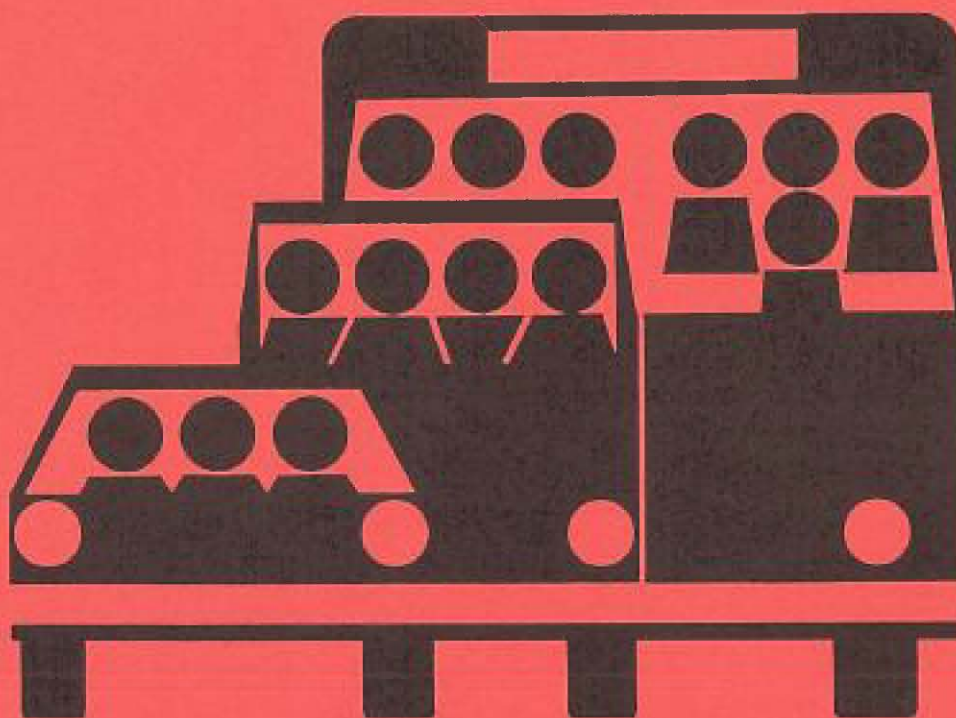


Transit/Taxi Coordination



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U.S. Department of Transportation

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PREFACE

This report is one of a series dealing with various necessary ingredients for a successful Carpool/Buspool Program. It was developed by Alan M. Voorhees and Associates, Inc. for the United States Department of Transportation.

The goal of a Carpool/Buspool Program should be to satisfy travel requirements more efficiently by increasing passenger occupancy in autos and buses, thereby reducing the number of vehicles using the streets and highways. Achievement of that goal calls for coordination among many institutions within a metropolitan region, including public agencies and citizen and business groups. Participation by all of these groups and their knowledge of necessary program elements are critical to the success of the program.

The information and techniques presented in this series of reports should be considered as a guide to the development of a sound program in a metropolitan area. The program should be designed to make the existing street and highway system more efficient, to have a significant effect relative to energy conservation, and to foster urban and environmental goals.

The other reports prepared as part of this series, as well as other important documents concerning carpooling and buspooling can be obtained from the U. S. Department of Transportation.

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TRANSIT / TAXI COORDINATION

INTRODUCTION

This report discusses potential opportunities and problems facing transit and taxi operations which may result from a carpool program. Strategies and guidelines for coordinating carpooling and integrating transit/taxi interests are outlined.

Background

As the energy crisis deepens, with gasoline shortages progressively restricting the accustomed mobility of all Americans, more and more people will turn to carpooling. It represents one of the best ways (and perhaps the only way) of maintaining mobility and still saving fuel. To preserve essential mobility within limited fuel allocations, vehicle occupancy must be increased, whether the vehicles are private automobiles, taxis, or transit.

Carpooling will affect transit and taxi services on a long-term as well as a short-term basis. The effects can be positive or negative according to the manner in which transit and taxi operations gear their activities to take advantage of opportunities generated by the carpooling program and improve their own services to remain competitive.

There are a variety of innovative ways for transit, taxi, and carpooling to operate synergistically to their mutual benefit. Society benefits as well by acquiring better mobility and conserving fuel. There may also be costs. This report discusses the various ways in which coordination for mutual advantage can be achieved, and the benefits and costs of carpooling in terms of their relationship to taxi and transit operations and to society.

In the present energy crisis, all forms of multi-passenger transportation will be called upon to expand their operations and increase their occupancy ratios. Each will have a specific role to fulfill. Transit will serve, perhaps in more varied ways, the higher density portions of our cities where there is sufficient demand to make use of transit's greater capacities. In low density suburban areas, rural areas, and small towns where transit cannot function economically due to low ridership, carpools could be the mode of choice. Between the two exists a market for what has come to be called "para-transit" -- forms of public transportation with capacities higher than

the private automobile but retaining many of its features of flexible time schedules and routing to best serve low to moderate density areas. Examples of "para-transit" include taxis, vans, jitneys, dial-a-ride, subscription bus, and rental cars.

Conventional transit functions best where demand is sufficient to provide high levels of peak and off-peak ridership. The high capacity of transit facilities make such conditions a prerequisite to economic viability. For this reason, transit's basic system usually consists of a network of "line haul" facilities (either rail rapid transit, commuter rail, or express buses) often arranged in densely populated radial corridors focused on the city center. Local collection/distribution or "feeder" facilities may exist to link the basic system to neighborhoods lying outside its walking range. These local systems can consist of park-and-ride automobiles, carpool-and-ride arrangements, or bus or para-transit service.

