and providing public support for the system up to this level.

The definition of public necessity and public good will probably vary with the size of the city, its location, and whether it is served by other modes of public transportation. Each system alternative consideration will have a differential impact on different cities and communities, and those impacts should be weighed against the mobility needs and desires of the citizens.

The approach taken in this study was to explore these questions of equity and necessity with respresentatives of the bus industry, the Interstate Commerce Commission, and the U.S. and Michigan Departments of Transportation. The study objectives were to identify policy options, assess them, relate them to existing regulations, and review present experience with subsidy programs, using Michigan as a study site.

One option for responding to these issues would be to initiate actions designed to increase the intercity bus percent of the passenger market. This could be done by increasing the attractiveness of the bus mode or decreasing the attractiveness of competing modes. Experience with market elasticity to service frequency and fare changes in intra-city bus transportation casts some doubt on the viability of this option. These experiences indicate that the increased revenue may not cover the cost of increasing the attractiveness of the service. This is particularly true in the rural transportation market segment, where the intercity bus is the only form of public transportation.

The use of special fares for unlimited travel did successfully increase the number of passenger miles on the national carriers, and this remains an option for service between major cities. This would also indicate that reducing the subsidy provided to competing modes (AMTRAK) could have a positive impact on bus ridership. However, the number of passengers and the passenger revenue to be gained from this source, on the limited number of routes where there is direct competition, would not appear to be sufficient to reverse the increasing trend in the industry operating ratio.

This option does not address the problem of the small operators offering primarily rural service in corridors not in direct competition with AMTRAK.

A second option is to expand the charter and small package delivery services that are profitable, and utilize these profits as a form of internal subsidization of the regularly scheduled intercity bus operations. This is presently being done, particularly with the smaller bus companies. However, unless there is reason to believe the subsidized portion of an industry will become profitable at some future time, there is little incentive to maintain service and make investments in that portion of the bus operation. Since there is no evidence that the increase in the operating ratio is temporary, this option might lead to the same service deterioration that characterized the rail industry under a similar cross-subsidy strategy.

Since the bus industry is regulated, impelentation of this option would require cooperation from regulatory bodies as well as the industry. Certificates for profitable charter service, high-volume regularly scheduled service, and package service would have to be limited to companies offering low-volume intercity service. Increased enforcement would be required to restrain "gypsy" operators from entering the charter market.

A third option is to provide external subsidies from the state and federal government to compensate the industry for its losses and to provide a reasonable return on their investment. These subsidies could either be industry-wide, route-specific, or granted to users to increase ridership to a profitable level. At its extreme, this option would include nationalization of the industry or the creation of a public corporation similar to AMTRAK.

A fourth option is to reduce or eliminate service on the low-patronage routes that do not generate sufficient revenue to meet their cost of operation. This would allow the industry to concentrate their resources on fewer, more profitable lines so that it could continue as profitmaking private enterprise.

This becomes a true option only if there is economic equilibrium at a reduced system size. However, little information is available to estimate the potential "domino" effect of these actions. The feeder routes are considered to be an important element of main line profitability, but the value of this component cannot be determined realiably with data available today.[2] Because of the lack of information for estimating the net effect of eliminating service on the light-density routes, this does not seem to be a prudent course of action now.

This same issue has never fully been resolved in the case of rail freight in Conrail service. The final extent of the system and the value of subsidizing branch lines is still unresolved.

---

2. Interview with Mr. James Corcoran, Director of the Washington Office, Greyhound Corporation, September 15, 1978.

As with the second option, this fourth one would require cooperation of the regulatory agencies, since franchised service cannot be discontinued without their approval.

Additional options can be developed from combinations of the four just described. For example, an operations model patterned after the airline industry appears to be worthy of serious consideration. Under this option, major carriers would operate non-subsidized (with the possible exception of terminals) service between major markets, with contract carriers providing rural service between smaller markets and feeder service between these smaller markets and the major terminals. These contract carriers could be independently franchised by the state in which they operate, and subsidized by state and federal funds. Subsidies would be reduced by limiting entry into charter and package service to contract carriers operating in accordance with the state plan. The state would determine the level of service to be provided citizens, and the subsidy level necessary to provide this service.

This option would retain the private carrier in profitable markets and still maintain the feeder market which is necessary for these profits. This option also separates the subsidized service from the non-subsidized service, thereby reducing the risk of over-investment in one component at the expense to the other. Finally, it allows the states to determine the level of service they desire and are willing to support with tax revenues.

3.6.2 Conclusions

One implicit goal of national policy is to maintain the viability of the intercity bus industry. The most appropriate method appears to be that of fostering creative enterprise on the part of bus companies. For example, the "regular route" bus lines may no longer be viable in rural areas. Communities still need service, but perhaps a "tailored" service of quite another kind. The bus companies should be encouraged to seek such new but profitable forms of rural community transportation.

Where profitability can not be maintained, government and industry should consider the use of "low fares" for certain users. The objective would be to increase passengers by providing subsidies proportional to the increased ridership.

Regular route service may not be the ideal for every market. The system was devised for larger population centers and should not be expected to function well in areas having few people. Other devices or forms may be profitable where regular routes are not. Our society has become complex, and our responses to varied transportation needs in different communities must be imaginative, ingenious, creative, and above all, laced with vision. No single response can be expected to satisfy the varied transportation needs of all communities.

3.6.3 Summary of Policy Recommendations. The following list summarizes the recommendations made in this study.

1. Give immediate policy attention to those problems stemming from "normal" changes accruing from technical developments and shifts in transportation preferences.
2. Delay, until additional studies have been made, decision in those policy areas associated with an "abnormal" development, namely, liquid fuel shortages and/or substitutes.
3. Provide funds for local communities to identify transportation needs, with such needs being integrated into regional transportation plans.
4. Subsidize service to provide "basic" mobility and "adequate transportation" for citizens living in rural communities consistant with these regional plans.
5. Limit the use of direct operating subsidies to main or expand regular route service on a uniform statewide basis.

3.6.4 Recommendations on the Michigan Intercity Bus Assistance Program

3.6.4.1 Operating Assistance Phase. It is clear from the findings of this study that this phase of the Michigan Bus Assistance Program has failed to achieve its two principal objectives. First, ridership has not increased, as anticipated by UPTRAN, on high density intercity routes where new regularly scheduled services have been added to existing levels

of service. Second, carriers contracted to provide new regularly scheduled services on low-density routes where no service was previously provided, have not continued to serve those routes after the completion of the State's subsidy contract, as originally envisioned.

Substantial restructuring of the operating assistance phase is recommended that would strengthen operating ratios on existing service routes without encouraging over-extension by providing service where no significant demand for such services exists.

States should encourage rural communities within a small geographically continguous region to organize local (inter-community) transit collectives.

The State might agree to provide the vehicles, of model and size appropriate to the estimated level of utilization, (e.g. vans, station wagons, mini-buses, etc.) and operating assistance. This bus transit could be demand responsive on a community scale and flexible to local, rather than nationally-oriented scheduling needs. This modification in the program on an experimental basis would also enable state planners to pretest specific travel patterns in rural areas should subsequent public transportation investments in such areas be anticipated.

3.6.4.2 Loan-Lease Purchase Phase. This most popular phase of the Michigan Bus Assistance Program should continue until the capital assistance fund is exhausted. The following modifications are recommended:

- Designate percentage of capital assistance fund for rural transit collectives (outlined above) whose eligibility is based on viability of their regional rural bus transit plans.

