
THIRD YEAR ANNUAL REPORT

.....

Aaron Adiv

Center for Transit Research and Management Development
University of Michigan Transportation Research Institute
2901 Baxter Road
Ann Arbor, MI 48109

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FINAL REPORT

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16. Abstract The Center for Transit Research and Management Development conducted six activities during the third year of its operation that are part of a long-term transit research and training program. The six activities reported here are: <ol style="list-style-type: none"> 1. Test Incipient Fault Detection System on AATA buses. 2. Analysis of terrain effect on bus durability, using UMTA Section 15 data. 3. Analysis of on-street parking meter behavior 4. Research Seminar in transportation "Transit Planning." 5. Create an Advisory Committee for The Center. 6. Develop short courses: <p style="margin-left: 40px;">"Issues in Bus Procurement," and "Traffic Engineering for Transit Managers"</p> 					
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1. INTRODUCTION

The Center for Transit Research and Management Development at The University of Michigan, is a unit within the University of Michigan Transportation Research Institute (UMTRI). During the third year, the project director was Dr. Aaron Adiv, Assistant Professor of Urban Planning and Assistant Research Scientist at UMTRI. Research investigators resided in the Engineering College, the College of Architecture and Urban Planning, and in UMTRI.

This document is the final report of the program for the third year of operation (1985-1986). The body of the report consists of a summary of each of the research projects, a description of a graduate research seminar in transportation planning, and a list of an advisory committee for the Center.

Plans for the Third Year

During the first year, the Michigan program was intentionally oriented toward the engineering and hardware aspects of transit operation. This came about partly because of our proximity to the vehicle manufacturing industry, and partially because Center personnel were strongly associated with a technical institute and with the Engineering College. During the second and the third year, the orientation of the Center's activities broadened to include some issues that centered on transit, but were not concerned solely with vehicle technology.

Research activities for the third year included three areas:

- (1) Further development and testing of bus electronic instrumentation to detect engine failure (a continuation of a previous UMTA research program from the first year).
- (2) Analysis of section 15 data concerning the effect of terrain on bus durability (an addition to the second year analysis concerning climatic effects on bus durability).
- (3) Analysis of travel behavior and utilization of on-street parking meters.

Other activities carried out by center personnel were:

- (1) Completion of a Graduate research seminar on "Transit Planning".

(2) Creation of an Advisory Committee for the Center.

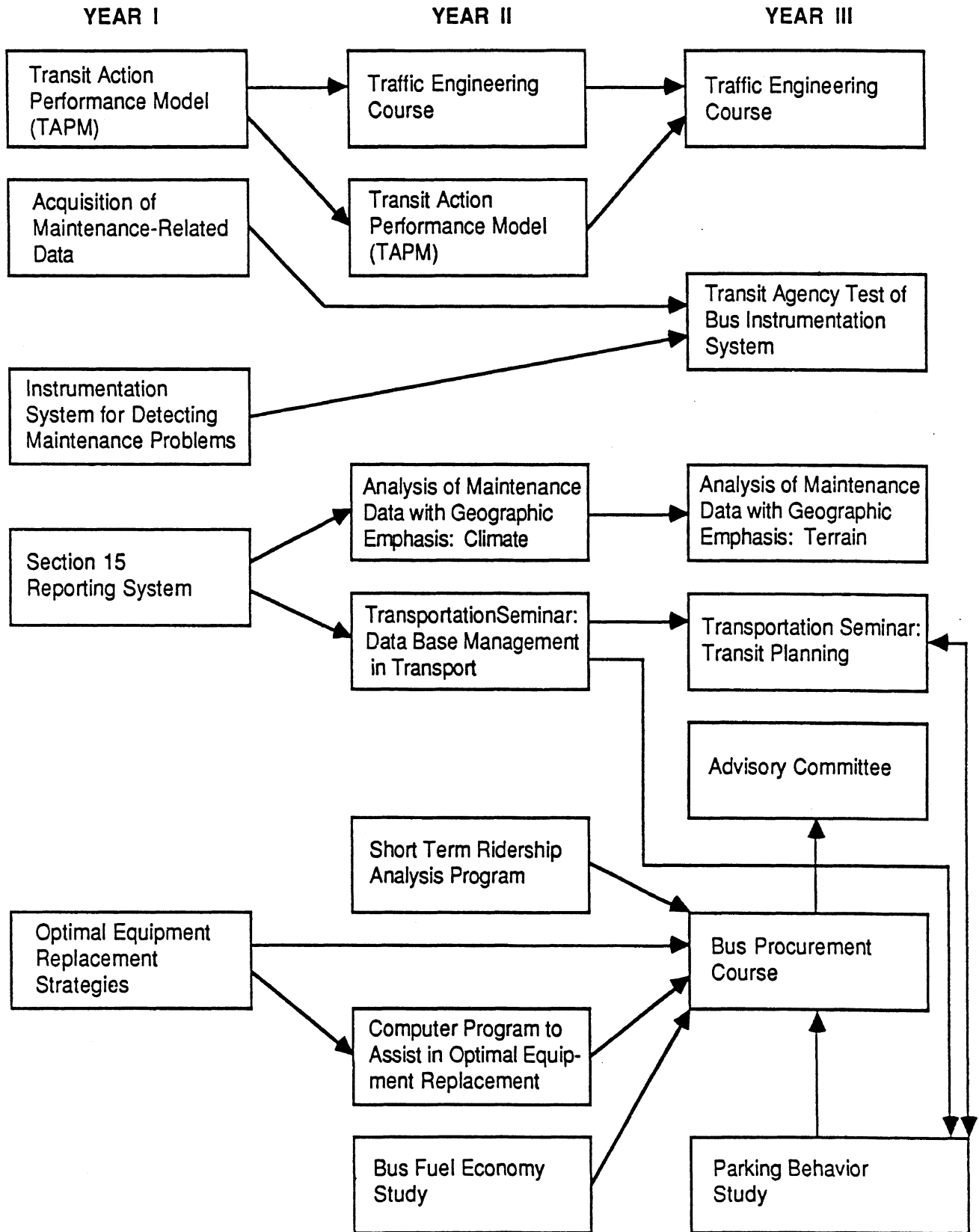
(3) Preparation of the 1983-84 Nationwide Personal Transportation Study (NPTS) data set for analysis on The University of Michigan OSIRIS IV system.

