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# PROCEEDINGS — *Eighteenth Annual Meeting*

Theme:  
“Transportation in Transition”

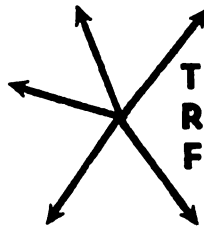
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**TRANSPORTATION RESEARCH FORUM**

# Comparison of an Employer-Based and a Community-Wide Rideshare Demonstration Program — Knoxville, Tennessee Experience

by Frederick J. Wegmann\* and Douglas Wiersig\*\*

## INTRODUCTION

TRANSPORTATION PLANNERS traditionally have been concerned with providing a supply of transportation facilities to accommodate future levels of travel demand. Recent events such as the energy crisis, the limitations being imposed on public agencies to finance capital improvements and labor intensive transportation services are leading to a reevaluation of these established transportation concepts. Today, greater consideration is being given to short-range actions which respond to immediate travel needs. The objective of these actions is to achieve greater utilization of transportation facilities already available to the community. Constraints imposed by fuel, conservation, and funding limitations are encouraging planners to seek efficient solutions. Promoting the use of high occupancy vehicles, buses, and vans, while simultaneously increasing the occupancy of private automobiles are examples of such efficient solutions. Many carpool demonstration projects have been established across the nation since enactment of the emergency Highway Energy Conservation Act (P.L. 93-239) and in recent years these carpool projects have been supplemented by vans to provide a comprehensive area-wide ridesharing effort. Public efforts have also been effectively supplemented by employer-based private rideshare programs.

Knoxville, Tennessee is the site of two experimental commuter rideshare programs. At the Tennessee Valley Authority (TVA), the largest employer in downtown Knoxville, an employer-based commuter rideshare program stressing regular and express buses, vanpools and carpools has been active since late 1973. The need to view ridesharing from a broad perspective was in part due to the limited coverage provided by the publicly owned conventional bus system

operating in the city of Knoxville. The program has proven to be highly successful in removing the single occupant automobile from the highway.

Currently efforts are being undertaken by the Knoxville Transportation Brokerage Demonstration Project to extend ridesharing to the community as a whole by creating a transportation brokerage service. The brokerage concept is somewhat unique to public transportation in that the broker attempts to match individual mobility needs with the available supply of transportation, thereby altering riding habits, and achieving more productive use of vehicles and facilities. The broker does not favor any particular mode, but utilizes marketing surveys to define the most appropriate modal response. Currently the brokerage service is being operated by the Transportation Research Center at The University of Tennessee and is being funded by a 15 month UMTA methods and services demonstration grant. The commuting function of this program is called the Knoxville Commuter Pool (KCP).

## OBJECTIVE

One difficulty associated with the increasing carpooling and vanpooling efforts is the lack of readily accessible data on program evaluation. Information assessing the effectiveness of experimental programs should be of assistance to organizations or communities desiring to establish comprehensive ridesharing efforts. The objective of this paper is to highlight the relative success and impact of the KCP and TVA commuter pooling demonstration programs, describe comparative ridesharing user profiles and identify the factors felt to underlie the success of these programs.

## TVA COMMUTER POOLING DEMONSTRATION PROGRAM

An experimental express bus program, under sponsorship of a neighborhood organization, was initiated between a middle income subdivision having a high concentration of TVA employees and downtown on December 3, 1973.