The remaining capital assistance funds should be allocated to certificated common carriers. Eligibility requirements (regular intra-state route mileage) should be increased as a percentage of total carrier system miles, rather than as percentage of total system regular route miles. These modifications would encourage the carriers to use some of the new coaches for regular route service as originally intended.

3.6.4.3 Facilities-Terminal Development Phase. There should be a continuing examination of these factors that are, and a clarification of those factors that should be, influencing FTD site-locations Presently, only those cities enjoying regular bus and passenger rail services have been approached by the State and encouraged to apply for FTD assistance. This bias toward the intermodal orientation neglects communities not receiving rail services, but for which improved bus facilities are viewed as a prerequisite to increased patronage. The State should allot a percentage of FTD funds for bus station improvements in larger cities and construction of minimal passenger shelters in small communities, especially those that would be served by the proposed regional rural transit collectives.

The intermodal transportation concept should also be examined. The State should establish a study commission to investigate the extent to which intermodal transportation is feasible in Michigan. This commission would, 1) make an inventory of all existing facilities, modal capabilities and services; 2) assess demand generators among major population centers or rural regions by mode and assess current routing. 3) propose an intermodal transportation plan for the State of Michigan that specifies the limits and optimization of intermodal transportation in the State.

3.7 Para-Transit Roles for the Private Sector

Roles for the Private Sector in Public Transportation,
J. Farrell, MTRP Staff, The University of Michigan,
Highway Safety Research Institute, Ann Arbor, Michigan,
September 1978, UM-HSRI- 78-41.

This report describes the results of a brief study suggested by the Michigan Transportation Research Program Advisory Committee.

3.7.1 Summary

The report reviews the traditional extensive involvement of the private sector in public transportation from the early Omnibus[1] in New York city in 1830, to today's modern rapid transit systems. American urban travel patterns are described in the report with regard to trip purpose, income, and spatial characteristics. In particular, with regard to commuting, a trend is described in which more and more work trips are originating and ending in suburbs rather than in center cities. These are almost completely automobile trips, and are the most difficult kinds of trips for conventional public transit to handle. As cities continue to decentralize, transit buses and trains will become increasingly incapable of satisfying travel demands in urban areas.

"Para-transit"[2] is identified as a new set of travel alternatives to fill the void between conventional transit on one hand and the private automobile on the other.

3.7.2 Conclusions

Para-transit operations of all types hold out the greatest opportunity for the financial participation of the private entrepreneur in public

1. A modified stagecoach in a box-like configuration which could accommodate from 12 to 20 passengers on its two lengthwise benches.
2. Taxicab, jitney, rental car, dial-a-ride, carpool, vanpool, and subscription bus are the para-transit modes most frequently discussed in the literature

transportation. Experience in Knoxville, Tennessee, indicates that a "transportation broker" can be successful in encouraging participation of the private sector by identifying local sources of transportation demand and breaking institutional barriers to both public and private efforts to satisfy it. Among other things, the Knoxville broker (a special public body) has founded a ridesharing computer matching service, helped to initiate express buses and a company vanpool, and submitted legislation to help private companies and individuals pool their transportation resources.

3.8 Motor Oil Recycling and Re-use

An Assessment of Waste Oil Utilization Potential in the State of Michigan, H. Bunch, for MTRP, The University of Michigan, Highway Safety Research Institute, Ann Arbor, Michigan, September 1978. UM-HSRI-78-49.

This study was requested by Mr. Charles Uray, Jr., Chief Deputy Director, Michigan Department of State Highways and Transportation. It was requested (in part) that "...an assessment should be made to determine funds available, types of viable demonstration programs, and how the State of Michigan can obtain federal support for one or more reclaimed oil demonstration projects..."

3.8.1 Summary

Although waste oil is normally heavily contaminated, it is composed almost entirely of "lube oil fractions" which are a valuable portion of a barrel of crude oil. It can be added to diesel fuel, after simple filtering to remove solids, for use in diesel engines, or it can be re-refined as a lubricant or as a feed stock for some other petroleum produce. Today about forty-three percent of all waste oil is reused as fuel; about eight percent finds its way back into the lubricating oil market as re-refined products; about eighteen percent is used as a road oil or as an asphalt, and the remaining thrity-one percent is disposed of in unknown ways, probably directly into the environment.

Waste oil is collected by a specialized industry that handles approximately seventy percent of all waste oil that is recycled. There are between one and two-thousand operators in this industry nationally, concentrated in urban centers. There are about fourteen in Michigan, almost all in the southeast quadrant of the state.

The waste oil industry has been declining since the 1960's. The U.S. Department of Energy is attempting to have the excise tax provisions amended on virgin lubricating oils that are used in re-refined lubricants.

The amendment would exempt re-refiners who blend virgin oil of less than fifty percent from paying the tax on the virgin oil component. The Department of Energy has also been attempting to improve the methods of collecting oils. They have developed a model "State Waste Oil Bill" that sets up procedures for licensing the collectors and receivers of waste oil, so as to encourage recovery and pollution abatement. DOE has also been working with local governments to establish successful waste oil recycling demonstration programs.

The re-refined oil industry has had major problems in the area of quality control in the past. The major problems have resulted from the inconsistency of the specifications of incoming products, and the inability of the refiners to maintain adequate quality control of the refining process itself. The problem areas have been the Federal Trade Commission's labeling requirements on re-refined oil containers and the Internal Revenue Service's position on not allowing tax rebates on virgin oil used as mixing components with re-refined oils. It appears these depressing influences are being overcome, however, The major thrust, in this regard, has come from the Federal Energy Administration, with strong support from the National Re-refiners Association. Further progress should be made in future toward improving the continuing specification and quality of the re-refined products. Many people are forecasting that the trend of improvement will be similar to experience in Europe, where the re-refined oil products have shown themselves to be comparable in quality to most of the virgin oil available in the market place.

3.8.2 Conclusions

(1) There is significant potential benefit available to the State of Michigan by the utilization of waste oil products. Though the study was charged with evaluating the benefits of the use of these products in public transit properties, it is believed that the benefits also can be extended to all vehicles in Michigan's motor fleet.

(2) The use of waste oil as a diesel fuel extender is an ineffective method of utilizing waste oil. The benefits of such use indicate that the savings will be roughly the equivalent of the cost of diesel fuel on a gallonage basis.

(3) An effective waste oil recovery program within the State of Michigan needs the support of state government, particularly in establishing model legislation to encourage the development of an effective collection system.

(4) The downward trend of re-refining operations in the United States is expected to stop, and future growth of the re-refining industry is expected to occur.

(5) There will be, in the near future, effective specifications developed by the National Bureau of Standards by which users can evaluate the quality and actual lubricating capabilities of re-refined lubricants.

(6) The State of Michigan should actively pursue the possibility of incorporating refined lubricants into the state's vehicle fleet.

(7) Michigan should develop close liaison and continuing relationship with appropriate personnel within the U.S. Department of Energy concerning oil re-refining.

(8) There should be an economic study of the current state of the oil-recycling industry in the State of Michigan. The study should include recommendations on appropriate fiscal and legislative actions that the state could take to encourage the growth of this industry.

(9) The State of Michigan should pursue the possibility of obtaining a Department of Energy construction subsidy for the establishment of a solvent/distillation re-refining plan in Michigan. This would be done by developing close contacts with the state's existing re-refiners and determining if any of these re-refiners singly, or as a group, have interest in the project. If so, then it is recommended that the State of Michigan develop a well coordinated program to present to the Department of Energy for the construction of a facility in Michigan.

