

ECBS

EMPLOYMENT CENTER BUS SERVICE GUIDELINES FOR IMPLEMENTATION

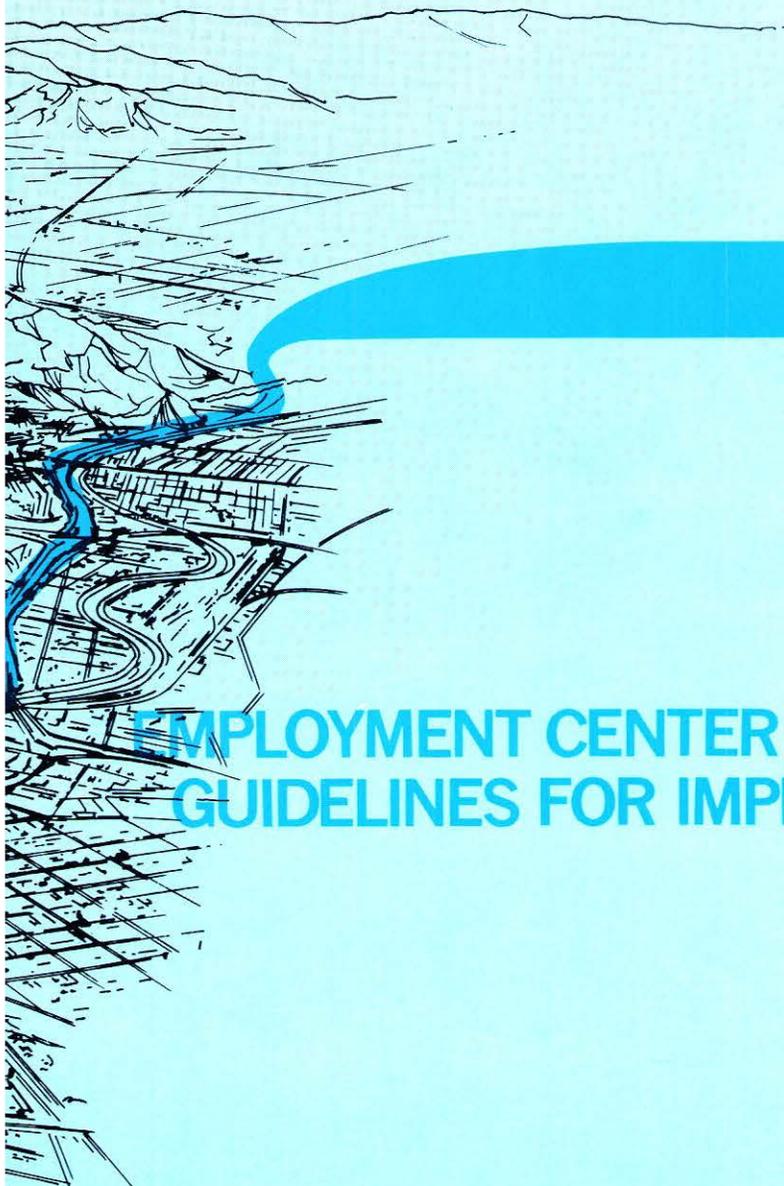
MARCH 1978

A NEW APPROACH TO
COMMUTER BUS SERVICE

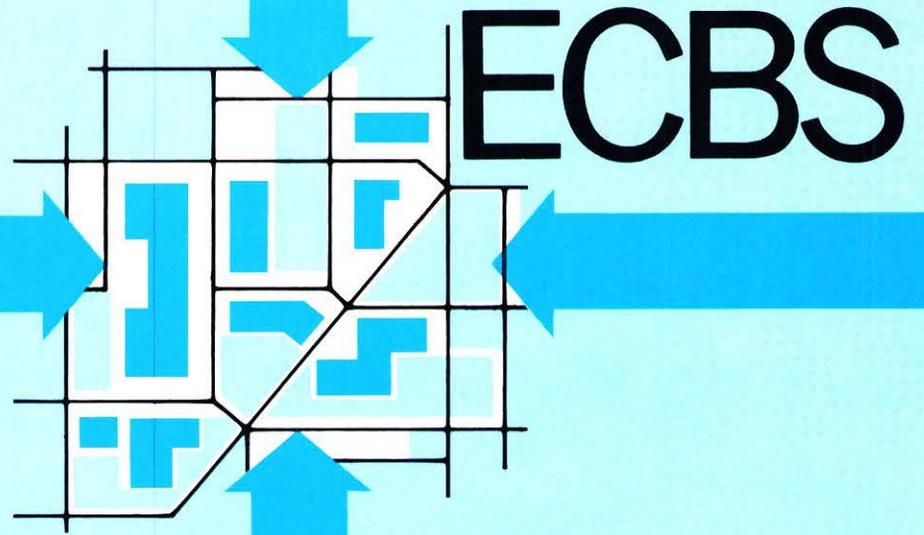


U. S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION
Office of Service and Methods Demonstrations
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EMPLOYMENT CENTER BUS SERVICE GUIDELINES FOR IMPLEMENTATION



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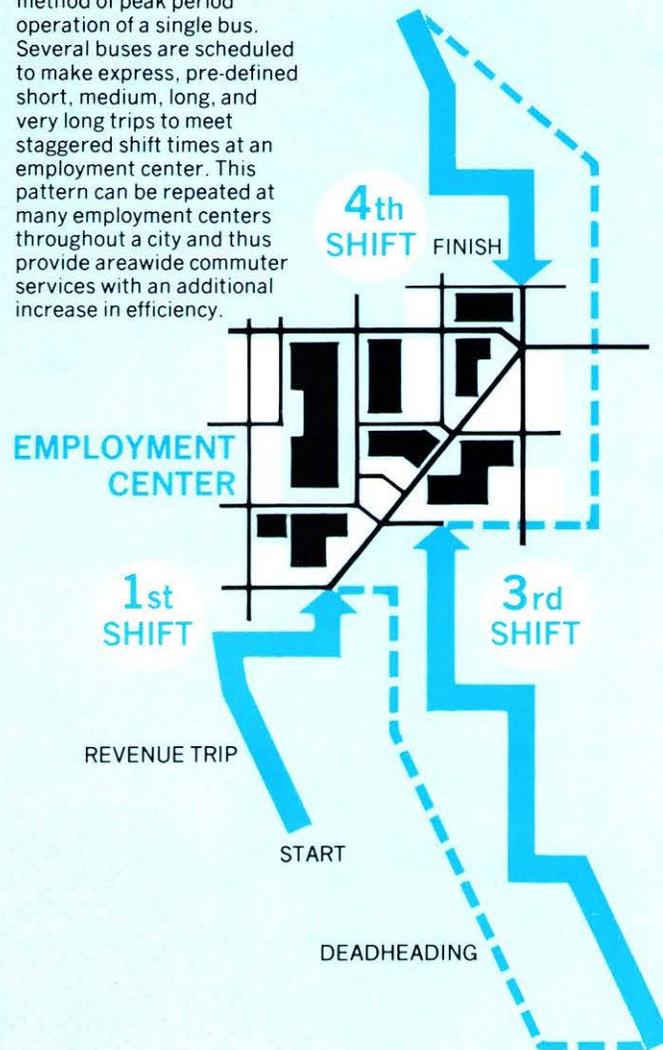
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ECBS — AN OVERVIEW

This depicts the Employment Center Bus Service (ECBS) concept and shows the method of peak period operation of a single bus. Several buses are scheduled to make express, pre-defined short, medium, long, and very long trips to meet staggered shift times at an employment center. This pattern can be repeated at many employment centers throughout a city and thus provide areawide commuter services with an additional increase in efficiency.