(4) Studies by graduate students of the Certificate of Transportation Studies conducted in cooperation with local public agencies; with the Ann Arbor Transportation Authority (AATA), an analysis of social agencies transportation services in Washtenaw County, Michigan, and an estimation of latent demand for a proposed Ann Arbor - Saline bus route; with the City of Ann Arbor, a survey of parking meter usage; and with the VA Hospital, a survey of employees travel behavior and parking.

Report Structure

The remaining sections of this report are devoted to individual descriptions of the three major projects, the research seminar, and other activities of the Center. Section 2 contains a report on the testing of the electronic instrumentation to detect engine failure in buses. Section 3 provides an analysis for the effects of terrain on bus maintenance data recorded in UMTA's section 15. Section 4 describes the study of on-street parking meter behavior. Section 5 is a report on the Transportation Research Seminar. Section 6 describes the Advisory Committee. And Section 7 describes short courses offered by the Center. The chart on the following page, provides an outline for the Center activities during its three years of operation.

Center Program Development



2. INCIPIENT FAILURE DETECTION IN BUS ENGINE COMPONENTS

The director of this project was Professor William B. Ribbens of the Department of of Electrical Engineering and Computer Science. He is also the director of the Vehicular Electronics Laboratory.

Introduction

This study was a continuation of a research project which started during the first year of the Center (grant MI-11-0006). The goal of this project in its entirety was to develop instrumentation and measurement procedures for detecting incipient failure in bus engine components (during normal bus operation).

During the first year of the project the efforts were directed toward developing the actual electronic instrumentation and demonstrating that it could detect degradation in an engine's performance. The instrumentation was installed and tested on a VW Passat with 1.6 L diesel engine and a 5-speed manual transmission, and on an Oldsmobile Vista Cruiser with a 350 CID V8 gasoline engine and 4 speed automatic transmission.

During the third year the study focused on installation and testing of the instrumentation on regular revenue-operated buses. Instrumentation was installed on two buses of the Ann Arbor Transit Authority (AATA). These are typical GMC buses of 6 cylinders and two stroke/cycle diesel engines with automatic transmission. Experimental tests were conducted over a period of several months in various operating conditions, and on a variety of city roads.

Details of Phase I can be found in "Incipient Fault Detection System Study, Technical Report," UMTA-MI-11-0006-02. This reports contains details of the theory and the methods used to measure degraded engine/powertrain performance, and results of dynamometer and road tests on a diesel powered automobile. For a summary see the "Executive Summary" of this report. Details of Phase II appear in "Incipient Failure Detection in City Buses," UMTA-MI-11-0009-03.

Concept

The method of detecting incipient failure in engine/drive-train components is based on the concept of continuous, real-time, non-contacting measurements of engine performance. These measurements utilize instrumentation which has been developed at the Vehicular Electronic Laboratory (VEL) at The University of Michigan.

The class of failure to which this method is applicable is a long term gradual deterioration of performance. In the context of the present project, failure is defined as performance which is below an accepted level. For this class of failure it is possible to estimate a time-to-failure. The estimate of time-to-failure is derived from experimental studies on actual degradation to failure for critical engine components. This project has established the beginning of a statistical data base from which this estimate can be made.

