

Incentives to Carpooling



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U.S. Department of Transportation

January 1974

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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INCENTIVES TO CARPOOLING

INTRODUCTION

Some type of motivation is behind every decision to form or join a carpool. For most pre-energy crisis carpools, this motivation was largely unplanned -- shortage of parking spaces, parking costs, and automobile operating costs. Successful carpool programs recognize the importance of these existing motivations, but rely on planned programs of incentives to encourage carpooling.

Carpool incentives are planned measures offering inducements for the use of carpools. Incentives are offered by a wide variety of agencies, employers, groups, and individuals. Incentives can be devised for carpool riders, carpool drivers, organizers, and combinations of all three.

Carpool incentive measures can be sorted in numerous ways; for example, according to sponsor, segment of society benefited, ease of implementation, start-up cost, etc. As yet, however, there is no existing formal structure for the organization and study of incentives. The following discussion of specific carpool incentives is structured on the basis of the basic motivations which the transportation planning process has established as the most meaningful determinants of travel behavior:

- Travel Cost
- Travel Time
- Convenience
- Intangible and Non-Travel Related Factors

In addition to the above types of incentives aimed at the traveler, a fifth category of incentive -- those intended to induce others (employers, etc.) to offer incentives -- is discussed.

COST-RELATED INCENTIVES

Travel cost is one of the most significant factors in the decision to form or join a carpool. Cost-related incentives can be devised to reduce automobile parking costs, ownership costs, operating costs, or all three. Conversely, cost-related incentives can be devised to increase the cost to non-carpoolers of operating and parking an automobile.

Parking Cost

The offer by either a public or private employer to cover all or a portion of the parking cost for carpoolers has been cited as an effective incentive to carpooling. The reduction in perceived out-of-pocket costs for commuting can encourage auto drivers to pool, depending on (a) current parking charges, (b) the potential of increased parking charges or surcharges, or (c) the opportunity to switch to alternative parking sites with no appreciable increase in parking cost.

Conversely, an increase in parking rates can produce the similar result of providing an incentive to carpooling. A general increase in parking rates for all parkers tends to promote the use of carpools without risk of diversion of existing transit riders to carpools. More selective parking rate increases can be achieved with varying amounts of increase, depending on automobile occupancy.

There are several examples of successful parking cost incentives. A recent survey of the employees at the King County assessor's office in Seattle, Washington indicated that free parking was nearly twice as effective as other methods in encouraging carpooling. In this case the average daily cost is \$.75. A pilot program will be instituted early in 1974 which will provide free parking at private lots within a 2 to 3 block radius of the employment site for 100 King County employees and 200 Seattle employees in carpools of 3 or more persons.

Another public employer in the Pacific Northwest, the Port of Portland, Oregon, implemented a trial program in which the Port pays the \$10 per month parking fee for employees in carpools of 2 to 4 persons. If the carpool is comprised of 5 or more, the Port pays the parking fee plus \$.11 per mile. (The Port will also pay \$.70 per day to bus riders.)

In San Francisco, California a 25 percent increase in the parking tax resulted in a significant decline in the number all-day parkers. A substantial portion of this reduced parking demand appears to be accounted for by an increase in carpooling.

Traveler's Insurance, Hartford, Connecticut, permits free parking (cost savings: \$10 monthly) to carpoolers. Prudential Insurance Company, Boston, Massachusetts, gives free indoor parking to carpools of 3 or more (regular cost: \$2.50 daily).

Automobile Ownership Cost

The rising costs of owning, insuring, and maintaining an automobile enhance the effectiveness of incentives related to these costs. In general, this type of incentive offers relief from some or all auto ownership costs in exchange for organizing and operating a carpool.

Provision of Company Cars - Employers may find it cost-effective to provide company-owned vehicles to employees for the purpose of driving several employees to work together. The vehicle then may be used during the day to conduct company business. The effectiveness of this incentive measure depends on several factors, such as the expense and tax position of the company, the availability of alternative transportation to the members of the carpool, and the potential for forming and maintaining a carpool under these circumstances. The driver responsibility may be assigned to one individual or may rotate.

A variation of this is a vehicle which is leased or assigned from a motor pool to one employee for both business and personal use with the stipulation that the vehicle be used for carpooling during the weekly commute hours.