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Special efforts were taken to make the service consumer oriented by scheduling the bus to arrive downtown just before TVA starting time and leaving directly after the close of TVA's work day. The bus was an instant success. Standees were riding the first day and a second bus had to be added before the month's end. By spring, 1974, seven express buses were operating to various areas of the community.<sup>1</sup>

With the decision in 1974 by TVA management to combine offices into a new twin tower complex, 1300 downtown parking spaces were to be lost. In response TVA management elected to take a rideshare solution, oriented around the early success of the express bus, rather than initiate a massive downtown parking construction program. Consequently six commuter vans were added to serve outlying areas unable to support bus service and a general rideshare program was initiated. Effective January 1975, TVA employees were reimbursed for travel by bus (express or regular fixed route), vanpools and carpools. For example, the commuter pooling program reimbursed bus riders for one-third of the cost of the commuter bus ticket or in the case of carpools (defined as three or more riders) were issued a five dollar monthly municipal parking ticket and vanpoolers were credited in the amount of three dollars per month for each TVA employee participating in the TVA Credit Union Vanpool Program.

Also as part of the commuter pooling demonstration program, the position of a transportation coordinator was established to assist employees in forming vanpools and carpools, negotiating services with public and private transit operators and administering the rideshare reimbursement program through the TVA Credit Union.

The impact of the commuter pooling program was immediate and dramatic. As noted by Table 1 during a period of three years, since initiation of the first express bus, the use of bus transportation increased from 3.5 percent to 31 percent of TVA's downtown work force. The proportion of single occupancy vehicles decreased from 65 percent to 18 percent. The incentive program has been continued and has expanded to include 18 vans and 24 express buses.

### KNOXVILLE TRANSPORTATION BROKERAGE SERVICES

There are many reasons for the success of the TVA program but among the key factors is the functioning of a transportation brokerage service provided by the TVA transportation coordinator.

Since many firms are too small to support a full-time brokerage operation and since many employers and employees have not yet recognized the benefits to be derived from ridesharing, the Knoxville Transportation Brokerage Service (KTBS) was initiated in January 1976. KTBS serves as a logical extension of earlier community-wide carpooling efforts. The KTBS broker has the responsibility to work on a community-wide basis and deals with a range of travel needs.

Brokerage functions, depicted in Figure 1, are different from traditional transit planning as they identify transportation demand on an individual traveler basis, rather than through aggregate statistics. Demand is to be identified through a general public market analysis program, and by working with employers and social service agencies to survey individuals within organizations having specific travel needs. The broker also identifies specific transpor-

TABLE 1

### KNOXVILLE COMMUTER POOLING PERCENT OF TVA WORK FORCE

Mode of Transport To Work	November 1973	December 1974	January <sup>1</sup> 1975	January 1977
Drive Alone	65	42	30	18
Ride Bus	3½	14	23	31 <sup>2</sup>
Carpool	30	40	42	41
Van, Bike, Walk	1½	4	5	10 <sup>3</sup>
Work Force	2,950	3,000	3,100	3,400

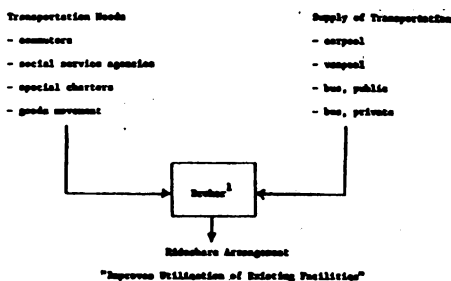
<sup>1</sup> First Month of Commuter Pooling Demonstration.

<sup>2</sup> Approximately 8 percent are on express buses and 27 percent on regular buses.

<sup>3</sup> Approximately 7 percent are vanpooling.

tation suppliers to fill these needs. A unique aspect of the program is that 51 seed vans are available to the broker to supplement available travel services through vanpooling. These vans are provided to permit individuals to experiment with vanpooling. Here the broker is absorbing the risk in permitting commuters to test a new transportation concept. Plans call for the disposal of city vans after three years to encourage private ownership of the vehicles. These vans will not be competing with public bus service as they will only be utilized where either the trip origin or destination is outside the city of Knoxville. The Knoxville demonstration project will have extensive local as well as national implications in creating a multi-modal integrated approach towards urban transportation which stresses flexibility and responsiveness to individual needs. At the termination of the demonstration period, the city is expected to assume responsibility for the continuation of the service.<sup>2</sup>