3.9 A "Level of Service" Methodology for Evaluating Public Transportation Services.

Level of Service in Urban Public Transportation, Dr. J. Brogan, Dr. W. Taylor, et al., Michigan State University, for MTRP, The University of Michigan, Highway Safety Research Institute, Ann Arbor, Michigan. September 1978, UM-HSRI-78-50.

In April, 1978, MTRP recommended to MDSH&T that a "level of service" methodology be developed in order to evaluate proposed demonstration projects (see Section 2.1 and Appendix II). Also during the year, certain study projects were requested by MDSH&T which raised transit efficiency questions that a level of service methodology could be very helpful in answering. As a result, this study was commissioned by MTRP to provide preliminary insights into the form of such a methodology and the ways in which it could be developed.

3.9.1 Summary

The term "level of service" as used in highway planning is a well-defined measure which has had wide-spread application in highway design and analysis for over thirty years. The Highway Capacity Manual (HCM) defines level of service by the effect of several highway operational factors, including operating speed, travel time, traffic interruptions, freedom to maneuver, safety, comfort, convenience, and cost. Limiting values of certain of these factors, specifically operating speed and the volume to capacity ratio (v/c), are used to define six specific levels of service, A through F. These six levels represent the entire range of operating conditions for the facility, from best (level of service A) to worst (level of service F). Similarly, at signalized intersections, level of service is discretely defined by limiting values of the "load factor" or the number of signal cycles that are fully "loaded" or utilized by approaching vehicles.

In contrast to the relatively well defined limits on levels of service in highway planning, urban public transportation has little in the way of

standardized measures for evaluating service. In the past, when the majority of public transportation operations in urban areas were privately owned, service evaluation was relatively unimportant and the provision, expansion, or discontinuance of service was based solely on economic considerations. That is, if a service change resulted in a net profit it was instituted; if the continued provisions of certain services could not be made at a profit, the services were discontinued.

This situation has changed considerably in recent years. Today nearly all urban transit systems are publicly owned and operated. Along with this trend in public ownership has come the increasing use of public funds to subsidize operation of these facilities. The emphasis in public transportation has thus changed from a private, profit-oriented operation to a public service function operated with tax dollars. As a public service, profitability alone is no longer a suitable measure to evaluate transit. There should be additional measures to evaluate the service provided by the expenditure of public dollars.

The study examines the level-of-service concept as it might be applied to public transportation services. It describes proposed definitions of public transportation levels of service based on both system and rider attributes. The variation in public transportation quality as viewed by various user market segments is examined and the sensitivity or demand elasticity to the various factors constituting "level of service" is then made. Finally, the study outlines a proposed study methodology to evaluate the increased level of service provided to user groups in line with their perceived measures of service quality.

3.9.2 Conclusions

There is no accepted definition of level of service for urban transit that will facilitate the evaluation of alternative improvements on the basis of cost-effectiveness. It is possible, based on the literature,

to estimate increased (or decreased) ridership that would result from changes in fare or service frequency. While these estimates would be reasonably accurate on the average, there would be substantial variation depending on the demographic characteristics of the service area.

Patronage alone is an inadequate measure of the level of service upon which fiscal decisions should be made. This measure fails to recognize additional benefits (or disbenefits) to those who will patronize transit with or without the expenditure. It also fails to recognize the differential benefits across various demographic strata of a unit change in each of several possible system parameters. For example, there is no way to compare the "net benefit" of a frequency change with the "net benefit" of a vehicle design change.

Finally, no reference could be found concerning research on the impact of informational signing or changeable message signs.

The literature review produced the following recommendations:

(1. The Michigan Department of State Highways and Transportation should conduct (or sponsor) research on the level of service concept in their fiscal year 1979 program. The purpose of the research should be to develop an operational definition of level of service that is both internally consistent across transit modes and externally comparable to the highway level-of-service definitions.

The models proposed by Hartgen and Botzow should be reviewed and (if applicable) calibrated to a selected Michigan city. In addition, new models should be developed which include additional parameters of interest, i.e., informational signs and demand-actuated service.

(2. A second project should be included in the research program. Its objective should be to identify the desirable market segments for programming transit expenditures. This should include definition of segments with statistically significant differences in perceptions of the value of transit attributes, and development of a weighting system that recognizes the public interest in providing transit service to each segment.

A procedure for determining the optional programming of funds for the improvement of public transportation should be developed from this definition of market segments.

4. Summary of Federal Funding Opportunities and Actions

4.1 Training Materials for Users and Drivers of Buses for the Elderly and Handicapped

A proposal for an UMTA demonstration grant (see Section 2.8) $340,000

4.2 Life-Cycle Cost (LCC) Test Management Plan

A proposal being prepared for submittal to UMTA (see Section 2.5) 55,000

4.3 LCC Test Program & Evaluation

A proposal to be developed as a follow-on to 4.2 above to conduct LCC data gathering in Michigan over a four (4) year period . . . . . 150,000/yr (est)

4.4 Intercity Bus Study for National Transportation Policy Study Commission

Approximately $8,000 was received from NTPSC as a cost share (MTRP share: $5,000) to conduct this study (see Section 3.6). 8,000

4.5 Short-Term Transportation Energy Contingency Plan

A proposal is being prepared from The University of Michigan, Michigan State University and Wayne State University for federal funding. (see Section 2.2) . . 150,000(est)

4.6 Matching Federal Funds for MTRP

(see Section 2.9) 150,000(est)

TOTAL $883,000

APPENDIX I

MTRP Organization and Membership

APPENDIX I

1. Sponsoring Organization

1.1 Michigan State Highway Commission

Peter B. Fletcher, Chairperson	Ypsilanti
Carl V. Pellonpaa, Vice Chairperson	Ishpeming
Hannes Meyers, Jr., Commissioner	Zeeland
Weston E. Vivian, Commissioner	Ann Arbor

1.2 Public Transportation Council

James H. Ramey, Chairperson
Frank M. Poorman, Vice Chairperson

Herman H. Dubblede	Phillip Marco
Dr. Susan K. Gillis	Robert Rucker
Dr. Francis A. Kornegay	Donald F. Tucker
Guy Larcom	

1.3 Michigan Department of State Highways & Transportation

John P. Woodford, Director
Mr. Charles Uray, Jr., Chief Deputy Director
Mr. James C. Kellogg, Deputy Director
Bureau of Urban & Public Transportation
T. Lebovic, MTRP Liaison Officer
S. Foster, MTRP Liaison Officer

2. Michigan Transportation Research Program (MTRP)

Dr. Charles G. Overberger, Director and Vice-President for Research
The University of Michigan.