The engine performance measurements of this project are derived from a non-contacting instrumentation for engine torque measurements. The theory behind this instrumentation is explained in detail in the Final Report to Phase I, "Incipient Fault Detection System Study, Technical Report," UMTA-MI-11-0006-02; and in the Final Report for Phase II, UMTA-MI-11-0009-02 (Theory and Methods, Chapter 2). In summary, the explanation is that the torque measurements are a result of a precise dynamic model for the engine, which relates an indicated torque to an instantaneous crankshaft angular motion. The crankshaft angular motion is measured via a non-contacting magnetic field system sensor and an electronic analog signal is processed. In turn, by using the dynamic model, the torque is calculated from the crankshaft motion.

Engine performance is further examined (in the VEL instrumentation) by calculating the non-uniformity in torque from cylinder to cylinder, and from cycle to cycle. An index of torque non-uniformity (denoted as "n" in the Final Report) was the primary performance measure used by this study. This index is a random variable. The statistics of this random variable provide important information about the engine's operational conditions.

The long-term maintenance benefit of this study lies in the possibility of developing a preventive schedule based upon estimated time-to-failure. This new concept could make it possible to avoid scheduling of routine maintenance before it is required as inferred from an estimated time to failure. Similarly, this method could prevent a bus breakdown in service, due to failures which fall within the scope of indicative measurements.

Activities

Major activities of this project during the third year were:

- (1) To install VEL-developed instrumentation on buses operating in simulated service on the road, and in the repair shop.
- (2) To study the statistics of the torque non-uniformity index (n), in order to develop a data base to estimate time to failure of a bus engine.
- (3) To develop, through an experimental study, an optimum procedures for collecting and analyzing performance measures.

This task was accomplished with cooperation of the Ann Arbor Transit authority (AATA). Two regular, in-service, AATA buses were modified slightly by installing the required sensors, and the VEL instrumentation for data collection. The instrumentation was installed on two GMC RTS04 1981 buses equipped with 6-cylinder, 2 strokes/cycle diesel engines and with automatic transmission. These are standard equipment in American bus fleets. Experimental tests were conducted on these buses over a period of several months in various operating conditions and on variety of city roads.

The data were stored in an internal memory of the on-board instrumentation for later retrieval. The on-board memory has sufficient capacity to collect data for an entire day's operation. This provides the capability to conduct performance measurements while the bus was in service. During the experimental studies the data retrieval was accomplished by means of a portable computer. The portable computer has the capability to conduct limited data analysis. However, the primary data reduction and analysis for the experimental studies was performed on a DEC 11-23 Computer. Data were transmitted to the DEC from the portable computer at the end of each experimental test.

In addition to the capability of detecting incipient engine failure, the instrumentation developed for this project has the capability of isolating individual cylinders having low performance. Hence it can also provide diagnostic assistance by helping the mechanic quickly locate the corresponding fault.

The tests were conducted in the following way: First, data were collected from well-tuned engines in order to establish a baseline for the non-uniformity torque index. Then, selected fuel injectors were purposely misadjusted to

produce a non-uniform torque production. This misadjustment simulated a defective fuel injector which is an example for the class of failure to which the present method is applicable. Increasing an injector's misalignment simulates a degradation of performance. Thus, various stages of degraded performance were simulated by manually misadjusting the fuel injectors.

Results and Recommendations

Several important observations were achieved from the experimental tests:

- (1) It was demonstrated that the mean value for the non-uniformity index (n) shifted to higher values for abnormal engine operation relative to normal operations. The amount of shift depended upon the severity of the abnormal engine conditions as well as the RPM.
- (2) The maximum shift in the mean value of n was observed for engines operating at or near idle conditions, with the transmission in gear and the brakes locked. This situation occurs during normal operation when a bus stops for a traffic light or to pick up passengers. Alternatively, it can be easily observed in the garage. Because the probability of detecting degraded performance improves with the shift in mean value of n , it became clear that the optimum operation condition for detecting incipient failure is at idle, in gear, with brake locked.
- (3) Because the performance deterioration of components such as the fuel injector is relative slow, it seems sufficient to measure performance only once a day (rather than continuously) to detect incipient failure.
- (4) The combination of findings (2) and (3) leads to the recommendation that performance measures be conducted once a day, preferably at the garage (with engine near idle, in gear, and brakes locked).
- (5) It is further recommended that the special purpose digital computer developed by VEL be installed and maintained permanently in the garage, while the bus will be equipped only with the required sensors (to detect non-uniformity in torque). This computer should maintain a past performance record (for each bus), and estimate time-to-failure from this historical record. The performance of each bus can then be measured before entering service by connecting the bus, through a suitable connector, to the computer. This daily test for incipient failure requires only about one minute. It can become part of the daily maintenance routine.

