TCRP

SYNTHESIS 53

TRANSIT
COOPERATIVE
RESEARCH
PROGRAM

Sponsored by
the Federal
Transit Administration

Operational Experiences with Flexible Transit Services

A Synthesis of Transit Practice

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

TRANSIT COOPERATIVE RESEARCH PROGRAM

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Operational Experiences with Flexible Transit Services

A Synthesis of Transit Practice

CONSULTANT
DAVID KOFFMAN
Nelson/Nygaard Consulting
San Francisco

SUBJECT AREAS
Public Transit

Research Sponsored by the Federal Transit Administration in Cooperation with the Transit Development Corporation

TRANSPORTATION RESEARCH BOARD

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TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in *TRB Special Report 213—Research for Public Transit: New Directions*, published in 1987 and based on a study sponsored by the Federal Transit Administration (FTA). A report by the American Public Transportation Association (APTA), *Transportation 2000*, also recognized the need for local, problem-solving research. TCRP, modeled after the longstanding and successful National Cooperative Highway Research Program, undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes a variety of transit research fields including planning service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA, the National Academy of Sciences, acting through the Transportation Research Board (TRB), and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

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The TCRP provides a forum where transit agencies can cooperatively address common operational problems. TCRP results support and complement other ongoing transit research and training programs.

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FOREWORD

By Staff
Transportation
Research Board

Transit administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to the transit industry. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire transit community, the Transit Cooperative Research Program Oversight and Project Selection (TOPS) Committee authorized the Transportation Research Board to undertake a continuing study. This study, TCRP Project J-7, "Synthesis of Information Related to Transit Problems," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute a TCRP report series, *Synthesis of Transit Practice*.

The synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

PREFACE

This synthesis will be of interest to transit agency staff responsible for vehicle operations and planning and to those who work with them in this regard. Staff can use this report to learn from the experiences of other agencies and to compare their experiences with those of others. It documents and summarizes transit agency experiences with "flexible transit services," including all types of hybrid services that are not pure demand-responsive (including dial-a-ride and ADA paratransit) or fixed-route services, but that fall somewhere in between those traditional service models. The report documents six types of flexible transit service: request stops, flexible route segments, route deviation, point deviation, zone routes, and demand-responsive connector service.

This report from the Transportation Research Board integrates information from several sources. It is based on data collected from a review of the relevant literature and a survey of transit agencies. Twenty-four transit agencies provided information. Survey responses were supplemented by follow-up interviews with transit agency staff and reference to service descriptions available on transit agency websites.

A panel of experts in the subject area guided the work of organizing and evaluating the collected data and reviewed the final synthesis report. A consultant was engaged to collect and synthesize the information and to write the report. Both the consultant and the members of the oversight panel are acknowledged on the title page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

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Valuable assistance in the preparation of this synthesis was provided by the Topic Panel, consisting of Howard Benn, Assistant General Manager, Customer and Operations Support, Department of Public Works and Transportation, Montgomery County Transit; Steven A. Billings, Administrator of Transit, Multimodal Operations–Transit Section, Missouri Department of Transportation; Dr. Liping Fu, Associate Professor, Department of Civil Engineering, University of Waterloo; Todd Hemingson, Vice President, Planning and Development, VIA Metropolitan Transit; Greg Hull, American Public Transportation Association; Barbara Lupro, Consultant, Murrieta, California; William Menzies, Manager of Planning and Schedules, Winnipeg Transit System; Peter L. Shaw, Senior Program Officer, Transportation Research Board; Mark Swope, Director of Planning, Kansas City Area Transportation Authority; and William Wiggins, Federal Transit Administration.

This study was managed by Donna L. Vlasak, Senior Program Officer, who worked with the consultant, the Topic Panel, and the J-7 project committee in the development and review of the report. Assistance in project scope development was provided by Jon Williams, Manager, Synthesis Studies. Don Tippman was responsible for editing and production. Cheryl Keith assisted in meeting logistics and distribution of the questionnaire and draft reports.

Christopher W. Jenks, Manager, Transit Cooperative Research Program, assisted TCRP staff in project review.

Information on current practice was provided by many transit agencies. Their cooperation and assistance was most helpful.

