U.S. DEPARTMENT OF TRANSPORTATION
OFFICE OF THE SECRETARY
AND
URBAN MASS TRANSPORTATION ADMINISTRATION
STATE-OF-THE-ART OVERVIEW
AUGUST 1974
FOREWORD

On March 16, 1972, the President sent a special message to Congress wherein he called "for a strong new effort to marshall science and technology in the work of strengthening our economy and improving the quality of our life." In this message he stated that in the final analysis, "the progress we seek requires a new partnership in science and technology—one which brings together the Federal Government, private enterprise, State and local governments, and our universities and research centers in a coordinated, cooperative effort to serve the national interest."

As part of its ongoing commitment to this principle of technology-sharing, the U.S. Department of Transportation has initiated a series of publications based on research and development efforts sponsored by the Department. The series comprises technical reports, state-of-the-art documents, newsletters and bulletins, manuals and handbooks, bibliographies, and other special publications. All share a primary objective: to contribute to a better base of knowledge and understanding throughout the transportation community, and, thereby, to an improvement in the basis for decision-making within the community.

This title in the series presents an overview of demand responsive transportation, an innovative approach that may help fill the need for flexibility in public transportation. The report is designed to make more accessible the body of knowledge that now constitutes the state-of-the-art in demand responsive transportation. A special feature is the inclusion of supplementary material to serve as a sourcebook for further information.
In developing this report the Technology Sharing Program Office of the Transportation Systems Center, Cambridge, Massachusetts, received extensive support, cooperation and information from the Office of the Secretary and the Urban Mass Transportation Administration. A special acknowledgment is made to the many State and local government transportation officials who participated in the process and made this document the product of a true Federal, State and local government partnership.
## CONTENTS

### FOREWORD, page i

### ACKNOWLEDGMENTS, page iii

### FIGURES, page vi

### I A PERSPECTIVE ON DEMAND RESPONSIVE TRANSPORTATION, page 1
- The Market Context of Demand Responsive Transportation, page 1
- The Concept of Demand Responsive Transportation, page 2
- The Role of Demand Responsive Transportation, page 4
- The Economics of Demand Responsive Transportation, page 6
  - Supply, page 6
  - Demand, page 7
  - Planning Guidelines, page 8

### II SUMMARY OF DEMAND RESPONSIVE TRANSPORTATION SERVICES IN NORTH AMERICA, page 11
- Inventory and Profile, page 11
- Characteristics of Selected Services, page 13
III IMPLEMENTATION OF DEMAND RESPONSIVE TRANSPORTATION, page 23

Decision-Making Aspects, page 23
   General, page 23
   Demand, page 28
   Institutional Aspects, page 30
   Operational Considerations, page 36
   Economic Considerations, page 37

Planning Considerations, page 39
   General, page 39
   Site Selection, page 40
   Special Transportation Needs, page 40
   Legal Analysis, page 42
   Project Initiation, page 45
   Management Responsibilities, page 45
   New Towns Applications, page 45

Operational Considerations, page 45
   Scheduling and Routing, page 45
   Communications, page 46
   Computer Applications, page 46
   Vehicles, page 46
   Marketing and Training, page 48
   Management Responsibilities, page 49

IV DEMAND RESPONSIVE TRANSPORTATION IN THE FUTURE, page 51

Demand Responsive Transportation Technology, page 51
Future Use of Demand Responsive Transportation Services, page 53
Future Research, page 54

SUPPLEMENTARY MATERIAL

APPENDIX A: Summary of Selected Characteristics of 80 Demand Responsive Services
APPENDIX B: References
APPENDIX C: Suggested Periodicals and Other Sources of Current Information
APPENDIX D: Directory of Consulting and Research Organizations
APPENDIX E: Directory of Governmental Units, Operating Agencies, and Transit Authorities
APPENDIX F: Directory of Vehicle Manufacturers
APPENDIX G: Urban Mass Transportation Act of 1964 Section 13(c)
APPENDIX H: Glossary
FIGURES

1. Chronology of 80 Demand Responsive Services, page 10
2. Summary Profile of 57 Demand Responsive Transportation Services in North America as of May 1, 1974, page 12
3. Selected Operating Characteristics of 24 Demand Responsive Transportation Services, page 14
4. Selected Demographic Characteristics of 15 Demand Responsive Service Areas in the United States, page 18
5. Demand Responsive Transportation Planning Flow Chart, page 24
7. 48 Demand Responsive Transportation Services Operating in 22 States, May 1, 1974, page 35
8. Top-Ranking Fare Levels in 50 Demand Responsive Transportation Services, page 37
9. Comparative Cost Per Revenue Hour In Regina, page 38
10. Major Capital Costs of Demand Responsive Transportation Services, page 39
11. Example of Site Selection Guidelines: Tampa Bay Study Criteria, page 42
12. Top-Ranking Vehicles Used in 18 Demand Responsive Transportation Services (Excluding Taxi Services), page 47
Given today's transportation technology and facilities, there are countless techniques and combinations of techniques that could improve the efficiency of existing facilities and equipment. They can reduce congestion with accompanying alleviation of environmental problems, improve transportation service, and reduce the need for capital expenditures on fixed transportation facilities. Many of these techniques require a reorientation in the manner in which transportation problems are approached and resolved. Problems need to be viewed first in terms of better service rather than increased capacity. This is not to imply that additional capacity will not be required. In many instances it will; but the requirements could be reduced. The current institutional setting prevents or makes extremely difficult, the implementation of many of these techniques, but the cost and social and environmental impacts of constructing additional transportation facilities make it imperative that greater consideration be given to approaches that more efficiently use the existing transportation facilities. Moreover, a number of these techniques increase the number and types of transportation services available to the public. This broadens the range of options available to individuals and increases the chance that the transportation services will better serve travel needs and requirements.

Most of the alternatives...have the attractive feature of flexibility. Transportation improvements can be made at minimum cost and the results need not be permanent. This is in contrast to construction facilities that are extremely costly, especially in built up urban areas, and that become essentially permanent features on the landscape. This quality of flexibility reduces the cost of mistakes and can encourage continuous experimentation and tailoring of transportation services to changing travel requirements.

The difficulties of implementing these alternatives should not be minimized. Institutional rigidity, established public attitudes and habits, and the interest of special groups must all be dealt with. Demonstrations must be tried to determine the full extent of the problems and effects of the various approaches, and to show whether they can work.

The potential payoffs in such approaches as well as the real possibility that soon these alternatives may be the only ones available to improve travel service require a major effort to encourage, promote, and implement them.

1972 NATIONAL TRANSPORTATION REPORT,
U.S. Department of Transportation
Chronology of Urban Transit

1819
HACKNEYS PARIS DILIGENCES

1827
HORSE DRAWN OMNIBUS

1832
HORSE DRAWN STREET RAILWAYS

1846
EXPERIMENTATION

1863
ELECTRIC STREET RAILWAYS

1868
SUBWAYS

1873
ELEVATED RAILWAYS

1876
CABLE STREET RAILWAYS

1893
SAN FRANCISCO REMAINING

ESCALATOR PATENT 1859

1867
PROPOSALS MOVING PAVEMENTS

1896
MOTOR BUS

FIRST OILWELL 1859

JITNEY 1914

1892

1896

1888 AUTOMOTIVE ENGINES

ELECTRIC INDUCTION MOTORS 1892

Source: N.D. Lea Transportation Research, Lea Transit Compendium, Vol 1 No. 1, 1974
A PERSPECTIVE ON DEMAND RESPONSIVE TRANSPORTATION

the market context of demand responsive transportation

IN RECENT YEARS attention has been focused on the need for adequate public transportation in a society increasingly dispersed and increasingly dependent on the private automobile. In an age of unparalleled personal mobility, large segments of the population are "transportation poor," including the elderly, the very young, the impoverished, the handicapped, and in some circumstances even the one-car family. At the same time pressures are increasing to constrain automobile traffic, reflecting growing environmental awareness and concern for the quality of urbanized life. The recent energy crisis and inflationary pressure on disposable income have given added impetus to a general movement among transportation planners and concerned citizens to provide an acceptable alternative to the automobile.

However, it is generally recognized that conventional public transportation suffers from major limitations. One form of public transportation, the private taxi,* does supply a high quality of service in terms of personalized, door-to-door transportation on demand,

*The taxicab is not regarded as a form of urban mass transit. It is, however, a public transit vehicle that plays an important role in moving people within urbanized areas. (Institute for Defense Analyses, Economics Characteristics of the Urban Public Transportation Industry, U.S. Department of Transportation, February 1972.)
but the fare is prohibitively high for many potential users. The alternative, mass transit -- scheduled rail or bus services -- is constrained by the economics of line-haul operations and cannot adequately serve the lower-density areas that now represent the bulk of the U.S. population. Service levels even in center-city areas have deteriorated as patronage has declined. Moreover, traditional transit systems were not designed to accommodate the aged, infirm or handicapped patron. Although some improvements may be implemented in this area, conventional transit cannot be expected to respond fully to specialized needs.

More specific deficiencies with respect to public transit service in lower-density areas reflect the lower volumes of traffic and the increased dispersion of origins and destinations. Thus the transit environment in many suburban areas has been characterized by:

- lack of any transit service at all in some areas
- infrequent and unreliable service
- inefficient utilization of vehicles
- inflexible routing
- poor connecting service
- slow speed and delays
- crowding and lack of comfort
- noise
- lack of scheduling information
- exposure to crime
- exposure to inclement weather

Efforts to supplant the automobile or to generally upgrade existing public transportation have produced a variety of transit innovations and service improvements ranging from aggressive marketing techniques to para-transit approaches such as carpooling, subscription bus services and jitneys. One of the most promising innovations is demand responsive transportation, the concept of flexibly-routed, personalized transportation available to serve individual demands.

**the concept of demand responsive transportation**

Demand responsive transportation denotes a range of public transportation services characterized by the flexible routing and scheduling of relatively small vehicles to provide shared-occupancy, door-to-door personalized transportation on demand and at modest fares. Demand responsive transportation thus represents a hybrid form of traditional bus and taxi service, combining the economic efficiencies of line-haul mass transportation with the point-to-point flexibility, convenience, and security of private taxis.

Shared-taxi services operating door-to-door qualify as demand responsive transportation. Indeed, at least two successful taxi-based demand responsive transportation
services presently operate in the United States, and the taxi industry has recently indicated strong interest in participating in the development of demand responsive transportation. However, most demand responsive transportation services to date have been implemented by public transit organizations to supplement or replace existing transit services.

The basic operation of a demand responsive transportation service involves dispatching a vehicle in response to a telephoned request for service to carry the patron to his destination, while simultaneously accommodating in the vehicle other patrons whose requests for service are compatible in terms of both time and geography. The actual number of intermediate stops made between the origin and destination of a particular passenger will vary with the pattern of demand responsive transportation service offered, the time of day, the capacity of the vehicle, the level of service offered, as measured in terms of waiting time and travel time for passengers, and other parameters of a particular service.

The patron’s request for service may be made just before the trip is to be made, or in advance. A particularly important case of advance request is subscription service provided to patrons who wish to utilize the service on a daily or other regular basis.

The basic elements of a demand responsive transportation service are thus: a fleet of vehicles, a means of communication between the patron and the service, a means of communication between the service and the vehicle drivers, and a control center to receive requests for service and schedule and dispatch vehicles. Around these basic elements, the concept of demand responsive transportation service lends itself to a variety of configurations in terms of organizational character, degree of automation, equipment, work force, service patterns, size of service area, and market role.

There are two kinds of demand responsive transportation service. The first, route deviation, is a limited form, in which a vehicle will deviate from a regular fixed route to pick up or discharge a passenger at a requested location, typically within several blocks of the main route. The more common kind is known as “pure” demand-responsive service, wherein the routing and scheduling of vehicles depends entirely on the particular requests of patrons. Three variants of the pure form may be employed as a basic service pattern:

- **Many-to-one**—providing transport from several origins to a common destination, such as a shopping center or bus terminal.
- **Many-to-few**—providing transport from multiple origins to a few destinations, such as major activity centers or points on a downtown loop.
- **Many-to-many**—providing transport between any origin-destination pair in the service area without limitation.

These service patterns may be used alone, in reverse, or in combination throughout a
Demand responsive transportation is too new a transportation concept to have been institutionalized. Although it is easy to identify the market roles it serves on the spectrum between fixed-route and taxi services, it is not so easy to characterize its institutional role. As a hybrid, demand responsive transportation partakes of both transit and taxi features, in terms of operations, technology, and economics. As a member of a regulated industry, it is subject to constraints on innovation generally that may strongly influence the implementation and integration of demand responsive transportation services in particular jurisdictions. Some of the considerations and developments with respect to institutional issues are discussed in Chapter III. At this point it seems fair to observe that the outlook for achieving the full potential of demand responsive transportation services is most favorable when undertaken by a public authority or agency.

Demand responsive transportation services can perform a variety of important roles with respect to improving the level of existing transportation services available to a community, such as:

- Feeder service to line-haul transit—the collection and distribution functions to provide door-to-door service for commuters and other transit patrons cannot be performed efficiently in traditional transit operations. By using demand responsive transportation to improve the overall level of service available to transit patrons, additional demand is generated for line-haul operations.
- Replacement service for conventional buses in low-density areas or at periods of low demand—demand responsive transportation provides a higher-quality service for areas or times, such as weekends and evenings, that cannot economically support traditional bus service.
- Route rationalization—demand responsive transportation is used to identify appropriate placement and revisions of fixed route service.
- Specialized service for the handicapped and elderly—demand responsive transportation vehicles can be designed to accommodate wheelchairs or other special equipment for the infirm or handicapped. Many elderly persons cannot negotiate the steps or long walking distances involved in using traditional transit, cannot afford the expense of taxi fares, and do not have an automobile available. Demand responsive transportation can be tailored to their needs.
- Substitute for or alternative to private automobile—even for the relatively affluent, demand responsive transportation can provide an appealing alternative to driving or riding in a private auto for such trip purposes as shopping, chauffeuring children, attending meetings, and commuting to work.
responsive transportation adapts well to non-radial and offpeak suburban trips that are not served adequately by traditional transit, and can offer the convenience of subscription service.

Other specialized segments of the transportation market that have been served by demand responsive transportation include:

-- parcel delivery
-- airport shuttle service
-- delivery of mail from post office boxes to business firms and local institutions
-- transfer of business data among branch banks
-- transportation of blood and other hospital supplies
-- shopping services sponsored by retailers
-- transportation of children to school
-- transportation of tavern patrons home.

Demand responsive transportation can also contribute to meeting national transportation goals. In his message to Congress in May 1973 on implementing national transportation policy, the Secretary of Transportation emphasized two important goals: first, to exploit low-capital-intensive opportunities to improve the service and capacity of existing resources; and second, to limit the harmful side effects of transportation, such as environmental damage. Demand responsive transportation services can help achieve both these goals.

- Demand responsive transportation is labor-intensive, rather than capital-intensive. The turnkey cost of a small demand responsive transportation service can be kept under $100,000, with opportunities to reduce initial costs by leasing the hardware components and contracting for labor.
- Demand responsive transportation utilizes the existing highway network and therefore requires no investment in expensive rights-of-way.
- Demand responsive transportation can serve to improve the utilization of existing transit services and facilities either directly by providing feeder service, or indirectly by identifying more appropriate routes or markets for fixed-route scheduled services. It can also offer employment to transit labor that would otherwise be underutilized.
- Demand responsive transportation utilizes existing technology. The components of a manual demand responsive transportation service are readily available, and the technology to support advanced automated, integrated operations is being developed.
- Environmental damage can be minimized by deploying aesthetically-appealing vehicles that meet higher standards of quiet, pollution-free operation than are typical of traditional buses or taxis. Conservation of energy resources could also
Comparative Passenger Costs

The economic viability of a demand responsive transportation service is determined by the supply characteristics of the service and the demand characteristics of the market area in which a service* is implemented. Generally, these factors interact to produce a steady level of ridership that is reasonably predictable for purposes of day-to-day operations and for analysis of longer-term potential. A pattern of normal variations by hour, day, or season will emerge, based on local conditions. The overall ridership of a service may increase over time, as the service is tailored to suit its particular market or may change in response to changes in the supply or demand variables. The object is to achieve a position that justifies operation of a demand responsive transportation service, ultimately in terms of financial performance. (Satisfactory financial performance does not necessarily imply a net operating profit, but includes providing services at an acceptable level of subsidy. It can also refer to the economic contribution of a service to the improved performance of another transportation service such as a line-haul transit system. These are matters for local decision.)

Characteristics of supply and demand that are necessary to achieve a viable service that is appropriate to local objectives have not been fully identified. For example, the sensitivity of demand to fare levels has not been established. (In one case, the reduction in demand predicted to result from a fare increase failed to materialize.) However, some insights have been gained from experience. These are noted in the following discussion of supply and demand factors.

SUPPLY. Demand responsive transportation is a labor-intensive enterprise. The overhead expense of the control center and driver wages represent the major portion of operating costs, and they are essentially fixed. They vary primarily with hours of operation, whether or not revenue is being generated. Thus, the economic object of the operator is to maximize the revenue-generating capacity of each vehicle, within the constraints of the service objectives. To do this, the operator may select or manipulate the key variables of a demand responsive transportation service: the size of the service area, the number and type of vehicles, the fare structure, hours of operation, operating patterns, and special services. The operator can determine the overall “level of service” for the demand responsive transportation service. Level of service is expressed in terms of wait times and travel times incurred by a patron. As a rule of thumb, it is considered necessary to maintain the level of service such that the ratio of waiting plus travel time for a demand responsive trip to the time required to make the same trip by private automobile does not

---

*“Service” is used to denote an operating entity that provides demand responsive transportation.
Higher ratios would presumably deter potential patronage, except where the ratio represents short periods of time in absolute terms (e.g., a ratio of 5.0 might be derived from absolute values of 10 minutes and 2 minutes respectively.) The level of service measure is not entirely satisfactory because it incorporates waiting time. Surveys have shown that patrons waiting at home are more concerned with an accurate estimation of the arrival time than with the length of time spent waiting for the vehicle.

The key indicator of economic performance is vehicle productivity—the degree to which the fleet generates revenue—measured in terms of the number of trips or requests per vehicle per hour. An individual vehicle must be deployed efficiently so as to minimize mileage and time spent in picking up and transporting passengers; the fleet must be deployed efficiently so that a given fleet can accommodate as many requests for service as possible. However, there are important tradeoffs. The level of service decreases as productivity increases, so that at some point demand may be affected. Conversely, increasing the number of vehicles in an area increases the quality of service, but the marginal cost may not be offset by marginal revenue.

Experience has shown that vehicle productivity in the many-to-many mode generally averages 7.0. This may or may not be sufficient to cover driver costs, depending on local wage rates and the fare level. Maximum achievable productivity to date is from 15 to 20, however, Regina has shown a productivity significantly higher with subscription service. Below a minimum level of productivity, there is no advantage over conventional taxi service. The maximum level sets an upper limit on financial performance for a given fare level, since it represents the maximum number of fares that can be collected.

Productivity varies with the type of service and vehicle supplied: many-to-many is typically associated with lower productivity than many-to-one or many-to-few. The maximum potential productivity of taxis is inherently lower than that of buses, although this is offset by the lower capital and operating costs. In addition, productivity will vary with such operating parameters as average length of trip.

**DEMAND.** As noted in a MITRE report (Reference 59): "The size of the market for a demand responsive system cannot be directly manipulated by the operator. By varying such service characteristics as fleet size, fare, service area, and hours of operation, the operator can create conditions that will stimulate demand for service. However, there also exist a number of factors that he cannot vary and that will strongly influence the magnitude and nature of demand. Any operator must take these factors into account and structure his service to account for them in order to maximize ridership."

*Haddonfield and New Jersey D.O.T. use 2.5.*
These factors are: (1) the origin and destination of trips made by the service area population; (2) quality of service available via alternative modes, including private automobiles; (3) user characteristics, such as age.

The limited demographic data available on users of demand responsive services indicates a disproportionate number of elderly and female users, although this may reflect largely the market sought by particular services. Demographic data may be particularly useful in considering latent demand. A Haddonfield survey showed that 12 percent of the trips made on Dial-A-Ride would not have been made if the service did not exist. A similar survey in Ann Arbor showed a 20 percent latent demand.

As important as the gross volume of demand, is the distribution of demand, in terms of spatial and temporal characteristics. The spatial distribution is expressed as demand density, i.e., the number of demands per square mile; the temporal distribution is the number of demands per hour, and is typically calculated for both peak hour and average daily demand. The more concentrated the demand, the more likely that satisfactory vehicle productivity can be achieved. Criteria for demand distribution have not been conclusively established for the various configurations of demand responsive service, although it is intuitively apparent that taxi-based services can be viable at lower concentrations of demand. Both taxi- and transit-type services are well-advised to exploit any opportunity for subscription services. These are efficient both in terms of vehicle productivity and in terms of control center efficiency, since subscription tours can be pre-planned at off-peak periods.