#### BROKERAGE FUNCTIONS AS ENVISIONED BY THE KNOXVILLE TRANSPORTATION BROKERAGE SERVICE



1 Strategy—"Adapt Transportation Facilities to Meet the Differing Needs of People in Different Areas and Sociological Groups"

FIGURE 1

Initially the broker has concentrated efforts in the areas of:

1. Overcoming institutional barriers hindering implementation of a community-wide rideshare program.
2. Increasing awareness on the part of employees and commuters for ridesharing opportunities by developing a comprehensive commuter data file.
3. Operationalizing the 51 seed vans.

#### Institutional Barriers

Two areas initially restraining the KTBS effort were those of regulation and insurance. Before the broker could implement the seed van program per-

mission had to be received from the Public Service Commission to exempt vehicles carrying 15 or fewer passengers and used for purposes of commuting from all regulations except those pertaining to insurance and safety. Also, satisfactory insurance rates had to be negotiated to make vanpooling competitive.<sup>3</sup> Only recently have insurance rates been established for multiple use of the vans, so that social service agencies may receive use of vans during non-commuting hours. Although the broker's efforts in overcoming institutional barriers to ridesharing can not be shown quantitatively, it is a vital function upon which the entire foundation of the rideshare program rests. Without regulatory exemption or elimination of excessive insurance rates an environment is not created in which ridesharing can occur.

#### Data Base Development

The KCP survey program involved having a representative contact 520 firms in the Knoxville area to outline the benefits of ridesharing and offer to survey employee travel patterns. Each employee was requested to note the home-origin of the regular commuter trip, their regular work hours and degrees of interest in ridesharing as a driver only, to shared driving, or rider only. The surveys enable the broker to determine the commuting potentials of the work force for various rideshare modes. Survey forms were then coded and computer matched in order to identify viable ridesharing arrangements among groups of employees from their firm and other nearby companies. As noted in Figure 2, a data file containing over 15,000 travel records was accumulated by the in-firm survey procedure. Each individual participating in the survey received a computer match list identifying other individuals living in a one mile by one mile zone, traveling within the same half-hour time period and going to the same destination zone. In areas and times where few matches were available the home origin was expanded to a nine square mile area.

Concurrently the broker has utilized the media to aggressively market ridesharing to the community. After an extensive television, radio, billboard and newspaper advertising program, a 66 percent general population awareness of the KCP has been reached.<sup>4</sup> The media advertising has stressed a telephone number for individuals to call for ridesharing matching information. The awareness study also indicated that 39

## DEVELOPMENT OF KCP DATA FILE

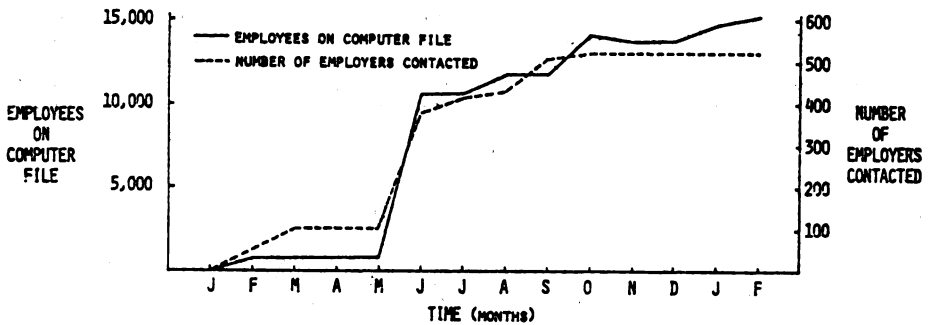


FIGURE 2

percent of the population surveyed at random knew how to contact the broker.