A similar method has been used to provide transportation for low income workers to hard-to-reach places of employment. The usual result in these cases has been that the worker, as soon as he had sufficient income, would purchase his own vehicle.

Company-Sponsored Vanpools - A variation on the use of vehicles for a carpool is the provision, by the employer, of vans or other vehicles suitable for pooling. In this case a driver, who also may be a paid employee of the sponsoring organization and who may be paid additionally for the responsibility of collecting and driving the pool riders, has an active role in creating and maintaining the pool. This service can operate in a circulating pattern within a small area or from a central collection point. The vehicle can have other use during the day and, as with other use of company vehicles, the cost might be borne by the company or by the riders.

In the highly successful program at 3M Company, St. Paul, Minnesota, vans are purchased by the employer (3M) and then operated, by employees, in a manner similar to a small private business.

An example of breakeven costs of this program (including ownership) for a 50-mile round trip is \$1.77 per mile, or \$1.11 per day for each

of eight passengers. The program has been very successful, with 35 vans in operation and long waiting lists of persons wanting to participate. Some of the reasons for the success of the program are the following incentives:

- For drivers:
 - Free ride to work
 - Unlimited personal use of van during off-work hours at a rate of seven cents per mile
 - Fares collected over operating expenses (for an average 25 mile round trip, this amounts to about \$2.00 per day for full occupancy)
 - Status and recognition; selection for vanpool driving is considered recognition of employee's worth and leadership attributes
 - Drivers have first option for buying vans whenever the vans are retired from service. To the extent possible, drivers are given the option of selecting make and color of van for their pool
- For riders:
 - Savings in travel expenses and elimination of need for second car
 - Preferential parking close to building
 - Automatically heated vehicles for vehicles parked next to the administration building
 - Useful travel time for other than driving (work, conversation, card games, etc.)
 - Social aspects are emphasized: new friendships formed, riding is enjoyable

Provision of Vehicles for Carpoolers - Most governmental agencies at the federal, state, county and local level have a pool of motor vehicles which are used to conduct government business. These are generally returned to a garage or lot at the end of the day to remain idle until the next morning. Such capital equipment could be more effectively utilized by allowing employees to drive the vehicles home at night if they form carpools. This can reduce the number of auto trips as well as reduce costs for the individual employees.

An example of this type of incentive is the widespread usage of police cars for the work trip. This was originally undertaken for the purpose of increasing the presence of police vehicles on the street; an additional

benefit has been the formation of carpools with cost-related benefits to users.

One problem with this carpool incentive technique is that taxpayers tend to view use of government property as a discriminatory benefit to government workers. This objection can be countered in several ways:

- Public information programs to show fuel savings from carpooling in the public interest
- Daily recording of mileage while vehicle is not on government business with a pro-rata mileage charge assessed against the carpoolers, possibly through a payroll deduction
- A flat monthly assessment for the carpool based on established mileage

This program is in operation at the Arkansas State Highway Department in Little Rock, Arkansas. State vehicles carrying a minimum of three carpool riders are permitted to be taken home at night. Information on degree of success is not yet available.

Automobile Operating Cost

In general, this type of incentive falls into two major categories: negative incentives which increase auto operating costs (generally brought about by either economic forces or legislation) and positive incentives, reductions in operating costs for carpoolers. Either can be implemented by employers and various levels of legislative bodies.

Gasoline Tax Rebates - Repayment, to the carpooling motorist, of some portion of state and/or federal fuel tax is a possible incentive. This would require state and/or federal legislation, but could result in shifting the tax burden to non-carpool drivers. The rebate could be handled at the point of purchase, or the authority could repay the tax at some later date. The major disadvantages in utilizing this type of incentive is that it could be very difficult and costly to regulate. Proof of regular carpooling and effective rebate arrangements could involve much administrative detail. A further disadvantage is the lack of immediate impact on the motorist, due to the possible time lag between purchase of fuel and reimbursement, as well as the fact that the initiative for repayment rests partially with the motorist.

State License and Local Tag Rebates - A similar approach would permit carpoolers to purchase state licenses or local tags at reduced fees. This, too, would require legal action and would be cumbersome to administrators.