PLANNING GUIDELINES. A recent MITRE report (reference 59) has developed planning guidelines based on a very small sample for use by planners designing demand responsive transportation services. The facing illustration has been excerpted from this document and should not be used apart from the supporting materials contained in the report. These guidelines are presented only as an illustration of the types of relationships to be developed by a more complete study and identify important economic relationships. The Transportation Systems Center is in the process of identifying these relationships for the 80 services listed in Appendix A.
EXAMPLE OF PLANNING GUIDELINES*

*Note. These graphs are only examples of the types of tools available to the planner and should not be used without the supporting materials of the total reference document.

Source: Reference 59
### Figure 1. Chronology of 80 Demand Responsive Services

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Month</th>
<th>Services Initiated In</th>
<th>Month</th>
<th>Services Terminated In</th>
</tr>
</thead>
<tbody>
<tr>
<td>1916</td>
<td>Atlantic City, NJ*</td>
<td>Sept</td>
<td>Ann Arbor, MI (E)</td>
<td>Feb</td>
<td>Davis, CA</td>
</tr>
<tr>
<td>1946</td>
<td>Little Rock, AK (E)</td>
<td>Apr</td>
<td>Regina, Saskatchewan</td>
<td>May</td>
<td>La Mirada, CA</td>
</tr>
<tr>
<td>1958</td>
<td>Ft. Leonard Wood, MO</td>
<td>Oct</td>
<td>Batavia, NY</td>
<td>June</td>
<td>Helena, MT (E)</td>
</tr>
<tr>
<td>1961</td>
<td>Hicksville, NY (E)</td>
<td>Nov</td>
<td>Columbus, OH (E)</td>
<td>July</td>
<td>Grand Rapids, MI (E)</td>
</tr>
<tr>
<td>1964</td>
<td>Peoria, IL (T)</td>
<td>Aug</td>
<td>Bramalea, Ontario</td>
<td>Aug</td>
<td>Ottawa, Ontario</td>
</tr>
<tr>
<td>1968</td>
<td>Reston, VA</td>
<td>Jan</td>
<td>Bramalea, Ontario</td>
<td>Feb</td>
<td>Alpena, MI</td>
</tr>
<tr>
<td>1969</td>
<td>Flint, MI (T)</td>
<td>Mar</td>
<td>Windsor, Ontario</td>
<td>May</td>
<td>Rockford, IL</td>
</tr>
<tr>
<td>1970</td>
<td>Mansfield, OH (T)</td>
<td>Oct</td>
<td>Klamath Falls, OR (T)</td>
<td>Aug</td>
<td>Portland, OR</td>
</tr>
<tr>
<td>1971</td>
<td>Kent, OH</td>
<td>Jan</td>
<td>Kent, OH</td>
<td>May</td>
<td>Traverse City, MI</td>
</tr>
<tr>
<td>1972</td>
<td>Kingston, Ontario</td>
<td>Oct</td>
<td>Bramalea, Ontario</td>
<td>Jan</td>
<td>Dover, DL</td>
</tr>
<tr>
<td>1973</td>
<td>Lower Naugatuck Valley, CT</td>
<td>May</td>
<td>Luddington, MI</td>
<td>Nov</td>
<td>Bensenville, IL</td>
</tr>
<tr>
<td>1974</td>
<td>Scott-Carver Counties, MN</td>
<td>Apr</td>
<td>Traverse City, MI</td>
<td>Jan</td>
<td>Iowa City, IA</td>
</tr>
</tbody>
</table>

*Information on other jitney services in the United States was not available for this report.

Source: APPENDIX A
II SUMMARY OF DEMAND RESPONSIVE TRANSPORTATION SERVICES IN NORTH AMERICA

A CHRONOLOGICAL LISTING of demand responsive transportation services appears as Figure 1. Although the forerunner of demand responsive transportation type service in the United States originated in 1910 with touring-car jitneys, the concept as applied to transit service was not implemented until 1964. Since that time demand responsive transportation has been developed to a point where the goal of providing services fully integrated with other community and regional transportation is now being pursued. As of May 1, 1974, there are 57 demand responsive transportation services in the U.S. and Canada known to be operating.*

Information on 80 demand responsive transportation services is presented in Appendix A. In addition to the 57 North American operations, these include 2 in Europe, 1 in South America, 6 U.S. services now terminated, 13 new services in the U.S. and 1 new service in Canada. They represent 2 jitney services, 9 taxi-based operations and 69 bus-based operations.

*This inventory does not purport to be exhaustive but represents all services identified in the course of reviewing the literature on demand responsive transportation. Many small-scale services are believed to be operating at the local level, generally limited to transportation of the elderly or handicapped. The Transportation Systems Center is planning to survey such services early in fiscal 1975.
Figure 2. Summary Profile of 57 Demand Responsive Transportation Services in North America as of May 1, 1974

a) Number of Services
- Presently Operating 57
  U.S. 48
  Canada 9
- Terminated (U.S.) 6
- Expanded
  U.S. 16
  Canada 3
- Planned New Services (U.S.) 11
- Planned Expansion (U.S.) 1 (1974)

b) Service Patterns of Presently Operated Services
- Many-to-many only 35
- Many-to-one only 3
- Many-to-few only 5
- Many-to-many and many-to-one 7
- Many-to-many and many-to-few 1
- Other 6

57

Source: APPENDIX A
A summary profile of the 57 services in the United States and Canada is presented in Figure 2. The profile of operating services may be summarized as follows:

- **Service Patterns**: most offer many-to-many, although a few services offer either many-to-one or many-to-few only. Some operators employ a combination of service patterns, depending on the characteristics of the market being served.

- **Vehicle Fleet**: at present, most demand responsive services are extremely small-scale. Eighty percent of the demand responsive transportation services involve fewer than 14 vehicles. This is not surprising in view of the historical development of demand responsive transportation through local initiatives, but does suggest the difficulties as well as the opportunities inherent in expanding the number and scale of operations.

- **Fare Structure**: seven services are provided at no charge to their customers, including the Detroit Model Cities and the Davis, California senior citizen service. The senior citizen service in the Cleveland Model Cities area accepts donations for service (not shown on graph). Cash fares range from the most expensive, taxi-based fares of over $1.00 down to 10 cents for route deviation and jitney services. The single most popular fare is 50 cents (13 services). More than 50 percent of the services charge between 35 and 60 cents. Many services offer discounts for senior citizens, multiple trips, and group tickets.

---

### Characteristics of Selected Services

Data on operating characteristics of demand responsive transportation services and the demographics of demand responsive transportation service areas are limited. Figure 3 tabulates the operating characteristics of 15 American and 9 Canadian demand responsive transportation services for which data were available*. On the basis of the information in Figure 3 and Appendix A, characteristics of the 24 services may be summarized as follows:

- **Service Objectives**: varied widely from supplying first transit service in the area (Bramalea) to maximizing profit (Hicksville shared-taxi). Twelve services were attempting to improve transportation, and 8 services set out to evaluate or measure various demand responsive transportation parameters.

---

*Ann Arbor, Michigan; Batavia, New York; Bay Ridges, Ontario; Bramalea, Ontario; Buffalo, New York; Columbia, Maryland; Columbus, Ohio; Davenport, Iowa; Detroit, Michigan; Ft. Walton Beach, Florida; Grand Rapids, Michigan; Haddonfield, New Jersey; Hicksville, New York; Kingston, Ontario; La Habra, California; La Mirada, California; Little Rock, Arkansas; Lower Navagatuck River Valley, Connecticut; Mansfield, Ohio; Metropolitan Toronto, Ontario; Ottawa, Ontario; Regina, Saskatchewan; Rochester, New York; and Stratford, Ontario.

**Note**: Not all summaries are the result of all services reporting data. When less than the full 24 services reported data the number of the sample is indicated.
### Figure 3. Selected Operating Characteristics of 24 Demand Responsive Transportation Services

<table>
<thead>
<tr>
<th>City and State</th>
<th>Date</th>
<th>Objectives of Service</th>
<th>Route Selection Method</th>
<th>Population Density (Per Sq. Mi.)</th>
<th>Seats Per Vehicle (Vehicles)</th>
<th>Veh. Per Sq. Mi.</th>
<th>Average Vehicle Productivity (Trips/Hr./Veh.)</th>
<th>Number of Employees (Eqv. Full Time)</th>
<th>Wage Scale</th>
<th>Hours of Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ann Arbor, Michigan (5/74)</td>
<td>5/74</td>
<td>Test: Evaluate market response. Improve transportation for dependent groups. Test dynamic dispatching. Continuation and expansion: To provide a high quality of public transit for all.</td>
<td>Manual – Route radioed to driver at start of tour.</td>
<td>7,100</td>
<td>10(3)</td>
<td>1.25 to 1.8</td>
<td>8.0-8.5 (winter 1974)</td>
<td>10 disp, 80 drivers, 13 admin. Includes those for scheduled buses.</td>
<td>Dispatcher: $5.69/hr, Driver: $5.50/hr, including benefits</td>
<td>Weekday: 6:30 am–11:00 pm, Saturday &amp; Sunday: 8:00 am–6:00 pm</td>
</tr>
<tr>
<td>Batavia, New York (5/74)</td>
<td>5/74</td>
<td>Reduce dependence on auto. Provide complete service to all.</td>
<td>Manual route selection. Digital communications tested. Radio to driver.</td>
<td>3,300</td>
<td>19(4)</td>
<td>1.4</td>
<td>14 subsc. 9 MTM</td>
<td>1 call taker, 1 dispatcher</td>
<td>Drivers: $3.50 plus fringe benefits</td>
<td>6:00 am–6:00 pm Mon–Fri.</td>
</tr>
<tr>
<td>Bay Ridges, Ontario (6/74)</td>
<td>6/74</td>
<td>Measure service characteristics of feeder bus service in residential community.</td>
<td>Manual route selection. Route radioed to driver.</td>
<td>10,100</td>
<td>17(3)</td>
<td>12(5)</td>
<td>11(6)</td>
<td>4.5</td>
<td>10.8 total 4.0–6.0 MTM</td>
<td>3 dispatchers</td>
</tr>
<tr>
<td>Bramalea, Ontario (3/74)</td>
<td>3/74</td>
<td>First transit service in area.</td>
<td>Manual route selection.</td>
<td>5,250</td>
<td>17(3)</td>
<td>20(2)</td>
<td>24(4)</td>
<td>1.2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Buffalo, New York (4/74)</td>
<td>4/74</td>
<td>Provide mobility and decrease isolation of blind, elderly and handicapped in Model Cities Area.</td>
<td>Manual route selection. 1-day advanced notice required.</td>
<td>2,200</td>
<td>11</td>
<td>2.3</td>
<td>–</td>
<td>1 dispatcher, 1 secretary, 3 admin. persons</td>
<td>Dispatcher: $6.00/hr, Driver: $6.50/hr.</td>
<td>7:00 am–12:00 pm</td>
</tr>
<tr>
<td>Columbus, Maryland (6/74)</td>
<td>6/74</td>
<td>Provide transit service to developing community.</td>
<td>Manual pick up addresses radioed to driver (evening only). Morning service prescheduled only.</td>
<td>3,400</td>
<td>10(3)</td>
<td>19(2)</td>
<td>23(5)</td>
<td>1.3</td>
<td>0.4</td>
<td>4.10</td>
</tr>
<tr>
<td>Columbus, Ohio (5/72)</td>
<td>5/72</td>
<td>Provide mobility to Model Cities Area residents. Provide safe and convenient night transportation.</td>
<td>Manual-pick up addresses radioed to driver.</td>
<td>14,800</td>
<td>19</td>
<td>1.6</td>
<td>7.7</td>
<td>1 call taker, 1 dispatcher</td>
<td>Drivers: $6.24/hr.</td>
<td>Weekday: 6:00 am–10:00 pm, Saturday: 8:00 am–8:00 pm, Sunday: 8:00 am–1:30 pm</td>
</tr>
</tbody>
</table>

(Valid Tuesday, October 14, 2020)
<table>
<thead>
<tr>
<th>City and State (date)</th>
<th>Objectives of Service</th>
<th>Route Selection Method</th>
<th>Population Density (Per/ Sq. Mi.)</th>
<th>Seats Per Vehicle (Vehicles)</th>
<th>Veh. Per Sq. Mi.</th>
<th>Average Vehicle Productivity (Trips/Hr./Veh.)</th>
<th>Number of Employees (Equiv. Full Time)</th>
<th>Wage Scale</th>
<th>Hours of Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davenport, Iowa (5/74)</td>
<td>Provide low cost transportation to growing market area.</td>
<td>Computer assisted manual dispatch. Now manual — they outgrow the computer! Calls radioed to driver.</td>
<td>5,000</td>
<td>6(20)</td>
<td>1.0</td>
<td>3.55</td>
<td>4 Dispatchers</td>
<td>Drivers-$4.00/hr. Drivers can lease veh., or $2.50/hr. mini lease $240/wk (maxi-lease)</td>
<td>24 hours/day</td>
</tr>
<tr>
<td>Detroit, Michigan (6/74)</td>
<td>Eliminate mobility barriers for Model City residents.</td>
<td>Manual route selection.</td>
<td>13,300</td>
<td>9(10)</td>
<td>17</td>
<td>6.1 weekday 7.5 Saturday 5.1 Sundays</td>
<td>3 call takers 1 dispatcher 14 drivers 3 offices</td>
<td>$550/mo. and up, Some volunteers</td>
<td>7:00 am–11:00 pm Mon-Sat Emergency Service after 11:00 pm</td>
</tr>
<tr>
<td>Ft. Walton Beach, Florida (8/72)</td>
<td>—</td>
<td>Manual-pick up addresses radioed to driver.</td>
<td>1,700</td>
<td>17</td>
<td>0.3 First Bus Only 24.2</td>
<td>—</td>
<td>1 dispatcher 1 office 6 drivers</td>
<td>—</td>
<td>6:00 am–6:00 am Mon-Sat</td>
</tr>
<tr>
<td>Grand Rapids, Michigan (8/73)</td>
<td>Provide transit to needy for work, personal, business, social.</td>
<td>Manual-pick up addresses radioed to driver.</td>
<td>—</td>
<td>17</td>
<td>5.5 avg. 8.0 max.</td>
<td>—</td>
<td>1 call taker 1 dispatcher</td>
<td>Service contracted to local bus company</td>
<td>8:00 am–1:00 am 7 days/week</td>
</tr>
<tr>
<td>Haddonfield, New Jersey (5/74)</td>
<td>Determine public attitude and acceptability of DRT. Determine economic feasibility. Test computer.</td>
<td>Manual-pick up addresses radioed to driver. Computer dispatching being implemented.</td>
<td>3,700</td>
<td>17(12)</td>
<td>1 wheel-chair</td>
<td>6.1 weekday 7.5 Saturday 5.1 Sundays</td>
<td>10 control centers 36 drivers</td>
<td>Dispatcher: $3.40/hr. + fringe benefits Driver: $5.67/hr. + benefits</td>
<td>24 hours/day</td>
</tr>
<tr>
<td>Hicksville, New York (1/74)</td>
<td>Maximize profit.</td>
<td>Manual-pick up addresses radioed to driver.</td>
<td>7,100</td>
<td>5</td>
<td>4.4</td>
<td>2.12</td>
<td>—</td>
<td>Drivers lease the vehicle</td>
<td>24 hours/day</td>
</tr>
<tr>
<td>Kingston, Ontario (3/74)</td>
<td>Improve evening transit service. Reduce evening transit deficits.</td>
<td>Manual route selection.</td>
<td>3,300</td>
<td>31(3)</td>
<td>0.6</td>
<td>12.7</td>
<td>—</td>
<td>—</td>
<td>6:30 pm–11:30 pm Mon-Sat</td>
</tr>
<tr>
<td>La Habra, California (5/74)</td>
<td>Evaluate acceptability of DRT as primary source of local transit service.</td>
<td>Manual-pick up addresses radioed to driver.</td>
<td>6,700</td>
<td>19(6) 4(1)</td>
<td>1.0</td>
<td>6–7</td>
<td>3 Controllers 6 drivers</td>
<td>Drivers- $3.12 plus fringe benefits</td>
<td>7:00 am–7:00 pm Mon-Sat</td>
</tr>
<tr>
<td>La Mirada, California (6/74)</td>
<td>Determine how well DRT would serve community transit needs.</td>
<td>Manual route selection. Radio to driver.</td>
<td>5,300</td>
<td>18(3) 14(3)</td>
<td>1</td>
<td>—</td>
<td>2 controllers 10 drivers</td>
<td>Dispatcher: $3.50 + benefits Driver: $3.00 + benefits</td>
<td>M-Sat. 7:00 am–7:00 pm</td>
</tr>
</tbody>
</table>

*School/buses are used for charter operations.*
<table>
<thead>
<tr>
<th>City and State (date)</th>
<th>Objectives of Service</th>
<th>Route Selection Method</th>
<th>Population Density (Per Sq. Ml.)</th>
<th>Seats Per Vehicle (Vehicles)</th>
<th>Veh. Per Sq. Ml.</th>
<th>Average Vehicle Productivity (Trips/Hr./Veh.)</th>
<th>Number of Employees</th>
<th>Wage Scale</th>
<th>Hours of Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Rock, Arkansas (4/74)</td>
<td>Manual-pick up addresses radioed to driver.</td>
<td>2,500</td>
<td>5</td>
<td>1.4</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>24 hours/ day</td>
<td></td>
</tr>
<tr>
<td>Lower Naugatuck River Valley, Connecticut (5/74)</td>
<td>Develop methods to encourage transit usage to health and social services. Evaluate fares and use of credit cards.</td>
<td>Manual-pick up addresses radioed to driver.</td>
<td>40 registered persons per sq. mi.</td>
<td>16 in wheelchair vehicles</td>
<td>0.1</td>
<td>3 MTM plus subscription</td>
<td>2 call takers 1 dispatcher 3 offices 10 drivers</td>
<td>Drivers $3.00-$3.25/hr. plus fringe benefits</td>
<td>6:00 am- 6:00 pm 5 days/ week</td>
</tr>
<tr>
<td>Mansfield, Ohio (8/70)</td>
<td>Test public reaction. Determine if DRT generates more revenue. Test driver as dispatcher.</td>
<td>Driver called directly. Driver selects route.</td>
<td>3,150</td>
<td>14</td>
<td>1.0</td>
<td>6.9 all trips</td>
<td>1 driver</td>
<td>$2.25/hr.</td>
<td>7:15 am- 6:15 pm Mon-Sat</td>
</tr>
<tr>
<td>Metropolitan Toronto (3/74)</td>
<td>Evaluate DRT as peak and off-peak mode. Measure impact on trip making. Fare and service experiments. Test computer dispatching.</td>
<td>Computer assisted manual dispatch. Digital communication planned.</td>
<td>—</td>
<td>17 (14)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Mon-Fri: 6:30-10:30 Sat: 9:30-6:30</td>
</tr>
<tr>
<td>Ottawa, Ontario (3/74)</td>
<td>Service low density suburban fringe areas.</td>
<td>3 control centers</td>
<td>5,250</td>
<td>23 (5)</td>
<td>22 (12)</td>
<td>3.3</td>
<td>—</td>
<td>—</td>
<td>$4.67 + fringes</td>
</tr>
<tr>
<td>Regina, Saskatchewan (5/74)</td>
<td>Reduce transit deficit. Provide viable alternatives to automobile. Reduce traffic congestion.</td>
<td>Manual-pick up addresses radioed to driver.</td>
<td>5,000</td>
<td>14 (6)</td>
<td>22 (4)</td>
<td>42 (7)</td>
<td>2.2</td>
<td>18.8</td>
<td>2 dispatchers &amp; 2 call takers in peak</td>
</tr>
<tr>
<td>Rochester, New York (5/74)</td>
<td>Increase and improve service in areas where little or no service existed before. To reduce costs, by improving utilization of manpower and equipment.</td>
<td>Manual-digital communication to driver.</td>
<td>4,500</td>
<td>23</td>
<td>0.7</td>
<td>10 Sub-DRT 6 Avg.</td>
<td>2 call takers 1 dispatcher 1 office</td>
<td>Drivers $6.50-$7.00/hr. plus fringe benefits</td>
<td>6:00 am- 9:00 am Sub. 3:00 pm- 6:00 pm bus 8:00 am 4:00 pm MTM Mon-Fri</td>
</tr>
<tr>
<td>Stratford, Ontario (3/74)</td>
<td>Replace evening fixed route service with DRT.</td>
<td>Manual route selection.</td>
<td>5,050</td>
<td>31 (1)</td>
<td>39 (5)</td>
<td>0.7</td>
<td>11.3</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Source: APPENDIX A
- **Service Patterns**: three route deviation, 10 many-to-many, 6 many-to-one, and 2 many-to-few. Many-to-one are primarily transit feeder operations; some serve shopping centers or schools. Hours of operation varied widely.

- **Routing Method**: manually selected and radioed to operator at beginning of tour. Computer-assisted manual dispatch is used in Regina and Toronto and was used in Davenport. Haddonfield and Rochester are implementing fully automated systems. Batavia, Toronto and Rochester have tested digital communications.

- **Funding**: Of 22 services, 9 obtained federal funds; 4, state; 12, local; and 6 used private resources. All of the reporting services are incurring net operating losses except the 3 taxi-based systems and Batavia. These 22 services may receive funding from more than one source.