While such a functional division of roles and tasks among transportation modes and types of vehicles (each matching capacity and operating characteristics to consumer demand) approaches the goal of efficiency, there are difficulties in its immediate achievement. The nation is currently faced with limitations on the capacity of transit and taxis to cope with the totality of the demands for increased vehicle occupancy that will likely emerge as a result of fuel shortages.

At the present time carpooling must play a primary role in the effort to increase vehicle occupancy, because transit and taxi systems do not have the necessary amount of excess capacity now during peak hours of operation to achieve desirable goals within a reasonable time frame. There are approximately 170,000 taxicabs and 61,000 transit vehicles in the United States as opposed to 35,000,000 commuter trips by private automobile per day. Present taxi and transit capacities would have to be 20 times greater to accommodate a full diversion of automobile drivers to these modes.

In World War II, the last period in which gasoline shortages were experienced, transit and taxi took up much of the slack in mobility. They were able to do so because these modes had more vehicular capacity available in that period, travel habits had not become so auto-oriented, and the population had not become suburbanized to its present extent.

Today, transit's and taxi's total capacities are lower. The consensus is that typical transit systems have only approximately 15 percent unused peak-hour capacity. Residences and jobs have moved in large

numbers to the suburbs. The automobile that made suburbanization possible largely remains the only mode capable of effectively servicing the dispersed infrastructure.

In the long run, public transportation has the potential for carrying a larger share of current automobile travel. It will mean, however, additions of large numbers of vehicles to present fleets and a reorientation of land use infrastructures to public transportation's operating characteristics and capacities. Both processes operate slowly, and it will take a number of years to achieve public transportation's potentials.

For the short term, transit and taxi operations can do their share in alleviating the present crisis by:

- Instituting more effective marketing programs to assure that they capture as many of the riders diverting from single-occupant automobiles as possible, up to transit and taxi capacity constraints.
- Using the carpooling programs to obtain information useful to their operations and generate added ridership using the program as a public information vehicle.
- Evolving additional necessary services as demand appears for them: for example, tailoring special "pool" services of their own to meet the specialized needs of certain groups of commuters.

There are understandable fears in the taxi and transit industries that carpooling efforts could attract a portion of their existing patronage. While this may occur in some instances, there is good reason to believe that any reduced ridership will be short term and limited in magnitude. This belief is supported by these considerations:

- Carpooling may increase the off-peak demand for taxis and transit, considering that all carpoolers, except drivers, will lack an automobile for personal mid-day travel. This offers special advantage to transit operations, one of whose major problems is that capacity created to handle peak-hour demand is under-utilized in the off-peak. From this cause stems a large share of operating deficits. Such deficits may thus be reduced indirectly by carpooling programs.

- Carpoolers will more likely come from the ranks of those who presently drive their own car than from those who ride taxis or transit. Transit and taxi users have no more reason to shift to carpools now with a fuel shortage than they did before the shortage. The real loser will be the single occupant automobile whose use will diminish in favor of all the alternatives: carpool, taxi, transit, walking, and bicycle or choosing not to travel.
- The amount of reduction in commuting fuel consumption due to shortages has been pegged at various levels. Assuming 25 percent as a realistic figure, this would mean removing 8 to 10 million vehicles daily from the traffic stream. Not all those necessarily diverted from the automobile can or will carpool. Transit and taxi may well have problems coping with their share of this new demand rather than losing patronage.
- Previous experience with gasoline shortages in World War II indicates that people, faced with a choice of carpooling and public transportation, choose both according to which best serves their travel needs and preferences.

It would appear that, with increased emphasis on public transportation, operators will have little to fear. However, should ridership and revenue reductions occur, in spite of the above considerations, they can be minimized if local officials, public and private, are: (1) aware at the outset of the problems this could bring to them, and (2) aware of steps that might be taken to aid public transportation in its several forms. As carpool and other urban gasoline crisis efforts mature, the transit and taxi industries can grow substantially if financial aid, regulatory practices, and genuine cooperative planning and marketing efforts are equal to the task.

The remaining sections of this report highlight the various strategies considered necessary for proper transit/taxi coordination during the course of a carpooling program.

CARPOOL IMPACT

The implementation of a carpool program could have both positive and negative impacts upon transit and taxi operations. In World War II, when large-scale carpooling occurred as a result of gasoline rationing, operating income for the transit industry almost doubled from \$76 million in 1940 to \$149 million in 1945. At this time, when carpooling

on a large scale may remove the need for gas rationing, the national mood is not quite as crisis-oriented. People may not accept transit's occasional drawbacks (e. g., crowding, waiting, walking to stops) as readily as they did in wartime. For this reason, it is not sufficient to say that just because more emphasis will soon be placed on carpooling throughout the nation, transit and taxi operating income will increase as significantly as during World War II. There is reason to believe, however, that with sustained long-range emphasis on carpools, and proper coordination, there could be distinct advantages to transit and taxi operations. If the emphasis should soon die, though, there is a possibility that the benefits derived by transit and taxi operators may also diminish unless offset by the attractions of improved service.