Employment Center Bus Service (ECBS) should greatly interest public transit operators in suitably dense urban employment sites. A new concept of personalized express bus service, ECBS is a transportation mode not now available that can better serve the commuting worker, may require little or no taxpayer cost, and lessens transportation-related community problems. This premium service also offers an attractive fare structure and payment policy, adaptable round trip scheduling, and convenient residential pickup points—features particularly central to the auto-oriented commuter's interests and not normally provided by conventional mass transit or paratransit.

At the heart of the ECBS concept is the ability to schedule the minimum bus fleet necessary to match staggered work shifts with essentially all worker commuting distances in either a "satellite employment center" (adjacent firms within a discrete outlying area) or a central business district. *This scheduling methodology is the unique aspect of ECBS.*

This brochure summarizes an earlier published study (cited inside back cover) on ECBS and includes some recent developments. Also presented is a supplementary effort to develop techniques for applying the ECBS concept to various urban areas, based on information obtained from a cross-section of the nation's transit operators and major employers (facing credits). In addition the preliminary configuration of an ECBS project under way in Los Angeles is described to illustrate the recommended start-up procedures. This demonstration is expected to showcase the benefits to transit operators, employers, and employees.

Putting ECBS into successful operation will require new service planning and operating techniques. But the benefits of ECBS to employers, communities, and the nation seem great enough to justify any additional promotion by measures such as subsidies and the creation of appropriate policies.

WHAT IS ECBS?



Employment Center Bus Service (ECBS) is the latest concept in commuter bus transportation. Designed to provide customized transit service to satellite employment centers and central business districts, ECBS offers lower transportation cost per mile than commuting by automobile or by most other forms of urban transportation. It is personalized service that coincides with an individual's work schedule and residence. ECBS is not an existing bus transportation concept but incorporates some of the desirable characteristics of subscription bus, park and ride, and "Early Bird Express Service."

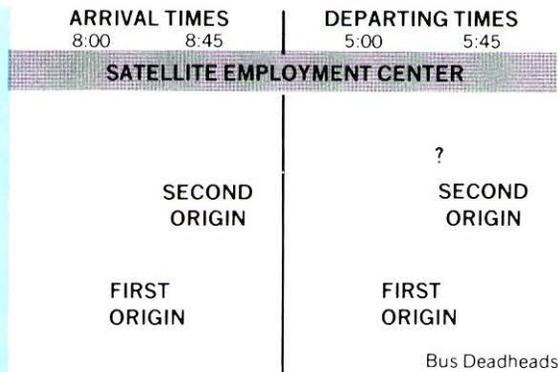
The unique aspect of ECBS is the methodology for scheduling express buses to operate routes of different, pre-defined lengths whereby an employment center having staggered work shifts can be served efficiently. Buses, acting in concert, serve several shifts during a peak period. The route lengths cover essentially *all* commuting distances. In particular, short and medium trip lengths are covered; these cannot be served adequately by existing transit and paratransit modes.

A convenient way to illustrate ECBS's unique scheduling methodology is by applying it to three typical work shift/commuter distance scenarios where the commuting distances differ.

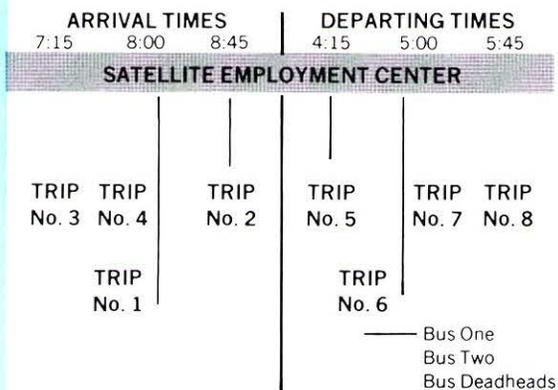
One Bus—Two Shifts. In this example, the use of one bus (instead of two) is projected to serve two staggered shifts that start at 8:00 and 8:45 am and finish at 5:00 and 5:45 pm where the route for the first shift originates 25 miles from an employment center. As illustrated, the single bus is able to serve both morning shifts by unloading the first shift passengers at the center and then deadheading to another origin close enough to the center to allow the return trip to be made in time. However, one bus cannot serve both afternoon shifts because if the first shift trip takes more than, say, 25 minutes it cannot deadhead back to the center in time to pick up the 5:45 pm passengers.

Two Buses—Three Shifts. Although one bus cannot serve two shifts at the origin distances shown, two buses, as illustrated, can fully serve three shifts if we introduce a third staggered shift. Here two buses can make three short trips and one long trip during each peak period. Each bus makes two round trips, and each morn-

Problem of Scheduling One Bus to Serve Multiple Trips of Differing Lengths



Two Buses Serving Three Staggered Shifts



Two Examples of Shift Length Combinations for Four Shifts Served by Two Buses Acting in Concert

STARTING SHIFTS				DEPARTING SHIFTS				No. OF BUSES	TRIP LENGTH			
A	B	C	D	A	B	C	D		A	B	C	D
								2	S	S	S	M
								2		VL		
								2	S	S		M M
								2	L			

ing trip is balanced by an afternoon trip. We also have an option of trip assignment: one bus can make trip numbers 1, 2, 5, and 6 or 3, 4, 7, and 8 while the second makes the other trips. (Many other trip combinations have been devised to serve three, or more, staggered shifts.)

Two Buses—Four Shifts. The scheduling methodology can be applied to show that two buses can handle four equally spaced shifts with service that is adequately functional and efficient. In the example illustrated, four trip lengths—classified as short (S), medium (M), long (L), and very long (VL)—are postulated. The S, M, and L trip lengths are keyed to the stagger time—the time between shifts. An S trip can be made within the span of the stagger time, which includes the time to deadhead to another origin in the morning or to the satellite employment center in the afternoon; an M trip relates to double the stagger time, and an L trip relates to triple the stagger time (i.e., the time between the first and fourth shifts). Although VL trips have no theoretical distance limits, their schedule, of course, is related to the employment hours.

If fares are defined to be approximately proportional to trip length and operating costs are kept fixed, the large numbers of derived trip combinations show a range of efficiency in terms of revenue-to-cost ratio. Efficiency is lowered as fewer shifts are served. Three-shift combinations are composed of only S, M, and VL trips. Since the middle shift cannot be served with M trips, a revenue loss results if M and VL trips are combined on the same route. We have demonstrated that a two-shift combination can serve only one trip category of any length. The efficiency of the average two- and three-shift combinations is significantly less than the average four-shift combination. For example, the efficiency of the two- and three-shift combinations would be about 60 and 80 percent, respectively, of a four-shift combination.