- **Service Areas**: varied from 1.34 square miles (Bay Ridges) to over 50 square miles (Little Rock). Population ranged from 14,000 (Ann Arbor test area) to over 130,000 (Toronto, Little Rock).

- **Activity Centers**: schools, shopping centers, hospitals, commuter rail stations, senior citizens housing, nursing homes, business areas, hotels and motels, and fixed route bus stops.

- **Competing Service Available**: More than half (13) of the 24 services had at least one competing service (i.e., taxi, school bus, transit buses, and special service transportation) and some had more than one.

- **Demand**: The number of (one-way) trips per day ranged from 76 (Mansfield) to 2000 (Regina). Demand density was reported for 14 services and varied from 2.75 (Davenport) to 22.4 (Bay Ridges). The ratio of peak demands to daily demand ranged from 1.3 to 3.5 (5 services reporting). Average vehicle productivity was 7.1 trips per hour for the 16 services reporting this data.

Figure 4 tabulates demographic data based on the 1970 U.S. Census for the service areas of the 15 United States services. Although no extensive analysis was undertaken, the following observations indicate the wide range of areas in which demand responsive transportation has been implemented. (Data refer to the service area population, not to ridership on the demand responsive service.)

- **Population by age**: relatively homogeneous, at 9% pre-school, 30% age 5-19, 52% age 20-64, and 9% over 64, although proportion of elderly (over 64) ranged from 2.7% (La Mirada) to 15.6% (Detroit).

- **Means of transportation to work**: more than 75% of the work force used an auto to travel to work, either as a driver or as a passenger. The remaining 24% was divided evenly between public transit users and all other means.

- **Unemployment rate**: ranged from 1.8% (Haddonfield) to 12.4% (Grand Rapids). Excluding 4 Model Cities areas, the average rate was 3.3%.
Figure 4. Selected Demographic Characteristics of 15 Demand Responsive Service Areas in the United States

<table>
<thead>
<tr>
<th>SERVICE AREA</th>
<th>POPULATION AGE GROUPS (%)</th>
<th>NUMBER OF WORKERS</th>
<th>MEANS OF TRANSPORTATION TO WORK %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;5</td>
<td>5-19</td>
<td>20-64</td>
</tr>
<tr>
<td>ANN ARBOR MI TEST AREA</td>
<td>8.0</td>
<td>23.5</td>
<td>60.6</td>
</tr>
<tr>
<td>BATAVIA NY</td>
<td>8.6</td>
<td>27.0</td>
<td>51.9</td>
</tr>
<tr>
<td>BUFFALO NY</td>
<td>10.7</td>
<td>35.1</td>
<td>45.1</td>
</tr>
<tr>
<td>COLUMBIA MD</td>
<td>15.6</td>
<td>30.6</td>
<td>51.2</td>
</tr>
<tr>
<td>COLUMBUS OH</td>
<td>9.0</td>
<td>28.8</td>
<td>48.3</td>
</tr>
<tr>
<td>DAVENPORT IA</td>
<td>9.8</td>
<td>26.4</td>
<td>52.8</td>
</tr>
<tr>
<td>DETROIT MI</td>
<td>8.3</td>
<td>22.9</td>
<td>52.9</td>
</tr>
<tr>
<td>GRAND RAPIDS MI</td>
<td>13.7</td>
<td>33.3</td>
<td>45.0</td>
</tr>
<tr>
<td>HADDONFIELD NJ</td>
<td>7.3</td>
<td>30.7</td>
<td>53.2</td>
</tr>
<tr>
<td>HICKSVILLE NY</td>
<td>6.4</td>
<td>54.5</td>
<td>55.6</td>
</tr>
<tr>
<td>LA HABRA CA</td>
<td>8.5</td>
<td>33.3</td>
<td>52.1</td>
</tr>
<tr>
<td>LA MIRADA CA</td>
<td>7.0</td>
<td>38.7</td>
<td>51.6</td>
</tr>
<tr>
<td>LITTLE ROCK AK</td>
<td>7.8</td>
<td>26.6</td>
<td>55.2</td>
</tr>
<tr>
<td>LOWER NAUGA TUCK VALLEY CT</td>
<td>8.7</td>
<td>28.3</td>
<td>54.3</td>
</tr>
<tr>
<td>ROCHESTER NY</td>
<td>8.8</td>
<td>27.9</td>
<td>55.3</td>
</tr>
<tr>
<td>AVERAGES</td>
<td>9.1</td>
<td>29.8</td>
<td>52.1</td>
</tr>
</tbody>
</table>

Service Limited to Model Cities Residents. Service Limited to Credit Card Holders.
Figure 4. Selected Demographic Characteristics of 15 Demand Responsive Service Areas in the United States (Cont.)

<table>
<thead>
<tr>
<th>SERVICE AREA</th>
<th>EMPLOYMENT</th>
<th>INCOME GROUPS (%)</th>
<th>AUTOMOBILES AVAILABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TOTAL CIVIL LABOR FORCE</td>
<td>UNEMPLOYMENT PERCENTAGE</td>
<td>&lt;$4000</td>
</tr>
<tr>
<td>ANN ARBOR MI TEST AREA</td>
<td>6973</td>
<td>2.9</td>
<td>6.3</td>
</tr>
<tr>
<td>BATAVIA NY</td>
<td>7400</td>
<td>5.2</td>
<td>10.3</td>
</tr>
<tr>
<td>BUFFALO NY</td>
<td>12766</td>
<td>9.6</td>
<td>34.6</td>
</tr>
<tr>
<td>COLUMBIA MD</td>
<td>3315</td>
<td>1.9</td>
<td>3.4</td>
</tr>
<tr>
<td>COLUMBUS OH</td>
<td>10750</td>
<td>8.3</td>
<td>37.3</td>
</tr>
<tr>
<td>DAVENPORT IA</td>
<td>40404</td>
<td>4.2</td>
<td>11.8</td>
</tr>
<tr>
<td>DETROIT MI</td>
<td>41405</td>
<td>10.9</td>
<td>29.1</td>
</tr>
<tr>
<td>GRAND RAPIDS MI</td>
<td>5420</td>
<td>12.4</td>
<td>28.1</td>
</tr>
<tr>
<td>HADDONFIELD NJ</td>
<td>15878</td>
<td>2.2</td>
<td>21.6</td>
</tr>
<tr>
<td>HICKSVILLE NY</td>
<td>31331</td>
<td>1.9</td>
<td>3.7</td>
</tr>
<tr>
<td>LA HABRA CA</td>
<td>12914</td>
<td>5.2</td>
<td>9.1</td>
</tr>
<tr>
<td>LA MIRADA CA</td>
<td>13024</td>
<td>4.8</td>
<td>4.1</td>
</tr>
<tr>
<td>LITTLE ROCK AK</td>
<td>80677</td>
<td>3.2</td>
<td>19.0</td>
</tr>
<tr>
<td>LOWER NAUGA-TUCK VALLEY CT</td>
<td>31648</td>
<td>3.2</td>
<td>5.7</td>
</tr>
<tr>
<td>ROCHESTER NY</td>
<td>24662</td>
<td>2.2</td>
<td>5.6</td>
</tr>
<tr>
<td>AVERAGES</td>
<td>5.2</td>
<td>14.1</td>
<td>29.9</td>
</tr>
</tbody>
</table>

• Median income: averaged $11,000, ranging from $5,400 (Columbus) to $16,700 (Haddonfield). Areas range from poverty-stricken urban neighborhoods in Model Cities to upper-middle-class suburbs.

• Auto availability: on the average, 20% of the service area population had no auto available, 42% had only one auto available, while the remaining 38% had 2 or more autos available. In three areas, over 50% had no automobile available.

Demographic data on users of demand responsive transportation has been collected for only a few services. They indicate a disproportionate number of females and elderly persons, than the total population, using demand responsive transportation. This may reflect the market objectives of a particular service rather than a generally-applicable profile of potential users. On the other hand, females and elderly persons are also less likely to have an automobile available for their use.

Despite the limitations of the data, the overall experience reflected in this chapter demonstrates that demand responsive transportation offers significant promise of providing high-quality public transportation that can be tailored to a variety of urban and suburban situations. Initially a product of strong local initiatives, demand responsive transportation has developed to the point where highly-sophisticated, large-scale integrated systems are being instituted on a regional basis.
Conceptual Framework for Dial-a-bus Services

- **Taxi Regime**: Many to many
- **Dial-a-Bus Regime**: Many to one, many to many via interchange
- **Premium Subscription Bus Service**: Many to one

Routing - Degree of Coverage and Access:
- **Long Walks**
- **Short Walks**
- **Doorstep at one step end**
- **Door to door**

Scheduling - Frequency of Service:
- **Conventional Bus Regime**: Many to one
- **Jitney**: Many to one
- **Radial Routes Single Interchange**: Many to one
- **Route Deviation Experiment**: Many to one
- **Premium Subscription Bus Service**: Many to one

Transport Modes:
- **Rail-Rapid Transit and Express Bus Regime**
- **Jitney**
- **Conventional Bus Regime**
- **Dial-a-Bus Regime**

Features:
- FEW DESTINATIONS
- MORE DESTINATIONS WITH TRANSFER
- ALL DESTINATIONS

- FEW DESTINATIONS WITH TRANSFER
- ALL DESTINATIONS

- LONG WALKS
- SHORT WALKS
- DOORSTEP AT ONE TRIP END
- DOOR TO DOOR
III IMPLEMENTATION OF DEMAND RESPONSIVE TRANSPORTATION

WHETHER OR NOT TO IMPLEMENT a demand responsive transportation service is a decision ideally based on thoughtful consideration of the complex factors involved in introducing an innovative transportation service. In practice, the development of demand responsive services has outpaced the analysis in many respects, and guidelines are still emerging from the experience of planners and operators to date. The purpose of this chapter is threefold: (1) to raise the major issues relevant to implementing demand responsive transportation; (2) to identify the guidelines or criteria for various aspects of demand responsive transportation that have been documented; and (3) to identify areas in which knowledge or experience is lacking. The material is organized into three sections corresponding to three phases of the implementation process: the initial decision to implement a demand responsive transportation service, planning for a specific service, and operations. The classifications are somewhat arbitrary, and in practice considerable overlap is both normal and desirable (see Figure 5).

decision-making aspects

GENERAL. The product of the initial phase will be the policy decisions and objectives to support a preliminary system design. Although specific decision-making aspects are discussed here as if they were sequential and independent, it is important to recognize their interrelatedness. Many iterations may be necessary before the preliminary system design can be formulated.
Figure 5. Demand Responsive Transportation Planning Flow Chart

1. Define transportation problems and objectives
2. Assess study applicability of DAB
3. Obtain political approval
4. Obtain funding
5. Designate manager and technical staff
6. Establish data base
7. Select DAB service site
8. Prepare work plan

PHASE 1
ACCEPTANCE
(RANGE: 94 - 340 DAYS)

Source: Reference 77
Figure 5. Demand Responsive Transportation Planning Flow Chart (Cont.)

9. Define Organizational Structure
- Operators (Vehicle and Control Centre)
- Maintenance
- Control Staff
- Labour Union

10. Design Control Centre Facility
- Location
- Function

11. Design Communication System
- Radio Band Reservation
- Telephone Service Reservation

12. Determine Number and Type of Vehicles Required

13. Establish Level of Policy
14. Subdivide Service Areas
15. Plan on Peak Period
16. Plan Off Peak Period
17. Design Dispatching System
- Peak
- Assisted
- Computer

18. Establish Control Centre and Service Reservation Strategy
- Daily
- Night
- Daily
- Night

19. Establish Control Centre and Service Strategy
- Inexpensive
- Serving
- Strategy

20. Design Routing Patterns
- General Pattern
- Transfer Points

21. Design Scheduling Patterns
- Independent System
- System Connected with Another System
- Service Duration

22. Plan Marketing Strategies 1
- Identification of the System by Colour and Symbol

23. Plan Marketing Strategies 2 (What is Dial A Bus?)
- Advertising
- Selling

24. Evaluate Mopower Equipment and Facilities
- Reference Quotations
- Personnel Required
- Vehicles Required
- Equipment Required
- Construction Site
- Laying of Control Centre and Garage

25. Determine Operational Budget
- Anticipated
- Alternatives

26. Determine Capital Budget
- Personnel Needed
- Maintenance

---

Expected Time (Days)

PHASE 2 DESIGN

(RANGE: 43 - 127 DAYS)

Source: Reference 77
Figure 5. Demand Responsive Transportation Planning Flow Chart (Cont.)

27. SELECT STAFF
   • OPERATORS
   • MAINTENANCE
   • CONTROL STAFF

28. CONSTRUCT OR LEASE FACILITIES
   (CONTROL CENTRE AND GARAGE)

29. PURCHASE OR LEASE COMMUNICATION EQUIPMENT FOR
   VEHICLE AND CONTROL CENTRE

30. PURCHASE OR LEASE VEHICLES

31. ESTABLISH PAPERWORK PROCEDURES

32. INSTALL CONTROL CENTRE EQUIPMENT

33. INSTALL VEHICLE COMMUNICATION EQUIPMENT

34. TRAIN STAFF
   • VEHICLE OPERATORS
   • CONTROL CENTRE OPERATORS
   • GENERAL CONTROL EMPLOYEES
   • MAINTENANCE PERSONNEL

35. PLAN MARKETING STRATEGIES – 3
   (DIAL-A-BUS IS COMING)

36. PLAN MARKETING STRATEGIES – 4
   (DIAL-A-BUS IS HERE)

EXPECTED TIME (DAYS)

PHASE 3 IMPLEMENTATION
(RANGE: 65 -- 170 DAYS)

TOTAL 112 DAYS

Source: Reference 77
Figure 5. Demand Responsive Transportation Planning Flow Chart (Cont.)

37. INITIATE FIRST STAGES OF SERVICE
38. BUILD UP TO FULL OPERATION
40. MODIFY SERVICE AND INTEGRATE IT INTO REGULAR SERVICE

39. ESTABLISH EVALUATION AND MONITORING PROGRAM

EXPECTED TIME (DAYS)

TOTAL 563 DAYS

PHASE 4 OPERATION
(RANGE: 410 - 630 DAYS)

Source: Reference 77
The initial decision to approve a demand responsive transportation implementation is inherently a political decision. It typically involves many decision-makers (with the exception of the smallest-scale services, which can be instituted unilaterally by the operator). The key dimensions of a particular demand responsive transportation application—the nature of the service, where it will be, who will run it, who will be served—will be the product of negotiations among various interest groups. Figure 6 identifies the principal groups involved.

Although the inventory of existing services indicates the flexibility and scope of potential applications, very little work is available to identify systematically the available options to be investigated, and the strategies to be pursued in implementing and expanding demand responsive services.

Demand responsive transportation supplies a public service within the context of an industry that is subject to regulation by Federal, state and local governments. Thus, perhaps the single most important factor in the general decision to implement demand responsive transportation in terms of shaping subsequent decisions is the geo-political level at which interest in demand responsive transportation is generated. That is, the options for a specific demand responsive transportation application are to some extent predetermined by its institutional setting. For example, a metropolitan transportation authority would not be faced with many barriers to implementation that would confront a local taxi-operator trying to institute a demand responsive transportation service for the same metropolitan area.

The stimulus to consider demand responsive transportation can come from various sources ranging from an individual citizen who has experienced demand responsive transportation in another community, local community organizations or an enterprising transportation operator, to the transportation professionals in both industry and government. A generally-acknowledged indispensable ingredient of success to date has been the presence of an enthusiastic, dedicated individual who will spearhead the effort. However, as demand responsive transportation is increasingly implemented on a larger scale than the pioneer and experimental services, presumably the role of the entrepreneur will diminish and the institutional advantages accruing to government agencies will be important factors in shaping the development of demand responsive transportation.

DEMAND. At this phase in the implementation process, the investigation of demand need not be highly refined, although it is important to identify the particular role that demand responsive transportation can play with respect to providing adequate public transportation in a given area. It is important for two reasons: first, to have the basis for building support for demand responsive transportation; and second, to be in a position to select the configuration of demand responsive transportation most appropriate to the particular role (and objectives) of the demand responsive transportation.
Figure 6. Principal Groups Involved in the Transportation Decision-Making Process

- Local
- County
- Metropolitan
- Regional
- Special district
- Transportation authority
- State DOT
- Other state
- A-95 agencies
- Federal DOT
- Other federal
- Law enforcement, public safety agencies
- Welfare, health agencies
- Chamber of commerce
- Developers
- Labor unions
- Merchants
- Newspapers
- Taxi companies
- Transit operators
- Advisory boards
- Fraternal organizations
- Homeowners
- Individuals
- League of women voters
- Neighborhood groups
- Parent teacher associations
- Religious groups
- School groups
- Service clubs
The initial demand analysis identifies the degree to which the proposed service area conforms to a generalized profile of demand responsive transportation applications, in terms of densities, major trip generators, specialized needs, and so on. While on the one hand, demand responsive transportation can be tailored to a wide variety of situations, careful analysis at this point, based on the body of accumulated experience, may avoid repetition of the Flint experiment which foundered on misperceptions of (1) demand densities and (2) the ability of demand responsive transportation to attract patrons from automobiles (see Reference 1).

The amount of funding available may determine the requirement for, and extent of, preliminary analysis. This will vary not only with the geo-political scale of the demand responsive transportation service but with sources of funds, particularly if Federal funding is anticipated.

Criteria for demand responsive transportation applications in large urban areas have been developed, as follows:

- Population densities of 3000 to 7000 persons per square mile
- Good transfer connections
- Significant internal activity centers
- Capacity for integration with other transportation services.

More detailed criteria for site selection are discussed in the section on planning considerations.

INSTITUTIONAL ASPECTS. This section deals with six issues bearing on the implementation of demand responsive transportation services legal status, labor considerations, funding, impact on other transportation services, community acceptance, and management capability. Much work remains to be done in this general area.

1. Legal Status

At present the legal status of demand responsive transportation services has not been conclusively established, owing to the relative novelty of the concept, and the varying applications of the principles of demand responsive transportation. Many services are operating as experimental systems or with regulations tacitly waived at the local level. It is nonetheless important to consider the current regulatory environment to identify any significant constraints on implementation, and to evaluate, if necessary, alternative management organizations or service configurations. An understanding of the regulatory aspects is also useful in analyzing the basis for opposition, if any, to a proposed demand responsive transportation service.

Generally, demand responsive transportation services come under federal or state jurisdiction depending on the extent of interstate operations. The federal and state statutes do not address demand responsive transportation services specifically, but rather they establish a general framework of safety and economic regulation. (Safety matters are not discussed further, since presumably there would be no distinction for safety purposes between existing services and demand responsive transportation services.)*

For purposes of economic regulation at the federal level, demand responsive transportation services would be classified by the Interstate Commerce Commission as "Special Operations" within the meaning of the Motor Carrier Act of 1935. This classification is a catch-all for flexible or irregular route operations of a common carrier. A certificate of public convenience and necessity is required, with the exceptions noted below. The classic statement of the issues involved in the public-convenience-and-necessity test notes that,

The question, in substance, is whether the new operation or service will serve a useful public purpose, responsive to a public demand or need; whether this purpose can and will be served as well by existing lines or carriers; and whether it can be served by applicant with the new operation or service proposed without endangering or impairing the operations of existing carriers contrary to the public interests. Pan American Bus Lines Operation, I.M.C.C. 190 at 203 (1936).

In exchange for undertaking the duty to serve the public, the carrier is protected by the certificate of public convenience and necessity from competition. However, compliance with regulations may be onerous.

Exceptions to the certification requirement are contract carriers, which are issued permits, and carriers which qualify for statutory exemption. Of particular relevance to demand responsive transportation operations are the following exemptions:
- Transportation of school children and teachers
- Bona fide taxicab operations with vehicle capacity not exceeding six passengers
- Transportation of persons or property "incidental to transportation by aircraft"
- Transportation within a municipality and adjacent commercial zone.

*Actually, there are important safety considerations in providing demand responsive transportation service that have not been adequately addressed. Also, the potential impact of no-fault insurance on an industry of self-insurers has not been investigated. See Safety in Urban Mass Transportation: The State of the Art, HRB Task Force, 1973.
In addition, transportation provided gratis to charitable institutions such as hospitals has been held to be exempt.

The only known federally-certificated demand responsive transportation service operated from 1966 to 1969. It was terminated for lack of ridership sufficient to break even.

Demand responsive transportation services operating within a single state would be subject to state statutes restricting entry to the motor carrier, transportation or public utilities industries. In general, these statutes protect the existing transit operators. (For example, under antijitney legislation in many states taxis are prohibited from carrying more than one fare at a time. This would effectively preclude the implementation of demand responsive transportation service by taxi companies under their existing authority.)