Tolls for Non-Carpoolers - On some existing toll-free facilities such as bridges, tunnels, or even highways, it may be possible to establish a toll that would, in effect, penalize one or two person cars during peak commuter hours as a positive incentive to carpooling. There are, however, some serious obstacles to such tolls:

- Tolls cannot be imposed on highways of the Federal Interstate System (they may be applied at time of construction in some cases, but must be removed after revenue bonds are redeemed)
- Truckers and bus operators may have objections to newly imposed tolls on all vehicles
- Other facilities might become more congested
- Such toll pricing could be considered discriminatory to non-carpoolers

Reduction or Elimination of Tolls for Carpoolers - This is a clearly defined incentive in those areas where toll crossings handle large volumes of commute traffic. Reduction or elimination of a toll is a perceived advantage in terms of out-of-pocket cost to a commuter and will tend to encourage carpooling -- especially if combined with reserved lanes on the facility for buses and/or carpools.

Because of pre-existing tolls on such facilities, implementation costs and obstacles are considerably less than in the previously cited incentive of imposing tolls on non-carpoolers.

On January 1, 1974, a rate schedule favoring carpools was initiated on the Walt Whitman and Benjamin Franklin Bridges linking Philadelphia with New Jersey. Rates for commuter carpools (three or more persons) are now \$.25 per crossing, compared to a non-carpool commuter rate of \$.40 and a cash rate of \$.60 per crossing.

Another example is the successful San Francisco-Oakland Bay Bridge toll reduction program, where reduced tolls are combined with reserved lanes for buses and carpools. The number of three or more person carpools have increased from approximately 1,000 to 1,800 in the morning

peak period. A monthly pass is issued for a fee of \$1.00; the pass is displayed as the vehicle goes through the toll area.

Congestion Tolls - Congestion tolls have been proposed in many areas as a means of reducing traffic on crowded highway facilities. With relation to carpooling, rates could vary by the number of occupants in a vehicle, with the highest occupancy vehicles paying the lowest fee. This can be coupled with time-of-day pricing to encourage high occupancy vehicles during the peak travel periods without undue cost to lower occupancy vehicles during less critical periods of the day.

TRAVEL TIME INCENTIVES

The primary area in which travel time incentives can be implemented is the journey itself. Thus, almost all travel time incentives involve travel on public streets and are implemented by public agencies only.

Some parking convenience measures also yield travel time savings. However, since the primary appeal of these types of measure is to comfort and ease of travel, they are included with "Convenience" incentives.

Vehicle Priority Traffic Control

Various types of traffic control techniques can be applied to give priority treatment to high occupancy vehicles. Many of the methods currently in operation give priority to buses only, but there are several examples where priority is given to any high occupancy vehicle -- whether it be a bus, carpool, or vanpool. Priority traffic control techniques include:

- Exclusive (separate) freeway lanes
- Reserved freeway lanes
- Contra-flow freeway lanes
- Reserved lanes at toll plazas
- Reserved lanes on surface streets
- Exclusive freeway ramps
- Priority metered ramps
- Priority traffic signal control

The basic motivation associated with all the above priority techniques is reduced travel time for high occupancy vehicle occupants. Typically, the priority treatments are in force only during peak periods and, thus, are applicable primarily to commuter vehicles.

Exclusive (separate) Freeway Lanes - This concept consists of providing a physically separated lane or lanes, within the freeway right-of-way assigned exclusively for use by high occupancy vehicles. This technique is perhaps the most powerful one in terms of time savings compared with peak period travel on the normal freeway, but it is also likely to cost more to implement than other priority methods because of the substantial amount of roadway construction involved. However, some freeways were constructed initially with features, such as reversible roadways in the median strip, which facilitate conversion to exclusive lane operation. The enforcement of the proper use of exclusive lanes is of proven feasibility.

An excellent example of the exclusive lane concept is the Shirley Highway (I-95) which connects the Northern Virginia suburbs with downtown Washington, D.C. This facility has two reversible lanes in the median strip which are used exclusively by high occupancy vehicles during commuting hours. In the initial stages of operation, only buses were permitted on the exclusive lane, but in December 1973 these lanes were opened also to carpools with four or more occupants. Even though the section of this facility approaching the bridges to Washington, D.C. is still under construction at this time (January 1974), travel time savings for high occupancy vehicles is dramatic. Approximately 15 minutes travel time is saved by buses and carpools during the height of the peak period. Impressive increases in bus ridership along the Shirley Highway corridor have been achieved. Currently, over 15,000 bus passengers are served on the exclusive lanes during the morning commuting period. Data on the number of carpools using the facility has not yet been reported. Violators of the exclusive lane rule are subject to heavy fines, and no serious enforcement problems have been experienced.