ADVANTAGES OF CARPOOLING TO TAXI AND TRANSIT

After a careful review of operational characteristics, the following possible transit and taxi associated advantages, short and long range, were identified if a carpooling program was implemented:

- Carpoolers, other than the driver, lacking an automobile for business, luncheon, and shopping trips during the business day, will turn to available transit and taxi services. This increase in transit demand at off-peak hours will not only increase transit usage but also improve the peak-to-off-peak ratio relationship. Service improvements and enlightened marketing may be needed to capture this market as there are the options of walking to destinations or deferring certain activities until after hours when a personal vehicle is available. Aggressive marketing on the part of taxi and transit operations during this time of public concern for energy conservation may expose new demands for service. For example, a restaurant owner may wish to charter a bus to circulate through an employment area transporting patrons to and from lunch. This type of demand would, of course, improve off-peak bus utilization.
- Transit and taxis can function as back-up systems and thus capture additional riders whenever the regular carpool ride is not available for such reasons as vehicle malfunction, driver illness, inclement weather, or unanticipated working hour changes.
- Carpools will often serve as feeders to line haul transit facilities from low population density suburban areas that would be otherwise uneconomical to service. This would help increase transit ridership.

- From a long-range point of view, carpooling may develop group-riding habits that will eventually turn carpoolers into transit riders when transit offers certain advantages such as more flexible schedules or time savings due to exclusive bus lanes.
- Information from carpooling questionnaires can be used to develop information on the location and magnitude of potential transit and taxi markets, trip origins and destinations. Such information can be used to modify routes and schedules to serve more patrons; support the offering of subscription, charter, and express services; and justify the elimination of non-productive routes and services.
- Carpool program sponsors can provide transit and taxi user information (e. g., route maps, schedules, "information" phone numbers and numbers to call for cab service) along with carpool matching names and numbers. Transit and taxi information provided in this manner could (1) help persons become more familiar with public transportation services often unused due to lack of information; (2) allow persons to choose among their total range of options the one which best matches travel needs; (3) may provide the information needed to form carpools that interchange with park-and-ride or kiss-and-ride transit opportunities; and (4) make persons aware of transit available for other than commuter trips, thus increasing off-peak travel.
- Carpooling and taxis may relieve pressures to provide added peak-hour transit capacity in corridors or systems where demand already exceeds capacity and where the transit operator is reluctant to add such capacity since this would seriously increase the deficit by worsening the peak-to-off-peak ratio.
- Carpooling's propensity to involve longer commutes in a single mode may, in combination with appropriate parking restriction or pricing policies, generate demand for transit or taxi shuttle services between parking facilities on the edge of downtown or other major employment centers to final destinations within the complex.
- Increasing numbers of carpools may generate justification for exclusive highway express lanes usable jointly by transit, taxis, and carpools. Exclusive bus lanes cannot always be justified because there are not enough buses to fill the capacity of one lane which could result in a net increase in congestion in the remaining lanes.

- A massive shift to save fuel by combining riders could, in many locations, increase demand sufficiently to justify establishing buspools, taxipools, or jitney service for the entire work trip or for segments of the trip such as home to line haul transit line, or fringe parking lot to destination.
- Carpool availability may relieve transit operators of growing pressures to establish routes that are loss-productive due to low trip volumes, such as crosstown and urban fringe service.
- Taxi operations may find opportunities to expand their present services and clientele by the institution of taxi-pooling or vanpooling.
- Many possible traffic operations improvements such as special turnouts, reserved lanes and streets, and progressive signal timing to aid carpools could also be of benefit to transit under joint use. The combined need may help increase governmental funding.
- Carpooling, by reduction of traffic volumes, will ease congestion, thereby producing faster travel times for taxis and transit buses.

DISADVANTAGES OF CARPOOLING TO TAXI AND TRANSIT

Certain disadvantages to transit and taxi operations are also possible if a carpooling program is implemented.

- Carpooling may reduce ridership in some instances, but usually only in the short-run, when carpool efforts are just beginning. Such adverse impacts can probably be offset or avoided by adoption of strategies such as marketing programs, service improvements, and coordination with the carpool program itself. Such actions would cause transit and taxi services to function as part of an integrated transportation system of which they, like carpools, are component parts with well-defined roles.
- Carpooling's attractiveness may be enhanced, to transit's disadvantage, by allowing carpools to have reserved lane, busway, and toll privileges usually granted to transit. Buses and automobiles have different operating characteristics, and combining them in constrained situations should be carefully analyzed for relative benefits and cost. For example, buses travel more slowly on grades and

during acceleration. However, they load and unload passengers more rapidly. The speed differences will be apparent on the line haul portion of the trip, while loading time efficiency conflicts may appear on downtown streets where buses and carpools encounter limited curb space. Traffic management techniques can be used to address some of these problems; such as by separate bus and carpool streets and turnouts downtown.

EVALUATION

It is important to realize that the same condition of fuel shortage which necessitates carpooling is also likely to increase transit and taxi ridership significantly. The advantages to the taxi and transit operators outweigh the disadvantages, but because of the nature of the services offered, coordination is essential to insure that the advantages are fully realized.

There is every reason to believe that coordination will provide taxi and transit operators an opportunity to (1) derive and disseminate useful information, (2) develop and offer added services, (3) in both short- and long-range situations, attract sufficient peak and off-peak ridership to improve their financial situation, and (4) develop intermodal linkages in an integrated comprehensive transportation system that can reduce congestion, air pollution, and energy consumption and provide better mobility to the total community.

There is also reason to believe that, even with a strong carpooling program, transit or taxi services will be desired. A 1973 survey of a large manufacturing plant in Knoxville, Tennessee, by the University of Tennessee, revealed that of 400 workers, 43 percent preferred express bus service, and 37 percent preferred carpool service to work. In Peoria, Illinois, a premium special buspool service, which provided peak-hour service to workers at the Caterpillar Tractor plant attracted a substantial number of auto drivers and carpool riders; 43 percent of the riders were former car drivers; 20 percent were bus riders, 20 percent were car passengers, and 9 percent were carpoolers. A recent survey of users of the Reston, Virginia, charter bus service to Washington, D. C. revealed that 88 percent would not carpool if the opportunity to do so was available.