For the purposes of economic regulation—rates, levels of service, schedules, and routes—most demand responsive transportation services can be classified as common carrier operations, which require a certificate of public convenience and necessity. Although the statutes and their interpretation vary widely from state to state, most states provide for exemptions from state regulation under limited conditions. Common carriers may be wholly exempt from regulation, or authority may be delegated to one or more local levels (e.g., municipal, metropolitan, transit district). Of particular relevance to demand responsive transportation are the following exemptions:

- Transportation services operated by a municipality or other public authority.
- Taxicab services—in most states, jurisdiction over taxis is a closely-guarded local prerogative. (Local ordinances governing taxi operations can be very restrictive and inflexible.)
- Contract carriage—wholly exempt in some states, certificates or permits required in others.

Both the municipal/metropolitan corporation statutes and the state transportation or public utility statutes should be reviewed to ascertain the requirements for commencing demand responsive transportation operations in a particular state, with emphasis on securing operating flexibility.

The only reported state court decision relating to demand responsive transportation has been the Ann Arbor case, in which the city's right to institute a demand responsive transportation service was upheld against the challenge of the local taxi companies.

*The service, Arrow Line, was organized by a Connecticut taxi operator to provide door-to-door, 24-hour a day service between any origin in Hartford County, Connecticut and any destination in the boroughs of New York City using 7 passenger Lincoln limousines at a one-way fare of $14. A total of 10 passengers per round trip was needed to break even.

**Recent Michigan legislation (Act 327) has enabled the development of demand responsive transportation services throughout the state.
With some exceptions, such as Michigan, the regulatory environment at the state level is generally not conducive to the opportunities for innovation and experimentation inherent in demand responsive transportation services. Enabling laws or regulations may be required. The federal statutes and administrative interpretations may serve as “persuasive analogies” to the States in responding to applications for certification of demand responsive transportation services.*

2. Labor Considerations.

It is clear that a proposed demand responsive transportation service of any significance must take account of organized labor, particularly transit labor, although taxi unions may also be involved. One labor spokesman has announced his union’s position in opposition to the implementation of a service that does not conform to current wage and benefit provisions. Such a service would be ineligible for federal funding by virtue of Section 13(c) of the Urban Mass Transportation Act of 1964 (see Appendix G).

On the other hand, demand responsive transportation has shown that labor can be a most cooperative partner in developing this innovation in transportation service. A key issue is work rules, and negotiations at the local level have been highly satisfactory.** Transit labor has been a prime source of experienced drivers who apparently welcome the more challenging demand responsive transportation assignments. Further, labor should not be viewed as monolithic; in one case, an attempt to organize a neighboring demand responsive transportation service resulted in the formation of a new local union by the neighbor.

Finally, whether union or non-union labor is to be employed, it is important to recognize the impact of driver wages on the financial performance of a service, and to analyze this factor in light of wage levels prevailing locally.

3. Funding

The availability of funds can be a major constraint on the choice of demand responsive transportation configurations especially if operating deficits are anticipated. The limited funding available to the early demand responsive transportation services within the

*An analysis of ICC decisions supporting variants of demand responsive transportation services, together with a review of other case law and a proposal for “experimental exemption” to permit rapid, flexible implementation of demand responsive transportation, appears in Reference 34.

**In Ann Arbor, the union anticipated the desirability and availability of part-time employees and initiated arrangements to take advantage of this flexibility in the work force.

context of a conservative, risk-averse industry dictated the development of small-scale services. While successful in many respects, they have not fully demonstrated the potential of demand responsive transportation. Moreover, valuable information pertaining to these operations could not be collected or preserved, for lack of funds.

However, the prospect of greatly-improved service characteristic of demand responsive transportation has stimulated some governmental response to funding needs. In Ontario the Highway Improvement Act was renamed the Public Transportation and Highway Improvement Act, and was amended to provide for subsidies from the provincial government covering planning studies, operating costs, and capital costs. The subsidy was considered an important element in gaining rapid acceptance of demand responsive transportation services.

In the United States federal funding is available from the Urban Mass Transportation Administration for technical studies and capital costs. These funds are available to any community that meets eligibility requirements. The grant application and funding criteria are designed to ensure that a proposed service is based on thorough analysis and evaluation of its cost-effectiveness and prospects for success in terms of local objectives. Federal funds are also supporting important demonstrations and vehicle studies.*

Most of the demand responsive transportation "action" in the United States is located in the states that can utilize gas-tax receipts or otherwise offer support to the demand responsive transportation concept, notably California and Michigan. Figure 7 displays the distribution by state of the 48 U.S. services. Wisconsin is currently exploring the demand responsive transportation potential for its communities. An example of one state approach is Michigan where the state is underwriting the development of demand responsive transportation services for communities willing to contribute $1000. At the year's end of the experimental operation, the community can purchase the service components - vehicles, communications system, etc. - for $1.00. In addition the state provides technical assistance in designing and implementing the services.

Another constraint applicable in some states is statutory limitations on local funding for transportation facilities and services. For example, state law in Iowa provides for a two-mill municipal levy in the case of bond financing of transportation capital costs, and a limit of ten mills in any one year on the total funding of a municipally-operated service. This type of statute may have the effect of precluding the development of innovative services for lack of funds, in the absence of overwhelming community support. Such community support was expressed in Ann Arbor, Michigan, whose citizens voted an increase in local taxes to finance the expansion of their transit operations to include the expansion of their demand responsive transportation service.

Figure 7. 48 Demand Responsive Transportation Services Operating in 22 States, May 1, 1974
4. Impact On Other Transportation Service

To date, demand responsive transportation services have been designed to enhance existing service or at least to avoid competing with it, whether taxi or transit. Data on diversion of patronage from other services are limited but suggest that a substantial amount is diverted from private automobiles. Developments in this area may depend upon the willingness of the management of existing local services to undertake demand responsive transportation services.

5. Community Acceptance

The general acceptance of demand responsive transportation service by the communities in which it has been implemented is shown by increasing ridership levels and the expansion of services. Nineteen services in the U.S. and Canada have been expanded. However, resistance has been encountered in many other communities so that demand responsive transportation services could not be implemented. The problems in this area have been documented (References 25, 27) but little guidance is available.

6. Management Capability

Demand responsive transportation service calls for a different type of organizational structure and management style than is characteristic of the generally conservative transit industry. The success of a particular demand responsive transportation service and the further diffusion and expansion of the demand responsive transportation concept in general may depend in large part on the ability and willingness of management to develop and replicate appropriate skills and organizations.

OPERATIONAL CONSIDERATIONS. The key operational characteristics to be considered in the preliminary decision-making process after the service area is determined are:

- Alternative management and organizational configurations
- Alternative fleet configurations
- Alternative service patterns
- Extent of automation required
- Levels of service to be provided.

These policy decisions should be made in light of two aspects which have been critical to the successful implementation of demand responsive services: the personalized nature of demand responsive transportation, and the dedication of the operator to providing high-quality service. At the same time, one of the prime attractions of demand responsive transportation is its inherent flexibility and capacity to accommodate changing transportation requirements. Thus, initial decisions are not irrevocable, and indeed modifications should be expected as the particular demand responsive transportation service evolves.
ECONOMIC CONSIDERATIONS. Enough experience has been accumulated and documented in the literature to support very rough estimates of the capital and operating costs associated with several types of demand responsive transportation operations. Therefore, for given levels of ridership and fares, net operating results can be calculated.

These results should be evaluated in terms of the objectives of the particular demand responsive transportation service. Only one demand responsive transportation service is known to have been instituted with the single objective of producing a net profit.* Rather, most demand responsive transportation services have been implemented by the public sector to provide important transportation services with no expectation of meeting full costs out of the farebox. Indeed, a key element of the financial structure — the fare — is frequently set low arbitrarily as a political determination. Thirty-three services charge 50 cents or less per ride, as shown in Figure 8. Unfortunately, despite several indications of the public's willingness to pay higher fares for improved service, little experimenting with the fare structure has been undertaken to determine either the elasticity of demand generally, or the effects on particular segments of the population. (As noted earlier, special fares for senior citizens are generally provided.)

![Figure 8. Top-Ranking Fare Levels in 50 Demand Responsive Transportation Services](image)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Amount</th>
<th># Services</th>
<th>% All Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50¢</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>40¢</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>free</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>25¢</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>35¢</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: Appendix A

On the other hand, a demand response transportation service can produce net economic benefits even while operating at a deficit as demonstrated in Regina. There the overall annual transit deficit was reduced by $67,000 as a result of the demand responsive transportation service, which generated revenues in excess of its higher costs. Similarly, demand responsive transportation can replace unprofitable transit services or routes with better service at lower net cost, and can reduce or minimize the costs of providing

*Shared-taxi operations in Hicksville, New York (cf. Davenport shared-taxi service in which the profit motive has been secondary to the objective of improving public transportation, and "staggering" expense has been incurred to develop computerized functions).
Figure 9. Comparative Cost Per Revenue Hour in Regina

Figure 9. Comparative Cost Per Revenue Hour in Regina

Source: Reference 69

off-peak service. (Another alternative to conventional transit—subsidizing conventional taxi operations—has not been documented, but presumably will be examined in the course of studies on taxi/jitney services now underway under the sponsorship of DOT.)

Noneconomic benefits of demand responsive transportation, such as increased mobility for various population groups, elimination of stress associated with driving under congested conditions, relief for the suburban mother's "station-wagon syndrome," or decreased street crime and increased security are more difficult and sometimes impossible to quantify. Nevertheless it is important to identify them so that there is an adequate basis for setting priorities for the expenditure of public funds.

The cost structure of demand responsive transportation reflects its labor-intensive nature. Thus, wages typically represent more than 50% of operating costs. In addition to the cost of drivers, demand responsive transportation involves the wages and other overhead expense associated with the dispatching or command-and-control function. Figure 9 compares the cost breakdown of fixed route and demand responsive transportation services in Regina. Comparative operating costs may vary substantially among services depending on prevailing wage scales and the type of service offered. In some areas the cost of demand responsive service will be less than transit costs.

More data are needed to fully analyze the costs of providing the various kinds of demand responsive transportation services, although it is now apparent that many-to-many is generally the most costly. While many-to-one or many-to-few services can be more efficient, they may also result in excess capacity during off-peak hours. However, the flexible nature of demand responsive transportation could allow many-to-few service for peak hour operations and many-to-many for off-peak hour operations thus minimizing excess capacity. As demand responsive transportation services become increasingly computerized, more sophisticated management analysis can be applied to the problems of joint costing and cross-subsidization.

The capital costs of demand responsive transportation have been fairly well established, although alternative financing arrangements such as leasing have not been fully documented. Capital costs of demand responsive transportation components are shown in Figure 10.

The cost of computer applications varies with the degree and sophistication of automation and the cost of tailoring the hardware and software to a particular area. One rule-of-thumb says that computer costs will add about 15 percent to total operating costs. The Haddonfield experiment should yield more information on these costs. Although total operating costs are increased, the benefits of increased capacity and more efficient utilization of the fleet are expected to be reflected in an improved net position.
Figure 10. Major Capital Costs of Demand Responsive Transportation Service

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-Passenger van</td>
<td>$4,000 - $10,000</td>
</tr>
<tr>
<td>Modifications to van</td>
<td>$5,000</td>
</tr>
<tr>
<td>20-passenger bus</td>
<td>$13,000 - $40,000</td>
</tr>
<tr>
<td>Wheelchair lifts</td>
<td>$2,000 - $4,000</td>
</tr>
<tr>
<td>Base Radio</td>
<td>$6,000 - $8,000</td>
</tr>
<tr>
<td>Mobile Radio</td>
<td>$1,200 - $1,500</td>
</tr>
<tr>
<td>Base Antenna</td>
<td>$400 - $600</td>
</tr>
</tbody>
</table>

Sources: (1) Summary of Field Experience with Small Transit Vehicles (unpublished draft report) April 1974; (2) MITRE Corp., Demand Responsive Transportation System Planning Guidelines, Reference 59.

planning considerations

GENERAL. The planning considerations at this stage involve refining the preliminary system design and laying the groundwork for implementation of operations. Experience to date indicates that a period of 6 to 9 months after the initial decision is required for implementation, of which 4 to 6 months is needed for delivery of equipment.* The prospect of successful implementation is considerably enhanced by a close working relationship between planners, whether in-house or consultants, and operators, including staff where feasible (see Figure 5).

Many of the early demand responsive transportation services were developed without extensive preplanning. Operational experience informed subsequent practice, and many problems that now can be anticipated were overcome by sheer force of an operator's personal commitment. Planning has become increasingly sophisticated. An excellent discussion of planning for a large-scale service to be implemented in three phases (manual, computer-aided, computer-based) is available in the Santa Clara County report (Reference 42). Santa Clara is developing a regional, integrated service with fixed-route segments fed by demand responsive transportation services.

SITE SELECTION. Given a large area, decisions to select particular portions of that area can be based on a careful comparative evaluation of the characteristics of the portions, in such respects as socio-economic characteristics, topographical configuration, trip generators, street network, demand densities, and population densities. It requires matching up available services with the anticipated nature of the demand. Thus, a high-income neighborhood may be attracted only to an extremely high level of service, whereas transit-dependent areas may respond well to more limited service. Accurate ridership figures cannot be obtained at this point, and experience has shown that it may take some months for ridership to develop. (On the other hand, the Bramalea experience showed that demand was grossly underpredicted.) The characteristics of other municipalities which have had demand responsive transportation service may suggest appropriate site selections in a new area. (Appendix A lists such communities.) Figure II presents an example of site selection guidelines which were developed in the Tampa Bay Study (Reference 76) on the basis of a review of demand responsive analyses to date. However, it is important to recognize that demand responsive services have been implemented in areas that do not meet one or more of these particular guidelines.

Several analytical tools exist that have been employed to estimate demand for demand responsive transportation, and the literature contains detailed descriptions and forms of these tools. (see References 3, 8, 9, 10, 18, 19, 20, 24, 30, 65, 82). They are, however, subject to important limitations.

- Modal split analysis—may underestimate demand because it does not adequately treat latent demand or effect of quantum jump in level of service that demand responsive transportation provides.
- Surveys of potential users—respondents have great difficulty envisioning the proposed system and therefore cannot gauge whether or not they would use it, so that results are unreliable.
- Attitudinal surveys—used both to determine potential ridership and to identify appropriate service parameters to meet consumer preferences, this tool suffers from unreliability due to difference between theoretical judgments and actual decisions.

SPECIAL TRANSPORTATION NEEDS. The special needs of the elderly or handicapped ridership deserves careful attention in terms of:

1. providing an appropriate level of service, which may require special equipment such as accommodations for wheelchairs and special attention from drivers (assisting the patron from house to vehicle)
2. recognizing that meeting special needs constrains the level of service in terms of time for the general population, so that special needs may require an essentially separate service.
<table>
<thead>
<tr>
<th>AREA</th>
<th>POTENTIAL APPLICATIONS</th>
<th>CURRENT STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LARGE METROPOLITAN AREAS</td>
<td>• SUBURBAN FEEDER/DISTRIBUTION IN LARGE COORDINATED TRANSIT SYSTEMS</td>
<td>• INDEPENDENT MODULES WITH MANUAL OR COMPUTER DISPATCH—NEEDS DEVELOPMENT FOR AREA-WIDE APPLICATION</td>
</tr>
<tr>
<td></td>
<td>• SUBURB-TO-SUBURB TRANSPORTATION</td>
<td>• SIMILAR TO FEEDER/DISTRIBUTION STATUS</td>
</tr>
<tr>
<td></td>
<td>• LOCAL SUBURBAN TRANSPORTATION</td>
<td>• INDEPENDENT MODULES WITH ANNUAL SUBSIDIES OF $15 TO $25 PER CAPITA</td>
</tr>
<tr>
<td></td>
<td>• HANDICAPPED AND OTHER SPECIAL NEEDS GROUPS TRANSPORTATION</td>
<td>• DEMONSTRATED - ECONOMIC ADVANTAGES TO CONSOLIDATION LIKELY</td>
</tr>
<tr>
<td>MEDIUM-SIZE CITIES AND REGIONS</td>
<td>• INTEGRATED IN BUS-BASED TRANSIT SYSTEMS</td>
<td>• MANUAL CONTROL SYSTEMS IN USE FOR SMALLER APPLICATIONS</td>
</tr>
<tr>
<td></td>
<td>• SPECIAL NEEDS GROUPS</td>
<td>• NEAR-TERM R&amp;D PROGRAM TO PROVIDE FOR LARGER APPLICATIONS</td>
</tr>
<tr>
<td>SMALL URBAN AREAS AND RURAL AREAS</td>
<td>• NEW SERVICE WHERE NOT NOW AVAILABLE</td>
<td>• DEMONSTRATED</td>
</tr>
<tr>
<td></td>
<td>• BETTER QUALITY THAN CURRENT SERVICE</td>
<td>• READY FOR LOCAL USE</td>
</tr>
</tbody>
</table>
There are unresolved issues with respect to service to the poor, particularly in urban areas, and some employment-oriented services have not been able to maintain patronage. However, there are several successful Model Cities demand responsive transportation services in operation.

**LEGAL ANALYSIS.** In addition to the routine legal matters associated with business operations, including insurance, the necessary certificates, permits, and licenses must be secured. Of particular importance is the need to obtain communication channels from the FCC.

**Figure 11. Example of Site Selection Guidelines:**
**Tampa Bay Study Criteria**

**Demand Criteria**
1a. Minimum average demand = 20 demands/mi²/hr
1b. Minimum mid-day demand = 50 demands/mi²/hr
1c. Minimum population density = 4,000 people/mi²

**Physical Criteria**
2. Minimum site area = 4 mi²
3. No major natural barriers to travel
4. Rectilinear street pattern with good connectivity
5. Reasonably regular site shape

**Demographic Criteria**
6. Range of socio-economic conditions included
7. Low rate of auto ownership

**Operational Criteria**
8. No existing bus service in area*
9. Many-to-many/many-to-few service
10. Good potential for future expansion

*One objective of this service was to avoid competing with bus service.

Source: Reference 76
BATAVIA DIAL-A-RIDE RADIO TELEPRINTER

SCHEMATIC OF SYSTEM LAYOUT

CENTRAL TRANSLATOR

BASE STATION COMBINATION CONTROLLED BY DISPATCHER

CONTROL CONSOLE WITH VIDEO SCREEN

DISPATCHER TRANSMITS INSTRUCTIONS TO DIAL-A-RIDE DRIVERS BY RADIO TELEPRINTER

DIAL-A-RIDE BUS

Source: Ford Motor Company, Batavia, New York Radio Teleprinter Test
PROJECT INITIATION. The first step in detailed planning is to work out appropriate objectives, goals, and policies for the service within the overall concept determined earlier in the decision-making process. The next step is to structure an overall project and management plan. Other tasks are to:

- Design and prepare control center
- Develop operating procedures, updating as necessary
- Determine service patterns; prepare maps, directories, files
- Order fleet and other hardware
- Determine integration criteria, policies, transfer points
- Calibrate computer software, if any
- Conduct recruiting and training.

MANAGEMENT RESPONSIBILITIES. Within the policies and objectives established for the demand responsive transportation service, the management is responsible for providing the best possible service. In addition, the management can be expected to develop the basis for future expansion or integration of the service. Many services have found that vesting authority in an executive director who has complete charge of operations is appropriate. One key responsibility of management during the planning stage is to ensure that the initial operations will be conducted in such a way as to generate a good public image. In general, this has benefited from a team approach. Many services have cited the important roles played by enthusiastic drivers and other staff members, who have contributed to the development of strong public acceptance of "their own" service.

NEW TOWNS APPLICATIONS. Demand responsive transportation has been used to a limited extent in "new towns" where transportation has been considered an integral part of the land use development. However, with the exception of commuter bus subscription service, surprising resistance to transit service has been encountered. Nevertheless, as a spokesman for the Regina service observed, demand responsive transportation opens the way to using transit as a planning tool for the development or modification of neighborhoods and the improvement of land use patterns. Columbia, Maryland has operated a successful demand responsive transportation service since 1971.

SCHEDULING AND ROUTING. The level of service that can be achieved with a given fleet in a particular area depends on the efficient utilization of the vehicles available. (see discussion of productivity, page 6). Scheduling and routing are therefore key functions, and much research has yielded fruitful ways of improving performance in this area. In demand responsive transportation practice, the range has been from a single-driver/
A Typical Demand Responsive Transportation Vehicle

dispatcher who performed all control and service functions to advanced computer-aided systems. It has been generally established that the maximum capacity of a manual system is 15 - 20 vehicles, representing 100 demands per hour. (Automated techniques are discussed below.) A variety of manual approaches are detailed in reports on specific demand responsive transportation services, with illustrations of maps, message holders, and other support equipment.

COMMUNICATIONS. Two communication components are involved in demand responsive transportation: one to enable the patron to request service, the other to enable the vehicle driver to receive scheduling instructions. For customer communication, voice communication via the telephone is generally employed. Direct service lines can be provided at high activity centers. Digital communication is an attractive alternative, although it should not be expected to totally supplant voice communication. Digital communication via radio teleprinters has been used successfully to relay information to drivers. Dispatching hardware is generally considered very satisfactory, although the profusion of competing systems suggests that a technical study would be useful.

