clear statement of the problem and an informed evaluation of alternatives.

Some of the improvements over previous methods are not immediately obvious. A form of partially distributed cost analysis was used in the past, but it was justified on the basis of the nonuser cost-responsibility myth (I should be taxed to help pay for my grocer's store because it serves me). When the assignment of residual costs is handled as a constrained optimization problem, at least we are informed of the criterion used and the consequences. The incremental-cost method was applied indiscriminately to variable as well as fixed costs without assessing its suitability. The emphasis on allocation of budgets rather than pricing of costs has meant that user charges have fallen along with expenditures (in real terms) at the same time that costs have been rising. Finally, attention is directed at the effects of alternative user charges on efficiency and equity, not at the largely pointless exercise of labeling expense items with vehicle-class names.

REFERENCES

1. Final Report of the Highway Cost-Allocation Study. 87th Congress, 1st Session, U.S. Government Printing Office, House Doc. 72, 1961.
2. M.Z. Kafoglis. Highway Policy and External Economies. National Tax Journal, Vol. 16, No. 1, March 1963, pp. 68-80.
3. A.A. Walters. The Economies of Road-User Charges. Johns Hopkins Press, Baltimore, MD, World Bank Staff Occasional Papers, No. 5, 1968.
4. A.E. Kahn. The Economics of Regulation, Volume 1: Principles and Institutions. Wiley, New York, 1970.
5. H. Mohring. Transportation Economics. Ballinger, Cambridge, MA, 1976.
6. J. Slavet, K. Bradbury, and P. Moss. Financing State-Local Services. Heath, Lexington, MA, 1975.
7. Wilbur Smith and Associates. Development of Strategies and Procedures for Highway Cost Allocation. Federal Highway Administration, Interim Rept. 1, Nov. 1975.
8. Congressional Budget Office. Guidelines for a Study of Highway Cost Allocation. Congress of the United States, Washington, DC, Feb. 1979.
9. First Progress Report on the Federal Highway Cost Allocation Study. Federal Highway Administration, U.S. Department of Transportation, March 1979.
10. W. Nicholson. Intermediate Microeconomics and Its Application, 2nd ed. Dryden Press, Hinsdale, IL, 1979.
11. R.A. Musgrave and P.B. Musgrave. Public Finance in Theory and Practice, 2nd ed. McGraw-Hill, New York, 1976.
12. Consequences of Deferred Maintenance. NCHRP, Synthesis of Highway Practice 58, 1979.
13. The AASHO Road Test. HRB, Special Rept. 73, 1962.
14. Highway Capacity Manual. HRB, Special Rept. 87, 1965.
15. W.J. Baumol and W.E. Oates. The Theory of Environmental Policy. Prentice-Hall, Englewood Cliffs, NJ, 1975.
16. J.C. Bonbright. Principles of Public Utility Rates. Columbia Univ. Press, New York, 1961.
17. S.C. Littlechild and G.F. Thompsson. Aircraft Landing Fees: A Game Theory Approach. Bell Journal of Economics, Vol. 8, No. 1, Spring 1977, pp. 186-204.
18. T. Sandler and J.T. Tschirhart. The Economic Theory of Clubs: An Evaluative Survey. Journal of Economic Literature, Vol. 18, No. 4, Dec. 1980, pp. 1481-1521.
19. Z. Haritos. Theory of Road Policy. Transportation Journal, Vol. 13, No. 3, Spring 1974, pp. 53-64.
20. F.P.A. Ramsey. A Contribution to the Theory of Taxation. Economic Journal, Vol. 37, 1927, pp. 47-61.
21. W.J. Baumol and D. Bradford. Optimal Departures from Marginal Cost Pricing. American Economic Review, Vol. 60, June 1970, pp. 265-283.