2.1 MTRP Advisory Committee

Dr. Robert L. Hess, Co-Chairperson Highway Safety Research Institute	Dr. William C. Taylor, Co-Chairperson Michigan State University
Dr. Robert W. Kaufman Western Michigan University	Dr. James A. Kent University of Detroit

Dr. Pieter K. Rol
Wayne State University

Mr. Chris M. Kennedy
Chrysler Corporation

Mr. Ricahrd H. Shackson
Ford Motor Company

Dr. William D. Brown
Environmental Research Institute
of Michigan

Dr. Michael J. Rabins
Wayne State University

Dr. William D. Drake
University of Michigan

Mr. George Burton
Bendix Research Labs

Mr. Henry McKenney
Alternate

2.2 Energy Efficiency

Dr. Robert Kaufman, Chairperson
Western Michigan University

Dr. Donald Cleveland
University of Michigan

Mr. Robert Larson
Wayne County Road Commission

Mr. Henry McKenney
Environmental Research Institute
of Michigan

Dr. Herman Koenig
Michigan State University

2.3 Michigan Car-on-Trains

Dr. William Drake, Chairperson
University of Michigan

Mr. Ricahrd Shackson
Ford Motor Company

Dr. Donald Cortright
University of Michigan

Mr. George Butler
Michigan Technological University

2.4 Demonstration & Development Program

Dr. Robert L. Hess, Co-Chairperson
Highway Safety Research Institute

Dr. William C. Taylor, Co-Chairperson
Michigan State University

Mr. George Burton
Bendix Research Labs

2.5 Bus Evaluation

Mr. Herb Wood, Chairperson
Chrysler Corporation

Dr. Ernst Petrick
U.S. Army, TARADCOM

Dr. Naeim Henein
Wayne State University

Mr. Karl Guenther
Ann Arbor Transit Authority

Mr. Richard Winston
American Motors General

Mr. Charles Kuehl
Southeastern Michigan
Transportation Authority

2.6 Transportation for the Mobility-Limited

Dr. James Kent, Chairperson
University of Detroit

Dr. Tapan Datta
Wayne State University

Ms. Nancy Kidney
Macomb County Essential
Transportation Service

Mr. Thomas McDonald
Chrysler Corporation

Dr. J. Raymond Pearson
University of Michigan

Dr. Julius Cohen
University of Michigan

Ms. Jeanne Fitzgerald
Wayne State University

Ms. Euline McCorkle
Ann Arbor Center for
Independent Living

Dr. Leon Pastalan
University of Michigan

Mr. Kunwar Rajendra
Lansing Planning Department

2.7 Hybrid-Electric Vehicle

Dr. James Kent, Chairperson
University of Detroit

Mr. George Burton
Bendix Research Labs

Dr. Gene Smith
University of Michigan

2.8 Transportation and Urban Demography Task Force

Dr. William C. Taylor, Chairperson
Michigan State University

Mr. Daniel L. Jones, Jr.
Systems Engineering SEMTA

Mr. Gary Krause
Market Research & Planning SEMTA

Dr. Michael J. Rabins
Wayne State University

Dr. Robert Smock
University of Michigan, Dearborn

Dr. Barbara B. Murray
University of Michigan, Dearborn

Dr. Eugene D. Perle
Wayne State University

Mr. George N. Skrubb
Oakland County Administrative

2.9 MTRP Staff

Mr. Leonard E. Newland
Program Manager

Mr. James L. Dries
Ms. Nancy E. Wallace
Mr. Alan S. Gregerman
Mr. John Browder
Mr. Michael Cynecki

Mr. William Ladd

Mr. William J. Milczarski
Mr. James Witkowski
Mr. James Farrell
Mr. Brian Bowman
Mr. Fred Wurtzel

3. Advisory Committee Meetings

November 11, 1977	Ford Motor Company
February 10, 1978	The University of Michigan
May 24, 1978	The University of Michigan
July 19, 1978	Wayne State University

APPENDIX II

MTRP RECOMMENDATIONS

FY1977-78 Demonstration and Development Program

(Reference Section 2.1)

THE UNIVERSITY OF MICHIGAN
ANN ARBOR, MICHIGAN 48109

November 14, 1977

C. G. OVERBERGER
Vice-President for Research

Mr. John P. Woodford
Director
Michigan Department of State
Highways and Transportation
Box 30050
Lansing, Michigan 48903

Dear Mr. Woodford:

As a part of the Michigan Transportation Research Program (MTRP) contract requirements, the MTRP has completed its review of the FY77-78 Demonstration and Development Program of the Bureau of Urban and Public Transportation (UPTRAN). By means of this letter, I am submitting to you for your review, and the review of the UPTRAN Staff, recommendations with regard to three projects for possible inclusion in the FY77-78 Program. These recommendations, by project title, are:

1. Energy Efficiency Analysis.
   This is a continuation of a project initiated in FY76-66. At that time, the MTRP Advisory Committee recommended to me that this project be extended to include the development of a short-term transportation energy contingency plan for the State of Michigan. I concurred, and my recommendation to you was accepted. Since then, MTRP has developed a procurement package to acquire a subcontractor to accomplish this work and will soon be making recommendations to UPTRAN for the implementation of this project.

   Therefore, my recommendation concerning the FY77-78 project is to continue the work initiated in FY76-77, and to broaden

it into a longer-term transportation energy contingency plan which would relate transportation energy use to energy use and conservation in other energy consumption sectors. This should be done in close coordination with the Michigan Energy Commission.

The level of funding budgeted for this project ($30,000), is probably not adequate for the recommended scope of effort. However, because of the uniqueness of this project in the United States, and its recognized need, as evidenced by federal interest, federal funding should be pursued to augment this project. The MTRP Staff is prepared to assist in securing federal funding.

2. Mobility-Limited Demand Analysis.

In the FY77-78 Demonstration and Development Program, there are five projects associated with the transportation requirements of the elderly and handicapped and otherwise mobility-limited persons. Taken together, $705,000 are allocated to these projects. Except for some data in parts of Southeastern Michigan, precious little data is available statewide concerning the travel patterns of mobility-limited persons in Michgian. Furthermore, only a few studies have been conducted nationwide concerning these travel patterns, and it is not known how transferrable these results would be to the Michigan experience. Therefore, stated needs for "accessibility" and even "total accessibility" to Michigan public transportation services by mobility-limited persons cannot be responded to by state government from the context of documented travel experience or latent travel behavior if services and facilities were available and accessible.

In view of this, I recommend that $70,000 be designated to initiate a continuing analysis of present and future travel behavior, and latent "unsatisfied" demand, of mobility-limited persons in Michigan so that at least estimates, if not "hard data" can be accumulated to support cost benefit analyses of alternative actions which UPTRAN,

and state government in general, might take.

3. Future Potential of Rail Abandonments.

In the legislation which provides for rail abandonment procurements by the Highway Commission, there is a provision requiring the Commission to retain ownership of the abandoned properties and facilities for a minimum of ten years. The properties can then be disposed of if it can be determined that there is no future beneficial use of the properties for the public good. Preliminary discussions have been held with the UPTRAN Staff in which it was suggested by the MTRP Staff that a methodology should be developed to allow for the analysis of the future economic development of regions in Michigan, recreational aspects, the transportation of energy (coal) for possible future decentralized district heating and electrical power generation in Michigan. As a result of this, a concept paper is being developed by MTRP Staff for consideration by UPTRAN Staff.

Therefore, I recommend that $25,000 be designated to initiate the development of a planning methodology to support the commission's decision making process with regard to the use and possible disposition of State owned rail rights of way.

For your information, the MTRP Staff has prepared a report for the use and consideration of the UPTRAN Staff which contains several observations and suggestions with regard to the content of the balance of the FY77-78 Demonstration and Development Program. These suggestions are meant to assist the UPTRAN Staff in the refinement of ongoing FY77-78 Demonstration and Development Projects as they evolve and are implemented. We hope that in this way, as appropriate and opportune, additional research and analysis activities can be integrated into the Demonstration and Development Program so that future research and demonstration project formulations can have evaluative and quantitative documentation upon which to rest, and furthermore, be more "saleable" with regard to potential Federal cost sharing and sponsorship.