OPERATIONAL EXPERIENCES WITH FLEXIBLE TRANSIT SERVICES

SUMMARY

In response to growth patterns, economic trends, and social changes that have not favored traditional forms of transit service, researchers and transit planners have proposed services that combine features of conventional, fixed-route service and purely demand-responsive service. This synthesis project was conducted to gather information about the experiences of transit operators using these flexible transit services. For purposes of this synthesis, "flexible transit services" are considered to include all types of hybrid services that are not pure demand-responsive service (including dial-a-ride and Americans with Disabilities Act paratransit) or fixed-route service, but that fall somewhere in between these traditional service models.

The primary source of information for the synthesis is a written survey that was sent to 81 transit systems. Completed responses were received from 24 transit systems that operate 28 flexible services. The survey responses were supplemented by follow-up interviews with transit agency staff and references to service descriptions available on transit agency websites.

The synthesis analyzes six types of flexible transit service. In order of increasing flexibility these are request stops, flexible-route segments, route deviation, point deviation, zone routes, and demand-responsive connector service.

Flexible transit services are being used by more than 50 transit systems of all sizes and in all types of service areas throughout North America. According to the survey responses there are three applications for flexible services. In order of frequency, from most common to least common, they are discussed as follows:

- First, flexible services provide service in limited areas that are considered hard to serve for reasons of demographics, street layout, or community preferences.
- Second, they provide service in low-demand time periods. In cities with ample fixed-route service, flexible operation typically substitutes for fixed-route operation in limited areas. In some cities with more limited fixed-route service, flexible operation replaces the entire fixed-route network at certain times.
- Third, they provide the entire transit service for a small city, low-density suburban area, or rural area. In these cases, coordination or consolidation with paratransit service is a key feature of the flexible service.

The following are some of the key conclusions of the synthesis:

- Each flexible service is unique. There is as yet little standard practice that operators can turn to in designing flexible services.
- To balance efficiency and flexibility, operators strive to find the right balance between fixed-route operation and demand-responsive operation in each situation.
- Operators have developed strategies to reduce the inefficiency of demand-responsive operation in flexible services. In many cases, these strategies involve limits on the degree of demand-responsive service that will be provided, or they give discretion to dispatchers or drivers in the way that they accommodate demand-responsive service requests.

- Although many flexible services require previous-day reservations for demand-responsive pick-ups or drop-offs, the experiences of other systems shows that much shorter advance notice requirements are possible, with or without the use of advanced technology.
- Fare surcharges for off-route service may be useful as a way to encourage riders to board and alight at established stops.
- Coordination with regional fixed-route networks and with paratransit service is an important component of most flexible service.
- Flexible service operated over an agency's entire service area successfully eliminates or reduces the expense of separate paratransit service.
- Trip sharing between flexible service and paratransit has the potential to reduce dependence on paratransit, although the actual cost savings from this strategy have not been determined.
- The fluid and discretionary nature of many flexible services makes it difficult to provide a succinct yet accurate service description in public information materials.
- In hard-to-serve areas, flexible services typically have relatively low ridership and productivity levels compared with that found in fixed-route service. This situation appears to reflect the inherent difficulty of serving these areas, or inherent limitations of demand owing to low density or demographics, which is more than a reflection of inefficiency in the service method.
- If ridership on flexible services were to climb significantly above current levels, many systems would take it as an indication that the area could be better served with conventional fixed-route service.
- Several transit agencies that employ flexible operation for their entire transit service have much higher ridership and productivity than most of the flexible services that the other surveyed agencies provide. In these cases, compared with potential fixed-route service in the same area, it is possible that deviations limit ridership and productivity, and increase passenger travel times. It also appears that the cost advantage of combining service to the general public and people with disabilities is an overriding concern for these agencies.
- The amount of time allocated for demand-responsive operation in flexible service varies (according to service type and agency objectives) from zero to all time exclusive of layover at a transfer point. Many agencies have no clear allocation of scheduled time at all. This appears to be an area where many agencies would benefit from additional guidance.
- Most flexible services are scheduled and dispatched without use of advanced technology.
- At most transit systems, drivers select flexible service assignments under a conventional bidding process, along with fixed-route assignments. Drivers do need some specific training to operate flexible service, which drivers bidding for this work may be required to complete. It is important that drivers understand the degree of independent decision making and passenger communication involved in flexible operation, so they can assess whether it is something they want to do.
- The research provided little evidence about specific training requirements for flexible service dispatchers. As in the case of paratransit, this appears to be an area where additional research and guidance would be useful.
- Most flexible services use some type of van or small body-on-chassis bus, either because these vehicles were judged appropriate or because they happen to be available. However, many operators would prefer to operate some other type of vehicle than the one being used.
- Many agencies have replaced flexible service with fixed-route services where they have determined that flexible operation is less attractive to riders than fixed-route service. However, interest in adding or expanding flexible service remains strong. Fourteen of the surveyed transit systems reported that they see future opportunities to implement new flexible services or expand existing ones.