Proposed Fare Policy for Advance-Reservation Bus Service

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This paper reviews the present fare policy of the advance-reservation bus service in Barnstable County, Massachusetts, examines several alternative fare policies, and, finally, proposes a new policy. The present fare policy allows individuals to ride an unlimited number of times at a flat rate for any purpose during a three-month period. Four alternative fare policies are described. The alternative proposed for implementation would charge riders on the basis of the number of trips taken and the length of each trip. Reduced rates would be available for elderly or handicapped persons and for those who made group trips. Riders would be sent bills at the end of each month like telephone bills—the trips and miles traveled would be detailed as long-distance calls are. These invoices would be prepared by the existing computer system, which currently maintains complete client listings and generates detailed drivers' schedules. The cost of this minicomputer system, including hardware and software, was about $50 000. The development of the billing and invoicing system would cost an additional $5500. The paper also recommends further research into alternative fare policies, including their effects on travel behavior, revenue generation, and subsidy requirements. Other recommended topics are alternative mechanisms for implementation of such fare policies, such as sale of tickets, punch passes, manual invoicing, and (as proposed) implementation as a component of a comprehensive computerized management information system.

As a result of increasing fiscal austerity at the federal, state, and local levels, government subsidies for public transportation services are expected to decline, although the need for and the costs of such services are increasing dramatically. As a result of this, consumers will be called on to pay higher proportions of total costs. As the amounts to be paid by consumers increase, the equity of the fare policies used will become of paramount importance. If public transportation is to maintain its feasibility in the 1980s, equitable fare policies, and means for implementing them, must be developed.

It has been proposed that the Cape Cod Regional Transit Authority (CCRTA) implement a fare policy for its advance-reservation demand-responsive service (the b-bus system) that is based on use, as measured by number of trips taken and the length of trips. This policy would require computerization; however, the CCRTA has a computer-based management information system (MIS) on line at its b-bus operations center that, with little modification, could accommodate the new fare policy.

The purpose of this paper is to introduce this proposed fare policy, describe the situation from which it developed, and present recommendations for further research into the equity and practicality of alternative fare policies.

HISTORICAL REVIEW

Barnstable County (Cape Cod), Massachusetts, has a year-round population of 140 000 and a summer population, due to a seasonal influx of tourists, of 450 000. The 15 communities that make up Barnstable County cover 1008 km² (389 miles²), giving a population density of 138 persons/km² (see Figure 1). It is significant that more than 33 percent of

the Cape's population can be described as either elderly or handicapped. This high proportion of transit-dependent persons explains the high priority that is given to the provision of paratransit services by local officials.

On March 17, 1976, the first step was taken by the region to develop a system to meet the needs of the Cape's elderly and handicapped residents. A proposal was submitted to the Federal Highway Administration (FHWA) under Section 147 of the Federal-Aid Highway Act of 1973 for a rural public transportation demonstration grant.

Among the innovative techniques that were proposed for development within the grant application was use of a serially coded flash pass (1). The pass numbers were to be used for monitoring and evaluation of socioeconomic and trip (origin-destination) information to produce comprehensive transit-rider profiles. A secondary function was to serve fare collection. Clients were to pay flat quarterly fees for use of the service. These payments were to be made by mail and tracked by flash-pass serial number. The potential for more-sophisticated revenue collection techniques by using the pass was recognized; however, it was impractical to

Figure 1. Barnstable County.

100 RESIDENTS
500 RESIDENTS

Note: 1 mile = 1.6 km.