(6) Given the scheme for incipient failure measurement described above--only one computer in the shop, with non-contacting sensors on each bus--the cost of the required instrumentation could be kept relatively low. Moreover, the data in the maintenance shop could be incorporated into a larger expert diagnostic system.

3. TERRAIN EFFECTS ON BUS DURABILITY

This research was conducted by Dr. Sandra L. Arlinghaus of the Center for Mathematical Geography and Professor John D. Nystuen of the Urban Planning Program.

During the first year of the Center operation, section 15 data were acquired, cleaned and installed on MIDAS, the Michigan Interactive Data Analysis System. These data were used in this study to analyze the impact of terrain on costs associated with maintenance of buses. A complete technical report on this research is available as UMTA-MI-11-0009-01.

Introduction

This study is part of a larger research effort by Arlinghaus and Nystuen to study "Environmental Effects on Bus Durability." The research in its entirety intends to cover the impact of three environmental components on costs of bus maintenance: (1) climate, (2) terrain, and (3) congestion.

The climatic effects were studied during the second year of the Center. A complete technical report is available as "Climatic Effects on Bus Durability," UMTA-MI-0008-03. It can be also found in Transportation Research Record No. 1066, October 1986. This year's study is a continuation of the research which started during the second year of the Center.

Methodology

This study presents a methodology to classify terrain. A taxonomy was formulated to construct a "Terrain Template." The template was based on evidence from topographical maps, and the resulting classes were characterized as "steep," "intermediate," and "flat" terrain peer groups. A set of 181 transit authorities was classified according to terrain type, and, in borderline cases, graphic displays were used to supplement the tabular display format of the classification. The Terrain Template was derived from applying allometric growth and census data to evidence from topographical maps.

Sets of Section 15 indicators involving bus maintenance performance measures were examined within terrain peer groups as an example of the potential for the application of these procedures. When the indicators "miles-per-gallon," "employees per vehicle-mile," and "cost per vehicle-mile" were displayed by terrain peer groups, ties were found between quality of maintenance and miles-per-gallon (as a surrogate for "durability") in steeper environments.

Terrain Template

The mechanics of constructing the Terrain Template involved the following classes of information.

(1) Terrain classification:

- (a) Terrain of slope more than 8% is "steep";
- (b) Terrain of slope between 2% and 8% is "intermediate";
- (c) Terrain of slope less than 2% is "flat."

Other boundaries might be used for these classes, and other classes might be chosen; automation of this technique, or of techniques based on this one, would facilitate such changes in classification.

(2) Boundary definition:

The boundary of an urbanized area was approximated by using a standard allometry technique in which a city is represented by a circle, the radius of which is proportional to its total population.

To determine a terrain type within a circular boundary, sets of evenly spaced line segments (called "contour-combs") representing 2% and 8% slopes, were used to sample the unevenly spaced contour lines within the allometric circle. The underlying terrain was then classified as "steep," "intermediate," or "flat."

The "flat terrain" peer group and the "intermediate terrain" peer group each included approximately 60 transit properties, while the "steep terrain" peer group included only 20 properties. For example, the "flat" peer group included New York, Chicago, and Detroit; the "intermediate" Philadelphia, Cleveland, and Denver; and the "steep," Los Angeles, San Francisco, and Kansas City.

Terrain Analysis of Ann Arbor

Analysis of 18 actual bus routes in Ann Arbor, Michigan, evaluated the accuracy of the Terrain Template methodology described above.

The Terrain Template assigned a value of about 2% to the terrain in the Ann Arbor allometric circle (applied at a common map scale of 1:250,000). To investigate this rough assessment, each of 18 bus routes were mapped as vertical profiles, and the average percent slope along each of them was calculated. This involved finding the total relief and the

total distance along each route. In order to obtain a finer resolution of the topography than the one prescribed by the Terrain Template, the evaluation study used map of scale 1:24,000 (rather than the standard 1:250,000).

Relief along each route was calculated by manually counting the number of contour lines crossed by the route. These numbers were converted to feet by multiplying them by the value, in feet, of the contour line interval. The route relief/route length gave an average slope along the route. This finer procedure indicated an average slope of 1.953%. It is very close, in magnitude, to the Terrain Template of approximately 2%.