Another example of exclusive freeway lanes is the San Bernardino Freeway in Los Angeles where construction of an 11 mile section of exclusive bus lanes in the median strip is nearing completion. This facility is a heavy commuter corridor connecting the Los Angeles CBD. Currently, the 7 mile long outer section is in operation. When completed, substantial travel time reductions for buses are anticipated.

Reserved Freeway Lanes - This concept involves reserving one or more of the existing freeway lanes for use by high occupancy vehicles.

No physical separation of the reserved lane is believed necessary, although this hypothesis has yet to be tested in the field. High occupancy vehicle flow in the reserved lane would be "with-flow", that is, in the same direction as normal traffic flow in the adjacent lanes. Traffic control would be accomplished through special lane-use control signs and markings. The number of reserved lanes assigned and the vehicle occupancy level required for eligibility can be varied depending on the unique characteristics of each freeway. A computer simulation model, called PRIFRE, for use in testing and evaluating reserved lane strategies, has been developed by the Institute of Transportation and Traffic Engineering at the University of California, Berkeley, under FHWA sponsorship.

In concept, restricting the use of one or more free-flowing lanes to buses and carpools while low occupancy autos move along at a slow pace in adjacent lanes has great appeal as a time saving incentive. However, there is not complete certainty that the concept will function in perfect accord with theory. Initiation of the scheme may cause severe overloading of the unreserved lanes and overall delay increases for the total stream. This is expected to induce shifts into buses and carpools. If a sufficient amount of shifting actually occurs, then the person-moving capacity of the freeway will increase. Vehicle miles traveled and total travel time on the facility will be reduced. The amount of shifting it takes to produce these benefits depends on the initial freeway traffic characteristics and initial vehicle occupancies. Some traffic engineers fear that severe traffic congestion and safety problems could occur both initially and during the transition period.

Several other potential problems with the reserved lane concept have been identified, including lane-use enforcement difficulties, lane change hazards caused by the high speed differential between the reserved and unreserved lanes, and difficulty and delay in weaving across the congested unreserved lanes to get to and from the reserved lane. These concerns are just as real as the potential benefits of reserved lane operation.

Reserved freeway lane projects are in various stages of development, but none is yet operational. In Miami, one extra lane in each direction is being constructed on a 10-mile section of I-95 for use as reserved bus and carpool lanes. In Northern New Jersey, a feasibility study for reserved lanes is almost underway. In Los Angeles, plans are moving rapidly for an early implementation of the reserved lane technique on the Santa Monica Freeway -- this project may be out into operation in early 1974.

Contra-Flow Freeway Lanes - This concept involves reserving a lane for buses on the "wrong-side" of the freeway during peak hours. This scheme is designed to take advantage of the fact that on many freeways peak hour traffic flow in the opposite direction is very low (for example, outbound traffic in the morning peak period is light). The excess capacity can be assigned to buses traveling in the heavy flow direction. The contra-flow bus lane traffic and the opposing flow are separated with traffic posts and extensive lane-use control signing. In some cases an extra buffer lane is also used as a separator to increase the level of safety.

The contra-flow lanes implemented to date have been for buses only. The addition of carpools raises serious questions regarding safety and the handling of vehicle breakdowns.

The most successful example of a freeway contra-flow lane is in Northern New Jersey where such a lane is operating on a 2.5 mile section of I-495 connecting the New Jersey Turnpike with the Lincoln Tunnel to New York City. The technique is applied during the morning commuting hours when 950 buses carrying 40,000 passengers typically use the contra-flow lane. Bus riders save 8 to 15 minutes compared with the previous situation when buses were mixed in a heavily congested stream with autos. No significant safety problems have arisen as a result of this contra-flow lane.

A five-mile contra-flow bus lane was implemented on Route 101 in Marin County, California, north of the Golden Gate Bridge. This lane carries commuters on buses outbound from San Francisco during the afternoon peak period. A buffer lane separates the two minor flow direction lanes from the contra-flow lane.

In New York, the Long Island Expressway has a two-mile long contra-flow lane for city-bound buses between the Brooklyn-Queens Expressway and the Queens-Midtown Tunnel. The buses travel this section in under four minutes compared to 18 minutes for normal peak hour traffic.