SCALE IN MILES
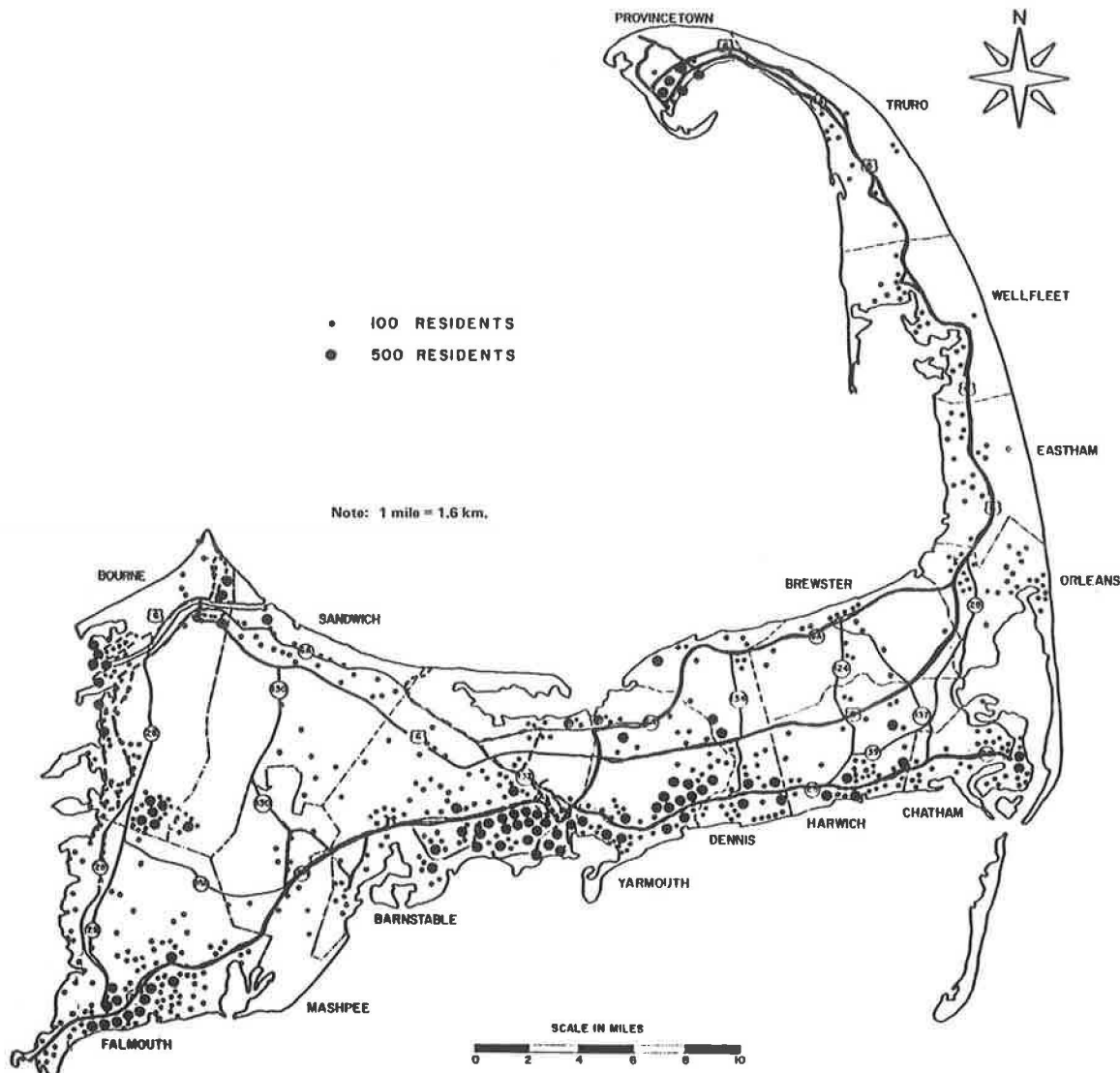
implement them without on-site computer assistance.

On July 20, 1976, FHWA approved the $868 750 grant request. As a result of this initial investment by FHWA, the county was able, for the first time, to provide a comprehensive regionwide public transportation service, the b-bus system. Today some 28 vehicles provide b-bus service, 8:00 a.m. to 4:00 p.m., five days a week. Clients request service by phone three to five days in advance and are given portal-to-portal service.

On February 9, 1979, the county's demonstration project was turned over to the newly formed CCRTA. CCRTA's initial mandate was to bring about coordination of all public transportation services that existed in Barnstable County. This coordination effort culminated in the full consolidation of services on June 1, 1979 (2). The elimination of duplications of effort in such areas as management, dispatching, and marketing resulted in substantial cost savings. Vehicle use was also increased, to yield higher productivities and increase the cost-effectiveness of the b-bus program.

Having brought about substantial cost savings and service improvements through consolidation, CCRTA turned its attention to refinement of its management tools. One of its primary concerns was to develop a procedure to equitably allocate costs among member municipalities (3). Consolidation presented the opportunity for development of a centralized MIS that could perform multiple functions, among them compilation of information on origins and destinations. Such information would allow use of a multivariable formula for assessments to the member municipalities that would be based on actual use by residents. It was the attractiveness of this possibility that led to the overwhelming support of the CCRTA Advisory Board for development of such a system.

On April 10, 1980, CCRTA awarded a contract to Crosbro, Inc., of Brockton, Massachusetts, for development of such a system. The computer went on line in December 1980 and is currently performing all necessary data-collection functions. In addition, the system aids in dispatching the vehicles, essentially eliminating pen and paper from the process, as described in a later section of this paper.