Analysis of Maintenance Data in Terrain Peer Groups

The 181 transit authorities were sorted into 16 maintenance subclasses, based on maintenance quality as a function of (annual):

- (1) Maintenance Value=
 $(\text{total vehicle miles})/(\$ \text{ maintenance});$
- (2) Maintenance Efficiency=
 $(\text{total vehicle miles})/(\text{maintenance employees}).$

When the Section 15 indicator of "miles-per-gallon" was introduced into this set of maintenance subclasses (of the 181 transit properties), "good" mileage corresponded to "good" maintenance, and "bad" mileage to "bad" maintenance.

The 181 properties were first partitioned into terrain peer groups and then separated into maintenance subclasses, where the "mile-per-gallon" indicator was introduced into these subclasses. Analysis showed that transit authorities with low ("bad") miles-per-gallon were more likely to fall into the worst maintenance subclass in the "steep" peer group than they were in the overall case. This suggests that ties between maintenance and fuel economy were stronger in steeper environments than they were in the whole sample.

Applications of Results

One implication of this sort of approach is that a transit authority might classify itself according to its terrain type, and use its position within the classification as a guideline in its maintenance efforts. Similarly, UMTA could use the terrain peer group to evaluate the quality of the maintenance efforts (in conjunction with other factors such as climate and congestion) of a particular property as compared to its peers. However, it should be noted that (1) the guidelines suggested by this study are very general, and

(2) that the numerical values are based on data which vary from year to year.

Future Research

Plans for future research include:

(1) Developing a model of a bus route as a linear form, changing in response to economic pressure on transit managers and needs of the underlying population for service. This would require expanding the application of second order linear differential equations to Newton's Law. For details see the Technical Final Report of this project.

(2) Development of a parallel report on "Congestion Effects on Bus Durability." The methodology would be based on "self-similarity," an idea underlying fractal geometry.

(3) Exploring the automation of this approach.

(a) Through the use of Geographic Information System (GIS). The use of GIS to plan bus stop spacing is presented in Duane, Marble, Hugh, Calkins, Donna, and Peuquet, Basic Readings in Geographic Information System, SPAD Systems, Ltd., 1984, pp. 2-20 to 2-24.

(b) Through the use of fractals. The use of fractals to simulate terrain is presented in M. Goldchild, "The Fractional Brownian Process as a Terrain Simulation Model," Modeling and Simulation, 1982, Vol. 13, 1133-1137.

4. ON-STREET PARKING METER BEHAVIOR

The director of this project was Dr. Aaron Adiv, Assistant Professor of Urban Planning and Director of the Center. He was assisted by Mr. Wanzhi Wang, a Visiting Scholar at UMTRI from the People's Republic of China.

Introduction

The Center, together with graduate students in transportation, conducted several studies concerning short and long-term parking. This was based on the premise that parking management is one of the most promising policies in curtailing solo driving, particularly for the work trip. The alternative to solo driving is transit, para-transit, and car-pools.

As a preliminary step to revision of parking policies, the Center studied parking behavior. The Center and the students were involved in the following studies:

(1) Study of parking behavior on a national level, based on statistical analysis of the 1977 Nationwide Personal Transportation Study (NPTS). In general, it was found that approximately 93% of those who drove to work parked free. There was not a significant difference among socio-economic groups concerning this phenomenon.

(2) Preparation of the 1983-84 NPTS data for analysis of parking behavior on a national level.

(3) Survey and analysis of travel behavior, parking, and usage of alternative travel modes (transit, car-pool, and van-pools) conducted, as a case study, for the Ann Arbor VA Hospital.

(4) Survey and analysis of on-street parking meter usage, conducted in cooperation with the city of Ann Arbor.

Parking Meter Study in Ann Arbor-General

This study employed empirical data about usage of on-street parking meters to examine the relationships among parking behavior, violations, enforcement, and revenues. The City of Ann Arbor, Michigan was used as a case study. Given its size, Ann Arbor represents medium-size cities (100,000-250,000). Given the vitality of its downtown, it represents larger cities. Finally, Ann Arbor has a medium level of enforcement, common to most cities in the U.S.

The study utilizes two sources of data:

- (1) Historical data about parking meter performance for a period of over twenty years, 1965-1986.
- (2) A survey of selected on-street parking meter sites in downtown Ann Arbor during 1986.

Historical Trends of Parking Meter Usage in Ann Arbor

Based on historical records by the City of Ann Arbor over the last 21 years, 1965-1985, this project studied the historical trends of on-street parking meter usage and enforcement, as reflected by the annual revenues from, and citations of, metered spaces in the city. These data are unique in that they cover a relatively long period of time, and as such made it possible to estimate the elasticity of parking meter revenue (or demand) to levels of fees (for usage) and fines (for violations).

Revenues, fees, and fines were measured and evaluated from two view points:

- (1) Nominal dollars not adjusted for inflation.
- (2) Constant dollars, 1967=100.

In addition, revenues were analyzed as "gross revenues," and as "revenues-per-meter."