Reserved Lanes At Toll Plazas - This concept involves reserving one or more channels at toll plazas (e.g., bridges, tunnels, turnpikes). Frequently, toll plazas are high-delay points during peak commuting periods. Reserved lanes present the opportunity for substantial time savings for high occupancy vehicles. This concept is operational at the San Francisco Oakland Bay Bridge toll plaza processing San Francisco bound vehicles in the morning peak period.

Two lanes are reserved for carpools with three or more persons, and one is reserved for buses. The high occupancy vehicles have monthly permits, at reduced rates, which eliminate the need to stop at the toll plaza. Approximately five minutes is saved by buses and carpools during the peak hour. The number of carpools using the bridge during commuting hours has increased from 1,000 to over 1,700, and approximately 500 well-loaded buses benefit from the scheme.

Reserved Lanes on Surface Streets - Reserved lanes for buses are widely employed on surface streets in U.S. cities, including both with-flow lanes on two-way streets and contra-flow lanes on one-way streets. Although these schemes have definitely improved bus operations, the magnitude of time savings by bus riders making relatively short-haul trips on surface street reserved lanes is not very large. This technique is not considered a very strong incentive to switching to a bus. However, if employed on a widespread basis, it may result in a worthwhile improvement in travel time and efficiencies in utilization of bus fleets. The addition of carpools raises serious questions regarding enforcement, lane capacity, turning movements, etc.

Exclusive Freeway Ramps - This concept involves the complete reservation of specified freeway entrance ramps for buses and carpools during peak hours. This scheme can provide a substantial time saving incentive for bus riders and carpools and may, as well, cause added delay or inconvenience to low occupancy vehicles. So far in practice, exclusive ramps have been used only for buses. Other high occupancy vehicles have not been included.

A good example of the concept is found in the Blue Streak Project in Seattle where buses traveling on the reversible lanes of Interstate 5 freeway use an exclusive exit ramp to avoid delay in getting to the downtown circulation loop. In the afternoon peak, the process is reversed, and the exclusive ramp is used by buses entering the freeway.

Priority Metered Ramps - A widely used freeway traffic control technique is ramp metering. The rate of vehicle entry to the freeway is controlled by special traffic signals operating during peak periods. In the priority scheme, a second lane is provided on the ramp for use by high occupancy vehicles. This lane gives the multioccupant vehicles preferential treatment by passing the queue of vehicles waiting at the metering signal.

This concept has been operating since June 1973 on the Lakewood Boulevard entrance ramp to the San Diego Freeway in the Los Angeles area. The low metering rate used during the afternoon peak period causes delays of 7 to 9 minutes. Any vehicle with two or more persons now avoids this delay. After the first two weeks of operation, the number of carpools using the ramp increased by 120 percent, and the average occupancy increased from 1.2 to 1.5 persons per car. Approximately 60 percent of these carpools are newly formed, while the remainder are carpools that shifted to the priority ramp from other ramps or city streets. Violations by single occupant vehicles have averaged about five percent even though only limited spot enforcement has been applied.

In Minneapolis, nine metered entrance ramps to Interstate 35 are set up for priority entrance by buses. Implementation is scheduled for early 1974.

Priority Traffic Signal Operation - Operation of traffic signals to give buses priority treatment has been tested successfully in several cities, including Los Angeles; Kent, Ohio; Madison, Wisconsin; and Washington, D.C. Delay reduction is accomplished through a bus preemption device which permits either an early start of the green signal or an extension of the green signal, or both. The FHWA Urban Traffic Control System Project in a network of 112 signals in Washington, D.C. is the first large scale test of the concept and results are not yet available. None of the previous priority signal operation schemes has been coupled with reserved bus lanes, but it is felt that combining the two schemes is essential to produce delay reductions large enough to be considered as incentives to shifting into buses. There does not appear to be any feasible way to include carpools in priority traffic signal control systems.

Priority traffic control techniques described above should be applied only after thorough traffic operations analyses have been made. Each freeway facility has unique physical and traffic flow characteristics, and the impact of any proposed priority technique will be highly dependent on the initial characteristics.

CONVENIENCE INCENTIVES

Convenience-related incentives increase the attractiveness of carpooling. There is some overlap between convenience incentives and cost or travel time incentives, since time and cost are often elements of "convenience." In general, however, the following incentives appeal most directly to the motorist's sense of comfort and his desire to minimize the effort related to travel.