If your office or the UPTRAN Staff have any questions, please contact Mr. L. E. Newland, Staff Manager, MTRP (313-764-6815). Or, if I can be of personal assistance to you, please contact me.

Very truly yours,

Dr. Charles G. Overberger
Vice-President for Research and
Program Director, MTRP

xc: Mr. C. Uray
Mr. K. Scott
Mr. I. Bartha

FY1978-79 Demonstration and
Development Program

(Reference Section 2.1)

THE UNIVERSITY OF MICHIGAN
ANN ARBOR, MICHIGAN 48109

C. G. OVERBERGER
Vice-President for Research

April 5, 1978

Mr. John Woodford, Director
Michigan Department of State Highways
and Transportation
State Highways Building
P. O. Box 30050
Lansing, Michigan 48903

Dear Mr. Woodford:

The Michigan Transportation Research Program (MTRP) has completed its evaluation of the UPTRAN Demonstration and Development Program for FY 78-79. Observations and suggestions with regard to the content of projects within this program have been developed by the MTRP staff and forwarded, under separate cover, to the UPTRAN staff. Based upon that evaluation, we have developed recommendations for additional projects which we suggest be considered for inclusion in the FY 78-79 Demonstration and Development Program. The recommended projects are:

1. Review Methodology for Proposed Demonstration Projects

In the evaluations that MTRP has conducted of the UPTRAN Demonstration and Development programs for next fiscal year and the preceding two fiscal years, it has become apparent that many of the projects are concerned with specific improvements in public transportation system operation, management, and equipment. These improvements have an overall goal of increasing system efficiencies and service which could result in increased ridership.

A major difficulty in evaluating these various proposals is the lack of an accepted mechanism for relating design changes, operating changes, and system changes to define a single measure of performance. It is our contention that these proposals could be better evaluated and prioritized if a concept similar to the highway capacity manual "level-of-service" were developed. This mechanism allows the analyst to compare on a cost-effective basis such changes as lane widening, geometric design changes, and capacity modification. There is presently no corollary to this concept in the field of public transit.

It is recommended that funds be set aside to develop a methodology to be used in evaluating the level-of-service benefits of proposed demonstration and development programs. We believe that such a methodology would be helpful to

the Department in screening proposals and suggestions for projects in a standardized way so that State funds could be allocated to those projects which would have the highest probability of improving system effectiveness.

Initially, such a methodology could be uncomplicated, providing only a comparative framework to be used in the evaluative process. These steps would consist of questions to be answered and brief analyses to be performed in order to develop a cost effectiveness "score" for the proposed project. Through time (and if justified), the evaluative process could be made more sophisticated utilizing computer processing and analytical models.

It is estimated that the initial methodology could be developed for $20,000.

2. Future Potential of Rail Abandonments (Branch Line Rail Analysis)

In my letter to you of November 14, 1977, I recommended that this project be included in the FY 77-78 program. It is my understanding that by recent action of the Public Transportation Council and the Highway Commission these funds were allocated to another project. We feel that this recommended project is very significant, and can be of assistance to the Commission and the Department in the management of State-owned rail rights-of-way. Therefore, we recommend that it be included in the FY 78-79 program. I quote from my letter of November 14, 1977:

> "In the legislation which provides for rail abandonment procurements by the Highway Commission, there is a provision requiring the Commission to retain ownership of the abandoned properties and facilities for a minimum of ten years. The properties can then be disposed of if it can be determined that there is no future beneficial use of the properties for the public good. Preliminary discussions have been held with the UPTRAN staff, in which it was suggested by the MTRP staff that a methodology should be developed to allow the analysis of the future of the economic development of regions in Michigan, recreational aspects, the transportation of energy (coal) for possible future decentralized district heating and electrical power generation in Michigan."
>
> "Therefore, I recommended that $25,000 be designated to initiate the development of a planning methodology to support the Commission's decision-making process, with regard to the use and possible disposition of State-owned rail rights-of-way."

If your office or the UPTRAN staff have any questions concerning these recommendations, please contact Mr. L. E. Newland, Staff Manager, MTRP (313-764-6815). Or if I can be of personal assistance to you, please contact me.

Sincerely,

Charles G. Overberger
Program Director, MTRP

CGO/mh
cc: I. Bartha
R. Hess
L. Newland
K. Scott
W. Taylor
C. Uray, Jr.

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, GOVERNOR

DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

STATE HIGHWAYS BUILDING, 425 WEST OTTAWA PHONE 517-373-2090
POST OFFICE BOX 30050, LANSING, MICHIGAN 48909

JOHN P. WOODFORD, DIRECTOR

April 25, 1978

Mr. C. G. Overberger, Director
Michigan Transportation Resources Program
Vice-President for Research
University of Michigan
Ann Arbor, Michigan 48910

Dear Dr. Overberger:

This is to acknowledge receipt of your letter dated April 5, 1978, containing Michigan Transportation Research Program (MTRP) recommendations relating to the FY 78-79 Demonstration and Development Program. UPTRAN staff is also in receipt, under separate cover, of MTRP staff observations and suggestions in this program area.

The recommendations, observations and suggestions have been distributed to appropriate UPTRAN staff. These comments will be taken into consideration when the program is finalized.

Sincerely,

for John P. Woodford
Director

MICHIGAN
THE GREAT LAKE STATE

FY-1979-80 Demonstration and
Development Program

and

Transportation and Urban
Demography Task Force
Recommendations

(Reference Section 2.1)

THE UNIVERSITY OF MICHIGAN
ANN ARBOR, MICHIGAN 48109

August 9, 1978

C. G. OVERBERGER
Vice-President for Research

Mr. John P. Woodford, Director
Michigan Department of State
Highway and Transportation
State Highways Building
P.O. Box 30050
Lansing, Michigan 48903

Dear Mr. Woodford:

Enclosed for your consideration is a copy of three project statements on proposed research. I would hope that you will consider including these statements in the MDSH&T UPTRAN Demonstration and Development Program for the 1979-80 fiscal year.

These project statements were developed by the Michigan Transportation Research Program's Task Force on Transportation and Urban Demography. (See enclosed membership list). The Task Force selected these three topics from a long list of topics suggested by Task Force members. Acting upon a recommendation from the Task Force, MTRP's Advisory Committee moved to submit the three project statements to the MDSH&T to ascertain whether funds might be available for research on the proposed topics.

Sincerely,

Charles G. Overberger
Vice President for Research
Program Director
Michigan Transportation Research
Program

Enclosure

cc: Mr. Charles Uray, Jr.
Mr. Ed Goodman
Mr. Thomas Lebovic
Dr. Robert Hess
Dr. William Taylor
Mr. Len Newland

Project Statement for Research on the Impact of Demographic Trends on Transportation

Although most states, including Michigan, are experiencing population growth, many cities within these states are losing population. The trend has been in the direction of decreased densities in the center of urban areas along with continued population growth in the suburbs. And, very recent trends indicate high population growth rates in counties that are not adjacent to metropolitan areas.

The central cities of more than one-half of Michigan's metropolitan areas decreased in population between 1960 and 1970. As everyone knows, most of the recent population growth in metropolitan areas has been in the suburbs. And very recently, growth rates in rural parts of the state have exceeded those observed for the urban sector. Both suburban and rural areas in Michigan are expected to experience rapid growth through the year 2000, according to population projections prepared by the U of M Population Studies Center. In that projection, the population in the Lower Peninsula north of Bay City is expected to more than double between 1970 and 2000. Decreasing urban population densities will mean larger labor market areas and probably longer work trips, on the average. More decentralization of the population in metropolitan areas is expected to be matched by more decentralization of industry. The consequences for transportation of these demographic trends will be in the direction of an increased demand for suburb-to-suburb travel within metropolitan areas, and an increased demand for inter-city travel across the state.