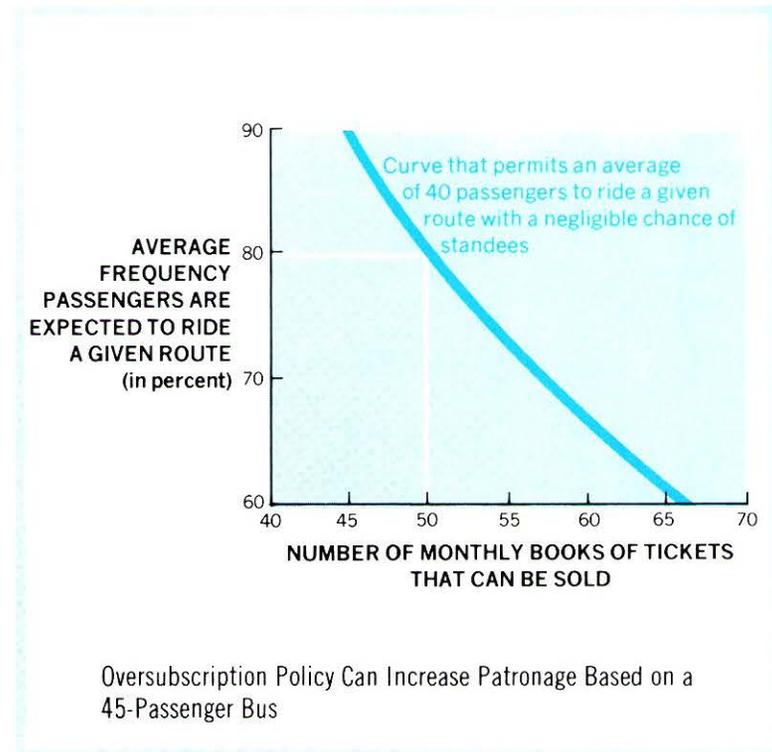
By serving adjacent satellite employment centers, which could lead to areawide service, we can further increase efficiency by reducing the amount of deadheading. This is achieved by interchanging buses between the centers during peak operation periods. The efficiency increase that can be attained is dependent, in part, on the distances between employment centers.

WHAT OTHER FEATURES DOES ECBS HAVE?

In addition to its scheduling methodology, ECBS is amenable to the inclusion of several other features that will appeal to the auto-oriented commuter and the transit operator. The fares could be proportional to trip length and competitive with auto operating costs.

An oversubscription policy—selling more monthly books of tickets for a particular route than there are seats—can be used safely. Its feasibility has been proven by an extensive computer simulation. As illustrated, an average load of 40 passengers can ride a given route in a 45-passenger bus with only a remote chance of having standees—one or two only once during a 1-month period. As shown, for an expected 80 percent average ridership for all passengers, 50 monthly books of tickets can be safely sold. This policy permits passengers to pay only for rides used and drive their cars when needed.

The ECBS is amenable to several fare payment plans that are convenient for the passengers and economical to implement and operate. Monthly books of tickets and payroll deductions are feasible. Eventually, a credit card automatic fare collection system may be cost effective. These plans also provide the real time data essential for managing ECBS and increase passenger convenience at low cost to the transit operator.



**WHERE DOES ECBS FIT IN URBAN
TRANSPORTATION?**





The ECBS can add a significant new dimension to existing modes of pooled commuting. It can fill the void between conventional bus service and the known demand for pooled transportation for the shorter commuting distances that cannot be filled economically or satisfactorily by buspools, vanpools, and carpools.

Conventional bus service serves the central business district well because there are many small businesses, varied employment hours, and numerous employee destinations and origins. It is especially well suited for commuting trips of less than 5 miles for which the penalty for slow transit time is not too noticeable. The time penalty essentially rules out conventional buses for the longer commuting trips, particularly those involving transfers. To attract the potential long trip passenger, transit operators have started special express services to the central business district, such as park and ride, that operate with headways commensurate with patronage. However, the routes are not tailored to an individual's origin and destination within the central business district.

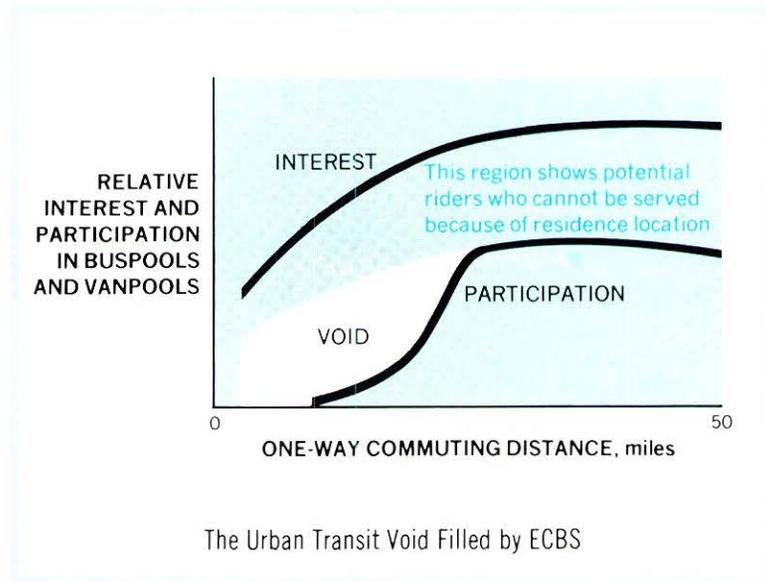
Conventional bus service is less capable of serving satellite employment centers composed of large, individual employers located in a suburban area—firms that are, in general, accessible only or mainly by auto. Since large groups of

employees have the same destination at the same time, the overall work trip density demand at these locations may not justify conventional service, or may call for only a few bus routes that operate at long headways and schedules that may not match employment hours. Under these conditions relatively few employees can or do ride the conventional bus.

It is not surprising to observe that satellite employment centers are being served by an increasing number of para-transit modes and special express bus services. The notable special services are subscription bus (or buspool) and Early Bird Express Service. Subscription bus generally serves only one busload of passengers each day. Early Bird achieves greater productivity by serving those employers who have nonpeak employment hours or could change to nonpeak hours, specifically avoiding the hours between 7:00 and 9:00 am, and between 3:45 and 6:00 pm. After or prior to transporting these passengers, Early Bird buses are deployed in conventional service elsewhere in the urban area. Subscription bus and Early Bird services, therefore, are limited: both to serving one shift, and the former, because of the high fixed cost to operate, to long commuting distances.