In the long view, public transportation will preserve and expand ridership to the limits of its capacity as it always has; not out of necessity due to energy shortages or by suppressing competing modes, but by

providing increasingly attractive service that is modern, efficient, convenient, economical, and responsive to the demands of the varied markets it best serves.

STRATEGY GUIDELINES FOR COORDINATION

To achieve the fullest degree of carpool program efficiency and energy conservation while also advancing the status of mass transit and taxi, the active support of the transit and taxi industries and local operators is needed. Only by proper coordination between common carriers and the carpool program and by the adoption of appropriate strategies can carpooling work to the mutually beneficial and reciprocal advantage of both forms of passenger transportation. This section outlines some of the strategies that appear best suited to produce such advantages.

Organizing for Coordination

As a minimum, a deliberate effort must be made to coordinate transit and taxi operations with carpooling program activities. There are distinct benefits to the public through action of this nature, because it insures efficient transportation.

For purposes of maximizing the utility of carpool matching efforts to the transit or taxi operator, he should become directly involved in the program, perhaps to the extent of even operating it in some communities if so doing is profitable or to his advantage. This approach is based on the definition of carpooling as a form of "mass transportation" which requires coordination with other forms for efficiency and maximum effectiveness in energy conservation.

Transit and taxi operators are an available resource already in the public transportation business. They have the potential to coordinate all multiple occupancy vehicle modes using each to its best effect. This potential management role should be brought to the attention of carpool program administrators -- if necessary, by the transit or taxi operators themselves.

The extent of carpool program participation by public transportation operators will vary according to local circumstances. At the very least, transit and taxi operators should function in an advisory capacity to the local carpooling program and actively support it. In that capacity they can voice their concerns over any potential problems foreseen as a result of the program.

At a higher level of coordination, there is potential mutually beneficial information gathering and dissemination. A next step would involve joint efforts in attacking problems of mutual concern such as obtaining reserved transit-taxi-carpool lanes or off-street passenger loading facilities. In such efforts it will likely be necessary to extend the coordination to public planning and other agencies capable of implementing solutions to the various problems. This emphasizes the value of undertaking various strategies in concert rather than unilaterally to avoid diluting the justification for mutually needed improvements.

A still closer meshing of carpool-public transportation interests would involve coordination of operations to avoid duplication and overlap of services, and provide inter-modal integration and interface opportunities. With intelligent pooling policies and responsive public transportation operators, citizens can probably have mobility that approximates that which they have been accustomed to in spite of fuel shortages. It is a matter of developing new ways of organizing the provision of transportation services.

At the far end of the involvement spectrum is the yet undeveloped concept of "carpool companies." While not clearly defined as to function, the growing use of carpools may generate needs that can best be met by transit, taxi, or other companies getting into the "carpool" business. Such service can be at two levels: supplying the matching function and/or the vehicle.

Several of the problems encountered in carpooling might be solved by the services such a company could provide: leasing of carpool vehicles, group accident insurance, regular vehicle maintenance, towing and vehicle replacement in case of breakdown, vehicle substitution during maintenance periods, organizing persons with similar trip origins and destinations for carpooling -- or buspooling or taxipooling -- and accounting for a fair division of costs among carpoolers.

If such carpool companies can be operated at a profit, benefits to the community may be obtained at no cost to the government. The concept appears worthy of encouragement, further study and development. Government support might be appropriate to investigate any legal barriers that presently prevent the organization of carpool companies by public transportation operators or others.

It is recognized that there are regulatory and union problems that may need to be overcome to implement such arrangements. The impetus to do so may come from the severity of the energy crisis. Necessity could force a rethinking of our entire concept of public versus private transportation.

Besides the transit/taxi strategies to facilitate coordination and understanding of the problems and potential solutions, further steps could be considered:

- Joint urban organizations to consider and plan new strategies for meeting opportunities by transit, taxi, carpooling and street traffic management.
- Employer financial aid to employees using public transportation, at least if there are direct or indirect financial incentives to carpoolers.
- Government financial assistance such as extension of present transit/taxi service subsidy programs for specific groups, and funds for special data gathering and planning studies directed toward the entire para-transit area.
- Transit/taxi operator initiative to become more deeply involved in the multi-modal approaches to serving urban transportation demands that are surfacing in the "balanced transportation" planning process.
- Broad-based efforts to increase transit capacity for the longer run solution to urban travel needs.

If these steps are taken, the transit and taxi industries will be in a better financial position, will be better informed, and will be more inclined to join in efforts to restructure urban travel patterns and habits caused by the reduction in automobile travel. The fact of the matter is that the crisis really presents a unique opportunity for growth, if encouraged. There are many strategies and service innovations to consider. Examples of these include:

- Developing joint suburban or fringe park-ride facilities and joint advertising for carpools, taxipools, and bus routes.

- Many variations in demand-responsive service which can be operated by taxi or transit as the specific case may be.
- New public transportation services or novel pricing schemes in general.

Managers of the operating and planning functions of the various modes need to begin communicating among themselves how they can be more mutually coordinative as well as competitive, and can have a part in squeezing the most transportation service out of limited energy supplies. A great deal of innovative thinking can be done in this whole area.

Data Collection

Carpool matching programs, whether manual or computerized, usually require the dissemination of a questionnaire to obtain essential data from would-be carpoolers: e.g., name, phone, home address, work place location, work hours, whether they choose to drive, ride or alternate; and choice of fellow carpoolers (male, female, or mixed). The same questionnaire, with transit and taxi agency participation, can be expanded to gain information useful to the agencies. Such information might include:

- Interest in transit service -- either feeder, regular, express, subscription or charter -- or taxi service -- jitney or taxipool.
- Willingness to join or organize a "buspool" or "taxipool."
- Desire to have specific route or schedule information forwarded.