According to the PSC projections, Michigan's population is expected to increase by about 39 per cent between 1970 and 2000. For the population aged 65 and

older, however, the expected increase is about 52 per cent — from about 750,000 in 1970 to more than 1.1 million in 2000. One consequence of this growth might be a significant increase in the demand for public transportation. Cities and transportation systems are not now geared to handle changes of this magnitude.

As the population increases over time so also does the labor force. The composition of the labor force is also changing. Recent years have witnessed a tremendous increase in the number of women in the total labor force. And, labor force participation rates among women are expected to increase even more in future years. This growth will have a major impact on travel — both weekday and weekend. We should anticipate major impacts on trip generation and trip distribution.

The objective of the proposed research would be to provide quantitative estimates of the changes in trip volumes and distributions expected to be generated as a result of forthcoming demographic changes in Michigan. Specifically, projections for the year 1990 and 2000 should be prepared for the metropolitan areas in the state and for groups of counties in the nonmetropolitan areas. These projections should include:

1. Total weekday and weekend travel.
2. Trip length (distance) by purpose of travel.
3. Intra-urban travel (central city/suburban), inter-urban travel, and rural/urban travel.

In addition to the total population, projections (1-3) would be prepared for selected sub-groups of the population, including the total labor force and those aged 65 and older.

The product of this work would serve as a starting point for several types of transportation planning projects. Some of the data obtained from this research would be used as input in Level of Service (LOS) analyses, and different types of modal split modeling activities. Another use of the data would be to provide reference statistics for planning agencies throughout Michigan.

Budget Estimate:

Total $50,000 - $60,000

Project Statement for Research on the Impacts of Alternative Subsidy Patterns in Transportation

Public subsidies are used in Michigan to support the use and/or existence of a variety of transportation services. These subsidies are based upon the public perception that without them external public costs will be incurred or that the continued operation of a specific transportation service will result in a future benefit. At the present time, urban transit services, some intercity bus and rail passenger services, and freight services on some light-density rail lines are receiving direct public subsidies in Michigan. There is also periodic controversy over whether or not fuel taxes paid by automobile users go toward subsidizing highway use by trucks and busses. Also, there is some debate over whether or not the rail freight rates paid by some shippers for commodity and class shipments are used to subsidize the rail movements costs of other commodity and/or class shipments.

The provision of public subsidies for transportation services in Michigan is based upon the assumption that there are short and long-term social benefits and costs associated with subsidized transportation. This assumption implies a knowledge of the magnitude of the present and future benefits and costs resulting directly from the subsidy or incurred because of a future loss of service. If this were the case, we might assume that the transportation subsidy decisions made by the State would result in economically efficient resource allocations.

At the outset of the proposed research, it is important to ask the following two questions:

1) In terms of economic efficiency, are there justifications for the subsidization of intercity passenger and freight transportation in Michigan?

2) What impact does this subsidization have on both the locational decisions of firms and households in the State, and the market shares attained by competing transportation modes?

The following research outline represents a rough draft strategy for addressing these issues.

I. Intercity Passenger Corridor. -

A. The objective of the study will be to determine:

1. Impacts of subsidy on market shares of non-subsidized, competitive modes.

2. Impacts of the availability or reduced cost of the subsidized mode on the location decisions made by households.

3. The economic efficiency of the allocation of resources (subsidy) made to the subsidized mode. (Does the decision, by households, to use the subsidized mode result in a less efficient resource allocation than would occur if no public subsidy were given?)

B. The study would proceed by determining:

1. Per passenger total cost of subsidized service. (includes travel time, etc.)

2. Per passenger total cost of alternate non-subsidized modes.

3. Per passenger amount of subsidy.

C. Using an econometric model, with known travel demands, origins and destinations, the modal choices of corridor passengers can be tested under varying conditions:

1. All passengers pay the full cost of service.

2. One mode receives current level of public subsidy.

3. Several modes receive different levels of public subsidy.

D. Comparisons can be made of the varying levels of public and private costs needed to provide corridor intercity transportation at a givel level of service. The study would require the gathering of data from intercity travellers in the corridor regarding their demographic characteristics, attitudes toward available transportation, and their historic transportation choice behaviors.

E. Examples:

1. Port Huron - Kalamazoo (rail and bus subsidy)

2. Jackson - Detroit (rail subsidy)

II. Goods Transportation Corridor:

A. The objective of the study will be to determine:

1. Impact of subsidy on the market shares, or potential market shares of competing non-subsidized transportation modes.

2. Impact of subsidy on the location decisions (and product decisions) of firms served by the subsidized mode.

3. Determination of the economic efficiency of the allocation of public resources to the subsidized mode.

B. Study Procedure

1. Review shipment records from the subsidized mode to determine shippers using that mode, and the commodities shipped.

2. Determine total costs of shipments by subsidized mode.

3. Determine average subsidy per shipment unit.

4. Inventory alternative modes used and the costs of use.

5. Estimate public costs of non-subsidized operation (related to job loss, firm closings,or relocation).

C. Examples:

1. Ann Arbor Railroad
2. Hillsdale County Railroad

3. Lenawee County Railroad

Budget Estimates:

Phase I Intercity Passenger	$25,000 - 30,000
Phase II Intercity Freight	$75,000 - 80,000
-75-	$100,000 - 110,000

9 May 1978
Detroit Free Press

Brock proposes Amtrak cutbacks, some in Michigan

From AP, UPI and Free Press Washington Staff

WASHINGTON — Transportation Secretary Brock Adams recommended Monday that almost one third of the Amtrak passenger train network be discontinued in 1979-80, an economy move which would affect two lines in Michigan.

The plan would cut into state Amtrak service by abolishing one train daily from the Detroit-to-Chicago run. There are currently three runs on the line.

That route lost $1.9 million last year, according to Amtrak figures.

Also axed by the proposal is the Port Huron-to-Kalamazoo train, which lost nearly $1 million last year.

THE REPORT makes little mention of the train that runs from Detroit via Buffalo to New York City through Canada. That service is now funded on a matching basis by the state and federal government. Amtrak officials said it would continue to operate as long as the state shares the cost.

Among the major routes Adams recommended dropping were Chicago-San Francisco via Denver, Chicago-Florida, Chicago-Texas via Little Rock, one of the two Chicago-Seattle routes and two of three routes across West Virginia. It would trim the present 27,000-mile system to 18,900 miles.

Adams emphasized Amtrak still would be national in scope, serving 160 major metropolitan areas. But its implementation would add Arkansas, Nebraska, Wyoming, Nevada and Utah to the current list of states — Maine, New Hampshire and South Dakota — with no passenger-train service.

STRONG OPPOSITION can be expected in Congress, which will have the final say on discontinuances but which will have to come up with money for the routes it wants to keep.

"This is sort of a political hot potato that Congress has handed over and I'm trying to avoid third-degree burns from it," Adams told a news conference.

Adams said if the 27,000-mile Amtrak system is allowed to continue as is, its federal operating subsidy will rise to $1 billion by 1984. His recommended 18,900-mile system still would require an $800 million subsidy by that year.