Although an extensive commuter data base has been established, difficulties exist in fully exploiting the available information. Generally the survey forms were noted as being clear and easy for individuals to understand and respond to. Yet at some firms the voluntary response rate was extremely low, in some cases less than 5 percent. Because an attempt was made to contact all firms in the community, only 77 percent of the respondents were matched. This means over 20 percent of the individuals taking the time to respond to the inform survey received no useful information in return. Also this "non-matched" statistic does not account for the fact that many of the primary matches contained only 1 or 2 other names.

In retrospect it also became evident that many individuals completed the survey form because of management suggestions and a follow-up response indicated they were not seriously interested in ridesharing. With the rapid turnover of employment in some firms, such as hospitals, rotation of shifts at other firms, it becomes evident that the development of a community-wide commuting data file has its limitations. The broker is now initiating a resurvey of selected employment concentrations to update the records. Attention needs to be given to simple, inexpensive methods to purge records and insert more current information. To a large extent the expensive matching process has not played a significant role in the formation of vanpools; rather, "word of mouth" appears to have been more effective. In the long run the development of an extensive data file is a valuable brokerage resource. Yet the process seems more amenable to incremental

expansion, starting at major employment concentrations where the interest and potential for ridesharing appear highest. It must also be remembered that approximately 42 percent of Knoxville's work force already rideshares to work (defined as two or more persons per vehicle). At some firms the rate approaches 60 to 70 percent of the work force and a point of saturation may well be reached.

## Seed Vans Program

The availability of 51 seed vans has been well received. Currently 47 vans are on the road carrying over 400 commuters and serving 15 firms. Of the 47 vans operating 12 are composed of passengers that work at different firms. These vans are concentrated in the CBD and University areas and demonstrate that vanpooling can also be successful on an inter-company basis. The KCP van initiations and terminations, per month, depicted in Figure 3, suggest that the concept is working well with much experimentation taking place. Vans which initially fail are sometimes reinstated with a new driver, but with the same nucleus of riders.

Knoxville Commuter Pool vans are leased to individuals with a one way commuting distance in excess of 15 miles. The monthly lease rate is figured on a daily round trip commuting distance and computed on the basis of eight paying riders for 12 seat vans and nine paying riders for 15 seat vans. This rate structure allows the driver to ride free and if desired keep those fares for the number of passengers hauled over the minimum limit.

In many cases when drivers are starting to form vanpools they are unable to get the minimum passenger load because riders are hesitant to com-

mit themselves before the van is operating. If a driver can get 5 or 6 riders together, the van can be leased to him on a trial basis where the first month's lease is figured on a reduced number of paying passengers. The trial program has worked well since many riders have started to vanpool once the van has started operation.

In the lease agreement the KCP is responsible for all maintenance, repairs, tires, taxes and reimburses the driver for gas and oil. The KCP will also make available a backup van and provide sufficient insurance coverage.

Van drivers are required to maintain a valid chauffeur driver's license, take the National Safety Council Defensive Driving Course, drive the van to and from work and pick up riders, maintain the minimum number of riders, and be responsible for collecting the fares. Drivers may also use the van for personal use at a rate of 9 cents a mile plus gas.

The effectiveness of a ridesharing program depends on inducing individuals to alter their mode of travel. An important element in operating a rideshare program is to consider the profiles and attitudes of the rideshare users.

#### RIDESHARE USER PROFILE

As mentioned previously fixed route-fixed schedule bus service is only provided in the City of Knoxville by the publicly operated Knoxville Transit Corporation (KTC). Service is provided over eight routes which cover 57 percent of the city's land area. Because of the limited coverage areas express operations were devised to extend beyond the city limits into Knox and Blount counties. KTC ridership has dropped from 24 million annual riders in 1950 to 3.4 million annual riders in 1976. Conventional transit carries less than three percent of the total daily trips made in the city and has a usage factor of 1.6 riders per mile. A 1975 survey identified over 83 percent of the riders could be classed as being transit dependent. Of the riders interviewed on the bus 60 percent did not possess a driver's license, 47 percent did not own a vehicle in the household and 61 percent did not have an automobile available for that trip. Thirty-one percent indicated an annual income of less than \$3000 dollars and 60 percent had an annual household income of less than \$6000 dollars. It is clear that in Knoxville most of the conventional bus riders are captive and have to rely on KTC as their main source of mobility. Although all the transit routes converge on the

downtown area, traditional transit carried only 3½ percent of the total TVA work force in 1973.<sup>5</sup>