CHAPTER ONE

INTRODUCTION

BACKGROUND

Public transportation services have traditionally been designed to serve concentrated travel patterns that allow for large numbers of people to be conveyed along established routes following set schedules. These services have worked well in densely built-up areas with strongly focused travel patterns, such as commuting to and from downtown areas. For at least the past 50 years, growth patterns, economic trends, and social changes have not favored traditional forms of transit service. Population and jobs have become more spread out. Economic and social changes have led to complicated personal activity patterns that require the most flexible possible personal mobility. Within the last 30 years, increasing social awareness has led to an understanding that many people, especially older people and people with disabilities, cannot use conventional public transportation and need other options.

Among the solutions proposed to help transit adapt to these changes have been multicentered transit networks using timed transfers and demand-responsive services such as personal rapid transit and dial-a-ride. Many proposals have in common attempts to make transit service more flexible, so that it can respond to changing demand; serve more spontaneous, amorphous travel patterns; and accommodate people who are unable to walk to and from bus stops and transit stations.

Multicentered transit networks have been widely adopted, but personal rapid transit has proved expensive and difficult to create, and it has so far seen only very limited application. Experience to date with the dial-a-ride concept has shown that it appears to have inherent limitations in efficiency that limit its applications to specialized service for older people and people with disabilities, as well as service to the general public in very small communities.

At least since the 1960s, practitioners have proposed services that combine features of conventional service and purely demand-responsive service (Cole 1968; Arrillaga and Mouchahoir 1974). One of the earliest documented experiments is the Merrill-Go-Round in Merrill, Wisconsin (Flusberg 1976; Mergel 1976), which used a "point deviation" mode of operation, as defined later in this report, and that is still operating. More recent research continues to propose flexible transit services as part of the toolkit to help transit operators address suburbanization and dispersed travel patterns (Cervero and Beutler 1999; Urbitran 1999).

Researchers have claimed a variety of benefits for flexible transit services, including increasing ridership (Flusberg 1976; Durvasula et al. 1998), more cost-effective and integrated service for people with disabilities (Multisystems Inc. and Crain & Associates 1997), combining the regularity of fixed-route service with the flexibility of demand-responsive services (Farwell 1998), serving areas with demand densities too high for door-to-door services but not high enough for fixed-route service (Pratelli 2002), and making transit more attractive to "choice" riders who have another mode of access (Potomac and Rappahannock Transportation Commission 2003). Rosenbloom (1996) interviewed 40 transit systems with flexible service and found that most of them had adopted flexible services as a way to remove or reduce the need to provide complementary paratransit mandated by the Americans with Disabilities Act (ADA). However, many of those systems were probably not in conformity with the ADA regulations.

Much of the literature about demand-responsive and flexible service has assumed that a high degree of automation would be a key element of its operation (Smith 1998; Durvasula and Priya 1999; Loukakos and Blackwelder 2000; Pratelli 2002). One of the key design issues in operating flexible transit is determining how much scheduled operating time needs to be reserved as slack time to accommodate demand-responsive service requests. Fu (2002) has shown how this problem can be approached using advanced mathematical simulation methods.

SCOPE AND METHODS

This synthesis project was conducted to gather information about the experiences of transit operators using flexible transit services, including the following:

- Kinds of flexible service in operation;
- Ridership markets;
- Ridership threshold levels found to make those services a viable alternative to traditional fixed-route service;
- Historical and funding contexts;
- Operating procedures and technology;
- Design factors and criteria, such as service area, headway, guaranteed stop locations, deviation sched-

uling, including "slack time," and real-time on-board requests;
- Costs and cost considerations;
- Staff training (e.g., drivers, schedulers, dispatchers, and controllers);
- Customer marketing and public information;
- Coordination and integration with paratransit service;
- Previous successes and failures; and
- Barriers and future opportunities.