Adams said the reduced system would "serve the American traveling public well by providing daily service on all routes and substantially lowering the annual cost of maintaining Amtrak with federal subsidies."

Congress, concerned about federal subsidies to Amtrak exceeding $500 million a year, had asked the Transportation Department to draw up a comprehensive service plan.

Amtrak was guarded in its comments, only saying it would study the plan.

THE STUDY is the first step in a long debate over Amtrak's future which will include public and congressional hearings. Even if the plan is agreed to, the first trains to be eliminated would come off no earlier than July 1, 1979.

Some of Adams' proposed major cuts and changes:

- The San Francisco Zephyr, which operates between Chicago and San Francisco through Denver, would be dropped. Service to Denver and San Francisco would be continued with spur trains from the Southwest Limited from Chicago to Los Angeles.
- One of two Chicago-Seattle trains would be dropped, which one depending on public hearings.
- Among trains to be dropped would be the Salt Lake City-Seattle Pioneer, the Inter-American between Chicago and Laredo, Texas and the Floridian between Chicago and Florida.

Michigan Transportation Research Program
Highway Safety Research Institute

Project Statement for Research on the Variations of the Concept of Level of Service as Viewed by Different Strata of Society

---

The Level of Service (LOS) of an urban transportation facility is generally defined by a variety of characteristics which attempt to explain the attractiveness of the facility as seen by the user. Such facility characteristics as user cost, travel time, waiting time, frequency of service, and walking distance are often used in the definition of LOS. Other characteristics which describe the facility (reliability, comfort, and convenience) are also often included in the definition.

Traditionally, transportation planning has considered the social perception of the level of service supplied by a transportation facility from an aggregate viewpoint. Demand estimates derived from the relationship between the total population in a corridor, for example, and the LOS of a facility have assumed that young and old persons, men and women, and white-collar and blue-collar workers all shared the same concept of the LOS, or that a composite LOS would adequately explain changes in ridership. Recent literature has reported that different segments of society view transportation differently, and hence the concept of LOS is not the same for each group. A few examples of such groups would include those formed by stratifications based on age, sex, family income, occupation, and population density of place of residence. This has led, in part, to the development of disaggregate behavioral modeling for transportation planning, which attempts to account for the individual's perception of the need for transportation.

This study would attempt to describe the LOS concept for various social strata and to demonstrate how the use of a stratified prediction process would improve aggregate prediction accuracy. The initial phase would be an

identification of, and elaboration on, various segments of society that appear to have distinct perceptions of transportation LOS. The LOS would be defined as a function of the facility characteristics for each group. Conceptually the LOS might be described as:

$$LOS_{ij} = f\left[C_{ij1}X_1 + C_{ij2}X_2 + \ldots + C_{ijn}X_n\right] = f\left[\sum_{k}^{n} C_{ijk}X_k\right]$$

where i = transportation facility index.

j = societal stratum index.

k = facility characteristic index.

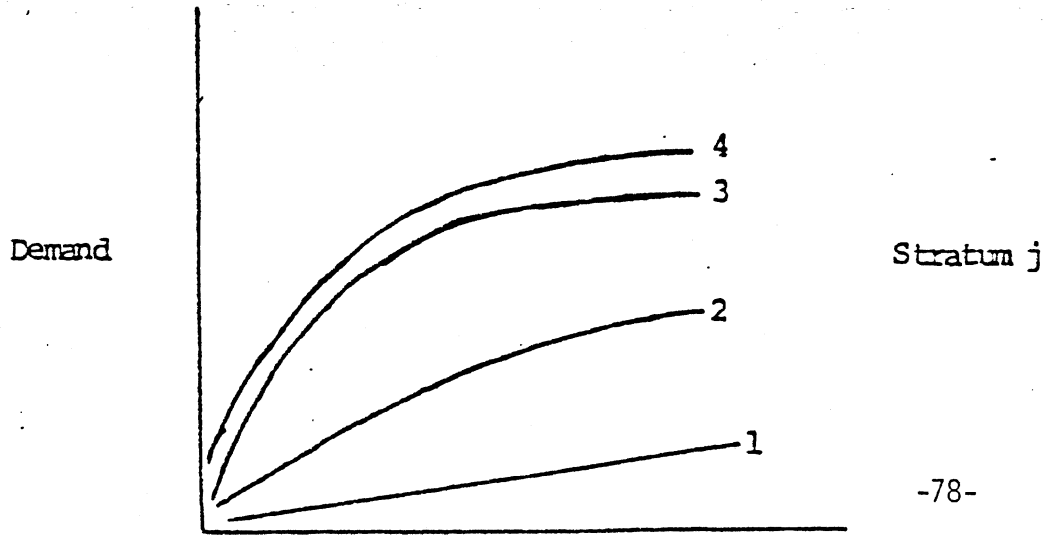
X = transportation facility characteristic {travel time, cost, walking distance, etc.}

C = constant coefficient for stratum j and facility i.

This task would identify the characteristics X_n and attempt to determine the functional relationship between these and the LOS. This relationship may not be linear.

The next phase of the analysis would be to determine the elasticity of demand for different social strata to changes in the LOS. This analysis could be represented as shown in Figure 1, where each curve represents the relationship between the LOS and the demand for one segment of society. While shown in a two dimensional figure, it is anticipated that the parameters and relationships

Figure 1



that define LOS will not be constant across societal strata. It may be appropriate to reduce the number of stratifications considered by aggregating strata which exhibit similar relationships. In this manner, the question of the "best" stratification could be addressed.

An analysis of the demography of the market area for the transportation system could be used to assess existing and future ridership potential. Projections of future demographic patterns within the state will allow for the analysis of future trends in transportation demand in terms of the LOS concept. Demographic projections for Michigan would serve as input to the research proposed here.

The last phase of this analysis would be an investigation of the impact of alternative investments (or operating strategies) on total demand. This could be approached through the LOS concept by determining the impact of a system change on each individual LOS, and thus on the patronage from that stratum by using the relationships shown in Figure 1. The total demand could be found by summing across all strata. This would be a most valuable planning tool in estimating the effectiveness of alternative investment strategies. The impact of operating changes could also be assessed with respect to the total population. In both cases the effectiveness of improving the mobility of specific segments of society could also be determined

Budget Estimate:

Phase I	$15,000 - 20,000
Phase II	10,000 - 12,000
Phase III	8,000 - 10,000
Total	$33,000 - 42,000

Life Cycle Costing and
Procurement of Small Buses

(Reference Section 2.5)

Michigan Transportation Research Program

Highway Safety Research Institute
The University of Michigan
2901 Baxter Road
Ann Arbor, Michigan 48109

August 3, 1978

Mr. Charles Uray, Jr.
Chief Deputy Director
Michigan Department of State Highways
& Transportation
State Highways Building
P.O. Box 30050
Lansing, Michigan 48909

Dear Mr. Uray:

Over the past several months the MTRP Bus Evaluation Ad Hoc Committee and the MTRP Staff, in coordination with the UPTRAN Bus Transport Division, have been formulating a study which would develop a life-cycle costing and procurement methodology for small buses.[1] This methodology would calculate the "cradle-to-grave" cost of small bus ownership as an incentive to suppliers to produce more durable equipments, which hopefully would yield real costs that would be lower than can be obtained through present low bid procedures. Our Bus Evaluation Ad Hoc Committee has met with representatives of UMTA to discuss their parallel program, and it would appear that the prospects are good for obtaining federal funds to develop a maintenance cost data base in Michigan when new small buses are procured by UPTRAN during the coming year. Also, in coordination with Messrs. DeRose, Mueller and Grimes, we have negotiated a scope of work for a contract with the U.S. Army Tank Automotive Research and Development Command (TARDACOM), Warren, Michigan, to translate their life-cycle-costing

1. This effort was initiated as a result of MTRP recommendations agreed to by the Department in early 1977. See: (1)letter to John P. Woodford from Dr. Charles G. Overberger, 12-23-76,(2)letter to Dr. Charles G. Overberger from John P. Woodford, 1-6-77.

procurement methodology for large military buses to small buses for the use and evaluation of UPTRAN. We feel that the TARDACOM methodology would provide MDSH&T a procedure which the Department can evaluate early on and compare to any federal methodology that emerges from the UMTA efforts. Also, as a major user of small buses the State of Michigan, we believe, can be in the forefront of the development of a whole new procurement strategy for public transportation equipments. The relationship that we have developed with UMTA in this program area, and the strong support that we have received from the Department, should ensure that Michigan's voice will be heard by the federal government in the process of the development of new procurement policies and procedures.