By comparison the consumer oriented express service attracts choice riders. A survey conducted in 1974 provided factual information about the characteristics of the express bus riders. It should be noted that the express bus system had not reached its full potential at that time and that the employee incentive program at TVA had not yet been initiated. The survey revealed strikingly different characteristics of the riders. It was found that only six percent of the riders had family incomes less than \$10,000 per year and 61 percent had incomes between \$10,000 and \$20,000 per year, while 11 percent of the riders had incomes of over \$25,000 per year. Another significant difference was in the occupations of the riders, as 53 percent of the respondents of the express bus survey were professionals and only two percent were laborers.<sup>5</sup>

A resurvey of the TVA employees utilizing either the express or regular bus service was performed in 1975. Most of the respondents represented express bus riders and this survey again revealed the unusual characteristics of the bus users. Only 0.9 percent of the respondents indicated that they did not have any car in operating condition, while 33.6 percent had one car and the remaining 65.5 percent owned two or more cars. The 1974 and 1975 surveys both obtained information on the mode of access to the bus stop and it was found that nearly one-half of all riders left their car near bus stops, either on park-and-ride lots or local residential streets. These users clearly had the choice of driving their cars to work. Circulation of the express buses is a significant service characteristic as 40 percent of the riders walk to the bus stop.

The 1974 and 1975 surveys asked the passengers to indicate the two most important reasons for which they chose to use the express bus service and also the two characteristics of the service that they disliked most. The rankings based on frequency distributions are shown in Table 2. It is interesting to note that the cost of travel and the conservation of gasoline were found to rank very high. Among the characteristics most disliked by the riders, "the loss of ability to go any time" ranked highest in both surveys and the "loss of flexibility to make intermediate stops" which is somewhat similar in nature ranked second.

Similar user profiles were developed for TVA and KCP vanpoolers. Direct

## NUMBER OF VAN STARTS AND VAN RIDERS PER MONTH

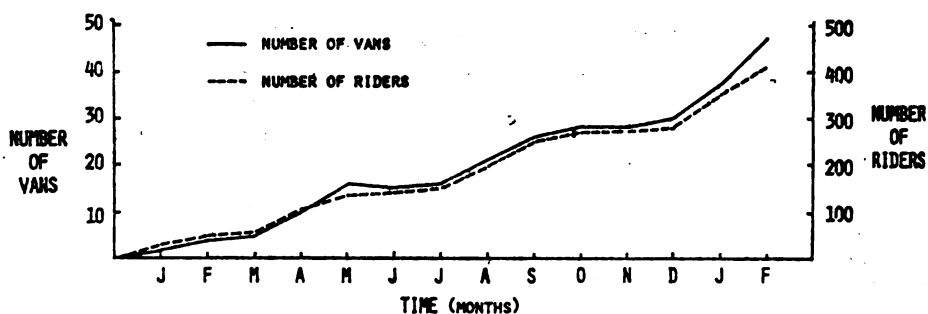


FIGURE 3

comparisons are not accurate between the two programs because of the different nature of the work forces carried. It is clear, however, from Tables 3 and 4 that both vanpool programs appeal to choice riders who desire making the family vehicle available to another family member or desire to reduce the cost and inconvenience of driving each day while also conserving gasoline. It is clear from the survey of both programs the characteristics of the van riders are quite varied. Vanpools have a mix of male and female riders as well as a wide stratification of incomes and occupations. In fact of the 66 vans in operation, eight are operated by female drivers. These results are positive indications of the acceptance of vanpooling among a broad range of employees. Similar to the express bus service, over 40 percent of the vanpoolers in each program leave their autos at the pickup location.