For purposes of this synthesis, "flexible transit services" are considered to include all types of hybrid services that are not pure demand-responsive service (including dial-a-ride and ADA paratransit) or fixed-route service, but that fall somewhere in between those traditional service models. In other words, the services of interest have some established stop locations and/or some established schedule, combined with some degree of demand-responsive operation. Fixed-route services that allow flag stops (a common method of operation in rural areas and some small cities, and after dark in some larger cities) but that have no other flexible features have not been included.

In the preliminary phases of the research, more than 80 transit systems were identified that might be operating some type of flexible service. Sources for identifying these candidate systems included published literature; requests to Internet e-mail discussion groups maintained by APTA and by the TRB Committees on Paratransit and Transit Planning; personal contacts; and website searches. A written survey (Appendix A) was sent to a total of 81 transit systems. Twenty-five systems returned completed questionnaires, of which one was determined not to provide flexible service. Appendix B lists the transit systems that responded. The survey responses were supplemented by follow-up interviews with transit agency staff and references to service descriptions available on transit agency websites.

REPORT ORGANIZATION

This synthesis begins with an overview of expectations for flexible transit services as revealed by published reports and papers during the past 35 years.

- Chapter two provides a classification of flexible transit services that is used for analysis throughout the rest of the report and a picture of the extent to which flexible services are actually used, including how long they have been in operation.
- Chapter three describes design decisions that operators have made in their flexible services, including provisions for spontaneous use as in conventional transit, provisions for demand-responsive use, fares, and coordination with conventional services and paratransit services.
- Chapter four describes the roles in which transit operators have used flexible services as an element of their overall service planning. That chapter also reviews how flexible services have been marketed; performance standards, measurement, and experience; and the barriers that transit operators have faced in the past and the opportunities that they see in the future for flexible services.
- Chapter five concerns operational issues, including the allocation of scheduled time between serving fixed-stops and demand-responsive service requests, scheduling and dispatching, staff selection and training, and choice of vehicles.
- Chapter six presents case studies of five systems, with additional detail about service design, some background and operating results, and lessons learned. The case studies were chosen because of their innovative character, performance, established history, likelihood of continuation, and availability of information.
- Chapter seven provides conclusions and suggestions for additional study.

CHAPTER TWO

STATUS OF FLEXIBLE TRANSIT SERVICES

Based on the completed surveys and later investigations, it was possible to confirm that 51 North American transit systems definitely operate flexible services. These systems are located in 20 states and 3 Canadian provinces.

The 24 transit systems that responded to the survey with information about flexible services are located throughout North America and operate in large urban areas, small cities, and rural areas. Table 1 shows the transit systems, any abbreviations, acronyms, or shortened names used to refer to them in this report, the principal city of each operator, and a brief description of their flexible services. Appendix C provides additional details about each of the flexible services at the surveyed transit systems.

TYPES OF FLEXIBLE TRANSIT SERVICE

According to the service descriptions provided by the surveyed transit systems, flexible services can be categorized as six service types. These six types, illustrated schematically in Figure 1, are as follows:

- Route deviation—Vehicles operate on a regular schedule along a well-defined path, with or without marked bus stops, and deviate to serve demand-responsive requests within a zone around the path. The width or extent of the zone may be precisely established or flexible.
- Point deviation—Vehicles serve demand-responsive requests within a zone and also serve a limited num-