Vanpools and carpools are also gaining in usage. However, the high fixed costs of vanpools, divided among 10 or

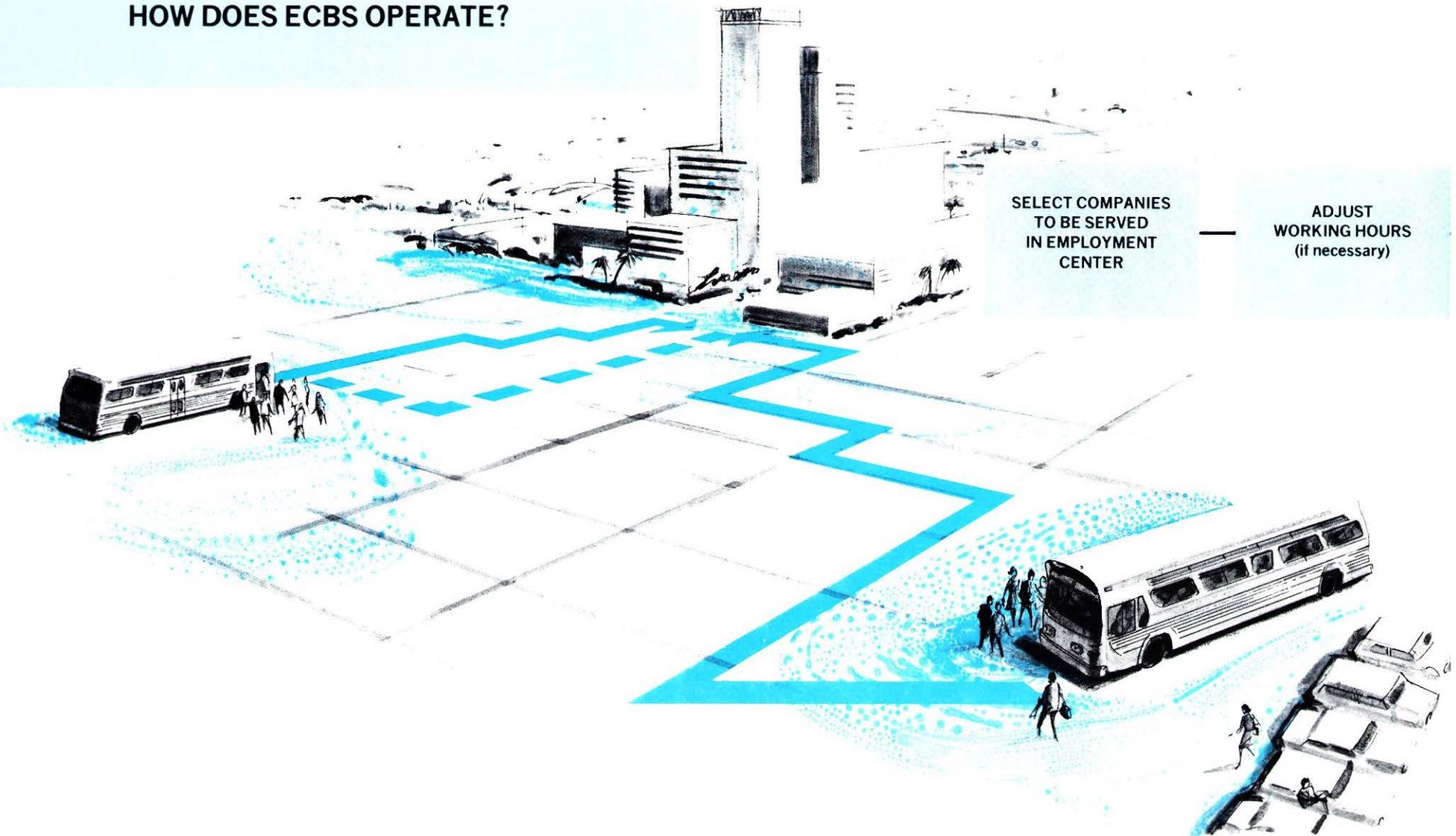
so passengers, limit patronage to those who commute more than about 15 to 20 miles one way. Although popular at almost all commuting distances, carpools have lower, effective values of modal split than you would expect by considering only the nominal size of carpools. For example, if



each member of a three-person carpool could not join the pool one or two days a week, the value of the pooling mode would drop significantly. Of course, this need for people to drive their cars to work on certain days will not affect the efficiency of ECBS when an oversubscription policy is used.

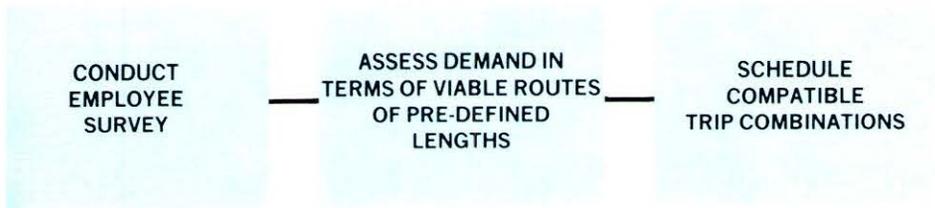
This examination of existing pooled commuting modes highlights the lack of customized, express transit service to accommodate the short and medium length trips to both the central business district and satellite employment centers. The ECBS can fill this void and can also provide lower cost, long distance subscription bus service. Most of the patronage would come from the auto commuters who could be attracted to ECBS by its service features and reduced travel time and cost. The ECBS could increase the number of persons commuting to the central business district by public transit and remove some of the undesirable peak demands made on conventional bus service. Other express and subscription services could be integrated into ECBS if desired and if permitted by institutional factors. Another potential ECBS market is the transit-dependent who lives in the inner city. Many of these people could be employed in a satellite employment center if they could be provided with economical transportation.

HOW DOES ECBS OPERATE?

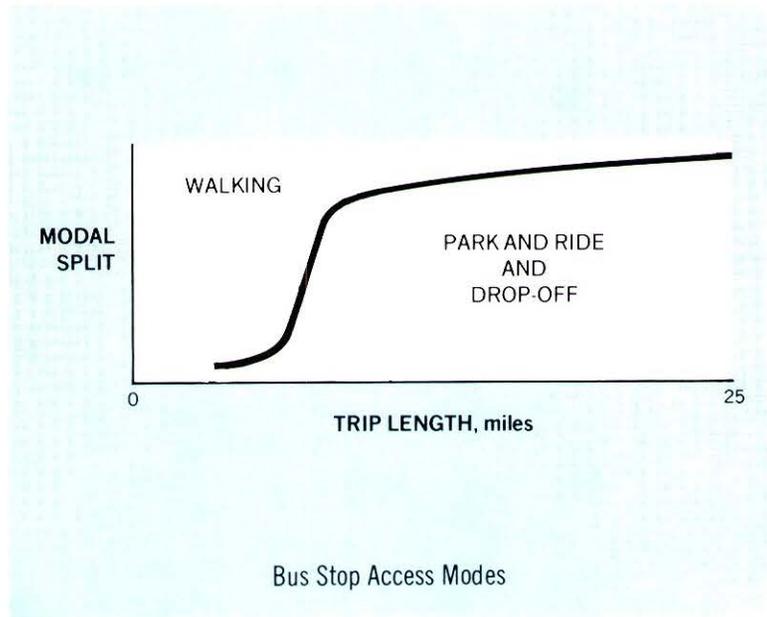


SELECT COMPANIES
TO BE SERVED
IN EMPLOYMENT
CENTER

ADJUST
WORKING HOURS
(if necessary)



Major Activities in Implementing ECBS



Bus Stop Access Modes

Initially, you must evaluate potential employment centers and select one or two that have the greatest possibility of enjoying a successful ECBS program. The employment center should have a high employment level and a natural stagger in shifts such that four shifts could be defined with a minimum of tailoring of working hours.