TARDACOM is a participant in MTRP. Dr. Ernst Petrick, Chief Scientist, TARDACOM, is a member of the MTRP Bus Evaluation Ad Hoc Committee. TARDACOM has proposed a contract effort of approximately $15,000 to translate their large bus methodology into a small bus life-cycle-costing methodology. We feel that in this case it would be much more expeditious for MDSH&T to contract directly with TARDACOM. If you would agree and go forward with this recommendation, we would also suggest that the MTRP Bus Evaluation Ad Hoc Committee be asked to perform a role of technical oversight in the conduct of this work and to review the results and findings for the Department. To this end, we have enclosed all pertinent correspondence, contract terms, and scope of work for your consideration. If the Department chooses to go forward, and if the approval of the Public Transportation Council and the Highway Commission is required, we would be

pleased to make available our MTRP staff members who have been involved in the formulation of this project for assistance to the Department and briefings to the PTC and Commission as you may deem appropriate.

Sincerely,

Robert L Hess

Dr. Robert L. Hess
MTRP Co-Principal Investigator
The University of Michigan

William C Taylor

Dr. William C. Taylor
MTRP Co-Principal Investigator
Michigan State University

cc: Dr. C.G. Overberger
MTRP Bus Evaluation Ad Hoc Committee
cc + enc: Mr. F. DeRose
Mr. T. Lebovic
Mr. L. Newland
Mr. J. Witkowski
file: 2.1.1
2.1.15.4

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, GOVERNOR

DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

STATE HIGHWAYS BUILDING, 425 WEST OTTAWA PHONE 517-373-2090
POST OFFICE BOX 30050, LANSING, MICHIGAN 48909

JOHN P. WOODFORD, DIRECTOR

September 8, 1978

Dr. William C. Taylor
Dr. Robert L. Hess
Co-Principal Investigators
Michigan Transportation Research Program
Highway Safety Research Institute
2901 Baxter Road
Ann Arbor, Michigan 48109

Dear Drs. Hess and Taylor:

We are in receipt of your letter dated August 3, 1978, containing the proposal entitled, "Cost-Benefit Analysis of Small Transit Vehicle." The letter recommended the Highway Commission contract with the Tank Automotive Research and Development Command (TARADCOM) for performance of the study and offered Michigan Transportation Research Program (MTRP) oversight and support services.

Bureau of Urban and Public Transportation staff have reviewed the proposal and feel it is a desirable project. They are exploring various funding alternatives including contacts with UMTA to encourage federal participation and coordination. There is also an important need to coordinate this proposal with other maintenance data gathering and small bus specification improvement efforts in the bureau.

When a more definite course of action evolves, we will be better able to determine MTRP's level of involvement. In the meantime, we appreciate your efforts on this proposal during the past eighteen months and will keep you informed of further developments.

Sincerely,

Charles Uray, Jr.
Chief Deputy Director

cc: Dr. C. G. Overberger
L. Newland
J. Witkowski
J. C. Kellogg
F. DeRose
I. V. Bartha

MICHIGAN
THE GREAT LAKE STATE

APPENDIX III

MTRP REPORTS

APPENDIX III

MICHIGAN TRANSPORTATION PROGRAM REPORTS AND DOCUMENTS: as of September, 1978

QUARTERLY REPORTS:

Date	Title
12/28/76	"Quarterly Progress Report" (10/1/76 - 12/31/76)
3/31/77	"Quarterly Progress Report" (1/1/77 - 3/31/77)
6/30/77	"Quarterly Progress Report" (4/1/77 - 6/30/77
12/31/77	"Quarterly Progress Report" (10/1/77 - 12/31/77)
3/31/78	"Quarterly Progress Report" (1/1/78 - 3/31/78)
6/30/78	"Quarterly Progress Report" (4/1/78 - 6/30/78)

ANNUAL REPORTS:

Number	Date	Title
UM-HSRI-77-54	9/30/77	"Annual Report" (10/1/76 - 9/30/77)
UM-HSRI-78-45	4/30/78	"Annual Report" (10/1/77 - 9/30/78)

OTHER REPORTS:

UM-HSRI-77-24	5/20/77	"Review of Research Evidence Bearing on the Desirability of Using Retro-reflective License Plates in Michigan" (P.L.Olson, D.V. Post; UM-HSRI)
UM-HSRI-77-59	7/77	"A Concise Annotated Bibliography of the Energy Efficiency of Various Transportation Modes" (W.J. Milczarski; MTRP Staff)
UM-HSRI-77-60	10/77	"A Study of Alternative Concepts for Providing a Lake Michigan Ferry Service" (R. Scher, V.Este, H.Bunch; UM) *INCLUDES AN "EXECUTIVE SUMMARY"

Number	Date	Title
UM-HSRI-78-32	8/78	"Optimization in Dial-a-Ride Systems Analysis, A Comparison of Recent Modelling and an Expected Value Model", (N. Wallace; MTRP Staff)
UM-HSRI-78-33	8/78	"The Potential for Use of Alternative Fuels in Michigan Public Transit Systems" (H. Bunch; UM - HSRI)
UM-HSRI-78-49	9/78	"An Assessment of Waste Oil Utilization Potential in the State of Michigan" (H. Bunch; UM - HSRI)
UM-HSRI-78-35	8/78	"An Informal Study of Transit Bus Tire Procurement in Michigan" (J. Dries; MTRP Staff)
UM-HSRI-78-39	8/78	"A Preliminary Analysis of the Potential Legal Issues Associated with Car and Van Pooling in Michigan" (M. Greyson, L. Rosenstock; UM - HSRI)
UM-HSRI-78-41	9/78	"Roles for the Private Sector in Public Transit" (J. Farrell; MTRP Staff)
UM-HSRI-78-44-1 78-44-2	9/78	"A Study of Digital Data Communication Features in Public Transit Systems" (Executive Summary and Technology Assessment) (T. Datta, B.L. Bowman and M.J. Cynecki; Wayne State Univeristy)
UM-HSRI-78-50	9/78	"Level-of-Service Concepts in Urban Public Transportation (W.Taylor and J. Brogan, Michigan State University)
UM-HSRI-78-60		"A Study of the Michigan Intercity Bus Industry" (R. Kaufman; Western Michigan University, W. Taylor; Michigan State University) FORTHCOMING: (sponsored jointly by MTRP and the National Transportation Study Policy Commission - NTPSC, The U.S. Congress).