As early as 1975, when the grant proposal for the b-bus program was submitted to FHWA, two items were recognized to be of paramount importance to the development and continuance of local support for a regional public transportation system on Cape Cod. The first, and the most urgent, was the development of an assessment formula for ensuring the equitable allocation of costs among member municipalities. Such a formula had to result in payment only for services received by the residents of each municipality. Of equal importance, but not as immediately essential, was the development of a fare-collection mechanism that would result in the equitable distribution among riders of the portion of the total cost to be paid by consumers.

Such a mechanism has been proposed for use by CCRTA and is, in fact, the subject of this paper. Simply stated, riders would be charged according to a cost formula designed to proportionally approximate the actual cost of the service received. A rate would be developed that would include a cost per trip and a cost per mile of travel. Travel distance would be estimated by using a zone-to-zone distance matrix, and invoices would be generated automatically by the computer and mailed to riders.

CURRENT FARE POLICY

Travelers who use the b-bus system are currently being charged on a quarterly flat-rate basis. An integral part of the current fare policy is the use of a serially numbered rider identification pass. Socioeconomic information is obtained as part of the pass distribution process (Figure 2). The possession of a pass qualifies elderly or handicapped persons to free health-care-related service. If the passholder would like additional service, or is neither elderly nor handicapped, he or she mails CCRTA a check or money order each quarter. When the passholder telephones to schedule a trip, the passholder identification number and trip data (e.g., pickup and drop-off times and origin and destination) are obtained and the information is entered into the computer. The MIS eliminates the need to write trip data onto request sheets and then onto driver logs, because the computer has the capability to print schedules. This information is also used for allocation of costs among towns (which meets the reporting requirements of Section 15 of the Urban Mass Transportation Assistance Act of 1970) and in billing and accounting.

ALTERNATIVE FARE POLICIES

During the last 12 months, CCRTA has considered several alternative fare policies to replace the current policy. Four alternatives reviewed are summarized in Table 1.

Each alternative can be described in terms of type of payment, method of fare collection, and the basis of the charge. Alternative 1, a free-fare

Figure 2. Questionnaire for b-bus client.

Table 1. Alternative fare policies.

Alternative	Type of Payment	Method of Collection	Basis of Charges
1. Free fare	None	None	None
2. Fare box	Cash	On board	Flat rate or sliding scale per trip
3. Prepaid tickets	Cash or money order	Mail	Flat rate per trip
4. Mail-in method	Cash or money order	Mail; bill sent after use	Base rate per passenger trip plus the rate per passenger mile

system, was discarded because of financial restrictions.

The second alternative included the collection of fares on the vehicle by means of a fare box, as is typically done on conventional fixed-route services in urban areas. This alternative was viewed unfavorably because of the need to hire special personnel to store and handle lock-type fare boxes and the potential for pilferage and theft.

Alternatives 3 and 4 both employed a mail-in method to collect fares; however, they differed in the type of payment. Alternative 3 required that the fee be paid before use. Tickets would be sold at a fixed rate on a per-trip basis. If a passholder purchased 10 tickets, the passholder would be entitled to make 10 one-way trips of any length for any purpose. Alternative 4, on the other hand, collected payment after the fact and charged passholders on the basis of the number of one-way trips and the length of the trip.

Alternative 4 was considered more favorably than alternative 3, because persons were charged not only for the number of trips but also for the distance traveled. The billing would be carried out by the computer by means of an accounts receivable system developed by Crosbro, Inc. (4). The necessary data files would include (a) the passholder file, which provides the user's identification number, name, and address; (b) the trip file, which has the user's identification number and each trip by origin and destination; and (c) the trip-distance file, which stores the minimum travel distance between each origin and destination pair. Use of the trip-distance file would eliminate the need for the driver to record odometer readings for each trip.

This fare structure takes into account the level of use, the rider's ability to pay (elderly or handicapped persons receive a 20 percent discount), and group-trip riding. Hypothetically, the discount for group riding would encourage this practice and lead to increased vehicle use.

IMPLEMENTATION OF PROPOSED FARE POLICY

The MIS installed at CCRTA provides for on-line scheduling of b-bus vehicles. The system provides various operational, managerial, and statistical reports. In addition, the data that are gathered and maintained by the system would enable CCRTA to install a billing and payment system of the type necessary to support the proposed fare-collection system.