TABLE 1
SUMMARY OF SURVEYED TRANSIT SYSTEMS

System	Principal City	Flexible Service Name	Brief Description of Flexible Services
Capital Area Transit (CAT)	Raleigh, NC	CAT Connector	Demand-responsive connector service in zones replaces most fixed routes evenings, nights, early morning. One daytime zone.
Central Oklahoma Transit and Parking Authority (COTPA)	Oklahoma City, OK	METRO Link	Point deviation replaces fixed route nights and Sundays. All-day point deviation service in an outlying area.
Corpus Christi Regional Transportation Authority	Corpus Christi, TX	Route 67 Bishop Driscoll	Rural route into Corpus Christi with demand-responsive pick-up areas in two rural communities.
Decatur Public Transit System	Decatur, IL	Decatur Public Transit System	Two on-call stops.
Fort Worth Transportation Authority (FWTA—The T)	Fort Worth, TX	Rider Request (mostly discontinued Oct. 2003)	Two to three fixed stops at transfer points to the fixed-route system, plus demand-responsive service in zones.
Greater Richmond Transit Company (GRTC)	Richmond, VA	Chesterfield LINK (discontinued July 2003)	Route deviation service for the general public also acting as paratransit in one suburban area.
Hampton Roads Transit	Hampton, VA	HRT On Call	On-demand route segments.
Lane Transit District (LTD)	Eugene, OR	Diamond Express	Rural route into Eugene–Springfield provides midday curb-to-curb service in the urban area.
Madison County Transit	Granite City, IL	EZ Ride (added Aug. 2003)	ADA subscription deviations. (Point deviation service added after completion of this research.)
Mason County Transit	Shelton, WA	None	Stops marked in schedule as requiring a request. Demand-responsive service in a corridor. Rural route deviation with flexible, informal deviation area, coordinated with areawide dial-a-ride.
Metro Regional Transit Authority	Akron, OH	Night zones	Late night service from downtown to regular bus stops in three or four zones.
		Town Center Routes	Route deviation service mainly for reverse commutes.
Metropolitan Transit System (MTS)	San Diego, CA	Flex Routes 961–964	Route deviation with narrow bands.
Minnesota Valley Transit Authority	Burnsville, MN	Flex Routes 420 and 421 Local route 440	Route deviation in zones approximately 1-mi wide. Eight reservation stops near the route.
Napa County Transportation Planning Agency (NCTPA)	Napa, CA	St. Helena and Yountville Shuttles	Two route deviation services in small towns.

TABLE 1 (*Continued*)

System	Principal City	Flexible Service Name	Brief Description of Flexible Services
Ottumwa Transit Authority (OTA)	Ottumwa, IA	Ottumwa Transit Authority	Entire transit system is fixed route with some deviations.
Pierce Transit	Tacoma, WA	Key Loop (modified Sept. 2003), Orting Loop	Rural demand-responsive connector operated by paratransit vehicles.
Potomac and Rappahannock Transportation Commission (PRTC)	Woodbridge, VA	OmniLink	Entire local service is route deviation areawide service with bands around routes.
Ride Solution (ARC Transit)	Palatka, FL	Ride Solution	Fixed-route general public service built on demand-responsive consolidated human services transportation.
River Valley Metro Mass Transit District	Kankakee, IL	Bourbonnais Flex	Three fixed stops in a demand responsive area in one of three communities served.
Sarasota County Area Transit (SCAT)	Venice, FL	SCAT About	Demand-responsive connector service supplements a fixed route on Venice Island.
St. Joseph Transit	St. Joseph, MO	St. Joseph Transit	Citywide routes with deviations through the city, also serving as paratransit.
Tillamook County Transportation District	Tillamook, OR	Deviated Fixed Route	Rural routes with flag stops and an informal deviation area.
Tri-Met	Portland, OR	Cedar Mill Shuttle	Peak-period demand-responsive connector to a transit center.
Winnipeg Transit System	Winnipeg, Manitoba	DART	Suburban demand-responsive connectors in four areas with marked drop-off locations.

number of stops within the zone without any regular path between the stops.

- Demand-responsive connector—Vehicles operate in demand-responsive mode within a zone, with one or more scheduled transfer points that connect with a fixed-route network. A high percentage of ridership consists of trips to or from the transfer points.
- Request stops—Vehicles operate in conventional fixed-route, fixed-schedule mode and also serve a limited number of defined stops near the route in response to passenger requests. (Request stops differ from flag stops in not being directly on the route.)
- Flexible-route segments—Vehicles operate in conventional fixed-route, fixed-schedule mode, but switch to demand-responsive operation for a limited portion of the route.
- Zone route—Vehicles operate in demand-responsive mode along a corridor with established departure and arrival times at one or more end points.

Other terms have been applied in the past to some of these services. For example, demand-responsive connector service has been called "demand-responsive feeder service" (Multisystems Inc. and Crain & Associates 1997). Individual transit systems call these services by many different names and do not follow any standard naming practice. These categories are useful in describing the flexible services operated by the transit systems that responded to the survey. However, other designs are possible, as are many variations on the basic categories described in this report.