COMPUTER APPLICATIONS. The purpose of automation in demand responsive transportation applications is not to reduce the cost of the dispatch operation or command and control center, but to increase the capacity of a given staff, improve productivity, provide higher levels of service, and provide better management and planning data. However, automation has not been implemented generally for two reasons: first, fully automated functions are still being developed; and second, most of the services are small enough to be adequately controlled manually. Computer assistance is generally confined to record-keeping, as in the case of subscriber files and management data. Elaborate studies have been conducted to develop algorithms for computerized scheduling and routing. The Haddonfield demonstration is designed to develop an automated control system and identify the benefits of automation.

The development of automated dispatching in the taxi industry has been documented, and has been highly successful in meeting the objectives of two different taxi companies. In one case, it achieved faster, more accurate throughput of customer calls and almost paid for itself in manpower savings; in the other case, traditional sources of friction between driver and dispatcher were overcome. In both cases, more than a year was required to make the automated systems fully operational.

VEHICLES. The consensus is that a 15-20 passenger vehicle is adequate for most demand-responsive operations, although smaller vehicles may be appropriate in some cases. The vehicle must be capable of traversing narrow suburban streets unobtrusively. The initial fleet size is related to the projected demand density, level of service, and type of service offered. A major determinant is whether the subscription service is offered, since subscription service generally entails capacity operations at peak hours.
Many different vehicles are in use for demand responsive transportation service today. Figure 12 shows the distribution of vehicle models ranked by the number of services utilizing a vehicle and the total number of vehicles in service.

**Figure 12. Top-Ranking Vehicles Used in 18 Demand Responsive Transportation (Excluding Taxi Services)**

<table>
<thead>
<tr>
<th>By # Services</th>
<th>Rank</th>
<th>By # Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courier, Flxette</td>
<td>1</td>
<td>Twin Coach</td>
</tr>
<tr>
<td>Twin Coach</td>
<td>2</td>
<td>Rec Vee</td>
</tr>
<tr>
<td>Econoline</td>
<td>3</td>
<td>Flxette</td>
</tr>
<tr>
<td>Maxivan</td>
<td>4</td>
<td>Maxivan</td>
</tr>
<tr>
<td>Vanhool, Grumman</td>
<td>5</td>
<td>Courier</td>
</tr>
</tbody>
</table>

*Includes combination fleets counted as 1 service per vehicle type.

*Source: Ford Motor Company, Internal Listing*

However, none is fully satisfactory in terms of meeting performance standards for demand responsive transportation service. Two problem areas are the initial purchase decision, and operations/maintenance.

The initial purchase decision involves choosing between a 3-year "throw-away" vehicle or a longer-life more expensive vehicle. Although there is operating experience no clear cut decision criteria exist.

The problems in operations and maintenance are related to the fact that the vehicles typically have been converted from another original function (minibuses, vans, recreational vehicle, or motor home). The various mechanical systems of the vehicles are not suited to the heavy duty requirements of demand responsive transportation service. Problems have appeared in braking, propulsion, and suspension systems, body design, and quality control. A contributory factor to unsatisfactory vehicle performance is the lack of maintenance experience on these vehicles by the service operators, particularly in the case of transit companies. Their maintenance facilities and mechanics are geared to conventional buses, and have not yet adapted to the requirements of demand responsive transportation vehicles. In contrast, the van type vehicles of one Canadian service are maintained by a local garage, resulting in better-than-average experience with mechanical problems.

Some progress has been made in developing a suitable vehicle. The Government of Ontario, Canada, and the United States Department of Transportation have recognized the inadequacies of present day vehicles and are in the process of developing standards for demand responsive transportation service vehicles. The Ontario Department of Trans-
Rochester, NY Promotional Handbill

WE'RE COMING TO GET YOU!

PORTATION and Communication has commissioned a newly designed vehicle for service in Toronto. This vehicle combines a “throw-away” chassis with a long-life, fiberglass body. The U.S. DOT is developing small-bus specifications and is in the process of awarding a contract aimed at production of a para-transit vehicle.

In terms of the supply of demand responsive transportation vehicles, there seems to be no problem. Although manufacturers of conventional buses are operating at capacity, excess production capacity exists in the motor home sector of the industry and among producers of other specialized vehicles.

The most recent information on vehicles is contained in a draft DOT report based on a survey of operating experience with small (7-25 passengers) bus-type vehicles currently available in the U.S. A general description and full specifications are provided for each of the 20 vehicles surveyed in addition to a brief discussion of user experience. The report concludes that “no vehicle has been free of problems. No vehicle appears to be clearly better than all others, although certain vehicles are better for certain applications... No single approach is appropriate for all possible applications.”

MARKETING AND TRAINING. Marketing efforts on behalf of demand responsive transportation services have ranged from simple flyers and local media spots to full-scale promotions, including in one case the rendition of “Tijuana Taxi” to announce the arrival of the demand responsive transportation vehicle. While operators have emphasized the importance of an adequate marketing budget, little is known about the relative advantages of different approaches. At a recent industry conference, it was suggested that a clearinghouse be established for marketing ideas. At a minimum, it is essential to provide for disseminating information about the service to actual and potential patrons.

One approach that has been successfully employed by several demand responsive transportation services is the adoption of one or more identifying elements, such as distinctive colors, logos, and uniforms. In addition to fostering consumer recognition and appeal, this approach offers the organizational advantage of strengthening staff morale and identification with the service.

Experience has shown that careful attention to training staff is essential for successful service. Both the control center staff and the drivers require training programs with some aspects of demand responsive transportation service common to both programs. The programs can be tailored to the particular demand responsive transportation configuration and patronage profile. In general, the introduction of new procedures or equipment into service should be preceded by an experimental phase in which feedback from actual operating experience is incorporated. Although typically the demand responsive trans-

---

1 Summary of Field Experience with Small Transit Vehicles, April 1974 (unpublished draft), pp. 73-74.
portation services have been staffed by transit or taxi workers, there has been successful experience in training unskilled residents of a Model City to perform various control center functions, including public contact.

The Urban Mass Transportation Administration’s Office of Transit Management has recently initiated a “Transit Marketing Project,” that addresses some of the marketing problems inherent in the operation of a transit service.

**MANAGEMENT RESPONSIBILITIES.** In the context of demand responsive transportation, management is called upon to monitor operations more closely than may be expected in less service-oriented organizations. Only by collecting and analyzing information on performance and demand can the inherent flexibility and efficiency of demand responsive transportation be realized. Fortunately, automated means of generating the data base are being developed.

Some of the operating problems that have emerged among the demand responsive transportation services have been:

- Bureaucratic roadblocks to expansion or innovation
- Disruption of service occasioned by driver illness, absence or change of assignment
- Difficulties with chronically-late patrons, no-shows, and cancellations
- Exaggerated peaking associated with school-oriented service
- Problems in integrating schedules and establishing transfer points for feeder/transfer services
- Paper-handling and other logistical difficulties.
IV DEMAND RESPONSIVE TRANSPORTATION IN THE FUTURE

DEMAND RESPONSIVE TRANSPORTATION in the future is expected to evolve from its present status as a relatively independent mode of transport to an integral element of a regional transportation service. Sophisticated methods now exist for analyzing the requirements and performance of independent demand responsive transportation service. Much more work is needed to address the complex issues involved in integrated services, such as (1) cross-subsidization and (2) trade-offs between demand responsive transportation, fixed route, and taxi services. Institutional and management analysis are other areas requiring further investigation.

Demand responsive transportation technology

The future technology of a demand responsive service includes the areas of computer dispatching, automatic vehicle monitoring, automatic scheduling, fully dynamic routing, and advanced management analysis systems. Prototypes of these technological developments are available today. For example, computer dispatching has been simulated by researchers and is presently being demonstrated in Haddonfield, and UMTA has demonstrated Automatic Vehicle Monitoring (AVM) with the Chicago Transit Authority bus system.

The technology of computerized dispatching and of automatic vehicle monitoring can be combined under the umbrella of command and control technology. Experience to
date reflects that demand responsive transportation services can be controlled manually to a limit of about 15-20 vehicles providing many-to-many service with about 100 demands per hour. For many present day services manual controls are adequate. However, it is today’s problem to develop a means for handling the expanded and growing services of the future.

An initial problem with automated control systems is to define the interface of manual/computerized operation. That is, to define the functions of the computer, the drivers, and the dispatcher, and how they interact. The purpose of some of the contemporary computer efforts is to define these relationships and to provide a basis for improving the performance of the various elements in the command and control system.

Presently, dispatching algorithms have been developed by several groups, including WABCO, Northwestern, MITRE, MIT, and DAVE/Lex. (Reference 35.) The computerization at Haddonfield is the largest test to date of automated demand responsive transportation. These algorithms have a common element of travel time prediction. Present technology allows a continuous measurement of travel time but assignment is based on static predictions. Future software research may lead to assignments based on continuous travel time to provide a higher level of service.

Automatic vehicle monitoring is the use of radio signals between vehicle and stationary receivers to keep track of the location of vehicles on their respective tours. The locations are displayed on a control console in a central dispatch office. Current technology provides only a sampling of vehicle locations, as the actual location is known only when a vehicle is close to a receiver. Intermediate locations can be determined by the knowledge of the route point where the receiver is located. This technique was demonstrated by the Chicago Transit Authority. Technological advancement would provide for direct continuous surveillance of all vehicles while operating, with direct input to the control computer. The knowledge of exact vehicle locations for a demand responsive transportation service can improve vehicle assignments by minimizing backtracking.

A near-term advanced type of communications might be called “touch-a-bus”, using “Touch-Tone” telephone equipment. A patron would call for service and enter a predetermined sequence of numbers to give the patron’s request to a computer. Electronic interfacing equipment would translate the telephone code, and service would be scheduled by the dispatching computer. The system could also return a prerecorded call automatically to the patron prior to the arrival of the vehicle, thus minimizing pickup times and improving service. This automatic requesting process could overcome the limitations on service associated with the receptionist function.

The use of computers for other functions beyond scheduling and dispatching can lead to more efficient means of compiling data and analyzing system characteristics such as:
- Level of service—wait time, ride time, and vehicle productivity
- Vehicle use parameters—e.g. fuel consumption, maintenance records
- Vehicle operations monitoring—tracking vital signs from the vehicle on a realtime basis.
- Vehicle locating.

The future development of demand responsive transportation service lies in its flexibility as a subsystem of an integrated regional transport service. To this end technology must progress to meet the requirements of this future system. The use of present day operating procedures must be refined so as to present an efficient methodology to centralize regional transport control. Optimally, a regional integrated transport service can be controlled by the use of sophisticated operations and management techniques.

In an integrated transportation environment computerized information bases will be essential to perform such calculations as scheduling rendezvous times for links between subsystems.

---

The future use of demand responsive transportation services

Demand responsive transportation service of the future will be integrated with other advanced modes of transport as well as other segments of a regional service. Other advanced modes might include dual-mode services, PRT’s, other guideway vehicles, and high-speed intercity links. Although the technology for these new modes of transport has been researched and prototype systems developed, the concept of service integration has yet to be addressed on a large scale.*

Another development in demand responsive transportation might involve long distance trip scheduling. For example, by making one phone call to a regional dispatcher or similar source travellers could take a demand responsive vehicle to an urban transport terminal, make an intercity trip, and have a demand responsive vehicle waiting to transport them to the final destination. With demand responsive service the potential problem of a vehicle not available upon arrival could be eliminated by prescheduling the trip by ‘long distance’ demand responsive transportation.

Operational experience with demand responsive transportation service has provided valuable guidance to planners and managers considering demand transportation services. Presently, the major area of concern is to review the operational experience to identify

future research

the parameters that are appropriate to larger-scale services. Some of the questions to be addressed might include:

- For area and service parameters, what operating characteristics can be expected and what is the sensitivity of these operating characteristics to the service parameters? These subjects are currently being investigated but more work is necessary in order to have a better understanding of these interrelationships.

- What are the costs and benefits of an integrated transportation system? How are these costs and benefits allocated to the components of the integrated system? On what basis should cross-subsidization decisions be made?

- What further technological developments are necessary to support interfacing with advanced transportation modes?

- Does demand responsive transportation technology have any spin-off application to other transport problem areas such as urban goods movement or dual-mode technology?

- What is the potential for an integrated fleet of various vehicles to provide a full range of demand responsive service, i.e., taxicabs for many-to-many and minibuses or vans for many-to-one or many-to-few?

Although large strides have been made in demand responsive transportation service since the 1960's, aspects requiring further development have surfaced as operational experience accrues. In order to make demand responsive transportation a viable future mode in an integrated transport system the questions raised above are only the beginning and the present is the time to begin addressing them.
SUPPLEMENTARY MATERIAL

APPENDIX A: Summary of Selected Characteristics of 80 Demand Responsive Transportation Services

APPENDIX B: References

APPENDIX C: Suggested Periodicals and Other Sources of Current Information

APPENDIX D: Directory of Consulting and Research Organizations

APPENDIX E: Directory of Transit Authorities, Operating Agencies, and Governmental Units

APPENDIX F: Directory of Vehicle Manufacturers

APPENDIX G: Urban Mass Transportation Act of 1964 Section 13(c)

APPENDIX H: Glossary
### APPENDIX A

**SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES**

<table>
<thead>
<tr>
<th></th>
<th>ALPENA, MI</th>
<th>ANN ARBOR, MI</th>
<th>ATLANTIC CITY, NJ</th>
<th>BATAVIA, NY B-LINE DIAL-A-BUS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE OF SERVICE</strong></td>
<td>many-to-many</td>
<td>many-to-few</td>
<td>many-to-many</td>
<td>many-to-many</td>
</tr>
<tr>
<td><strong>POPULATION SERVED</strong></td>
<td>13,805</td>
<td>6,500</td>
<td>100,000</td>
<td>18,000</td>
</tr>
<tr>
<td><strong>SERVICE AREA (MI²)</strong></td>
<td>7.4</td>
<td>1.36</td>
<td>21.8</td>
<td>5.5</td>
</tr>
<tr>
<td><strong>NUMBER OF VEHICLES</strong></td>
<td>4</td>
<td>3</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td><strong>AVERAGE WEEKDAY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RIDERSHIP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FARE (ADULT CASH)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FUNDING SOURCE (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SPECIAL SERVICES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FEATURES:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **ALPENA, MI**: Senior citizens half fares, 5 buses with wheelchair lifts
- **ANN ARBOR, MI**: "DIAL-A-RIDE" initial, "TELTRAN" expanded
- **ATLANTIC CITY, NJ**: jitney, fixed route, varied stops
- **BATAVIA, NY B-LINE DIAL-A-BUS**: Subscription service for workers; Jr. college students; package delivery

- **DATE INITIATED**
  - ALPENA, MI: July, 1974
  - ANN ARBOR, MI: Sept. 1971
  - ATLANTIC CITY, NJ: Summer 1974

- **TYPE OF SERVICE**
  - ALPENA, MI: many-to-many
  - ANN ARBOR, MI: many-to-few
  - ATLANTIC CITY, NJ: many-to-many
  - BATAVIA, NY B-LINE DIAL-A-BUS: many-to-many

- **POPULATION SERVED**
  - ALPENA, MI: 13,805
  - ANN ARBOR, MI: 6,500
  - ATLANTIC CITY, NJ: 100,000
  - BATAVIA, NY B-LINE DIAL-A-BUS: 18,000

- **SERVICE AREA (MI²)**
  - ALPENA, MI: 7.4
  - ANN ARBOR, MI: 1.36
  - ATLANTIC CITY, NJ: 21.8
  - BATAVIA, NY B-LINE DIAL-A-BUS: 5.5

- **NUMBER OF VEHICLES**
  - ALPENA, MI: 4
  - ANN ARBOR, MI: 3
  - ATLANTIC CITY, NJ: 45
  - BATAVIA, NY B-LINE DIAL-A-BUS: 35

- **AVERAGE WEEKDAY RIDERSHIP**
  - ALPENA, MI: 5-6,000
  - ANN ARBOR, MI: 214
  - ATLANTIC CITY, NJ: 5-6,000 projected
  - BATAVIA, NY B-LINE DIAL-A-BUS: 455

- **FARE (ADULT CASH)**
  - ALPENA, MI: 50¢
  - ANN ARBOR, MI: 60¢
  - ATLANTIC CITY, NJ: 25¢
  - BATAVIA, NY B-LINE DIAL-A-BUS: 30¢

- **FUNDING SOURCE (%)**
  - ALPENA, MI: State
  - ANN ARBOR, MI: State 63%, City 37%
  - ATLANTIC CITY, NJ: City 100%
  - BATAVIA, NY B-LINE DIAL-A-BUS: private

- **SPECIAL SERVICES**
  - ALPENA, MI: Senior citizens half fares, 5 buses with wheelchair lifts
  - ANN ARBOR, MI: "DIAL-A-RIDE" initial, "TELTRAN" expanded
  - ATLANTIC CITY, NJ: jitney, fixed route, varied stops
  - BATAVIA, NY B-LINE DIAL-A-BUS: Subscription service for workers; Jr. college students; package delivery
References/Sources of further information:

Alpena: Phone conversation with Jerald Geile, Michigan State Highway Commission, Urban Transportation Division. (517) 373-6572. 4/74.


Phone conversation with office of Traffic Commission Bryant, 4/8/74.

<table>
<thead>
<tr>
<th></th>
<th>BAY RIDGES, ONTARIO</th>
<th>BENSENVILLE, IL</th>
<th>BENTON HARBOR-ST. JOSEPH, MI</th>
<th>BRAMALEA, ONT.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INITIAL SYSTEM</strong></td>
<td>GO-TRANSIT DIAL-A-BUS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EXPANDED SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TYPE OF SERVICE</strong></td>
<td>Transit feeder</td>
<td>many-to-many</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>off peak</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>POPULATION SERVED</strong></td>
<td>13,700</td>
<td>25,000</td>
<td>14,000</td>
<td>30,000</td>
</tr>
<tr>
<td><strong>SERVICE AREA (MI^2)</strong></td>
<td>1.34</td>
<td>12</td>
<td>7</td>
<td>5.1</td>
</tr>
<tr>
<td><strong>NUMBER OF VEHICLES</strong></td>
<td>4</td>
<td>14</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td><strong>AVERAGE WEEKDAY RIDERSHIP</strong></td>
<td>460</td>
<td>950</td>
<td>150</td>
<td>1800</td>
</tr>
<tr>
<td><strong>FARE (ADULT CASH)</strong></td>
<td>25¢</td>
<td>30¢ (May 1972)</td>
<td>50¢</td>
<td>35¢</td>
</tr>
<tr>
<td><strong>FUNDING SOURCE (%)</strong></td>
<td>province 100%</td>
<td>province 50%</td>
<td>local</td>
<td>local</td>
</tr>
<tr>
<td><strong>SPECIAL SERVICES FEATURES</strong></td>
<td>weekly booking</td>
<td></td>
<td>1/2 price for students;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>elderly</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Senior citizens</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>half-fare.</td>
<td></td>
</tr>
</tbody>
</table>
References/Sources of further information:

Bay Ridges:  Ontario Dept. of Transportation & Communication.  Toronto.
            Dial-a-bus: the Bay Ridges Experiment.  J.A. Bonsall, August, 1971
            Simpkins, B.D. (Ontario Ministry of Transportation and Communications).
            Phone conversation with Les Dickout, supervisor of transportation.  6/24/74

Bensenville:  Phone conversation with Frank DeVita, supervisor of Dial-A-Bus.  4/9/74

Benton Harbor:  Phone conversation with Jerry Gelle, Michigan State Highway Commission, Urban Transportation Div. (517) 373-6572.  7/12/74

            Simpkins, B.D. (Ontario Ministry of Transportation and Communications).
### SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES (CONT.)

<table>
<thead>
<tr>
<th></th>
<th>BUFFALO, N.Y. MODEL CITIES JITNEY</th>
<th>CALGARY, ALBERTA BLUE ARROW BUS EXPRESS</th>
<th>CAMBRIDGE, ONT.</th>
<th>CARACAS, VENEZUELA POR PUESTOS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE OF SERVICE</strong></td>
<td>many-to-many</td>
<td>many-to-one; many-to-many</td>
<td>many-to-many</td>
<td>fixed route demand stops</td>
</tr>
<tr>
<td><strong>POPULATION SERVED</strong></td>
<td>7,000</td>
<td>11,000</td>
<td>1,760,000</td>
<td></td>
</tr>
<tr>
<td><strong>SERVICE AREA (MI²)</strong></td>
<td>3.0</td>
<td>(est.) 40 miles of routes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NUMBER OF VEHICLES</strong></td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>6,000</td>
</tr>
<tr>
<td><strong>AVERAGE WEEKDAY RIDERSHIP</strong></td>
<td>350 (1/74)</td>
<td>950</td>
<td>460,000</td>
<td></td>
</tr>
<tr>
<td><strong>FARE (ADULT CASH)</strong></td>
<td>free</td>
<td>35¢</td>
<td>40¢</td>
<td>10¢ up to 6 miles 20¢ over 6 miles</td>
</tr>
<tr>
<td><strong>FUNDING SOURCE (%)</strong></td>
<td>Federal (HUD) 100%</td>
<td>City</td>
<td>Province</td>
<td>Private</td>
</tr>
<tr>
<td><strong>SPECIAL SERVICES FEATURES:</strong></td>
<td>For those 60 yrs. old and up plus handicapped. Groups may charter.</td>
<td>Subscription Service</td>
<td>Senior citizens 10¢</td>
<td>Parcel post, messenger service</td>
</tr>
</tbody>
</table>
References/Sources of further information:

Phone conversation with Michael White, 4/74.