The MIS is operated on a Data General Nova 4/S computer with 64K of metal oxide semiconductor (MOS) memory. The hardware includes 20 megabytes of disk storage, a 180-character/s printer, and three cathode-ray tube (CRT) terminals. This configuration is sufficient to handle up to 7500 clients and 40 000 trips/month (i.e., three times the current load). The hardware is highly expandable and can be altered to support new applications, as well as greater volumes. The programs were written in Data General Business BASIC. The data files are all index-sequential files, some of which require multiple keys. All data files and indexes have been assigned contiguous disk space to provide the fastest possible access.

The MIS itself can be broken down into four major functions or components, sometimes called subsystems:

1. File maintenance and inquiry routines,
2. Scheduling and trip-related data entry,
3. Monthly and annual routines, and
4. Client billing (i.e., the proposed fare system).

File Maintenance and Inquiry Routines

The file maintenance and inquiry routines allow the operator to add, delete, and modify master file records. The routines allow on-line inquiry against particular records, as well as report capabilities that produce a hard-copy listing of all the records in each file. The file maintenance and inquiry routines support the master files that form the data base required by the other major components of the system. The master files include (a) a vehicle file that contains equipment and maintenance data, (b) a town file, (c) a location file that identifies villages within the towns, (d) a trip matrix that contains the distances between villages, (e) a client file that contains residence and socioeconomic data on each client, (f) a purpose-code file that categorizes trip purposes, (g) a standard trip file that contains data on repetitive trips, and (h) a vehicle-schedule file that contains the current driver-vehicle-schedule assignments.

Scheduling and Trip-Related Data Entry

Scheduling and the trip-related data entry routines are the heart of CCRTA's daily operations, which include booking trips, printing the schedule, entering vehicle data, and entering changes to previously booked trips. There are eight routines required to perform these tasks, each of which is described below.

The system provides three methods for booking trips. The first method, the request-for-service routine, is used to book advance reservations taken over the phone. If the request is made by a new client, the operator will create a client record and issue a pass number before attempting to book the request. The booking itself is accomplished by entering the date, time, origin, destination, and trip purpose. The operation will then enter the most geographically appropriate schedule. The trips already booked on the selected schedule will be displayed. The operator will then analyze the schedule to see whether the request can be accommodated. The operator can review several schedules in an attempt to accommodate a single request. Both outgoing and return trips can be booked through the same routine. The routine ends when the operator confirms or denies the request. Regardless of confirmation, a trip record is added to the trip transaction file. The record includes all the data entered in the request for service, as well as a pickup code that indicates whether or not the request was confirmed.

The flag-stop and nutrition-trip routine is the second method of booking a trip. This type of booking allows the operator to create a trip record for a trip that has already been taken. In these situations, the trip data are not available to the operator until the driver returns the schedule listing at the end of the day. Data on any nonscheduled trips are written on the listing by the driver. The operator then enters these data by using the flag-stop and nutrition-trip routine.

The final booking method is the standard trip-scheduling routine. This routine is executed once a month. The routine converts the day of the week, found in the standard trip file records, into dates that occur in the forthcoming month. The routine then creates one trip record for each converted date. This routine accounts for approximately 25 percent of all trips.

The schedule print routine produces the schedule listing. It is printed each night for distribution to the drivers the next morning. A schedule update routine is available to allow the operator to make

last-minute adjustments to the schedule. Each time the schedule print routine is executed, the vehicle-schedule file is used to post the appropriate vehicle and driver to the schedule listing and to the individual trip record.

The trip-by-client inquiry allows the operator to print or display on the screen all trips on file for a given client.

The trip-transaction maintenance or inquiry allows the operator to add, delete, and modify trip records. This routine's primary function, however, is to allow changes to the pickup code when a client cancels a trip or fails to show at the scheduled pickup location.

The daily vehicle log allows the operator to enter the vehicle mileage, fuel consumption, and maintenance data that are turned in daily by the driver of each vehicle. Each entry results in the creation of a vehicle log record that is posted in the daily vehicle log file.

Monthly and Annual Routines

The monthly and annual routines (a) produce management and statistical reports, (b) invoice the various social-service agencies that purchase service from CCRTA, (c) purge old trip and vehicle log records, and (d) reset monthly accumulators in the vehicle and town files during year-end processing.