In general, until 1978 constant dollars followed, at a somewhat lower level, the nominal path. However, from 1978 on, a sharp increase in nominal revenues showed no significant change, or even a mild decline, when measured in constant dollars. During the 22-year there were several increases of fees and fines. However, in real terms, fees fell below the 1967 level, and fines increased by only 50% (compared to a 400% nominal increase). These data indicate a deterioration of the fees-fines structure for prime parking locations downtown.

The study conducted a regression analysis of the historical data to study the relationships among fees, fines, enforcement tickets, and availability of on-street and off-street parking. 15 different models are presented in the Final Report.

In summary, the regression indicated that on-street parking meter revenue is better explained by real cost, rather than nominal cost, and by revenues-per-meter rather than gross revenue. In terms of policy implication, it reinforces the evidence that enforcement pays--unsurprisingly, revenues rose with enforcement. More importantly, it suggests that raising fees rather than fines is a more effective means of increasing (real) revenues from on-street parking. This is in contrast to

a common practice by Chambers of Commerce which opposes fee increases, fearing that it will discourage downtown patrons, and advocates instead an increase in fines.

Survey of Parking Behavior

The research team selected a sample of three sites with on-street parking meters in Ann Arbor, and continuously monitored their usage during six mid-week days. They included Main Street of downtown (in mid 1986), and two secondary shopping areas near the University (in late 1985).

At each site the surveyors systematically circled a block or group of blocks, visiting the same meter every 20 minutes on their routes (i.e., 3 times-per-hour). At each meter they recorded the license-plate of the parked car, if a violation occurred, and if it was cited. They observed 69 meters near the University, and 27 on Main Street. In total they conducted 2,004 observations, and covered 810 block-faces. For comparison, a similar study in Washington D.C. covered only 310 block-faces.

Results

(a) Demand

As expected, the demand for on-street metered spaces was very high. "Occupancy Ratio" (occupied space-hour/available space-hour) was about 95% during the peak, and 80% during off-peak.

(b) Violations

The survey recorded two types of violations:
(1) "Insufficient Payment." (within time limit)
(2) "Exceeding Time Limit" (even if paid for; 1 hour in Ann Arbor).

"Violation/Vehicle Ratio" (all violations divided by total vehicles parked) was about 50%. About one-third of vehicles violated some legal usage, and 60% violated both "payment" and "time."

"Unpaid Meter Space Ratio", the ratio of used but unpaid space-hour, averaged about 25%. This represents a loss to the City. However, a calculation showed that from a fiscal viewpoint, the existing situation (of fees plus fines for cited violations) provides the City with more revenues than if every user had paid the fees.

(c) Enforcement

The empirical data indicated low levels of enforcement, measured in terms of citations issued versus violations which took place. Overall, the survey recorded 396 violations of on-street parking meters. Only 33 of them (8.1%) were ticketed. During the off-peak the ratio was 0.0%. A previous survey in Ann Arbor in 1978 indicated even a lower enforcement level.

The low enforcement level is not unique to Ann Arbor. Comparative data for other Michigan cities indicated a similar level of enforcement personnel and citations (adjusted for city size). However, even this low level was sufficient to discourage most users from not paying. Recall, only 25% parked free. The users seemed to behave rationally to the magnitudes of fees and fine. The expected value of the fine (fine x probability of being caught) was very close to the value of the hourly fee: ($300 \times 0.081 = 24.3$ cents) and 25 cents respectively.

(d) Utilization and Turnover

One of the major goals of on-street parking meters is to provide short-term parking at a short walking distance to the final trip destination. The average stay was 41.5 minutes (median 40.0 minutes). Almost half of the vehicles (47.2%) parked for 20 minutes or less, and 81.8% for one hour or less. This indicates that for the most part, meters did what they were designed for.

However, further analysis indicated a low level of enforcement for "exceeding time limit" (35% of violations vs. 3.3% of tickets issued), and abuse of space by medium and long-term parking. The abused space (space used beyond the legal time limit), accounted for almost 25% of the available space-hour. Most of it was abused by long-term parking (i.e., meter feeding). For example, 11 vehicles representing only 2.3% of all users, parked for 3 hours or more, and abused 11.8% of the available space.

Conclusions

(1) For the most part on-street parking meters provide an efficient means of allocating limited premium space.

(2) Violation level is high (almost 50%), while enforcement is low (less than 10% of violations are caught).

(3) Even the existing low enforcement level is sufficient to discourage most users from long-term parking.

(4) Consumers tend to behave rationally in that that their expected value of the fine equals the parking fee.

(5) Historical data indicate a deterioration of (real) fees and fines over the last two decades, in spite of nominal increases. Real (constant \$) provides a more reliable measure of evaluation.