Calgary: Phone conversation with Lloyd Morasch, Calgary Planning Department. 4/26/74. (403) 268-2424

Cambridge: Phone conversation with Cambridge Transit Authority. (519) 623-7721

### SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES (CONT.)

<table>
<thead>
<tr>
<th></th>
<th>CLEVELAND, OH</th>
<th>COLUMBIA, MD</th>
<th>COLUMBUS, OH MODEL CITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DIAL-A-RIDE</td>
<td>BUCKEYE,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FOR SENIORS</td>
<td>TREMONT AND</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MODEL CITIES</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aug. 1971</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Oct. 1971</td>
</tr>
<tr>
<td>TYPE OF SERVICE</td>
<td>many-to-many</td>
<td>many-to-many</td>
<td>&quot;Easy Rider&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(home-to-work)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>many-to-many</td>
</tr>
<tr>
<td>POPULATION SERVED</td>
<td>14,000</td>
<td>12,000</td>
<td>17,300</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>37,045</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>55,000</td>
</tr>
<tr>
<td>SERVICE AREA (mi²)</td>
<td>9</td>
<td>12</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.56</td>
</tr>
<tr>
<td>NUMBER OF VEHICLES</td>
<td>1</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>AVERAGE WEEKDAY</td>
<td>35</td>
<td>54</td>
<td>80-100</td>
</tr>
<tr>
<td>RIDERSHIP</td>
<td></td>
<td></td>
<td>355</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>485</td>
</tr>
<tr>
<td>FARE (ADULT CASH)</td>
<td>donations</td>
<td>10¢</td>
<td>25¢</td>
</tr>
<tr>
<td></td>
<td>accepted</td>
<td></td>
<td>50¢</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20¢</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25¢</td>
</tr>
<tr>
<td>FUNDING SOURCE (%)</td>
<td>Federal</td>
<td>Federal 70%</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local 30%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Federal (HUD) 100%</td>
</tr>
<tr>
<td>SPECIAL SERVICES</td>
<td>For elderly</td>
<td>For senior</td>
<td>Children (6-11)</td>
</tr>
<tr>
<td>FEATURES:</td>
<td>only</td>
<td>citizens and</td>
<td>half fare</td>
</tr>
<tr>
<td></td>
<td></td>
<td>handicapped.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Charter service to day</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>care centers</td>
</tr>
</tbody>
</table>
References/Sources of further information:

Cleveland: Collinwood Eldercare Center. Third Grant Year - First Quarter Report from October 1, 1973 through December 31, 1973. Rileigh F. Coleman, Director.
Phone conversation with Rileigh Coleman, 4/74.
Phone conversation with Goldie Lake, director, Neighborhood Elderly Transportation Project. 6/26/74

Phone conversation with Mark Weissart, transportation supervisor. 4/4/74.

Columbus: Mid-Ohio Regional Planning Commission, Columbus, OH, and Ford Motor Co., Transportation Research and Planning Office.
Sponsored by the City of Columbus and the Model Neighborhood Assembly.
Phone conversation with office of Edward Cummings, project manager. 4/4/74
### SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES (CONT.)

<table>
<thead>
<tr>
<th>Date Initiated</th>
<th>Type of Service</th>
<th>Population Served</th>
<th>Service Area (Ml²)</th>
<th>Number of Vehicles</th>
<th>Average Weekday Ridership</th>
<th>Fare (Adult Cash)</th>
<th>Funding Source (%)</th>
<th>Special Services Features:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CRANSTON, RI “TRANSVAN”</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept. 1971</td>
<td>many-to-many</td>
<td>10-11,000 eligible 545 subscribed</td>
<td>28</td>
<td>3</td>
<td>160</td>
<td>subscription: $1.25/mo.</td>
<td>UMTA 86.4% local 13.6%</td>
<td>elderly (62+) &amp; handicapped. One bus with wheelchair ramp.</td>
</tr>
<tr>
<td><strong>DALLAS, TX DIAL-A-TRIP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept. 1972</td>
<td>route deviation to 1 fixed location</td>
<td>200-250</td>
<td>2-3</td>
<td>1</td>
<td>30</td>
<td>10¢ (regular fare)</td>
<td>local 100%</td>
<td>one block deviation to a senior-citizens complex</td>
</tr>
<tr>
<td><strong>DAVENPORT, IA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall, 1974</td>
<td>transit feeder</td>
<td>6,000</td>
<td>19.7</td>
<td>6</td>
<td>1300</td>
<td>25¢ by zones Average $1.03</td>
<td>federal</td>
<td></td>
</tr>
<tr>
<td><strong>DAVIS, CA SENIOR CENTER TRANSPORTATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb. 1973</td>
<td>shared taxi</td>
<td>98,500</td>
<td>19.7</td>
<td>20</td>
<td>25-30</td>
<td>free</td>
<td>private</td>
<td>package delivery</td>
</tr>
</tbody>
</table>

**For senior citizens or handicapped.**
References/Sources of further information:

Cranston:  "Transvan History, 1971-1974"  
Phone conversation with Arthur Butler, Jr., Executive director. 4/5/74

Dallas:  "DTS Begins "Dial-a-trip" Service" Passenger Transport July 7, 1972, p. 2  
Phone conversation with Jerry Johnson, director of public information for Dallas Transit. 4/3/74
Phone conversation with City Transit Planning office. 7/11/74

Heathington, Kenneth W. and Marcil T. Zobrak, An Analysis of Two Privately Owned Demand-Responsive Transportation Systems.  
Heathington, Kenneth W. and Frank Davis, Jr. An Example of Demand-Responsive Transportation Systems in the Private Sector.  
For presentation at 53rd Annual HRB Meeting. Jan. 1974  
Phone conversations with Bob Hill, 4/3/74 and Robert Cherry, 5/74

Davis:  Phone conversation with Sue Snively, supervisor of Senior Center, 630 Second St., Davis, DA 95616. 758-4020 4/5/74
<table>
<thead>
<tr>
<th></th>
<th>DETROIT, MI</th>
<th>DOVER, DEL SURRY</th>
<th>EL CAJONE, CA &quot;EL CAJONE EXPRESS&quot;</th>
<th>EMMEN, NETHERLANDS</th>
<th>FAIRFAX CITY, VA</th>
<th>FLINT, MI MAXI-CAB COMMUTER CLUB</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE OF SERVICE</td>
<td>many-to-many</td>
<td>many-to-many</td>
<td>route deviation; one-to-many</td>
<td>many-to-many</td>
<td>subscription</td>
<td>home-to-work</td>
</tr>
<tr>
<td>POPULATION SERVED</td>
<td>120,000</td>
<td>16,800</td>
<td>60,000</td>
<td>4,000</td>
<td>23,000</td>
<td>196,940</td>
</tr>
<tr>
<td>SERVICE AREA (MI²)</td>
<td>9.0</td>
<td>21</td>
<td>17</td>
<td>0.5</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>NUMBER OF VEHICLES</td>
<td>13</td>
<td>4</td>
<td>14</td>
<td>2</td>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>AVERAGE WEEKDAY RIDERSHIP</td>
<td>500</td>
<td>102</td>
<td>600</td>
<td>110</td>
<td>est. 400</td>
<td>230</td>
</tr>
<tr>
<td>FARE (ADULT CASH)</td>
<td>free</td>
<td>free</td>
<td>50¢</td>
<td>30¢</td>
<td>25¢</td>
<td>by zones</td>
</tr>
<tr>
<td>FUNDING SOURCE (%)</td>
<td>HUD, local</td>
<td>local</td>
<td>local</td>
<td>local 100%</td>
<td>local 100%</td>
<td>US. DOT 66.4% private 5.3% local 28.3%</td>
</tr>
<tr>
<td>SPECIAL SERVICES FEATURES:</td>
<td>For senior</td>
<td></td>
<td></td>
<td>Discontinued</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>citizens</td>
<td></td>
<td></td>
<td>May, 1972</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References/Sources of further information:

**Detroit:**
Phone conversation with William McGuire, project director for transportation. 4/4/74

**Dover:**
Phone conversation with Don Hodge, assistant city manager for Dial-A-Ride. (302) 674-1000. 6/21/74

**El Cajone:**
Phone conversation with Norman Bryant, Yellow Cab Operations manager. (714) 239-8061. 7/10/74

**Emmen:**

**Fairfax City:**
Phone conversation with Mark Weiss, project director. 4/11/74

**Flint:**
Flint Transportation Authority. Fare Structure: Design, Implementation and Evaluation, June 1970
American Academy of Transportation, Flint, MI. Flint Transportation Authority Demonstration Project MICH-MTD-2, Feb. 1970
American Academy of Transportation, Origin-Destination Data Plotting and Analysis, June 1970
## SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES (CONT.)

<table>
<thead>
<tr>
<th>FT LEONARD WOOD, MO Fort Cab Co., Long Cab Co.</th>
<th>FT WALTON BEACH, FL &quot;CALL-A-BUS&quot;</th>
<th>GOTHENBURG, SWEDEN</th>
<th>GRAND RAPIDS, MI MODEL CITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE OF SERVICE</td>
<td>many-to-many</td>
<td>route deviation</td>
<td>many-to-many</td>
</tr>
<tr>
<td>POPULATION SERVED</td>
<td>est. 40,000</td>
<td>12,000</td>
<td>12,000</td>
</tr>
<tr>
<td>SERVICE AREA (MI²)</td>
<td>12</td>
<td>7.0</td>
<td>20</td>
</tr>
<tr>
<td>NUMBER OF VEHICLES</td>
<td>80</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>AVERAGE WEEKDAY RIDERSHIP</td>
<td>1000</td>
<td>60</td>
<td>2000</td>
</tr>
<tr>
<td>FARE (ADULT CASH)</td>
<td>40¢</td>
<td>50¢ door-to-door 35¢ regular</td>
<td>25¢</td>
</tr>
<tr>
<td>FUNDING SOURCE (%)</td>
<td>private</td>
<td>private</td>
<td>local 100%</td>
</tr>
<tr>
<td>SPECIAL SERVICES FEATURES:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References/Sources of further information:

Fort Leonard: Phone conversation with Robert Forrester, manager, Fort Cab Co. (314) 368-2494 4/23/74
Wood: Phone conversation with Edward Saul, supervisor, Long Cab Co. (314) 368-7101. 4/23/74

"Telephone Brings Bus to Door" Passenger Transport. March 3, 1971, p. 8


Michael Dewey and Betty Mikkelsen, Oct. 9, 1973
Phone conversation with Robert Paul Rosson, project director, 4/4/74.
## SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES (CONT.)

<table>
<thead>
<tr>
<th></th>
<th>HADDONFIELD, NJ</th>
<th>HARTFORD, CT</th>
<th>HELENA, MT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INITIAL SYSTEM</td>
<td>EXPANDED SYSTEM</td>
<td>INITIAL SYSTEM</td>
</tr>
<tr>
<td>TYPE OF SERVICE</td>
<td>transit feeder (peak)</td>
<td>many-to-many</td>
<td>many-to-one</td>
</tr>
<tr>
<td>POPULATION SERVED</td>
<td>24,381</td>
<td>44,000</td>
<td>25,000</td>
</tr>
<tr>
<td>SERVICE AREA (mi²)</td>
<td>6.5</td>
<td>11</td>
<td>est. 20</td>
</tr>
<tr>
<td>NUMBER OF VEHICLES</td>
<td>10</td>
<td>19 (1 wheelchair)</td>
<td>6</td>
</tr>
<tr>
<td>AVERAGE WEEKDAY RIDERSHIP</td>
<td>360</td>
<td>1200</td>
<td>100</td>
</tr>
<tr>
<td>FARE (ADULT CASH)</td>
<td>50¢</td>
<td>30¢</td>
<td>donations</td>
</tr>
<tr>
<td>FUNDING SOURCE (%)</td>
<td>Federal (UMTA) 80%</td>
<td>state</td>
<td>UMTA 67%</td>
</tr>
<tr>
<td></td>
<td>NJ DOT 20%</td>
<td>local</td>
<td>local</td>
</tr>
<tr>
<td>SPECIAL SERVICES FEATURES:</td>
<td>Subscription service</td>
<td>Senior citizens only.</td>
<td>wheelchair accommodations (expansion dates: 9/72, 3/73, &amp; 8/73)</td>
</tr>
<tr>
<td></td>
<td>Senior citizens half fare</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References/Sources of further information:

Haddonfield:  
“New Jersey Dial-a-Ride System Building Ridership in 2nd Year”, Highway Research News, No. 51 Summer 1973  
Zobrak, Marcel and Douglas M. Medville. Haddonfield Dial-a-ride Experiment: Interim Results.  
Presented at the International Conference on Transportation Research.  
Implementation and Operation of a Demand Responsive Public Transportation System (Haddonfield Dial-A-Ride).  

Hartford:  
Telephone conversation with William Knopf, director. (203) 278-9950 ext. 306. 6/25/74.

Helena:  
Telephone conversation with William Emge, manager of transportation systems. 4/5/74.
<table>
<thead>
<tr>
<th>Service</th>
<th>Date Initiated</th>
<th>Type of Service</th>
<th>Population Served</th>
<th>Service Area (mi²)</th>
<th>Number of Vehicles</th>
<th>Average Weekday Ridership</th>
<th>Fare (Adult Cash)</th>
<th>Funding Source (%)</th>
<th>Special Services Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEMET, CA DIAL-A-RIDE</td>
<td>Jan. 1974</td>
<td>many-to-many</td>
<td>17,200</td>
<td>6.5</td>
<td>2</td>
<td>90</td>
<td>$.50</td>
<td>Local</td>
<td>24-Hr. Service</td>
</tr>
<tr>
<td>HICKSVILLE, NY</td>
<td>1961</td>
<td>many-to-many</td>
<td>48,100</td>
<td>6.8</td>
<td>30</td>
<td>814</td>
<td>By zones</td>
<td>Private</td>
<td>Senior Citizens Half Fare</td>
</tr>
<tr>
<td>HOLLAND, MI</td>
<td>Feb. 1974</td>
<td>many-to-many</td>
<td>26,000</td>
<td>13.8</td>
<td>5</td>
<td>250</td>
<td>$.50</td>
<td>State</td>
<td>Senior Citizens Half Fare</td>
</tr>
<tr>
<td>HOUGHTON-HANCOCK, MI</td>
<td>July, 1974</td>
<td>many-to-many</td>
<td>10,900</td>
<td>3.8</td>
<td>3</td>
<td>8.14</td>
<td>$.50</td>
<td>State</td>
<td>Senior Citizens Half Fare</td>
</tr>
<tr>
<td>ISABELLA CO., MI VAN-TRAN</td>
<td>June, 1974</td>
<td>many-to-few</td>
<td>43,769</td>
<td>572</td>
<td>2</td>
<td>55</td>
<td>$1.00</td>
<td>State</td>
<td></td>
</tr>
<tr>
<td>KENT, OH DRUBS</td>
<td>Jan. 1971</td>
<td>many-to-one</td>
<td>105 households</td>
<td>75</td>
<td>1</td>
<td></td>
<td>Free</td>
<td>UMTA 100%</td>
<td></td>
</tr>
</tbody>
</table>
References/Sources of further information:

Hemet: Phone conversation with David Oltman, superintendent of public works. 658-9411


Holland: Phone conversation with Jerry Geile, Michigan State Highway Commission. Urban Transportation Division (517) 373-6572. 4/74.

Houghton- Hancock: Phone conversation with Jerry Geile, Michigan State Highway Commission. Urban Transportation Division (517) 373-6572. 4/74.

Isabella Co.: Phone conversations with Jerry Geile, Michigan State Highway Commission, Urban Transportation Division, (517) 373-6572, 7/12/74, and Jill Kooiman, Isabella Co. Commission on Aging, (517) 772-0911, 7/12/74.

<table>
<thead>
<tr>
<th></th>
<th>KENT, OH CAMPUS BUS SERVICE</th>
<th>KINGSTON, ONTARIO</th>
<th>KLAMATH FALLS, OR</th>
<th>LA HABRA, CA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INITIAL SYSTEM</td>
<td>EXPANDED SYSTEM</td>
<td>INITIAL SYSTEM</td>
<td>EXPANDED SYSTEM</td>
</tr>
<tr>
<td>TYPE OF SERVICE</td>
<td>many-to-few</td>
<td>many-to-many within many-to-one without</td>
<td>Fixed route Flag down</td>
<td>many-to-many</td>
</tr>
<tr>
<td>POPULATION SERVED</td>
<td>40</td>
<td>18,000</td>
<td>32,000</td>
<td>47,000</td>
</tr>
<tr>
<td>SERVICE AREA (MI²)</td>
<td>6.0</td>
<td>5.4</td>
<td></td>
<td>7.0</td>
</tr>
<tr>
<td>NUMBER OF VEHICLES</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>AVERAGE WEEKDAY RIDERSHIP</td>
<td>165</td>
<td>150</td>
<td>450</td>
<td>100</td>
</tr>
<tr>
<td>FARE (ADULT CASH)</td>
<td>$8/3 month subscription</td>
<td>35¢</td>
<td>25¢</td>
<td>50¢</td>
</tr>
<tr>
<td>FUNDING SOURCE (%)</td>
<td></td>
<td>Federal (UMTA) 71% State 21% Local 8%</td>
<td></td>
<td>Local (Gas tax)</td>
</tr>
<tr>
<td>SPECIAL SERVICES FEATURES</td>
<td>Handicapped only</td>
<td></td>
<td>Originally off-peak only using school buses. Expanded to full time for summer. Discontinued</td>
<td>Senior citizens 25¢. All propane vehicles.</td>
</tr>
</tbody>
</table>
References/Sources of further information:

Phone conversation with Joseph Fiala, general manager, 4/11/74

Kingston: Bonsall, J.A. (Ottawa-Carleton Regional Transit Commission, Ontario) and B.D. Simpkins (Ministry of Transportation and Communication, Ontario).
Dial-a-Bus: Three Years’ Experience in Ontario.
Simpkins, B.D. (Ontario Ministry of Transportation and Communications).


La Habra: Shilling, David R. “Dial-a-Ride: The La Habra Experiment”
Paper presented at the 26th Annual Western Dist. Conf. of the Institute of Traffic Engineers, Las Vegas, 1973
### SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES (CONT.)

<table>
<thead>
<tr>
<th></th>
<th>LA MESA, CA</th>
<th>LA MIRADA, CA</th>
<th>LINCOLN, NEB</th>
<th>LITTLE ROCK, ARK</th>
<th>LOS ANGELES, CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE OF SERVICE</td>
<td>many-to-many</td>
<td>many-to-many</td>
<td>many-to-many</td>
<td>many-to-many</td>
<td>many-to-many</td>
</tr>
<tr>
<td>POPULATION SERVED</td>
<td>45,000</td>
<td>32,000</td>
<td>3500 eligible</td>
<td>190,000</td>
<td>110,000</td>
</tr>
<tr>
<td>SERVICE AREA (MI²)</td>
<td>7.0</td>
<td>6.0</td>
<td>51.0</td>
<td>53.0</td>
<td>8.6</td>
</tr>
<tr>
<td>NUMBER OF VEHICLES</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>75</td>
<td>7</td>
</tr>
<tr>
<td>AVERAGE WEEKDAY RIDERSHIP</td>
<td>275</td>
<td>360</td>
<td>100</td>
<td>3000</td>
<td>250</td>
</tr>
<tr>
<td>FARE (ADULT CASH)</td>
<td>50¢</td>
<td>25¢</td>
<td>40¢</td>
<td>By zones</td>
<td>15¢</td>
</tr>
<tr>
<td>FUNDING SOURCE (%)</td>
<td>State</td>
<td>Local</td>
<td>UMTA 90%</td>
<td>Private</td>
<td>UMTA 100%</td>
</tr>
<tr>
<td>SPECIAL SERVICES FEATURES:</td>
<td></td>
<td></td>
<td>Handicapped only</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A-21
References/Sources of further information:

La Mesa: Phone conversation with Norman Bryant, operations manager. (714) 239-8061. 7/10/74.

Phone conversation with Donald Pruyn, administrative assistant for public transit. (213) 943-0131. 7/11/74.

Lincoln: Phone conversation with James Zeitlow, administrator for the city/county commission on the aged. 477-1241. 4/5/74.