From data compiled from the completed questionnaire, the transit and taxi operators could:

- Locate peak demand locations and times for transit or taxi service which would assist in (1) modifying transit routes and schedules, or taxi stand locations; (2) tap latent but unserved transit or taxi demand; or, conversely, (3) justify the avoidance or discontinuance of low patronage transit routes.
- Identify and facilitate the organization of groups with similar commuting characteristics large enough to necessitate a buspool or a charter, subscription, or regular express service basis or taxipool or group taxi service.

A carpool/transit information system was developed as a cooperative effort between the University of Tennessee and the Knoxville Transit Authority during the Fall of 1973. Workers for major employers were asked to complete carpool matching information and state their preference for transit or carpool service. The data provided was analyzed by a computer program which produced printouts displaying: (1) a matrix showing the number of persons desiring to travel between pairs of geographic zones at a given hour; (2) employee names, addresses, phone numbers; and (3) carpool versus transit preference listed by zone. Samples of the printouts, now proving useful in arranging Knoxville transit and carpool services, are contained in Exhibits I and II. The information gathering system is about to be expanded to cover the entire city.

Public Information

Carpool matching mailouts containing the names of potential carpoolers sent to questionnaire respondents can become a total transportation information kit. Transit and taxi operator coordination with this effort can provide recipients with, in addition to carpool information, transit route maps, fares, and timetables; maps of taxi service areas, taxi stand locations, and fare zones; plus telephone numbers to call for transit information and taxi service. Kits might be tailored to the individual recipient to the extent of informing him of the location of his nearest transit stops or taxi stands and the time schedule of transit/taxi vehicles that match his work hours.

Possession of this information aids the commuter in deciding whether carpool, transit or taxi best serves his travel needs. Should he choose to carpool, it can also make him aware of what "back-up" services are available should his carpool ride be occasionally unavailable.

Carpool Back-Up Service

As carpooling becomes more widespread, the incidence of carpool arrangements breaking down with one or more commuters left stranded will occur more frequently. Taxis and transit are logical choices to provide alternative back-up service. Operators can anticipate and promote business from this source by effective dissemination of information concerning the availability of their services for this purpose. Taxi operators may desire to increase their potential for offering such service by seeking to remove any impediments to group/
shared riding or taxipooling that may exist.

EXHIBIT I.

CARPPOOL LOCATOR MASTER LIST
FROM GRID X15Y25 TO GRID X16Y22

NAME	HOME ADDRESS	PHONE	CARPPOOLING ^{1/}	EXPRESS BUS
FROM GRID X15Y25				
0000-0000				
COOPER, BOB	600 BENTON RD	KNOXVILLE TN 37920	NO PHONE	I NO
0700-1500				
BRUNO, BOB	808 N DRIVE	KNOXVILLE TN 37920	500-0207	N YES
COOPER, BOB	800 CANTON OAK DR	KNOXVILLE TN 37920	500-4800	I NO
BOSS, BOB	1000 BRESNAN ST	KNOXVILLE TN 37920	570-0206	I YES
1500-1200				
BYNOR, BOB	800 AVENUE B	KNOXVILLE TN 37920	500-3900	VI NO
1600-1200				
COOPER, BOB	800 AVENUE B	KNOXVILLE TN 37920	500-5060	I NO
COOPER, BOB	RT 8 MT PINE RD	KNOXVILLE TN 37920	500-1010	I NC

^{1/} VI - Very Interested
I - Interested
M - Most Interested

EXHIBIT II.

NUMBER OF PERSONS IN EACH HOME GRID DEPARTING FROM GRID X16Y22 FROM 3:30 P.M.

	1	3	5	7	9	11	12	13	14	15	16	17	18	19	21	23	25	27	29	31	33	35
1																						
3																						
5																						
7				1	3	4						3		4								
9		2	4	14	1								1	2		5	1					
11										7		32		13	1				1	5		
13			1		2	2				4		1		1	34							
15				1		5		7		2				7	6	2						
17				2	11	6		20		3		4		9	8	6	4	1				
19			2		2	2	4	1	5	19	3	9	7	8	18	2						
20						3	21	5	22	24	3	5	15									
21		1	1	2	1	4		4	14	14	26	13	12	1	2					4	1	
22						6	8	20	33	71	73	40	10									
23	2	1		3		5	4	10	17	12	13	6	13	2	1		8	1				
24						3	2	8		11	17	1										
25				6	3	1	2	2	1	12		3	9	2		1	1	1				
26						2				5			1									
27	1	1		5	7				1	1				11	3	1		1				
29		4	9	1	1					1				1								1
31		2	4	2				11		1												
33	3	1						2		9												
35																						

Another aspect of carpool back-up service with which transit and taxi operators should be prepared to deal is the added demand generated for numerous short business, shopping, and luncheon trips made by carless carpool members during the business day. Transit will absorb many of these trips. Taxis will also serve a large number based on door-to-door convenience. Large employment centers and downtowns will be the focus of much of this demand.

A final dimension of back-up demand exists where employers have encouraged their employees to use their personal vehicles for around-town business trips in return for reimbursement for mileage. The cost of maintaining a carpool or fleet of company cars is thereby avoided. Carpooling may eliminate many of the cars formerly available for such business travel. The back-up systems used will often be taxis and transit.