(6) The demand for on-street parking is unique in that the provisions of off-street parking is not a true substitute. In spite of increase in off-street facilities, the demand for on-street remained almost at 100%.

(7) From a fiscal viewpoint, revenues generated by a combination of fees and fines exceeds the "loss" from unpaid metered space.

(8) "Exceeding Time Limit" deserves special attention. This underenforced "hidden" violation, abuses 25% of the available space. If better enforced it could increase dramatically the available space: between 30 and 60 percent, at an average stay of 41.5 and 20 minutes respectively.

5. RESEARCH SEMINAR IN TRANSPORTATION

For a second year the Center combined research activities with the academic program by offering the course "Research Seminar in Transportation," listed in the University catalog as Urban Planning 671. The course, taught by Aaron Adiv, had the subtitle "Transit Planning." The topic for the seminar changes from year to year. In the second year of the Center it was "Information and Data Base Management in Transportation."

The objective of the seminar was to integrate knowledge in transportation and planning, and to familiarize the students with different aspects of transit planning. The specific topics included a wide area, from financial and technical management to bus production.

The Seminar met twice a week: once to discuss the students' research papers and required readings, and once to hear a lecture from an expert guest speaker, and/or a visit to transit site. Many of the guest speakers were members of the Advisory Committee (see section 4).

As a final product, students were required to write a research paper on transit planning. They were allowed to work in teams. The research papers included: "Transit security", "Short-term parking in Ann Arbor", "Travel and parking behavior at the VA Hospital," and "Dual mode bus operation".

Guest Speakers and Topics

(* indicates a member of the Advisory Committee)

Aaron Adiv, UMTRI

"Private Public Cooperation in the Provision of Specialized Transportation"

Ann Grimm, UMTRI

"Bibliographic Resources at UMTRI" (1/10/86)

*Michael Bolton, Director AATA

Site visit to AATA, and Lecture "What makes AATA the Best Transit Authority for its Size in the US ?" (1/17/86)

*Edward Stokel, Director, Bus Group, GMC Bus and Truck Group
Site visit to GM bus production plant, Pontiac Michigan.
(1/24/86)

Sharon Balius, Assistant Head, Engineering Library

"Data Bases at the Transportation Engineering Library- TRIS, NTIS, and COMPENDEX." (1/31/86)

Perry Schechtman, Associate Director, AATA

"AATA Transit Development Program 1986-1991" (2/7/86)

Christopher White, Assistant Director, AATA
"Transit Grantsmanship" (2/14/86)

*Frank DeRose, Administrator, Bus Transit Division, Michigan
DOT
"The Status of Local Bus Transportation in Michigan"
(3/7/86)

Field Trip to Toronto Canada, Site Visit to Toronto Transit
(3/14-3/15/86)

Michael Clarke, Comsis Corporation
"MINUTP Workshop" (3/21-3/22/86)

*John Sejovec, SEMTA, Director of Planning and Marketing
"The People Mover" (3/28/86)

*Irving Rubin, Ford Motor Company, Governmental Affairs
"Public Transportation and Rational Public Investment"
(4/11/86)

*Robert Polk, Director, Detroit-DOT
Site Visit to Detroit-DOT, and lecture "The Challenge and
Frustration of Running a Major Bus Company" (4/18/86)

6. ADVISORY COMMITTEE

During the Fall of 1985 Professor Adiv established an Advisory Committee for the Center at the University of Michigan. The purpose of this committee is to use the experience of its members in transit to help in setting directions, goals, and possibly funding sources for the Center. Members of the committee include directors of the major transit properties in southeastern Michigan, bus manufacturers and rebuilders, and state officials. The full list of members is given below.

Advisory Committee, Membership List

- (1) John M. Amberger
Executive Director
SEMCOG
800 Block Building
Detroit, MI. 48226
(313/961-4266)
- (2) Michael Bolton, Director
Ann Arbor Transportation Authority
2700 S. Industrial Highway
An Arbor, MI. 48104
(973-6500)
- (3) Frank DeRose, Jr.
Administrator
Bus Transit Division
Bureau of Urban and Public Transportation
Michigan DOT
425 W. Ottawa Street
Lansing, MI. 48909
(517/373-0470)
- (4) Dewey Henry
Downriver Community Conference
15100 Northville Road
Southgate, MI. 48195
(283-8933)
- (4) Albert Martin, Director
SEMTA
660 Woodward Avenue
13 Floor
Detroit MI.
(256-8704)