Employee surveys are used to solicit patronage and to schedule and plan routes. The buses operate on arterial streets, make only several stops near employee origins in the morning, and arrive within 5 or 10 minutes before the scheduled shift. In the afternoon buses depart the center soon after the end of a shift and carry the same groups of passengers to their morning pickup points.

Since the ECBS routes converge at the employment center, access modes at the origin are likely to be a brief walk to the bus stop for the short trip lengths. Park and ride, drop off, or carpools are generally the access modes for the long trips. The graph depicts the probable distribution of access modes as a function of trip length. Because of the multiple pickup points, the number of cars that are to be parked at any one bus stop should not present a severe parking problem.

An appropriate stagger time for satellite employment centers in large urban areas, where 80 percent of the working population lives within 20 miles of the center, is approximately 45 minutes. This stagger time represents a 2¼ hour peak period and permits a desirable balance among trips of each length category. Small urban areas characteristically have shorter commute distances, shorter peak periods, and

smaller satellite employment center populations. If the peak period were 1 hour, the stagger time would be 20 minutes for a four-shift operation. The trip lengths for both areas would have the following approximate values in uncongested traffic.

TRIP LENGTH CATEGORY	APPROXIMATE TRIP LENGTH, miles	
	LARGE URBAN AREA	SMALL URBAN AREA
S	7 or less	3 or less
M	7 to 15	3 to 6
L	15 to 25	6 to 11
VL	25 or more	11 or more

In all cases, the greater part of the demand could be met by aggregating multiples of selected trip combinations. For example, consider the following demand matrix of busloads per shift as a function of trip length category.

TRIP LENGTH CATEGORY	NUMBER OF BUSLOADS PER SHIFT			
	SHIFT A	SHIFT B	SHIFT C	SHIFT D
S	2	2	2	0
M	2	1	1	3
L	2	0	0	1
VL	0	2	0	0

The demand matrix can be exactly satisfied by aggregating four selected trip combinations. The aggregation shown below illustrates that if 40 passengers were served per trip, 720 passenger round trips per day could be made with eight buses.

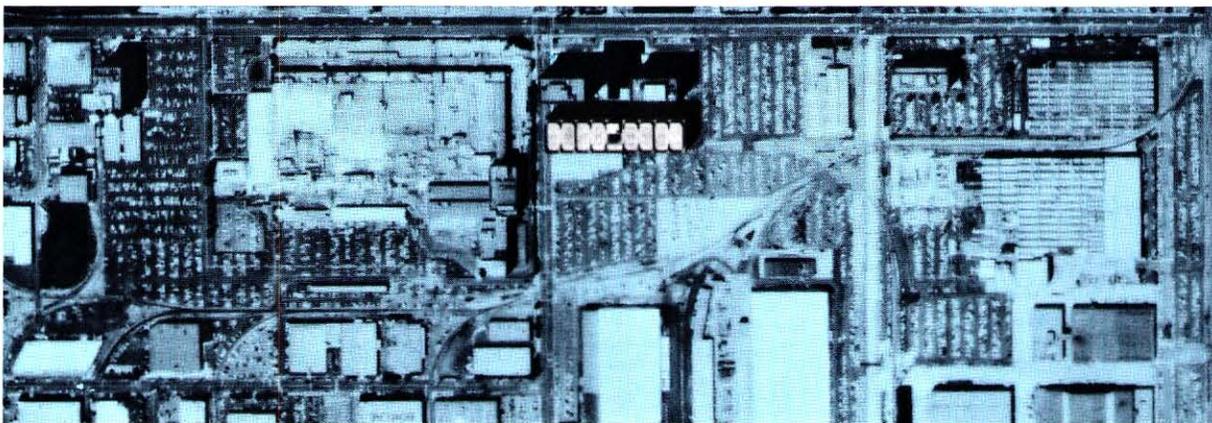
REPRESENTATIVE TRIP COMBINATION NUMBER	TRIP LENGTH CATEGORY SERVED PER SHIFT			
	SHIFT A	SHIFT B	SHIFT C	SHIFT D
1	S	S and VL	S	M
2	S and L	S	M	M
3	M and L	M	-	M
4	M	VL	S	L

Trip combinations should be modified to suit local conditions. For instance, if the stagger time is less than 20 minutes and the demand for S trips of less than 3 miles is negligible, trip combinations should be selected that have no or only one S trip in four or five trips as illustrated by Nos. 3 and 4 of the previous trip combination example. These modifications result in only slight penalties in efficiency.



WHO BENEFITS FROM ECBS?

EVERYONE



Aerial photo of a typical employment center: scattered buildings surrounded by acres of parked cars. The highlighted area is a five-level parking structure.

Courtesy of METREX Management Corporation

Transit Operators—Operators benefit because ECBS will:

- Have a higher revenue-to-cost ratio than conventional service
- Serve satellite employment centers they could not serve previously
- Introduce a more efficient park and ride service to the central business district
- Provide a commuter service that can compete with the auto

Employers—Based on their vanpool experience employers can expect:

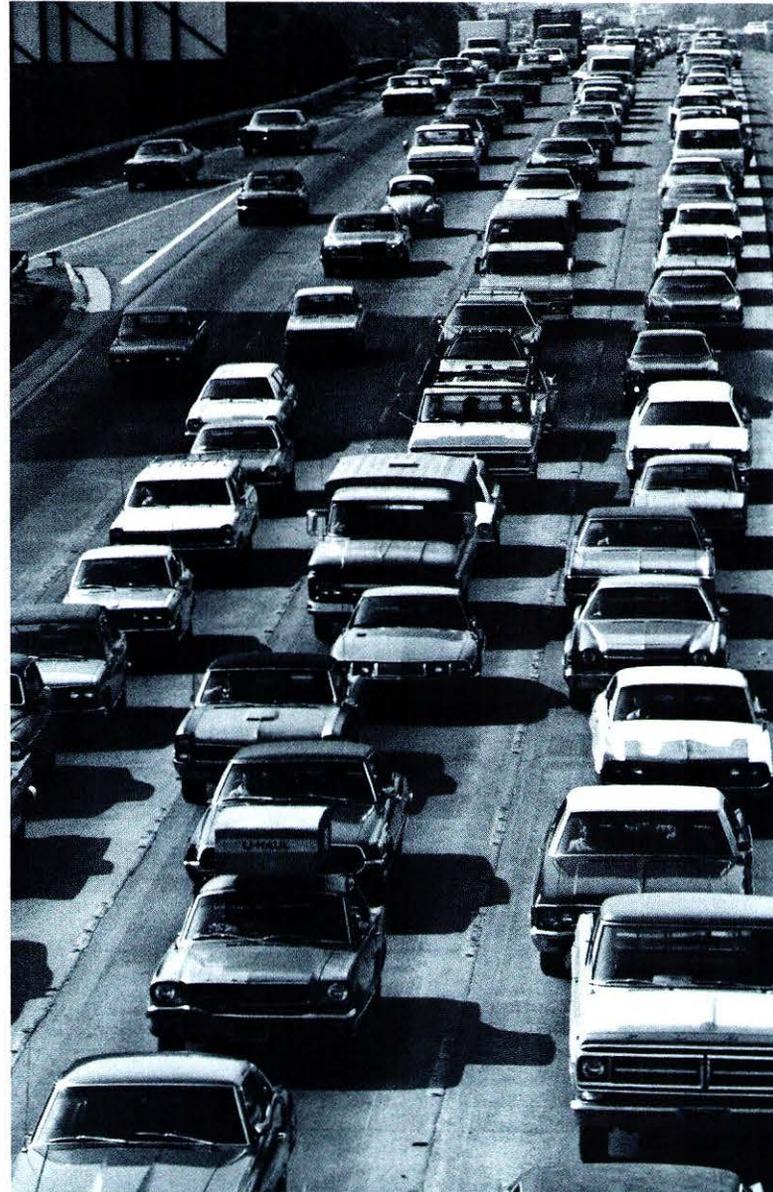
- Reduced absenteeism and almost no tardiness
- Increased potential for greater employment of minorities—Tennessee Valley Authority officials credit vanpooling for tripling minority employment on one major construction project
- Improved employee relations by promoting a convenient, lower cost commuting mode
- Reduced parking subsidy—the 3M company at St. Paul has saved \$2.75 million by not having to provide 800 additional parking stalls