Priority/Preferential Lanes

Interest has increased greatly in the past two years in preferential and priority treatment for buses in the general traffic stream. Strong support for this is coming from traffic management people, making the interest a reality. It has been found desirable in some locations to extend use of the priority lane to taxipools and carpools.

Opening priority lanes to all multiple occupant vehicles above a certain minimum increases justification for their provision. Priority treatment for buses and pools means faster travel, more reliable service, and reduction in annoying congestion. For public transportation, this means happy customers and ultimately more customers. It also means more utilization of vehicles in the peak period by faster trip turn-around (at least in the larger cities). Finally, it means lower operating costs and fuel consumption. Eventually, as traffic volumes grow, the preferential lane may be justified for transit vehicles exclusively. This would provide added incentive for transit use while reducing that for carpooling, bringing riders from the lower to the higher capacity mode for added energy savings. A necessary condition to such diversion would be a concurrent increase in transit capacity and attractiveness to avoid a return to single car occupancy.

The success of preferential lanes has been repeatedly demonstrated. In Houston, 100 percent use of curb lanes by buses (no right turn vehicles, no trucks or taxis) on only two-thirds of a mile of downtown Main Street saved from 5 to 10 percent of the total running time from terminal to terminal for one-third of the buses operating in the peak period. On the New Jersey I-495 approach to the Lincoln Tunnel, a

contra-flow lane for buses only for 2.5 miles reduced the travel time for 470 buses in that segment of the route by 15 minutes each in the morning peak hour. A 2.2 mile contra-flow bus lane on the Long Island Expressway saved 8 minutes each for 100 buses in that peak hour.

Service Options - Transit

In addition to those strategies described above which apply mutually to transit and taxi coordination with carpooling, there are various service options that can provide further opportunities for coordination with carpool programs and help preserve mobility for those who might otherwise suffer its loss during the energy crisis. This section describes some of these options as they apply to transit operations.

Buspools - Whereas carpools represent a means of combining trips of a few persons with similar origins and destinations and travel times into a single vehicle of limited capacity, "buspools" simply expands the concept to include large numbers of persons riding in a high capacity vehicle where warranted by sufficient demand. The same information used to identify carpools can also identify buspools. As carpools from a given area reach a certain number, buspool service can be offered. A variety of buspool arrangements are possible, and several examples of their success are available.

- Employer Sponsored Service - In one case example the buspoolers are the employees of one large company coming from a common geographic area. They receive a monthly "subscription" pass by paying a lump sum which entitles them to ride the bus express between the same locations each work day.

Some major Los Angeles employers sponsor express buspools from park-and-ride lots, usually in shopping centers, to the work place. The employers initiate the arrangements, sometimes collect the subscription fare as a payroll deduction, and occasionally subsidize the service to reduce its cost to the employee and provide an added incentive for its use. Southern California Rapid Transit District, which provides the buses for the "subscription" buspool services, reports the services as becoming quite popular since their introduction in the Spring of 1973.

- Citizen Organized Service - In cases where citizens initiate buspool service, it usually involves organizing enough persons and collecting from each sufficient money to charter a bus for their exclusive use in commuting. The prime example is the Reston, Virginia, community-organized charter bus service to downtown Washington, D.C.

Buspools can frequently accommodate their patrons sufficiently to swing loops through neighborhoods or destination areas to cut down walking distance or avoid the need to park and ride.

When the popularity of a charter buspool service grows, as in Reston, additional buses can be chartered. These additional buses provide riders with alternative departure times and destinations so that flexibility is added to their schedules. The service gradually resembles a regularly scheduled express bus operation.

Detailed descriptions of buspools are contained in the report in this series bearing that title.

- Transit Initiated Express Bus Service - This form of service is usually a regularly scheduled service of the transit operator, initiated by citizen requests or market demand. It qualifies as buspooling by reason of catering to the needs of a specific group of riders who use it habitually or to a neighborhood which has requested it.

Express bus service seeks to shorten trip times by linking two local locations over high speed roads without intermediate stops enroute. Various route configuration and operating policy combinations exist: park-and-ride, feeder bus to line haul express, door-to-door service, neighborhood and destination area loops. The attractiveness of this service has been increased by such means as reserved bus lanes or busways for faster trips; free park-and-ride facilities, often in shopping centers, public, church, or theatre lots; and provision of such conveniences as waiting shelters, newspapers and refreshments.

Examples of successful express bus operations are numerous. They include Seattle's "Blue Streak", Washington's

"Shirley Highway," and Los Angeles' "San Bernardino" busways -- all of which operate on reserved lanes.

Express bus service has found applications even in the moderate size cities and acceptance in what have been thought of as unlikely transit marketing areas. In Knoxville, Tennessee, an 800-family higher income subdivision requested bus service. A local firm offered to cover any deficit for the first month of operation. A door-to-door, premium fare express bus service was instituted and now carries from 40 to 60 passengers on each run.

Specialized Transit Services - Carpooling, air pollution controls, and the energy crisis, in combination, may generate demand for certain more specialized transit services, some of which have only been treated on a conceptual or experimental basis. Transit service opportunities include: shuttle services; feeder bus to express line haul transit, local "coverage" circulation within confined areas, dial-a-ride demand-responsive or subscription service, and "special mobility" services for elderly and handicapped persons.

These services respond to market needs that have previously existed or that are emerging as a result of fuel shortages. They appear to have in common sets of needs that are not met by traditional line haul transit service or even the more recent buspool express services just described. Such needs include: short journeys between two locations that fall slightly outside walking range; service with flexibility, mobility, and demand-responsiveness more nearly matching that of the automobile but with fare levels lower than taxi due to higher capacity vehicles and longer routing and travel time; and services that match the particular mobility needs or physical limitations of such groups as the elderly, handicapped or those with lower incomes.