- (5) Dan Morril
Midwest Bus Rebuilders
1940 West Stewart Street
Owosso, MI. 48867
(723-5241)
- (6) Robert Polk, Director
City of Detroit
Department of transportation
1301 E. Warren
Detroit, MI. 48207
(833-7690)
- (8) Irving J. Rubin
Ford Motor Company
Governmental Affairs
The American Road
Dearborn, MI. 48121
(323-0585)
- (9) Edward Stokel
GMC Truck & Bus Group
General Motors Corporation
31 Judson Street
Pontiac, MI. 48058
(456-4077)

Activities

A first general meeting of the Advisory Committee took place on December 6, 1985. This was a working lunch which included most members of the Committee and University personnel who have been involved in research activities of the Center. Participants from the University included:

- (1) Aaron Adiv, Center Director
- (2) Howard M. Bunch, Acting Director of UMTRI
- (3) Donald E. Cleveland, Professor of Civil Engineering
- (4) Jac Guerts, Visiting Professor of Urban Planning
- (5) John Nystuen, Professor of Urban Planning
- (6) James W. Thomson, Assistant Director, UMTRI

Professor Adiv reviewed activities of the Center during its first two years, and plans for the third year. Other university personnel reported on their research projects through the Center. Later, there was a discussion and exchange of ideas among the Advisory Committee and members of the University. Two areas of major concern to members of the committee were: (1) maintenance, and (2) mid-management training.

In the short-run, the Center used members of the Advisory Committee mainly as resource people for the Seminar in Transportation (see section 5 above).

7. SHORT COURSES

Part of the Center's mission was to provide training to professionals in the transit industry. The Center planned for one short course per year, in an area of particular interest to transit managers.

(1) Issues in Bus Procurement

This workshop took place September 15-18, 1985. The objective of the workshop was to provide information to transit management personnel on current important issues in buying buses. The workshop included 27 paying attendees, and 47 participants. For a full report on this workshop see "Second Year Annual Report," UMTA-MI-0008, pp. 30-39, and Appendix A,B.

(2) Traffic Engineering for Transit Managers

The Center planned a three-day workshop on "Traffic Engineering for Transit Managers" (a similar course was offered during the first year). The workshop was planned for March 31-April 2, 1986. Dr. Waissi and Dr. Adiv spent several months in preparation for this workshop. Unfortunately, due to elimination of UMTA Section 10 Fellowships, many prospective students canceled their participation, and finally the course had to be canceled. Originally, we expected 12-15 students, however, more than half of them canceled because of financial limitations. See Appendix A for the Tentative Program.

APPENDIX A

TRAFFIC ENGINEERING FOR TRANSIT MANAGERS

Tentative Program For Short Course
March 31 - April 2, 1986.

Monday - March 31

9:30-11:30 Course participants arrive, registration

12:00- 1:30 Welcome/Introduction
North Campus A. Adiv, D. Cleveland
Commons

2:00- 4:00 Traffic engineering principals
UMTRI H. Levinson, U of Connecticut

4:15- 5:30 Traffic engineering for bus operations
UMTRI D. Cleveland, UM

Dinner at Michigan League, speaker M. Bolton, AATA
H. Bunch, UMTRI

Tuesday - April 1

8:30-10:30 People movement, parking, bus stops, passenger
information systems, and selected European transit
systems
UMTRI D. Cleveland, UM, L. Kostyniuk, MSU, G. Waissi,
UM

10:30-11:00 Break

11:00-12:30 Litigation and Transit
UMTRI M. Wallen, Wallen Associates

12:30- 1:30 Lunch - North Campus Commons

2:00- 4:00 Computer lab at Chrysler Center or UGLI.
(transit software TAPM, MCTRANS, ..., theory and
demonstration).
G. Waissi, W. Wang, UM

4:00- 5:30 Visit at AATA
M. Bolton, AATA, A, Adiv, UM

Wednesday - April 2

8:30-10:30 HCM (Highway Capacity Manual) and Transit
UMTRI D. Cleveland, G. Waissi

10:30-11:00 Break

11:00-12:00 Panel Discussion on Transit Issues
UMTRI (Future of different transit modes, anticipated
problem areas, litigation, representatives of
participating agencies and organizations are
encouraged to present relevant issues, applications
and tell experiences from their organizations
before the general audience, discussion, question -
answer session, conclusion and closing remarks.)
D. Cleveland, A. Adiv, L. Kostyniuk, M. Wallen,
G. Waissi

12:00- 1:30 Lunch - North Campus Commons

2:00- 3:00 Visit of UMTRI, (Research underway, facilities).
J. Thomson, A. Adiv

Important Addresses:

Michigan League (in Central Campus)
911 N. University
Ann Arbor, MI 48109

U of M Transportation Research Institute, UMTRI
2901 Baxter Road (North Campus)
Ann Arbor, MI 48109
Phone: (313) 763-3585

North Campus Commons
2201 Bonisteel Blvd.
Ann Arbor, MI 48109