Employees—Again, based on vanpool experience employees will:

- Have lower commuting expenses; may possibly defer the purchase of a new or additional auto
- Have more time to read, work, sleep, converse—less time behind the wheel
- Feel they are contributing to reduced national dependency on foreign oil

Community—The community in general will benefit from:

- Reduced traffic congestion
- A near-term implementable supplement to the urban transportation system
- Reduced amount of pollutants released into the local environment



HOW IS ECBS IMPLEMENTED?

Before proceeding with a step-by-step outline of the guidelines for implementing ECBS, you should become aware of certain characteristics of ECBS.

GENERAL GUIDELINES

The ECBS requires more planning and cooperation from external groups to implement and operate than existing bus services because:

- It is personalized.
- Some employment hours may require tailoring.
- Routes are configured by origin distributions and not by transit operator jurisdictional service area.
- Routes are reconfigured and schedules are revised to meet changing demand patterns.
- It benefits from an increase in scale because the fraction of the number of employees that can be served increases with the population of the employment center.

These needs introduce the following requirements:

- You must interface extensively with passengers, employers and, possibly, local government.
- A large volume of planning and management data must be processed quickly and efficiently.
- A satellite employment center population should be maximized.
- Revision of institutional regulations to remove constraints.
- A subsidy may be desirable to increase patronage or forestall an increase in your deficit, although you may find the ECBS to be self-supporting.

These requirements may be approached in the following manner:

Data Handling

The labor-intensive aspects of planning and managing an ECBS are:

- Tabulation and presentation of employee interest and origin data
- Route configuration and schedules
- Passenger interface with respect to routes and schedules
- Tabulation of operational ridership data
- Fare collection

Initially these tasks could be performed manually, supplemented, at times, by simple computer tabulations. Computer assistance may be available to perform each task by the time expanded service is being contemplated.

Employer Interface

You must meet with employers to acquire employee origin and other data and to effect changes in employment hours, if necessary. Although these tasks may appear formidable, it is evident that employer attitudes have changed in the last few years, making these tasks easier. An increasing number of employers are concerned about their employees' commuting modes. This may be traced to changes in our economy (e.g., the high cost of gasoline and autos) and new federal regulations pertaining, for example, to equal employment opportunity and the hiring of minorities. In some instances the cost of providing employee parking has become excessive, and the "good neighbor" image has been damaged by contributing to traffic congestion.

Although many employers recognize the need for and benefits of additional pooled commuting by their employees and want to promote it, the task of negotiating a change in employment hours among a group of employers composing a satellite employment center requires much preparation. You should establish an organization of prestigious mem-

bership to implement changes in employment hours. This organization should publicize the general benefits of such changes and also contact the highest level of employer management on a personal basis.

You should prepare factual data on the impacts of ECBS on employees, employers, and community so that employers can evaluate the benefits and costs of changes in employment hours. The benefits would be dependent upon local conditions (e.g., costs to provide parking, parking fees, traffic congestion, air quality, attitudes toward energy conservation and social issues, and existing commuting modes). The possible disruption of existing paratransit modes (e.g., carpooling, buspooling, and vanpooling) must be considered when suggesting changes in employment hours.

Local Government Agency Discussions

Discussions with local government agencies may be necessary to remove jurisdictional questions created by ECBS and, perhaps, to solicit a subsidy for the new service.

The jurisdictional questions originate because, in some areas of the country, the transportation policies established to satisfy public needs and to foster the best conventional and subscription bus services are constraining to ECBS deployment and efficiency. These policies are most harmful when they prevent the operation of trips in all length categories. This is caused by:

- The establishment of a well-defined but restrictive area of operation for the dominant transit operator who could best supply ECBS.
- The absence of an effective mechanism for coordinating many, relatively small public and private transit operators who would operate an ECBS in an extended area.¹

The prospect of supplying a highly productive bus service and measurably increasing bus patronage may be sufficient incentive for

¹ The following report treats the institutional barriers which limit the introduction of new transportation modes and provides additional information to the above discussion: F.W. Davis, Jr., K. Oen, *Solving Public Passenger Transportation Problems; A Need for Policy Reorientation*, January 1977. DOT-OS-40096, Final Report, Volume II.

local government agencies to revise constraining regulations. The societal benefits estimated for ECBS should also be of interest to government agencies and may prompt a subsidy from these sources.

Serving Employment Centers

In defining a satellite employment center, emphasis should be placed on maximizing the potential demand. As a consequence of the relatively large seating capacity of buses, increasing demand permits serving more routes. Obviously, employees of different employers located within a short walking distance of each other who have the same working hours can share the same buses. Most important, large employers could be separated by several miles without decreasing efficiency. Each employer, moreover, need not have more than one shift as long as the goal of four, equally spaced shifts among all employers is attainable.

Although many industrial parks have large working populations, they have low densities and resemble small central business districts. They may have an adequate natural stagger in employment hours but a large dispersal of company locations. In these instances, the center can be served by one or more terminals from which most employees can walk or be served by a local collection and distribution system.

The few large employers typically located in central business districts could be aggregated in the same manner as those in a satellite center, and the employers could be served at their company doors.

Inaugural Services

Inaugural services should be provided to a satellite employment center rather than the central business district because:

- Existing transit modes provide little or no service to satellite employment centers.
- ECBS planning and managerial tasks would be simpler; viz.: fewer employers need be surveyed; origin, destination, and other data would be more readily available and, perhaps, in computer, carpool matching form; and the centralization of passengers should ease the route selection task.

However, if the only sizable employment center in an urban area is the central business district, it could be treated in the manner previously described for industrial parks.



Courtesy of Teledyne Geotronics

OUTLINE OF SPECIFIC TASKS

These brief task descriptions are keyed to the general steps necessary to provide inaugural service to a satellite employment center and are applicable to a broad spectrum of urban areas. They are grouped under three phases of activity: planning, service implementation, and operations.