Little Rock: Phone conversation with John W. Hall, president, Black and White Cab Co. 1010 Markham St., Little Rock, Ark. 374-0333

Los Angeles: Phone conversation with John Maxwell, project director. (213) 564-4401. 4/10/74
<table>
<thead>
<tr>
<th>Service</th>
<th>Lowell, MA</th>
<th>Ludington, MI</th>
<th>Mansfield, OH Dial-A-Ride</th>
<th>Medford, OR</th>
<th>Menlo Park, CA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Service</strong></td>
<td>shared taxi</td>
<td>many-to-many</td>
<td>route deviation</td>
<td>route deviation</td>
<td>many-to-one</td>
</tr>
<tr>
<td><strong>Population Served</strong></td>
<td>90,000</td>
<td>9021</td>
<td>3150</td>
<td>30,000</td>
<td>2500</td>
</tr>
<tr>
<td><strong>Service Area (mi²)</strong></td>
<td>3.2</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of Vehicles</strong></td>
<td>40</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Average Weekday Ridership</strong></td>
<td>200</td>
<td>76 (14.4 door-to-door)</td>
<td>50-100; 5-10 use deviation</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td><strong>fare (Adult Cash)</strong></td>
<td>50¢</td>
<td>35¢ regular</td>
<td>25¢</td>
<td>Free</td>
<td></td>
</tr>
<tr>
<td><strong>Funding Source (%)</strong></td>
<td>State</td>
<td>Local</td>
<td>Federal (OEO) until July 1973, local continuation.</td>
<td>Private</td>
<td></td>
</tr>
<tr>
<td><strong>Special Services Features</strong>:</td>
<td>Senior citizens half fare</td>
<td>Discontinued Jan. 1971</td>
<td>4.8 miles of possible deviation from 12 mile regular route.</td>
<td>For senior citizens</td>
<td></td>
</tr>
</tbody>
</table>
References/Sources for further information:

Lowell: Phone conversation with Mr. Sullivan of Diamond Cab of Lowell. (617) 458-6861

Ludington: Phone conversation with Jerry Geile, Michigan State Highway Commission. Urban Transportation Division. (517) 373-6572.

Mansfield: Richland County Regional Planning Commission, OH. The Mansfield, Ohio, Dial-a-ride Experiment. August, 1970

Medford: “Dial-a-ride Experimentation Spreading”, Passenger Transport, August 11, 1972, p. 6
Phone conversation with Mr. Nelson, county commissioner for transportation. 4/74.

Menlo Park: Phone conversation with office of Ms Jean Von Ezdorf, executive director of “Little House” (415) 326-2025. 4/10/74
<table>
<thead>
<tr>
<th>MERCED, CA MERCED, CA MIDLAND, MI</th>
<th>MERCED, CA DIAL-A-RIDE</th>
<th>MIDLAND, MI</th>
<th>MT PLEASANT, MI</th>
<th>NEW ORLEANS (ST. BERNARD PARISH) &quot;PORTAL-TO-PORTAL&quot; SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE OF SERVICE</td>
<td>many-to-many</td>
<td>many-to-many</td>
<td>many-to-many</td>
<td>many-to-many; route deviation</td>
</tr>
<tr>
<td>POPULATION SERVED</td>
<td>25,000</td>
<td>25,000</td>
<td>35,176</td>
<td>20,504</td>
</tr>
<tr>
<td>SERVICE AREA (MI²)</td>
<td>16</td>
<td>16</td>
<td>24.9</td>
<td>5.1</td>
</tr>
<tr>
<td>NUMBER OF VEHICLES</td>
<td>18</td>
<td>4</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>AVERAGE WEEKDAY RIDERSHIP</td>
<td>130</td>
<td></td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>FARE (ADULT CASH)</td>
<td>50¢/person</td>
<td>25¢</td>
<td>50¢</td>
<td>50¢ extra 40¢</td>
</tr>
<tr>
<td></td>
<td>$1.00 minimum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUNDING SOURCE (%)</td>
<td>Private</td>
<td>Local</td>
<td>State</td>
<td>State</td>
</tr>
<tr>
<td>SPECIAL SERVICES FEATURES:</td>
<td></td>
<td></td>
<td></td>
<td>Senior citizens half fare</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Senior citizens half fare</td>
</tr>
</tbody>
</table>
References/Sources for further information:

**Merced Cabs:** Phone conversation with Mr. Ed Hladick, president. (209) 772-2741. 4/10/74

**Merced (city):** Phone conversation with Ms. "Pete" Hansen (209) 722-4131. 4/10/74

**Midland:** Phone conversation with Jerry Geile, Michigan State Highway Commission, Urban Transportation Div. (517) 373-6572 4/74.

**Mt. Pleasant:** Phone conversation with Jerry Geile, Michigan State Highway Commission, Urban Transportation Div. (517) 373-6572 4/74.

**New Orleans:** Phone conversation with Peter Rusck, manager of St. Bernard Bus Co. (504) 279-5556. 4/11/74
### SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES (CONT.)

<table>
<thead>
<tr>
<th></th>
<th>OTTAWA, ONT &quot;TELE-TRANSPO&quot;</th>
<th>PEORIA, IL &quot;PREMIUM SPECIAL SERVICE&quot;</th>
<th>REGINA, SASKATCHEWAN &quot;TELEBUS&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INITIAL SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TYPE OF SERVICE</td>
<td>many-to-one</td>
<td>many-to-one</td>
<td>line feeder; many-to-few</td>
</tr>
<tr>
<td>POPULATION SERVED</td>
<td>27,400</td>
<td>4900</td>
<td>18,000</td>
</tr>
<tr>
<td>SERVICE AREA (M1²)</td>
<td>5.2</td>
<td>2.75</td>
<td>5.0 peak 8.5 off-peak</td>
</tr>
<tr>
<td>NUMBER OF VEHICLES</td>
<td>17</td>
<td>17</td>
<td>7</td>
</tr>
<tr>
<td>AVERAGE WEEKDAY RIDERSHIP</td>
<td>1410</td>
<td>2000</td>
<td>1200</td>
</tr>
<tr>
<td>FARE (ADULT CASH)</td>
<td>50¢ peak; 35¢ off-peak</td>
<td>50¢ peak; 35¢ off-peak</td>
<td>25¢; 35¢</td>
</tr>
<tr>
<td>FUNDING SOURCE (%)</td>
<td>Province 50%; Local 50%</td>
<td>Federally funded test; private continuation</td>
<td>Local Provincial Federal</td>
</tr>
<tr>
<td>SPECIAL SERVICES FEATURES:</td>
<td></td>
<td>Discontinued Jan. 1971</td>
<td></td>
</tr>
<tr>
<td><strong>EXPANDED SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DATE INITIATED</td>
<td>March 1974</td>
<td></td>
<td>June 1972</td>
</tr>
<tr>
<td>TYPE OF SERVICE</td>
<td>many-to-one</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POPULATION SERVED</td>
<td>32,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SERVICE AREA (M1²)</td>
<td>2.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUMBER OF VEHICLES</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVERAGE WEEKDAY RIDERSHIP</td>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FARE (ADULT CASH)</td>
<td>50¢ peak; 35¢ off-peak</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUNDING SOURCE (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPECIAL SERVICES FEATURES:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References/Sources of further information:

**Ottawa:**
Bonsall, J.A. (Ottawa-Carleton Regional Transit Commission, Ontario) and B.D. Simpkins (Ministry of Transportation and Communication, Ontario).
Phone conversation with Joel Coffman, transit planning officer. (416) 248-3785. 6/28/74

**Peoria:**

**Regina:**
Phone conversation with Jerry McAdoo, General Manager, Regina Transit System. 5/74.
<table>
<thead>
<tr>
<th></th>
<th>RESTON, VA COMMUTER BUS</th>
<th>RHODE ISLAND SENIOR CITIZEN'S TRANSPORTATION</th>
<th>RICHMOND, CA</th>
<th>ROCHESTER, NY &quot;PERT&quot; &quot;PILOT PROJECT&quot;</th>
<th>ROCKVILLE, MD DIAL-A-BUS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE OF SERVICE</strong></td>
<td>many-to-few</td>
<td>many-to-many</td>
<td>many-to-many</td>
<td>subscription; many-to-many</td>
<td>many-to-many</td>
</tr>
<tr>
<td><strong>POPULATION SERVED</strong></td>
<td>25,000</td>
<td>150,000</td>
<td>44,000</td>
<td>30,000</td>
<td>50,000</td>
</tr>
<tr>
<td><strong>SERVICE AREA (Mi²)</strong></td>
<td>11.5</td>
<td>1214</td>
<td>4.9</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td><strong>NUMBER OF VEHICLES</strong></td>
<td>25</td>
<td>28</td>
<td>13</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td><strong>AVERAGE WEEKDAY RIDERSHIP</strong></td>
<td>2000</td>
<td>900</td>
<td>440</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FARE (ADULT CASH)</strong></td>
<td>$1.40</td>
<td>free</td>
<td>25¢</td>
<td>basic fare $1.00 25¢ each additional person</td>
<td>25¢</td>
</tr>
<tr>
<td><strong>FUNDING SOURCE (%)</strong></td>
<td>Private</td>
<td>Federal 75% State 25%</td>
<td>Federal Local</td>
<td>County</td>
<td></td>
</tr>
<tr>
<td><strong>SPECIAL SERVICES FEATURES:</strong></td>
<td>subscription home-to-work</td>
<td>for those 60 and over</td>
<td>digital communications subscription service for peak hours</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References/Sources of further information:

Phone conversation with Ms. Hed, office manager. 7/12/74

Rhode Island: A DEMAND RESPONSIVE TRANSPORTATION SYSTEM DESIGNED FOR RHODE ISLAND’S OLDER POPULATION.
A report to the U.S. Senate Special Committee on Aging, hearing on Transportation and the Elderly. Feb. 25, 1974
Phone conversation with Catherine O’Reilly Collette, program planner. (401) 277-2858. 7/9/74.

Richmond: “AC Dial-a-ride arrives with the Sound of Music” Passenger Transport, Jan. 25, 1974
Phone conversation with Dale Goodman, manager of transportation. (415) 654-7878. 6/21/74.

Phone conversation with Robert Aex, 5/74.

Rockville: Phone conversation with Wayne Hucke, transportation planner (301) 424-8000. 4/74.
### SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES (CONT.)

<table>
<thead>
<tr>
<th>ST. PETERSBURG, FL “TOTE”</th>
<th>SANTA CLARA COUNTY, CA</th>
<th>SAULT STE. MARIE, MI</th>
<th>SCOTT-CARVER COUNTIES, MN</th>
<th>STRATFORD, ONT. “DART”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE OF SERVICE</strong></td>
<td>many-to-many</td>
<td>many-to-many</td>
<td>many-to-many</td>
<td>many-to-many</td>
</tr>
<tr>
<td><strong>POPULATION SERVED</strong></td>
<td>30,000 eligible</td>
<td>1.1 million</td>
<td>15,136</td>
<td>5,403</td>
</tr>
<tr>
<td></td>
<td>15,000 registered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SERVICE AREA (MI^2)</strong></td>
<td>10.0</td>
<td>241</td>
<td>15.7</td>
<td>688</td>
</tr>
<tr>
<td><strong>NUMBER OF VEHICLES</strong></td>
<td>13 (including 2 wheelchairs)</td>
<td>90</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td><strong>AVERAGE WEEKDAY RIDERSHIP</strong></td>
<td>400 (10,000/month)</td>
<td>20</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td><strong>FARE (ADULT CASH)</strong></td>
<td>1 day reservation $.35</td>
<td>25¢</td>
<td>40¢ or 50¢</td>
<td>25¢ to 30 miles</td>
</tr>
<tr>
<td></td>
<td>same day $.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FUNDING SOURCE (%)</strong></td>
<td>UMTA 67% Local 33%</td>
<td>UMTA 25%</td>
<td>State</td>
<td>State 20% Local 80%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>County 25%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SPECIAL SERVICES FEATURES:</strong></td>
<td>Those over 60 or handicapped.</td>
<td>Blind, free. Subscription service.</td>
<td>Senior citizens half fare</td>
<td>Senior citizens only</td>
</tr>
</tbody>
</table>
References/Sources of further information:

Phone conversation with Ken Schreiber. 4/3/74.

Phone conversation with James T. Pott, assistant executive director for the Santa Clara County and assistant executive
director for the Santa Clara Transit District. 4/18/74.

Sault Ste. Marie: Phone conversation with Jerry Geile, Michigan State Highway Commission, Urban Transportation Div., (517) 373-6572

Sponsored by UMTA.

Stratford:  Bonsall, J.A. (Ottawa-Carleton Regional Transit Commission, Ontario) and B.D. Simpkins (Ministry of Transportation and
Communication, Ontario).
Paper presented at the Roads and Transportation Association of Canada, Annual Conference, Halifax, Nova Scotia,
October 9-12, 1973
Simpkins, B.D. (Ontario Ministry of Transportation and Communications).
### SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES (CONT.)

<table>
<thead>
<tr>
<th></th>
<th>SUDBURY, ONT.</th>
<th>TOLEDO, OH MODEL NEIGHBORHOOD</th>
<th>TORONTO, ONTARIO &quot;GO DIAL-A-BUS&quot;</th>
<th>TRAVERSE CITY, MI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE OF SERVICE</strong></td>
<td>many-to-few</td>
<td>many-to-many</td>
<td>many-to-one</td>
<td>many-to-many</td>
</tr>
<tr>
<td><strong>POPULATION SERVED</strong></td>
<td>1000</td>
<td>40,000</td>
<td>20,800</td>
<td>18,048</td>
</tr>
<tr>
<td><strong>SERVICE AREA (MI²)</strong></td>
<td></td>
<td>3.5</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td><strong>NUMBER OF VEHICLES</strong></td>
<td>1</td>
<td>7</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td><strong>AVERAGE WEEKDAY RIDE</strong></td>
<td>28</td>
<td>350</td>
<td>800</td>
<td>630</td>
</tr>
<tr>
<td><strong>FARE (ADULT CASH)</strong></td>
<td>45¢</td>
<td>10¢</td>
<td>40¢</td>
<td>40¢</td>
</tr>
<tr>
<td><strong>FUNDING SOURCE (%)</strong></td>
<td>HUD</td>
<td>Province 100% for 3-year trial</td>
<td>State</td>
<td></td>
</tr>
<tr>
<td><strong>SPECIAL SERVICES</strong></td>
<td>Subscription only</td>
<td>1 day notice Dial-A-Ride to clinics (expanded July 1973)</td>
<td>3 vehicles adapted for wheelchairs</td>
<td>Senior citizens half fare</td>
</tr>
</tbody>
</table>
References/Sources of further information:

**Sudbury:**
Bonsall, J.A. (Ottawa-Carleton Regional Transit Commission, Ontario) and B.D. Simpkins (Ministry of Transportation and Communication, Ontario).

**Toledo:**
Phone conversation with Robert Taylor, project director, (419) 248-6676. 7/3/74.

**Toronto:**
Simpkins, B.D. (Ontario Ministry of Transportation and Communications).

**Traverse City:**
Phone conversation with Jerry Geile, Michigan State Highway Commission, Urban Transportation Div. (517) 373-6572. 4/74.
<table>
<thead>
<tr>
<th></th>
<th>VALLEY TRANSIT DISTRICT</th>
<th>WASHINGTON, DC METROPOLITAN COUNCIL OF GOVERNMENT</th>
<th>WEST PALM BEACH, FL “LIFT-LINE”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE OF SERVICE</strong></td>
<td>shuttle</td>
<td>subscription service</td>
<td>route deviation</td>
</tr>
<tr>
<td></td>
<td>many-to-many</td>
<td>many-to-one</td>
<td></td>
</tr>
<tr>
<td><strong>POPULATION SERVED</strong></td>
<td>25,000 (est.)</td>
<td>75,000</td>
<td>30,000</td>
</tr>
<tr>
<td><strong>SERVICE AREA (MI²)</strong></td>
<td>15</td>
<td>56.0</td>
<td>300</td>
</tr>
<tr>
<td><strong>NUMBER OF VEHICLES</strong></td>
<td>2</td>
<td>3</td>
<td>6-8</td>
</tr>
<tr>
<td><strong>AVERAGE WEEKDAY RIDERSHIP</strong></td>
<td>130</td>
<td>200</td>
<td>1000</td>
</tr>
<tr>
<td><strong>FARE (ADULT CASH)</strong></td>
<td>25-35-45¢</td>
<td>Varies 25¢ to $2.50</td>
<td>free</td>
</tr>
<tr>
<td><strong>FUNDING SOURCE (%)</strong></td>
<td>Federal (UMTA)</td>
<td>FHA 100% for 1-1/2 year</td>
<td>State; DOT Federal (HEW)</td>
</tr>
<tr>
<td></td>
<td>State</td>
<td>demonstration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Local</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SPECIAL SERVICES FEATURES:</strong></td>
<td>1 vehicle adapted for handicapped. Credit card fare collection.</td>
<td></td>
<td>For elderly, handicapped, and disadvantaged.</td>
</tr>
</tbody>
</table>
References/Sources of further information:


**Washington:** Phone conversation with Christopher Neumann, transportation engineer, 4/11/74

**West Palm Beach:** Phone conversation with David Duffy, Florida DOT Urban Transportation Operations Bureau. 488-3251. 4/30/74
Phone conversation with Eugene Eddy, Transportation coordinator for State Dept. of Human Resources. 686-4555. 4/30/74
### SUMMARY OF SELECTED CHARACTERISTICS OF 80 DEMAND RESPONSIVE TRANSPORTATION SERVICES (CONT.)

<table>
<thead>
<tr>
<th></th>
<th>WESTERN OLDER CITIZEN'S COUNCIL PROJECT INDEPENDENCE TRANSPORTATION (ANDROSCOGGIN-FRANKLIN-OXFORD CO., ME)</th>
<th>WILLINGBORO, NJ &quot;DIAL-A-JITNEY&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE OF SERVICE</td>
<td>many-to-many</td>
<td>many-to-many</td>
</tr>
<tr>
<td>POPULATION SERVED</td>
<td>45,000</td>
<td></td>
</tr>
<tr>
<td>SERVICE AREA (MI²)</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>NUMBER OF VEHICLES</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>AVERAGE WEEKDAY RIDERSHIP</td>
<td>224</td>
<td>90</td>
</tr>
<tr>
<td>FARE (ADULT CASH)</td>
<td>free</td>
<td>$.75 avg (by zones)</td>
</tr>
<tr>
<td>FUNDING SOURCE (%)</td>
<td>Federal Local</td>
<td>Private</td>
</tr>
<tr>
<td>SPECIAL SERVICES FEATURES:</td>
<td>For senior citizens only.</td>
<td></td>
</tr>
</tbody>
</table>

A-37
References/Sources of further information:

Western Older Citizens:
- Phone conversation with Project Independence office (207) 645-4222

Willingboro:
- Lundberg, Barry D. and Charles W. Lustig
  Phone conversation with office of Mr. James Schoonover, manager 871-9300.
APPENDIX B

REFERENCES

NOTE: Materials available from the National Technical Information Service are indicated by a "PB" order number.


40. Kent State Univ., OH. DRUBS: DEMAND-ROUTED URBAN BUS SERVICE. Sponsored by UMTA.


APPENDIX B (CONT.)


APPENDIX C

SUGGESTED PERIODICALS AND OTHER SOURCES OF CURRENT INFORMATION

This list represents the more important trade journals and other periodical literature that are known to contain articles and information on demand-responsive transportation. These sources are available by subscription or at major public and university libraries.