The monthly reports generated by these routines accumulate trips, passenger miles, vehicle miles, and vehicle hours and report the totals by town and by vehicle. In addition, a socioeconomic report is produced that breaks down trips by age, family income, availability of other transportation (i.e., client possesses a driver's license or owns a car), and physical disabilities. This report can be further broken down by trip purpose.

Another monthly routine invoices the Department of Public Welfare for authorized medical trips taken during the month. In addition, this routine produces a report that summarizes medical trips taken by clients of more than 60 years of age during the past month. This report is used to justify Elder Service invoices, which are produced manually.

The month-end purge deletes the past month's records from the trip-transaction file and the daily vehicle log. Before they are purged, daily vehicle data are summarized and posted to the vehicle record. The operator can elect to produce a year-to-date vehicle performance report from these data at any time.

The annual or year-end routine clears vehicle maintenance and revenue data from the vehicle and town files.

Client Billing

The client billing system as called for by the proposed fare-collection system begins in the request-for-service routine. When a client requests a trip, the system will automatically decide whether the trip is billable, based on the type of client and the trip purpose. If the trip is billable (e.g., a shopping trip), the system will determine the trip distance from the trip matrix file. A trip cost will be calculated and displayed on the screen. This allows the client to cancel prohibitively expensive trips. Another feature of the request-for-service routine is the ability to offer group discounts such that a discount percentage can be applied while the trip is being booked. The discounted cost will also be displayed. Finally, the date of the oldest unpaid invoice will be displayed,

which gives the operator an opportunity to inquire about payment of overdue invoices.

The next step in client billing is the actual invoice printing. In the proposed system, an invoice will be produced that gives a line-by-line breakdown of all charges incurred by the client during the past month, along with all past-due charges. These charges will be summarized to show a total due charge. The invoice will also cite any nonbillable trips and any group discounts that may have been granted. In addition to the printed invoice, an invoice record that summarizes the past month's charges will be added to the invoice file. All invoices remain on file until they are paid.

A cash-receipts-or-payment routine will allow the operator to enter payments and post them to unpaid invoices. For each entry, a payment record will be created and it will be stored in the invoice file. At the same time, the payment will be added to the appropriate revenue accumulator in the town file. A cash-receipts journal will be printed that shows all payments received during the day's processing.

An adjustment routine will allow the operator to enter credit and debit memos to adjust for overcharging and undercharging. For each such entry, a memo record will be created and posted in the invoice file. The debit memo will be treated as an additional charge to the client, and the credit memo can be used as a payment to be applied to an open invoice.

During month-end processing, payments will be matched up with invoices and those invoices that are paid in full will be purged along with the associated payments. After the invoice file has been purged, an "aging" report will be generated. This report will show the age of all open invoices by client. The report can be used by management to initiate appropriate dunning action on delinquent accounts.

CONCLUSIONS AND RECOMMENDATIONS

1. Fiscal austerity at all levels of goverment, increasing operating costs, and increasing demands for service will lead to the need for greater fare-box revenues.

2. Higher costs to consumers will increase the importance of equity in generation of fare-box revenues.

3. Equitable fare structures should ideally take into account the number of trips taken, miles of service received, ability to pay, and group riding (3).

4. Fare policies that take these four factors into account may be cost effective when they are implemented as part of a comprehensive computer-based MIS.

5. Such fare policies will be more cost effective when (a) trip lengths vary significantly, (b) both the general public and elderly or handicapped clients are served, (c) vehicles are centrally dispatched, and (d) many vehicles are dispatched from a single office.

Recommendations for further research include

1. Evaluation of the equity and practicality of alternative fare policies;

2. Evaluation of possible strategies for implementation of such fare policies, e.g., punch passes, tickets, fare box, manual invoicing, invoicing by means of off-site batch processing, use of single-function dedicated computer systems, and (as recommended) use of a comprehensive MIS;

3. Evaluation of alternative hardware and software options for implementation of alternative fare

policies by using a MIS strategy, e.g., micro, mini, and main-frame computers and alternative programming languages;

4. Evaluation of the suitability of implementation strategies for alternative fare policies under various constraints, e.g., fleet size, labor rates, and decentralized or centralized dispatching;

5. Evaluation of the effects of alternative fare policies on consumer behavior, e.g., ridership, trip lengths, and travel patterns; and

6. Evaluation of the feasibility of alternative fare policies from a public policy standpoint, e.g., rider acceptability, acceptability to policymakers, acceptability to funding agencies, overall effect on subsidy requirements, and efficient use of available subsidy funds.