PLANNING

Employment Center Selection—Select one or more approximately rectangular areas of about 10 square miles or less that contain large working populations. For each area, identify the major and nearby smaller companies, and acquire current employment levels, working hours, and the general distribution of employee commute distances. Establish an approximate, appropriate shift stagger time. Identify the site that has the largest potential for patronage and is amenable to a four-shift, equal stagger time operation. More than 5000 employees for the combined companies, very roughly equally divided among shifts, may be required along with possible tailoring of employment hours.

Selection of Employees To Be Served—Acquaint the major employers on the pertinent aspects of the service. Obtain data on employee origins, current commuting modes, and other data from which ridership can be estimated (e.g., buspool interest, unscheduled overtime requirements, and unusual difficulties in auto commuting). Also, identify employer problems that could be reduced by more pooled commuting, and assess employer interest in the service.

In selecting and in negotiating with companies within the satellite employment center, it may be sufficient to assume that the ridership will be about 10 to 20 percent of those employees who are not commuting in a pooled mode. It may be necessary, however, to perform the remaining planning activities concurrently.

Fare Structure and Service Policy—Establish the fare structure and service policies. These are critical because of their strong impact on ridership.

Fares may be more easily established from the following

data: in a typical four-shift operation, an average bus revenue of \$100.00 per day corresponds to round-trip daily fares of \$.60, \$1.00, \$1.50, and \$2.00 for short, medium, long, and very long trips, respectively. Fares should be below the average auto operating costs unless there are circumstances, such as high parking fees, that would permit higher fares to be competitive.

A fare incentive plan may be appropriate; it should be devised in conjunction with a simple, appealing fare collection scheme. An oversubscription policy is recommended. In addition, establish the minimum passenger levels for initiating and maintaining a route.

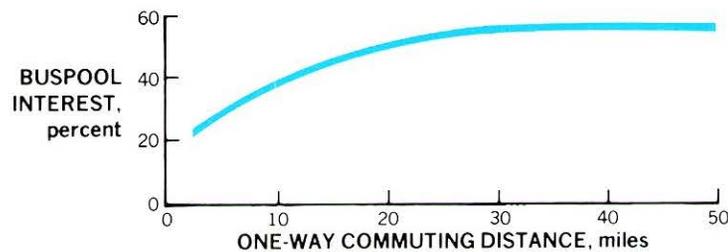
Preliminary Route Configuration—Establish preliminary routes and schedules, and estimate the employees served on each shift. This effort should appraise the vitality of ECBS in serving the selected company grouping. This information would also be used in subsequent meetings with the employers and, perhaps, with local government agencies.

If employee origin data are available from a carpool matching program, and if buspool interest was also determined, suitable routes can be configured by using the following patronage criteria: assume the average daily ridership to be one-half the employees who are interested in buspools and reside within an access distance about equal to 10 percent of the commuting distance (within 1 mile of the route at a 10-mile commute). If local buspool interest data are lacking, you may use the relationship shown, which was developed for Los Angeles. If there are no regional data on buspool interest, a “best guess” working hypothesis must be made to estimate patronage and define routes.

Pre-Marketing—Conduct a pre-marketing activity stressing the service features and fare structure of ECBS before making an employee survey. The activity should include newspaper articles, multimedia announcements, briefings, company newsletters, and advertisements. Advise all the center’s employers of the timing of future activities in which they will participate.

Employee Survey—Conduct a survey of the center’s employees to determine interest in using ECBS. The survey should contain an identification of employer and shift, and a summary description of the fare schedule and service features. It should request information that would supply the necessary inputs for route configuration (e.g., nearest arterial street intersection, one-way commute distance, desired maximum access distance, and expected frequency of ridership).

Route and Schedule Definitions—Enter the number of potential ECBS passengers at each arterial intersection on

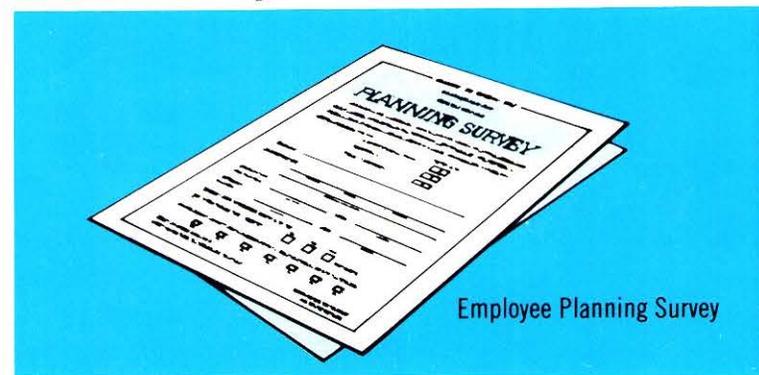


Buspool Interest as a Function of One-Way Commuting Distance (developed for Los Angeles)

a street map. Use these data to define routes and schedules, including deadhead routes. To achieve near optimum service, several iterations among routes of various lengths and trip combinations will be required. Use your existing procedures for verifying routes and schedules and prepare timetables.

Operations Planning—Develop and prepare marketing material or kits, passenger ticket order and request for service forms, and operational management forms. Also conduct the necessary preservice functions [e.g., marking bus stops, auto parking areas (if required), and fare purchase locations, and training of personnel].

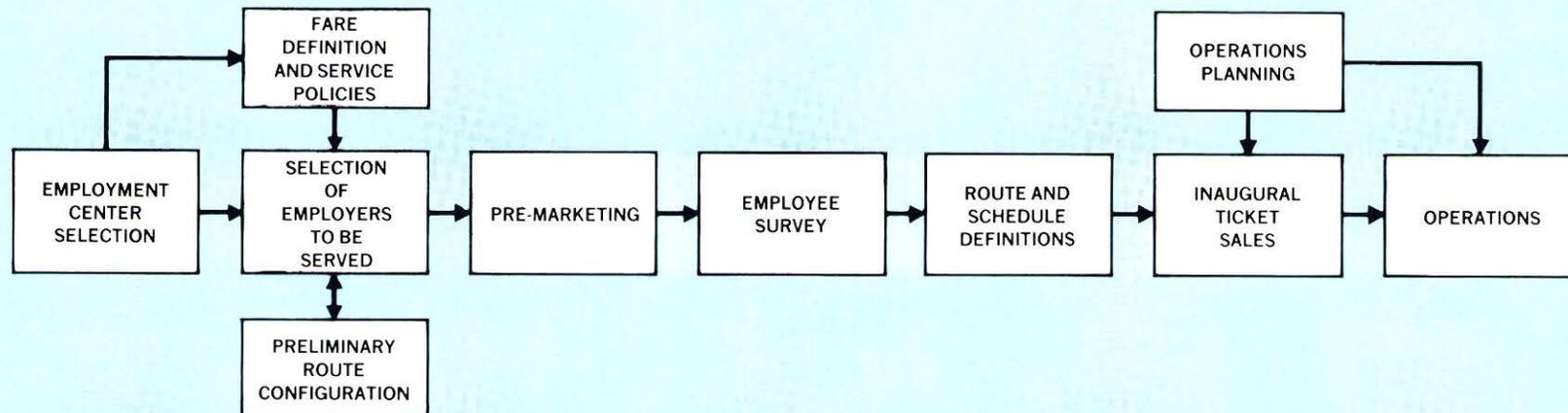
Inaugural Ticket Sales—Distribute, collect, and process the ticket order forms. Modify routes and schedules, if necessary, using the additional information acquired from the ticket order and request for service forms. Prepare final timetables. Notify employees when service will start and the fare collection procedure.