Many of these needs are now served by private automobile. As the auto's availability declines or grows more expensive in a fuel shortage period, demands for such specialized services may require greater transit agency response to preserve essential mobility.

Problems of Service Additions - Buspool, express bus and specialized transit services that may be generated by public demand entail a variety of problems. Examples of the problems necessary to be addressed in the provision of added bus service, especially in the peak hour, include:

- Lack of express capacity in the form of unutilized equipment may deter service additions.

- Diverting equipment from what may appear to be "underutilized" routes to serve more "productive" ones may be difficult due to such political and social considerations as the responsibility to serve "captive" rider groups without mobility options.
- Adding service in the peak hour without a concomitant rise in off-peak demand just increases the deficit by generating additional idle or underutilized labor and equipment in off-peak hours.
- Express bus services usually involve long distances making possible only one peak-hour trip per bus.
- Obtaining park-and-ride lots is sometimes difficult. Reaction of shopping center owners to permitting their lots to be used varies on a case-to-case basis. Considerations of amount of surplus parking space available, liability incurred, and degree of trade that can be expected from park-ride commuters enter into decisions. Underutilized public, theater, church and school lots provide other possibilities.
- Uncertainties as to the true demand potential may make experimentation with new services costly. Occasionally, groups "demand" service which, when provided, is not utilized by a sufficient number of persons; sometimes not even by the persons demanding the service.

Strategies that have been used to counter some of the problems listed above include:

- Obtaining employer agreements to stagger working hours to stretch out the peak period, thereby permitting more bus runs and reducing overloads. (This makes carpooling more difficult, however).
- Reduced fares and marketing of charter services to school, church, senior citizen, club and other groups to increase off-peak utilization.
- Designation of reserved bus lanes and streets to speed peak-hour operations and permit more runs.
- Utilization of highway funds to create publicly-owned park-and-ride facilities.
- Arranging driver schedules to avoid idle time and overtime to the extent possible.

- Obtaining guarantees of subsidies from local governments, employers, businesses, community groups, or others to cover losses incurred in providing services whose economic viability is uncertain.
- Having the groups desiring service organize and administer it by contacting and signing up potential riders; collecting fares and chartering service at a fixed rate per bus regardless of actual ridership. The carpool data collection process described previously can provide lists to community organizers that would be useful in canvassing for buspoolers.
- Carpooling itself can promote viable new service by dynamically growing to levels that would justify a buspool.

Service Options - Taxi

The following strategies appear potentially useful to taxi operators in coordinating services with a carpooling program for mutual advantage.

Taxipooling - Analogous to carpooling, taxipooling involves a small group of commuters or other users with similar origins and destinations and time schedules hiring a taxicab on a regular basis for their travel purposes. The group is considered a single client for fare purposes. By splitting the common fare, the cost to each taxipooler is less than what a lone passenger would pay. By combining their contributions, however, the taxi operator will usually end up with a greater amount than he would have collected from one rider. Both passengers and drivers thus benefit from the arrangement.

Taxipooling has often been used in the past for transporting groups of school children, handicapped, elderly, and others requiring door-to-door public transportation. Its use for commuters is somewhat rare but is becoming more common. A taxi operator in Huntington, Long Island, New York, operates a subscription taxipool to transport commuters from home to the local commuter rail station. The use of taxipools as feeders to line haul rail or express bus lines from low density residential areas appears to represent a particularly beneficial application of the concept. In Houston, Texas, would-be taxipoolers can arrange with the taxi dispatcher on the previous evening for next morning pickup at their choice of 13 suburban shopping centers. Service users will also be dropped off at any one of three downtown destination locations. Fares for a month of rides add up to \$10 or \$20 less than the usual downtown parking fee for the same period. Salt

Lake City, Utah, has a similar taxi service that transports taxipoolers from their home to one of four city center destinations. A St. Louis, Missouri operator is promoting the idea to employers with evidence of interest.

None of the existing taxipool services is yet serving large numbers of persons on this basis, but the feasibility and potential of the concept for solving problems of gasoline shortages, parking, traffic congestion, and air pollution are demonstrated in these examples.

Some problems with taxipooling appear to be the following:

- Taxi companies can market the idea but cannot, by regulation, solicit individuals to join taxipools. A person desiring the service has to take the initiative in making the arrangements to join an existing pool or asking fellow employees or neighbors to join together for pooling. Government could assist taxipooling by removing this restriction.
- Some companies may be constrained from making the service too large a part of their operation by public utility commission regulations or franchise conditions that require them to provide a uniform level of service throughout their operating area, and to be demand-responsive at all times. Again, a change or relaxation of the constraints would alter the situation.
- It is not difficult to assemble a taxipool group for the morning commute, but different quitting times, last minute delays, and after-work activities and errands make it difficult to reassemble the same group in the evening. Where existing taxipool operations operate for the evening commute, the procedure involves curbside starters filling cabs at designated pick-up points with groups assembled by common destination.
- Fare regulations occasionally require modification to permit charging a group a common fare or a group rate different from an individual passenger rate.
- To be successful, taxipooling requires a high demand level around a trip origin point to fill a taxi and reduce pickup time before starting the trip. It appears to work best in denser close-in areas and among income groups that can afford a more expensive ride than transit normally

offers (though in some instances it may even be cheaper). However in a fuel shortage period, taxipooling may well be most needed in low demand areas transit cannot feasibly serve. The lower taxi fares due to taxipooling also appear desirable for taxi's "captive" market: non-car owners who are also likely to have lower incomes.