Table 2 shows the number of transit systems in the survey that reported each type of flexible service. Several of the 24 surveyed transit systems operate more than one type of flexible service and are counted in multiple categories; therefore, the total of service types reported is 28. In this tabulation, if a transit system operates multiple routes of the same type, it is considered one "service." Some of the services share characteristics of multiple categories, but they have been classified according to the feature that is most defining of that service.

By far the most common method of flexible operation is route deviation service, which is used at 12 of the 24 transit systems in the sample. A number of subtypes can be distinguished within this category:

- Deviations are incidental to a primarily fixed-route mode of operation, intended mainly for people with disabilities and older passengers who might otherwise need paratransit service. Ottumwa Transit Authority (OTA) in Ottumwa, Iowa, exemplifies this type of operation. The availability of deviations is communicated verbally, by drivers and by staff in community presentations. Deviations are usually limited to one or two blocks off the regular route. Approximately 2% of total passenger trips involve a deviation.
- Deviations are an essential and prominent feature of the operation, so that separate paratransit service for people with disabilities is not required, or it is provided by means of the deviations. St. Joseph Transit

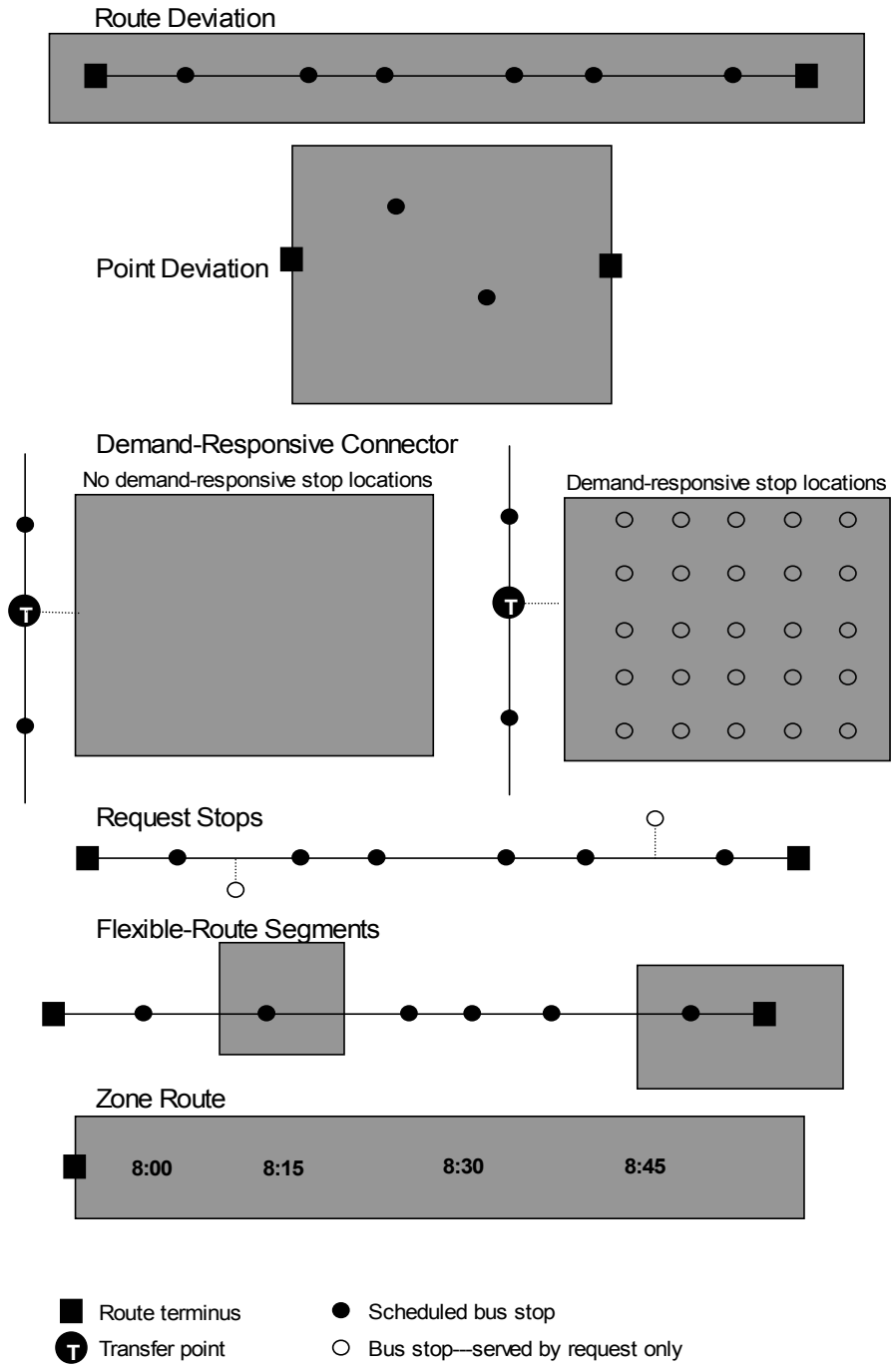

FIGURE 1 Flexible service types.

TABLE 2
TRANSIT SYSTEMS USING EACH TYPE OF FLEXIBLE SERVICE

Type of Flexible Service	No. of Transit Systems
Route deviation	12
Point deviation	3
Demand-responsive connector	6
Request stops	4
Flexible route segments	2
Zone route	1
Total transit systems reporting	24
Total service types reported	28

in St. Joseph, Missouri, illustrates this method of operation. The buses will deviate on request for any rider to provide curb-to-curb service to any address in the city, except for some cul-de-sacs, parking lots, and very steep or narrow streets. Passengers can register for ADA paratransit. However, in practice, ADA paratransit is the same as deviation service, except that ADA-certified riders pay a lower fare than the general public. Schedules allow ample time for deviations, and 24% of passenger trips involve a deviation.