Major dislikes of the program include the inability to leave work anytime. The higher response to this category by TVA personnel can largely be attributed to the fact that TVA vanpools have been operating longer and individuals probably have had more experience with the inconvenience of not being able to leave early during inclement weather. In general both vanpool programs received extensive praise from their users.

## COMMUNITY TRAVEL IMPACTS

The impact of both ridesharing programs can be translated into reduced commuter vehicle-miles of travel and reductions in the number of vehicles utilizing the highways. In all cases the number of vehicles removed from daily service will not be directly proportional to the number of rideshares.

As noted in Table 5, over 50 percent of the KCP vanpoolers previously car-pooled (defined as two or more persons per vehicle) to work, while the figure for TVA vanpoolers was 36 percent. The comparable figure for express bus riders was only 22 percent. Vanpools then appear to be a logical extension of existing rideshare relationships and the previous tendency of individuals to commute in groups can be effectively exploited to form vans. In fact KCP's initial vans represented the consolidation of separate carpools into more efficient vehicles.

Both vanpool programs have removed vehicles from the highway. In the case of KCP and TVA 173 and 110 vehicles respectively are not being driven to work each day. In the aggregate this represents a savings of over 12,000 daily vehicle miles of travel. The entire TVA commuter pooling demonstration program accounts for a reduction of over 50 percent of the daily commuting vehicle-miles of travel. Because of



TABLE 2

## OPINION OF EXPRESS BUS RIDERS

A COMPARISON OF REASONS FOR EXPRESS BUS USAGE:  
1974 VS. 1975

Reason for Riding Express Bus	Frequency of Response	
	1974 Survey	1975 Survey
Less Damaging to the Environment	9.0%	2.8%
Safer in Case of an Accident	5.8%	1.8%
Conserves Gasoline	27.3%	22.1%
Freedom from Tensions of Driving an Auto	26.1%	27.0%
More Comfortable Riding	3.5%	1.0%
Less Expensive Means of Travel	22.7%	37.7%
Faster Means of Travel	4.4%	1.9%
Other (Car Can Be Used By Others, Parking Difficulties, etc.)	1.2%	5.7%
Total	100.0%	100.0%

A COMPARISON OF CHARACTERISTICS OF EXPRESS BUS SERVICE  
DISLIKED BY RIDERS: 1974 VS. 1975

Characteristics Disliked by Riders	Frequency of Response	
	1974 Survey	1975 Survey
Not Enough Privacy	2.8%	2.5%
Not Safe in Case of Accident	5.0%	2.4%
Less of Ability to Go Any Time	32.6%	38.9%
Less of Ability to Go Directly	10.7%	7.1%
Uncomfortable Ride	9.2%	7.8%
Too Slow	5.7%	5.1%
Too Expensive	9.9%	2.0%
Less of Flexibility to Make Intermediate Stops	15.6%	14.7%
Other (Overcrowding, Lack of Air Conditioning, etc.)	8.5%	19.5%
Total	100.0%	100.0%

TVA's travel concentrations in both time and space and location in the CBD as compared to the more dispersed community-wide KCP program, the TVA rideshare program has noticeably eased travel congestion on the major arteries leading to downtown. Of particular interest is the removal of all day parking from downtown Knoxville. It is estimated the pooling demonstration at TVA has actually removed 1145 vehicles from downtown Knoxville. When considering TVA employment has increased by 450 over the last 3 years, with ridesharing 1481 additional downtown parking spaces would have been required to accommodate the TVA work force.

## SUMMARY

In Knoxville the challenge is being met to conserve fuel and reduce the

cost of commuting by instituting employer-based and community-wide rideshare programs. Both programs demonstrate that substantial savings can be achieved by focusing on the commuter trip which is repetitive in nature and has the necessary travel commonality in time and space to permit development of efficiencies. In areas of large employment concentration, much can be done through the leadership of the major employer. For others, reliance must be placed on a community broker to assist in overcoming ridesharing barriers and alerting both employers and commuters of the benefits to be derived from ridesharing.