OPERATIONS

You may want to conduct a passenger survey after several months of operation to effect service improvements. When new ticket order forms, requests for service, and the monitoring of ridership indicate significant demand changes, restructure routes and timetables. With a successful inaugural service you may want to restructure routes to include additional employers within the center, or provide service to an adjacent center thereby achieving the increased efficiency of areawide service.

Implementation Flow Chart





TRIP LENGTH	H-1	R	H-2
	HUGHES El Segundo Div (6:45-3:15)	ROCKWELL B-1 Div (7:30-4:12)	HUGHES Space & Com Gr (8:15-5:15)
SHORT	3	3	3
MEDIUM	2	-	2
LONG	-	1	1
TOTALS	5	4	6
BUSES REQUIRED: 7			

Preliminary Configuration of Demonstration Project Showing Coverage by Revenue Routes

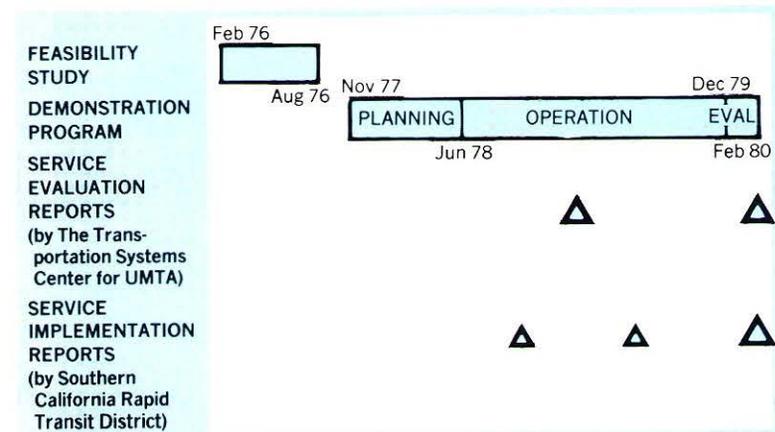
WHAT IS THE STATUS OF ECBS APPLICATION?

An ECBS Demonstration Project is under way in the City of El Segundo, a satellite employment center of Los Angeles. The Southern California Rapid Transit District is conducting the 2-year program under the sponsorship of the Urban Mass Transportation Administration, Office of Service and Methods Demonstrations. Service is planned to start on June 1, 1978, and routes are currently being designed.

The preliminary configuration of the demonstration project, developed during the feasibility study of the ECBS concept, is briefly described. The description emphasizes the procedures used to implement ECBS.

The selected site is a densely industrialized, 12-square-mile area immediately southeast of Los Angeles International Airport. The major companies were apprised of the ECBS

ECBS El Segundo, California Demonstration Project Schedule



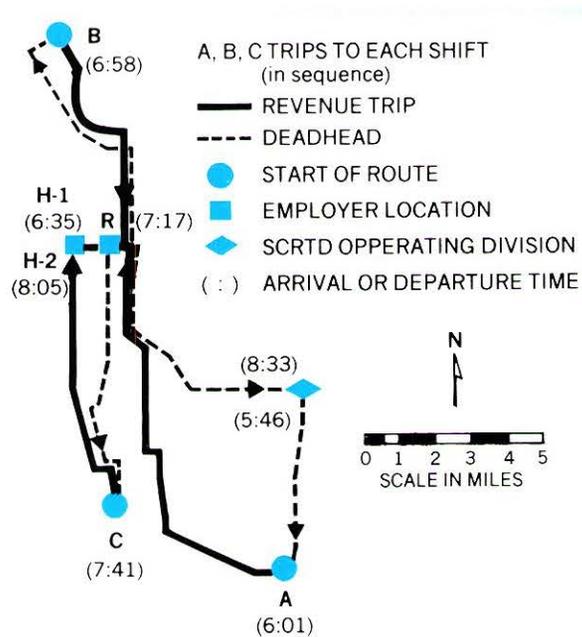
concept in order to acquire the following correlated employee data for the purposes listed.

DATA	PURPOSE
<ul style="list-style-type: none"> • Shift hours and number employed on each shift 	<ul style="list-style-type: none"> • To assess the composition of the employment center.
<ul style="list-style-type: none"> • Residence locations 	<ul style="list-style-type: none"> • To determine desired stagger time and trip lengths.
<ul style="list-style-type: none"> • Current employee commuting modes 	<ul style="list-style-type: none"> • To avoid disrupting existing buspool service and assess the impact of ECBS on carpooling and conventional bus service.
<ul style="list-style-type: none"> • Employee buspool or vanpool interest 	<ul style="list-style-type: none"> • To define patronage and routes using developed criteria based, in part, on buspool or vanpool interest.

Most of the companies in the area had been recently surveyed on these points by Commuter Computer, the local carpool and vanpool matching agency; fortunately, all of the desired data were available in computer printout form for the companies later selected to comprise the "El Segundo Employment Center." The residence locations were given in terms of square cells having sides about 1.25 miles long.

An optimal stagger time of 45 minutes was estimated from an analysis of the employee commuting distance distributions. An examination of the existing shifts in the employment area showed that only three were spaced with the desired staggered time. It was considered inappropriate to ask an employer to modify his hours for a demonstration project; moreover, it was felt that a three-shift operation would be adequate for the purpose of concept demonstration. The shifts selected represented part of the employment of the Hughes El Segundo Division (H-1), Rockwell International (R), and the Hughes Space and Communications Group (H-2). The Hughes El Segundo Division had the lowest level of employment (1800) and it was considered adequate.

Using maps, one for each shift, showing the number of employees in each cell who were interested in buspool or vanpool service, short, medium, and long routes of approximately 7, 15, and more than 15 miles long were configured. Only a portion of the anticipated demand was satisfied. This was done by aggregating appropriate three-shift trip combinations until a meaningful size for the demonstration was reached. The result was a 15 revenue trip operation, using seven buses and serving about 800 people riding on the average of four days in five. None of the routes backtrack; moreover, the routes represent very nearly the minimum time paths between origins and employers.



Routes and Schedule of One Morning Bus

The morning routing sequence of one bus, including all deadhead trips, is illustrated. Initially, the first shift is served by a medium trip, A, and the second and third shifts by short trips, B and C, respectively. The figure also illustrates the following:

- The operating division is selected to minimize dead-heading.
- The deadhead routes do not generally duplicate revenue routes, but rather are minimum time paths.
- The scheduled arrival time at each employer is about 10 minutes prior to the start of each shift.

If initial results of the demonstration are successful, the Southern California Rapid Transit District plans to expand the service within the El Segundo area and, perhaps, to another employment center.



The background document referenced in this brochure is: *Feasibility Study of the Employment Center Bus Service Concept*, PB 259941, August 1976. It is available from the National Technical Information Service, Springfield, Virginia 22151.

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