- Definitions are provided in clearly defined zones or bands around specific routes. For example, the Metropolitan Transit System (MTS) in San Diego, California, operates four routes that provide deviations within one-quarter-mile bands on either side of the routes. The zones are shown on the route maps provided to the public. In this type of situation, deviations are provided mainly to increase coverage rather than to serve passengers with disabilities. Approximately 3% of passenger trips involve a deviation.

Seven transit systems reported operating demand-responsive connector service, making it the second most frequently reported method of flexible service. Some variations on this theme include the following:

- Service is provided between a transfer point and any safe address within a defined zone where fixed-route service is considered inappropriate or infeasible owing to street patterns. Portland Tri-Met operates a service of this type that provides peak-hour-only connections between the Cedar Mills area and the closest transit center.
- Service is provided between a transfer point and defined drop-off points. The Winnipeg Transit System in Winnipeg, Manitoba, provides a service of this type, operating mainly in low-demand time periods. Although drop-off points are defined, drivers do have the discretion to drop off passengers at home, and pick-ups are always made at passengers' homes. Akron, Ohio, provides a late night flexible service that uses three or four buses to take passengers from downtown transfer points to any bus stop normally served by the 30 routes that depart from downtown.

LENGTH OF EXPERIENCE OPERATING FLEXIBLE SERVICE

As shown in Figure 2, 5 of the 24 surveyed transit systems have been operating flexible service for more than 10 years, whereas the median length of operation is between 5 and 6 years. The OTA has operated flexible service since 1982, and Ride Solution in Palatka, Florida, has operated flexible service since 1988.

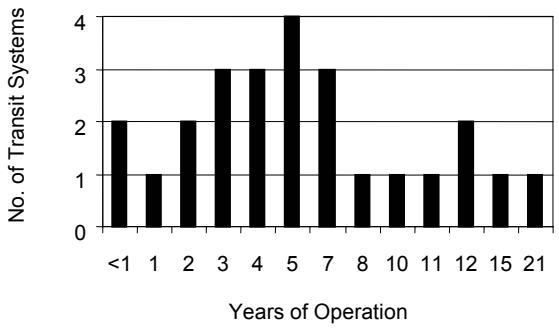

FIGURE 2 Years of flexible service operation (as of June 2003).

Although the survey results might be taken to indicate that interest in flexible service peaked a few years ago, other findings suggest that it continues to be strong. Several of the surveyed transit systems have implemented additional flexible services since the year they first began such services. Half of the surveyed transit systems indicated that they see further opportunities to implement or expand flexible services. In addition, there are several known, recently begun flexible services operated by transit systems that did not respond to the survey. A recent decline in implementation, however, may reflect a general drop in new transit services under tightened budgetary circumstances resulting from the economic downturn that began in 2000.