It has been shown that ridesharing is a viable option for commuter transportation and both public and employer-based programs can have substantial impacts on reducing the vehicle miles

TABLE 3

## CHARACTERISTICS OF VANPOOLERS

Number of Vehicles Available For Travel to Work	TVA Vanpoolers n=171	KCP Vanpoolers n=206
None	1.8	8.0
One	33.5	51.2
Two	54.1	34.3
Three or More	10.6	6.5
<b>Annual Household Income</b>		
Under \$ 4,000	1.3	3.9
4,000 - 8,000	7.1	14.9
8,000 - 12,000	9.7	24.7
12,000 - 16,000	19.4	33.3
16,000 - 20,000	39.4	9.8
<b>Occupation</b>		
Professional, Technical	29.4	15.4
Managers, Administration	19.6	6.2
Clerical	30.1	12.3
Craftsman, Foreman	19.6	32.8
Operators Non-Transport	0.0	9.7
Laborers	1.2	19.5
Service Workers	0.0	4.1
<b>Sex</b>		
Male	65.8	61.1
Female	34.2	38.9
Average Time In Vanpool (Yrs)	8.4	2.3
Average Years Making the Trip (Yrs)	5.7	3.7
Average Trip Length (Miles)	21.9	25.3
Park Vehicle at Pick-up Point (%)	40.4	40.2

TABLE 4

OPINIONS OF VANPOOL RIDERS  
(Percent of Individuals Checking)

	TVA (n=171)	KCP (n=206)
<b>LIKES</b>		
Makes Vehicle Available During the Day	18.1	16.5
More Dependable than Bus Service	7.6	2.9
Increased Availability and Reduced Cost of Parking	56.7	4.4
Avoids Buying A Second Car	10.5	10.7
Avoids Driving Every Day	62.0	52.9
Saves Money	70.2	45.1
Conserves Gasoline	68.4	42.7
Do Not Own A Car	0	3.4
Other	7.6	10.7
<b>DISLIKES</b>		
More Inconvenient	8.2	4.9
Dislike Personalities of Riders In Pool	3.5	.5
Lack of Privacy	2.3	0
Not Able to Leave Work Any Time	45.0	23.3
Uncomfortable Ride	8.8	12.1
Too Expensive	9.9	10.7
No Dislikes	36.2	56.1
Travel Time Too Long	8.8	7.8
Cannot Work Overtime	9.4	11.7
Other	7.6	8.2

TABLE 3

## MADE BEFORE JOINING VANPOOL

Previous Mode	TVA Vanpooler	KCP Vanpooler
Bus	11.6*	9.4**
Drove Alone	45.7	34.2
Pooled With Family	2.7	1.0
Pooled With One Rider	8.5	8.9
Pooled With Two Riders	9.8	6.9
Pooled With Three or More Riders	15.2	32.7
Other	6.5	6.9

\*Most were express bus riders. Vans were introduced to relieve overcrowding on selected buses.

\*\*Primarily due to discontinuing express bus service to one employment center.

of travel. The two programs have demonstrated ridesharing is acceptable to a wide range of individuals, both male and female, representing a broad spectrum of income and occupations. Ridesharing will attract the choice rider and can serve commuters working at different firms. Yet it is clear no one single transportation mode can satisfy the need of all commuters and a range of rideshare alternatives must be developed.

Essential to the program, besides a range of rideshare options, is coordination and employer commitment. In the case of direct incentives substantial modal shifts can be realized. Other commitments, such as priority parking and in-plant information dissemination can also aid in fostering a positive climate for ridesharing. In Knoxville it has been shown that both public and employer-based rideshare programs can work in harmony and one program by itself will not be able to achieve the full potential offered from ridesharing.

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