- Current Literature in Traffic and Transportation (bibliographic source)
- Lea Transit Compendium
- Motor Coach Age
- New Concepts in Urban Transportation
- Passenger Transport
- Taxicab Management
- Traffic Engineering
- Traffic Engineering and Control
- Traffic Quarterly
- Traffic World
- Transit Topics
- Transitrends
- Transport Central
- Transportation Engineering Journal (ASCE)
- Transportation Research
- Transportation Research Board Publications (formerly Highway Research Board)
## APPENDIX D

### DIRECTORY OF CONSULTING AND RESEARCH ORGANIZATIONS

<table>
<thead>
<tr>
<th>Organization</th>
<th>Address Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amalgamated Transit Union</td>
<td>5025 Wisconsin Ave. N.W. Washington, DC</td>
</tr>
<tr>
<td>American Transit Association</td>
<td>475 L'Enfant Plaza W SW Washington, DC</td>
</tr>
<tr>
<td>Barton-Ashman Associates</td>
<td>1771 West Howard Chicago, IL</td>
</tr>
<tr>
<td>Bendix Corp.</td>
<td>1730 K Street NW Washington, DC</td>
</tr>
<tr>
<td>Boeing Surface Transportation Systems</td>
<td>The Boeing Co. Boeing Center P.O. Box 16858 Philadelphia, PA 19142 (215) 522-7270</td>
</tr>
<tr>
<td>Booz, Allen Applied Research</td>
<td>4733 Bethesda Ave. Bethesda, MD</td>
</tr>
<tr>
<td>Canadian Urban Transit Association</td>
<td>1138 Bathurst St. Toronto, Ontario</td>
</tr>
<tr>
<td>Centre for Transportation Surveys</td>
<td>Utrecht, Holland</td>
</tr>
<tr>
<td>Crain and Associates, Urban Consultants</td>
<td>625 South Kingsley Drive, Los Angeles, CA</td>
</tr>
<tr>
<td>Cranfield Institute of Technology</td>
<td>Cranfield, Bedfordshire, England</td>
</tr>
<tr>
<td>DAVE Systems, Inc.</td>
<td>Hotel Claremont Suite 221 41 Tunnel Road Berkeley, CA (415) 548-7037</td>
</tr>
<tr>
<td>De Leuw, Cather and Co.</td>
<td>165 West Wacker Chicago, IL</td>
</tr>
<tr>
<td>DGA International</td>
<td>1225 Nineteenth St., N.W. Washington, DC 20006</td>
</tr>
<tr>
<td>ECI Systems</td>
<td>1033 Massachusetts Ave. Cambridge, MA (617) 864-5810</td>
</tr>
<tr>
<td>Ecole Polytechnique</td>
<td>Montreal, Canada</td>
</tr>
<tr>
<td>Ford Motor Co., Transportation Research and Planning Office</td>
<td>23400 Michigan Ave. Dearborn, MI (313) 551-2200</td>
</tr>
<tr>
<td>Ford of Europe Inc.</td>
<td>Laindon, Essex, G.B.</td>
</tr>
<tr>
<td>General Motors Research Laboratories</td>
<td>Transportation Research Dept. Warren, MI</td>
</tr>
<tr>
<td>General Research Corp.</td>
<td>P.O. Box 3587 Santa Barbara, CA 93105</td>
</tr>
<tr>
<td>Goodell, Grivas &amp; Associates, Inc.</td>
<td>Southfield, MI</td>
</tr>
<tr>
<td>Huron River Group, Inc.</td>
<td>209 East Washington Ann Arbor, MI 48103</td>
</tr>
<tr>
<td>Isuzu Motors, Ltd.</td>
<td>Japan</td>
</tr>
<tr>
<td>Kates, Peet, Marvin &amp; Co.</td>
<td>Commerce Court West P.O. Box 31 Commerce Court Postal Station Tokyo, Ontario (416) 853-3500</td>
</tr>
<tr>
<td>LEX Systems, Inc.</td>
<td>3000 Sandhill Rd. Menlo Park, CA 94025</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology</td>
<td>Urban Systems Laboratory Cambridge, MA</td>
</tr>
<tr>
<td>MITRE Corp.</td>
<td>Westgate Research Park McLean, VA 22101 (703) 893-3900</td>
</tr>
<tr>
<td>Pratt (R.H.) and Associates</td>
<td>Garrett Park, MD Kensington, MD</td>
</tr>
<tr>
<td>Rouse Co.</td>
<td>American City Building Columbia, MD 21043 (301) 730-7700</td>
</tr>
<tr>
<td>Simpson &amp; Curtin</td>
<td>1405 Locust St. Philadelphia, PA 19102 (215) 545-8000</td>
</tr>
<tr>
<td>Stanford Research Inst.</td>
<td>333 Ravenswood Avenue Menlo Park, CA (415) 326-6200</td>
</tr>
<tr>
<td>Sverdrup and Parcel and Associates,</td>
<td>Transportation Technology Div. 800 North 12th Boulevard St. Louis, MO 63101 (314) 436-7600</td>
</tr>
<tr>
<td>Teknekron Inc.</td>
<td>1610 Massachusetts Ave. NW Washington, DC (202) 687-1002</td>
</tr>
<tr>
<td>University of Oklahoma</td>
<td>Urban Transportation Institute Norman, OK</td>
</tr>
<tr>
<td>University of Tennessee</td>
<td>Transportation Research Center Knoxville, Tennessee (614) 974-5311</td>
</tr>
<tr>
<td>The Urban Institute</td>
<td>2100 M Street, NW Washington, DC 20037 (202) 223-1950</td>
</tr>
<tr>
<td>Alan M. Voorhees &amp; Associates</td>
<td>Westgate Research Park McLean, VA 22101 (703) 893-4310</td>
</tr>
<tr>
<td>University of Pennsylvania</td>
<td>Urban Transportation Institute Norman, OK</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology</td>
<td>Urban Systems Laboratory Cambridge, MA</td>
</tr>
<tr>
<td>MITRE Corp.</td>
<td>Westgate Research Park McLean, VA 22101 (703) 893-3900</td>
</tr>
<tr>
<td>Pratt (R.H.) and Associates</td>
<td>Garrett Park, MD Kensington, MD</td>
</tr>
<tr>
<td>Rouse Co.</td>
<td>American City Building Columbia, MD 21043 (301) 730-7700</td>
</tr>
<tr>
<td>Simpson &amp; Curtin</td>
<td>1405 Locust St. Philadelphia, PA 19102 (215) 545-8000</td>
</tr>
</tbody>
</table>

D-1
# APPENDIX E

## DIRECTORY OF GOVERNMENTAL UNIT, OPERATING AGENCIES, & TRANSIT AUTHORITIES

<table>
<thead>
<tr>
<th>Agency</th>
<th>Address 1</th>
<th>Address 2</th>
<th>City, State, Zip</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Transit</td>
<td>508 16th Street</td>
<td>Oakland, CA 94612</td>
<td>(415) 654-7818</td>
<td></td>
</tr>
<tr>
<td>Alpha Communications Development Corp.</td>
<td>57 E. Canfield</td>
<td>Detroit, MI</td>
<td>(313) 663-0154</td>
<td></td>
</tr>
<tr>
<td>Ann Arbor Transit Authority</td>
<td>400 W. Washington Annex</td>
<td>Ann Arbor, MI 48104</td>
<td>(313) 663-0154</td>
<td></td>
</tr>
<tr>
<td>Bensenville, Village of, Dial-a-Bus</td>
<td>700 West Irving Park Road</td>
<td>Bensenville, IL</td>
<td>(312) 766-1010</td>
<td></td>
</tr>
<tr>
<td>Black and White Cab Co.</td>
<td>1010 Markham St.</td>
<td>Little Rock, AR 72201</td>
<td>(501) 374-0333</td>
<td></td>
</tr>
<tr>
<td>Buffalo (NY) Model Cities Jitney Transportation</td>
<td></td>
<td>Buffalo, NY</td>
<td>(716) 858-4020</td>
<td></td>
</tr>
<tr>
<td>City of Calgary Planning Dept.</td>
<td></td>
<td>Calgary, AB</td>
<td>(403) 268-2424</td>
<td></td>
</tr>
<tr>
<td>Cambridge Transit Authority</td>
<td></td>
<td>Cambridge, ON</td>
<td>(519) 623-7721</td>
<td></td>
</tr>
<tr>
<td>Collinwood ElderCare Center</td>
<td>985 E. 152nd St.</td>
<td>Cleveland, OH 44110</td>
<td>(216) 249-5100</td>
<td></td>
</tr>
<tr>
<td>Columbia (MD) Transit System</td>
<td>1000 Century Plaza</td>
<td>Columbia, MD 21044</td>
<td>(301) 730-6100</td>
<td></td>
</tr>
<tr>
<td>Dial-a-Bus</td>
<td>10921 Hooper Ave.</td>
<td>Greater Watts Model Cities</td>
<td>(213) 663-0154</td>
<td></td>
</tr>
<tr>
<td>Dial-a-Ride Transit Corp of Columbus, Inc.</td>
<td>994 E. Broad St.</td>
<td>Columbus, OH</td>
<td>(614) 268-8422</td>
<td></td>
</tr>
<tr>
<td>City of Dover</td>
<td>City Manager's Office</td>
<td>Dover, DE</td>
<td>(302) 674-1000</td>
<td></td>
</tr>
<tr>
<td>Cranston TransVan</td>
<td>858 Park Avenue</td>
<td>Cranston, RI</td>
<td>(401) 461-2400</td>
<td></td>
</tr>
<tr>
<td>Dallas Transit System</td>
<td>101 N. Peak St.</td>
<td>E. Dallas, TX 75226</td>
<td>(214) 827-3400</td>
<td></td>
</tr>
<tr>
<td>Davis California Senior Center</td>
<td>Davis, CA</td>
<td>(916) 758-4020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detroit Model Neighborhood Transportation Service</td>
<td>57 E. Canfield</td>
<td>Detroit, MI</td>
<td>(313) 833-0155</td>
<td></td>
</tr>
<tr>
<td>Fort Cab Co.</td>
<td>Fort Leonard Wood, MO</td>
<td>(314) 368-2494</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Rapids Transit Authority</td>
<td>1151 Sheldon Ave. S.E.</td>
<td>Grand Rapids, MI 49507</td>
<td>(616) 245-2136</td>
<td></td>
</tr>
<tr>
<td>Community Renewal Team of Greater Hartford</td>
<td>2680 Main Street</td>
<td>Hartford, CT</td>
<td>(203) 278-8950</td>
<td></td>
</tr>
<tr>
<td>Dial-a-Bus</td>
<td>10921 Hooper Ave.</td>
<td>Greater Watts Model Cities</td>
<td>(213) 663-0154</td>
<td></td>
</tr>
<tr>
<td>Helena Bus Co.</td>
<td>Helena, MT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kent State Univ. Campus</td>
<td>Bus Service</td>
<td>112 Wilson Avenue</td>
<td>Kent, OH 44240</td>
<td>(216) 672-2712</td>
</tr>
<tr>
<td>City of La Mirada</td>
<td>13700 La Mirada Boulevard</td>
<td>La Mirada, CA 90638</td>
<td>(213) 942-0131</td>
<td></td>
</tr>
<tr>
<td>Lawton-Auburn Dial-a-Ride</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lincoln Senior Handibus</td>
<td>411 South Thirteenth, Room 204</td>
<td>Lincoln, NE</td>
<td>(402) 477-1241</td>
<td></td>
</tr>
<tr>
<td>Little House</td>
<td>800 Middle Ave.</td>
<td>Menlo Park, CA 94025</td>
<td>(415) 368-7101</td>
<td></td>
</tr>
<tr>
<td>Montgomery County Dept. of Transportation</td>
<td>6100 Executive Blvd</td>
<td>Rockville, MD</td>
<td>(301) 770-2521</td>
<td></td>
</tr>
<tr>
<td>Michigan Department of Highways and Transportation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Jersey Dept. of Transportation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oregon DOT Mass Transit Division</td>
<td>(503) 378-0281</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ottawa-Carleton Regional Transit Commission</td>
<td>1500 St. Laurent Boulevard</td>
<td>Ottawa, ON</td>
<td>(613) 445-2171</td>
<td></td>
</tr>
<tr>
<td>Regina Transit System</td>
<td>1157 Albert St.</td>
<td>Regina, SK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reston, Virginia Volunteer Citizen Corp.</td>
<td></td>
<td>Reston, VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reston Commuter Bus, Inc.</td>
<td>11404 Washington Plaza</td>
<td>Reston, VA 20190</td>
<td>(703) 437-7800</td>
<td></td>
</tr>
<tr>
<td>Rhode Island Division on Aging</td>
<td>150 Washington St.</td>
<td>Providence, RI 02903</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richland County OH Regional Planning Commission</td>
<td>248 Park Ave. West</td>
<td>Mansfield, OH</td>
<td>(419) 522-8454</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX E (CONT.)

Rochester-Genesee Regional Transportation Authority
2 State Street
Rochester, NY 14614
(716) 546-7340

Royal Cab Co.
315 Harrison St.
Davenport, IA 52801
(319) 383-0151

St. Bernard Bus Lines
6732½ St. Claud
Arabi, LA
(504) 279-5556

St. Petersburg Municipal Transit System
1830 Ninth Ave. N
P.O. Box 2842
St. Petersburg, FL 33731
(813) 893-7171

Santa Clara Transit District
1555 Berger Drive
San Jose, CA 95112

Toledo Area Regional Transit Authority
Box 4702
Toledo, OH 43620
(419) 243-1241

Toronto Transit Commission
1900 Yonge Street
Toronto 285
Ontario
(416) 481-4250

Transportation Development Agency
2085 Union
Montreal, Quebec, Canada H3A 2C3

Valley Transit District
59 Elizabeth Street
Derby, CT
(203) 735-6408

Metropolitan Washington DC Council of Governments
1225 Connecticut Ave. NW
Washington, DC
(202) 223-6800

West Palm Beach, Florida
City Hall
(305) 655-6811

Western Older Citizens Council
Wilton, ME
(207) 645-4222

Willingboro Dial-a-Jitney
Willingboro, NJ
(609) 871-9300

Yellow Cab Co.
639 Thirteenth St.
San Diego, CA 92101
APPENDIX F
DIRECTORY OF VEHICLE MANUFACTURERS

Airstream, Inc.
Jackson Center, OH 45334
(513) 596-6111

Apeco Transit Division
White Pigeon, MI 49099
(616) 483-7621
Apeco MRF

Batronic Truck Corp.
Boyertown, PA 19512
(215) 367-2146

Carpenter Body Works, Inc.
Mitchell, IN 47446
(812) 849-3131
Carpenter Cadet

Chrysler Corp.
Detroit, MI 48231
(313) 956-5252
Dodge Maxivan

Coach and Equipment Sales Corp.
Penn Yan, NY 14527
(315) 536-3316
Fortivan

Electrobus
Studio City, CA 91604
(213) 877-3566

Flxible Co.
Loudonville, OH 44842
(419) 994-4141
Flxette

Ford Motor Co.
Dearborn, MI 48121
(313) 322-3000
Ford Econoline, Courier

GMC Truck and Coach Division
Pontiac, MI 48063
(313) 335-4111
GMC Van, Rallywagon,
Chevrolet Van, Sportsvan

Grumman Allied Industries, Inc.
Garden City, NY 11530
(516) 741-3500
Grumman

Highway Products, Inc.
Kent, OH 44240
(216) 673-9821
Twin Coach

Mercedes Benz of North America
Fort Lee, NJ 07024
(201) 947-4747
Mercedes 0930D

Minibus, Inc.
Pico Rivera, CA 90660
(213) 723-9071

Pace-Arrow, Inc.
Ontario, CA 91761
(714) 984-1252

Rek Vee Industries
Scarborough, Ontario
(416) 759-1963

Superior Coach Corp.
Lima, OH 45802
(419) 222-6010
Superior Coach

Volkswagen of America, Inc.
Englewood Cliffs, NJ 07632
(212) 524-8881

Winnebago Industries, Inc.
Forest City, IA 50436
(515) 582-3535
Appendix G

Urban Mass Transportation Act of 1964
Section 13 (c) *

It shall be a condition of any assistance under section 3 of this Act that fair and equitable arrangements are made, as determined by the Secretary of Labor, to protect the interests of employees affected by such assistance. Such protective arrangements shall include, without being limited to, such provisions as may be necessary for (1) the preservation of rights, privileges, and benefits (including continuation of pension rights and benefits) under existing collective bargaining agreements or otherwise; (2) the continuation of collective bargaining rights; (3) the protection of individual employees against a worsening of their positions with respect to their employment; (4) assurances of employment to employees of acquired mass transportation systems and priority of reemployment of employees terminated or laid off; and (5) paid training or retraining programs. Such arrangements shall include provisions protecting individual employees against a worsening of their positions with respect to their employment which shall in no event provide benefits less than those established pursuant to section 5 (2) (f) of the Act of February 4, 1887 (24 Stat. 379), as amended. The contract for the granting of any such assistance shall specify the terms and conditions of the protective arrangements.

* 49 U.S.C. 1609 (c)
algorithm
A set of rules used in mathematical computations.

attitudinal survey
A survey of users of transportation facilities to try to identify psychological factors associated with patronage of transportation services.

automatic interfacing
Process of conveying customer requests for demand responsive transportation service to control center via digital communication in lieu of voice communications.

automatic vehicle monitoring (AVM)
Process of collecting information on vehicle location via electronic communication.

BUXI
Combination of "bus" and "taxi". Name of demand responsive transportation service (route deviation) in Emmen, Netherlands.

Call-a-bus
Name of demand responsive transportation service in Ft. Walton Beach, Florida (now defunct).

Call-a-ride
Name of demand responsive transportation service in Columbus, Maryland.

C.A.R.S.
Acronym for Computer-Aided Routing System. Used by MIT Urban Systems Laboratory to designate its project on demand responsive transportation.

computer aided service
A demand responsive transportation service in which some, but not all, control center functions are performed by a computer.

D-J
Demand-jitney. Name used by General Motors Lab to denote demand responsive transportation service.

D.A.B.
Acronym for Dial-a-Bus, popular name for demand responsive transportation service.

daily demand
The total number of requests for service per day.

D.A.R.T.
Acronym for (1) Dial-a-Ride Transit, Name of demand responsive transportation service in Stratford, Ontario; (2) Demand Activated Road Transit, Name used by the Institute of Public Administration; (3) Dynamically Activated Road Transit; (4) Name of Michigan DOT demand responsive transportation services.

demand density
The number of requests for service per unit area. Typically per square mile (kilometer).

demand responsive transportation (DRT)
Generic term for range of public transportation services characterized by the flexible routing and scheduling of relatively small vehicles to provide shared-occupancy, door-to-door personalized transportation on demand for a modest fare.

Dial-a-bus
Popular name for demand responsive transportation service. Used in Batavia, New York; Bensenville, Illinois; Los Angeles, California and other communities.

Dial-a-ride
Name most commonly used for demand responsive transportation services, e.g., Haddonfield, New Jersey; Mansfield, Ohio.

Dial-a-trip
Name of demand responsive transportation service provided by Dallas Transit System.

dispatch
Function of relaying service instructions to drivers. May include vehicle scheduling, routing and monitoring. Dispatching can be manual, or partly or fully automated.

DRT
Initialism for Demand Responsive Transportation.

DRUBS:
Demand Routed Urban Bus Service. Name of demand responsive transportation service under Kent State University Demonstration Project.

dynamic routing
Process of constantly modifying vehicle routes to accommodate service requests received since vehicle commenced operations, as opposed to predetermined route assigned to vehicle.

extra-off
Patron who wishes to depart vehicle at point before or after scheduled destination.

extra-on
Patron who has not called for service but wishes to board vehicle.

feeder service
Local transportation service which connects with another, usually express or long distance, transit service.
few-to-many (FTM)
Reverse operation of many-to-few service.

flexicab
Generic term for variety of innovative taxi/jitney services representing extensions or modifications of conventional taxi service.

gather
Refers to demand responsive transportation service in which passengers are collected from multiple origins for transportation to a common destination such as a transit terminal, typically involving pre-scheduled or regular service; also known as many-to-one.

hardware
The various pieces of equipment necessary for operation: radios, vehicles, computers, etc.

jitney
A transportation service characterized by a fixed route and picking up and discharging passengers upon demand for a low fare.

level of service
A quantitative measure of transport service. For demand responsive transportation expressed as a ratio of total travel time (including waiting) for demand responsive transportation to auto.

manual service
A demand responsive transportation service that operates without the assistance of automatic data processing equipment in the control center.

many-to-few (MTF)
Refers to demand responsive transportation service in which passengers are collected from multiple locations (origins) within the service area, for transportation to a few pre-selected destinations, typically activity centers or transfer points.

many-to-many (MTM)
Refers to demand responsive transportation service in which passengers are collected from multiple locations (origins) and transported to their individual destinations; generally, service offered between any combination of origin-destination points in the service area.

many-to-one (MTO)
Refers to demand responsive transportation service in which passengers are collected from multiple locations (origins) within the service area, for transportation to a common destination such as a transit terminal; also called “gather”.

Maxi-cab
Name of demand responsive transportation service in Detroit, Michigan (Model Cities project).

Minibus
A small bus vehicle seating under 20 passengers, designed mainly for use in residential areas.

modal split
Analytic procedures used to estimate the proportions of the future intracity travel demand allocated to alternative modes of transportation.

Multiple-stop dispatching
Driver is assigned series of stops or “tour” which must be completed before next series is assigned.

one-to-many (OTM)
See “scatter.” Reverse of many-to-one.

peak demand
The largest number of demands during a period. Typically one hour during the day.

PERT
PERsonal Transit. Name of demand responsive transportation service in Rochester, New York.

PT
Initialism for Personal Transport, the name of the Santa Clara, CA demand responsive transportation service.

radio teleprinter
A device that converts digital communications to printed form.

route deviation
A demand responsive transportation service pattern in which a normally fixed route bus will leave the route upon request to serve patrons not on the fixed route.

scatter
Refers to the distribution of passengers to many destinations from a single origin such as a rail depot, typically involving prescheduled or regular service. Also known as one-to-many.

gather
Operating procedure whereby driver receives instructions for next route segment at each assigned stop.

software
The documentation and manuals of service operation such as: dispatchers guidelines, training and orientation manuals, computer programs, etc.

subscription bus service
The service provided by advance reservations of the same trip for a long period of time (typically AM and PM work trips).

Taxi-bus
Name of demand responsive transportation service in Menlo Park, California.

Telebus
Name of demand responsive transportation service in Regina, Saskatchewan.
APPENDIX H (CONT.)

Teletranspo
Name of demand responsive transportation service in Ottawa, Ontario.

Teletran
Name of demand responsive transportation service in Ann Arbor, Michigan.

tour
The route plan and schedule for a vehicle to follow in serving a specified set of passenger requests.

traffic generator
A location in the service area that has a high concentration of patrons for a transportation service.

TransVan
Name of demand responsive transportation service in Cranston, Rhode Island.

travel time
The total amount of time taken to travel from beginning to the end of a trip.

vehicle density
The number of vehicles per unit area. The quotient of vehicle fleet and service area. Typically, vehicles per square mile (square kilometer).

vehicle fleet
The number of vehicles dedicated to transportation service in one service area.