The research of such topics could be extended through consideration of such concepts as demand elasticity, utility maximization, social benefit, market segmentation, service coordination, and funding coordination.

It should be noted that the existence of the computer-based MIS now serving CCRTA's b-bus program presents a tremendous opportunity for the research efforts recommended above. Grant funds would not be required for purchase of hardware and could be spent entirely on the research recommended.

REFERENCES

1. R.P. Warren and J. Collura. Data Recording and Evaluation: The Barnstable County Experience. TRB, Transportation Research Record 696, 1978, pp. 58-65.
2. R.P. Warren, A.D. Rogers, and J. Collura. Coordination Through Consolidation: The Barnstable County Experience. Proc., 21st Annual Meeting of Transportation Research Forum (Philadelphia), Richard B. Cross Co., Oxford, IN, 1980, Vol. 21, No. 1, pp. 21-29.
3. J. Collura and D.F. Cope. Applications of the Concept of Equity to Cost Allocation. Civil Engineering Department, Univ. of Massachusetts, Amherst, 1979.
4. Cape Cod Regional Transit Authority: Accounts Receivable System Feasibility Study. Crosbro, Inc., Brockton, MA, Aug. 1980.

Income Equity of Two Transit Funding Sources

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Currently, a number of funding sources are used to subsidize public transit. These originate at all levels of government, and their mix differs greatly among regions. Each source or combination has implications for equity that are often overlooked since each has a unique incidence, i.e., pattern of who pays by income group. The purpose of this paper is to examine the incidence of two commonly used sources: a sales tax and a motor fuel tax. Previous studies of the incidence of these taxes are not comparable; what is necessary is a single source of data on which to examine them. Suitable data to calculate incidence are available from the 1972-1973 Consumer Expenditure Survey of the Bureau of Labor Statistics, a comprehensive source of information on consumption expenditures by detailed items and income for 40 000 U.S. families. These data allow the relative percentage of income paid as sales or motor fuel tax to be calculated. The results indicate that both sources are regressive. Use of the S-index of progressivity for comparison suggests little short-run difference in income equity between the two (although exactly what items are subject to the sales tax can affect the results). The study points out that the equity impact of potential funding sources should be understood, available, and part of the decision-making process.

Transit systems throughout the United States have become increasingly dependent on subsidies from various levels of government. Each system tends to have a unique set of funding sources that is usually determined by law and politics in a particular geographic area. As new and expanded sources of transit funding are sought, the equity issue of who is paying from each source (the incidence) is often overlooked.

In addition, great concern is placed by federal agencies to ensure that their funded activities comply with Title VI of the Civil Rights Act of 1964. As an example of this concern, the Urban Mass Transportation Administration (UMTA) issued Circular 1160.1 (December 1977). A number of the objectives of this circular relate to this issue of equity of federally funded activities. Although most of the emphasis of Title VI has been on the distribution of benefits, a less obvious but related potential inequity involves the distribution of burdens. That is, Who pays for transit and what are the equity implications of different funding sources? A complete examination of equity would thus involve analysis of both who pays and who benefits. This paper attempts to shed light on a portion of the former aspect of this issue, recognizing that it is only a piece of the total equity problem.

Recent legislation has changed the funding mechanism used to provide subsidies for public transit in the Chicago area. The essence of the change was that a 5 percent tax on motor fuel was eliminated; a general sales tax increase was substituted (1 percent in Cook County, 0.25 percent in the adjacent five counties). The main purpose of this change was apparently to generate more funds. In addition, an issue of geographic equity (the relationship between the funds raised and the funds expended in an area) was addressed. However, very little analysis has been undertaken to determine the income equity (who pays versus who benefits by income groups) of the funding switch.

The purpose of this paper is to explore the equity of two common sources of transit subsidies suggested by the Chicago Area Regional Transit Authority's funding switch from a sales tax to a motor fuel tax. A recent survey by the American Public Transit Association (APTA) (1) listed 24 regions that use a sales tax and 5 areas that obtain transit funds through a gasoline tax. It will be