- Regulations may specify taxi load limits (e. g. , 4 versus 5 passengers) that cut down the number of riders and increase each passenger's share of the common fare.
- Fare collection system options appear to range from collection on a per ride basis to a prepaid weekly or monthly subscription pass. The subscription advantage accrues to the taxi operator who is paid whether the subscriber rides or not. For taxipoolers, fares paid by the ride give the advantage of payment only for services received.

Group/Shared Riding - Group and shared riding differ from taxipooling, in that multiple passengers may fill a cab on a pickup basis at point of origin (group) or enroute (shared) rather than by prearrangement. Group/shared riding is subject to a variety of constraints that require modification to obtain full utilization. They include:

- Regulations may prohibit shared riding by driver's choice except under emergency or peak demand conditions. Sharing with passengers' permission may not be obtainable due to passengers' preference to travel in privacy or without enroute diversions and delays or fears of inadequate protection if a person with criminal intent happens to be the one picked up.
- Fare arrangements may promote or inhibit sharing or grouping (each passenger pays full fare versus each passenger pays only fare from previous drop-off point. Group/shared riding appears to work to the taxi operator's advantage in a zone fare system with each passenger charged by zones crossed rather than dropping the flag after each drop-off.
- Regulated procedures for grouping and delivering passengers may also promote or discourage group or shared riding. The dispatcher may quote a fare by straight line distance between each passenger's origin and destination

to avoid charging for distances deviated to assemble group. Drivers may add passengers as hailed, provided there is little if any deviation in direction for pickup or delivery. The requirement that passengers be delivered in the same order as they are loaded may cause some to bypass their destinations and have to pay for back-haul.

- Taxi operators are sometimes given exclusive franchises to pick up fares in specified areas or locations, such as airports. Other companies may deliver but not pickup fares in those zones. This can lead to wasteful deadheading by outside companies.

In anticipation of greater application of shared/group riding in taxi operations as a means to greater efficiency in the use of energy resources, there have been proposals to research and develop computer programs capable of quickly assembling phone-in customers into groups with similar origins and destinations for dispatcher use in making cab assignments. For very large cities or operations this may be necessary and applicable. For others, the extraordinary capabilities of many dispatchers to achieve the same result by manual and memory means should not be overlooked nor underutilized.

In the final analysis, however, the major impediment may be regulations rather than technical problems. Regulations that limit taxi occupancy ratios or cause deadheading should be identified by taxi operators as a first step in a lobbying effort for their removal.

A significant incentive to taxi companies to seek changes in regulations that would permit taxipools and group/shared riding is to justify obtaining sufficient fuel allocations. Higher taxi occupancy ratios may be required to qualify taxi operators for adequate gasoline supplies.

Vanpool Services - Instances are known of taxicab companies acquiring fleets of vans accommodating 10-12 passengers each, for use in contract transportation of school children. After making one or two runs with the vans mornings and afternoons, drivers shift to their cabs for the balance of their work day (or could use the van for goods movement).

Such examples suggest there may be applications of the concept to transport peak-hour commuters in vanpools as a part-time operation of cab companies. The concept appears to apply particularly to areas having no transit operator and to low density suburbs where regular transit service is infeasible due to cost.

Low patron price, due to a shared common fare or subsidies from government or employers, could make such service attractive to

potential users. A guaranteed level of reimbursement could provide incentive to taxi operators to provide such service as long as it did not violate their franchise obligations by becoming too large a part of their business or conflict with transit franchises in the same area.

The principle of taxi companies being "total transportation" enterprises appears to be well-established, from large cities where taxi operations sometimes encompass van, delivery and trucking services to small cities and towns where cab companies at times also operate transit vehicles, school buses, car rentals, ambulances and funeral cars. Vanpools appear to add another possible dimension to such integrated comprehensive operations.

Transit operators should also be aware of such potentials for increasing vehicle capacity and occupancy, and perhaps explore ways in which they might offer similar vanpool services where they are the more appropriate operator. Another transit option would appear to be using vans for peak-hour commuting service and the rest of the day in a shuttle mode or for local circulation service.

Jitney Services - Jitney service presently operates in some areas on an unofficial and sometimes illegal basis. It usually involves a car, van, or bus with a driver who circulates through an area, stopping when hailed, and often diverting to deliver passengers to their door. Usually a fare is collected. Areas with lower income populations or lacking in transit service have been the usual locations of jitney services. Jitney service comes in response to a need apparently inadequately served or served at a higher price by other means. Informal jitney services usually avoid regulation as to safety and fares and may have drivers unlicensed for for-hire passenger service.

If the need for the type of services jitneys offer grows, it may be desirable to study how to bring such service within the law for the safety and protection of its patrons. Transit and taxi operators, who have viewed jitney service as unfair competition, may wish to examine how their services could be expanded to cover the needs met by jitneys at comparable fares -- or seek to operate jitneys themselves.

Jitney operations, if regulated to complement mass transit by serving as feeders to line haul routes or replacing unproductive low volume bus lines, could prove more palatable to transit operators. This would answer some transit operator objections to jitney services on grounds that, by running service parallel to transit lines, they siphon off ridership.

CONCLUSION

It might be better if the carpool program were to carry a more broadly-based label, one which suggested that a multimodal transportation industry program was being mounted to alleviate the gasoline shortage in urban areas. It is quite clear that the transit and taxi industries could not begin to meet the problem alone, but there is need to be concerned that they might not be encouraged to do enough.

Major, permanent changes in urban travel practices will probably result from the energy crisis, and perhaps from the clean air program needs too, and there is ample justification for transit and taxi services -- call it public transportation -- to have every opportunity to grow and alter their services in this transition period.