Preferential Parking Space Allocation

This procedure may be applied by individual employers either public or private, who control a single parking area or by coordinated management at a multiemployer site. The purpose of this method is to offer carpoolers an advantage over other drivers at the work site in terms of convenience, time savings, or comfort. The methods of application include:

- Assignment of close-in spaces to carpoolers in parking lots
- Assignment of reserved parking spaces to carpoolers
- Assignment of parking spaces nearest street level of multilevel parking structures to carpools
- Assignment of sheltered parking spaces to carpoolers where some parking areas are not sheltered
- Assignment of all parking spaces to carpools only

The most common procedure for implementing preferential parking is the issuance of stickers which are applied in a readily visible spot on the vehicle, thus permitting easy identification of unauthorized cars either at point of entry or while patrolling parking areas. Enforcement must include a method for inspecting incoming or outgoing vehicles to ascertain that the vehicle is indeed carrying the number of persons specified.

This incentive is most successful only when employees can perceive a distinct advantage to themselves over their fellow employees who do not carpool, not merely a marginal improvement over an existing parking situation.

Preferential parking can be implemented quickly and inexpensively. It has been proven of significant value in a large number of applications. Among them: McDonnell Douglas Corporation, St. Louis. With

reserved lots for carpoolers, they have achieved a car occupancy of 2.8 persons per car arriving at the plant. Connecticut DOT, Hartford, has reserved 245 choice parking spaces for carpoolers. The successful NASA program, Washington, D.C., allocates preferred spaces on the basis of car occupancy as well as years of service. The ECCO program, Omaha, Nebraska, cites preferential parking as the first suggested incentive. Hartford Insurance, Hartford, Connecticut, offers preferential parking in a covered garage for carpoolers. In Little Rock, Arkansas, the provision of 500 close-in parking spaces has been a factor in an increase of carpoolers from 400 to 1,000 at state offices.

Facilities for Carpoolers

Employers and public agencies can provide a number of facilities to encourage the use of carpooling. Such facilities are generally being provided with little capital or maintenance cost. In some cases, the required facilities already exist and need only be designated for carpool use.

Park and Ride Lots for Carpools - One successful method for encouraging carpools is to locate and designate certain parking areas for use of carpoolers as a rendezvous point. Many shopping center lots now are being used in this manner either with or without the agreement of the management.

Other likely locations are areas around highway interchanges where it is convenient for drivers coming from various compass directions to assemble in one vehicle for the major portion of the trip. In some cases it is possible to pave over a portion of the area beneath a freeway interchange; in other sites merely paving or stabilizing a shoulder of the roadway will permit cars to park safely off the main roadway.

Three lots, with a total capacity of 10,000 spaces, were opened by Nassau County, Long Island early in 1974. These park and ride lots are expected to serve commuters working in New York City and those using various Long Island expressways. Large numbers of carpoolers are already meeting at expressway interchanges in Nassau and Suffolk Counties.

Carpool Loading Areas - To encourage carpooling from the employment site the employer may set aside a sheltered area where carpoolers may comfortably wait for their driver. This area may be a

bay or simply a reserved area that will permit standing for a short time while carpool vehicles are loaded without interfering with the normal outflow of traffic from the employee parking lot or garage.

The cost of these pick-up zones could vary from a minimal cost for some curb paint and a sign to several thousand dollars for additional construction for a bay outside the main traffic lane.

Carpool Shelters - As an additional encouragement to carpooling from the employment site, the employer can provide sheltered waiting areas for carpool riders. These areas may simply be designated in existing buildings that are convenient to carpool parking areas, or they may be shelters constructed specifically for this purpose.

The cost of this type of facility ranges from an almost negligible cost for designating space in an existing building to a cost of several thousand dollars for a new bus-shelter type of building.

Carpool Gates and Plant Entrances - Large employers, with company grounds and buildings having various gates and entrances, may reserve some for the exclusive use of carpools. Carpools would also be permitted to use any other gate or entrance open to employees.

This type of incentive is more effective in situations where existing access to grounds and buildings is hampered due to congestion or circuitous routings.

The cost of this type of incentive consists of an almost negligible amount to designate existing gates and entrances as carpool facilities. Construction of new gates, entrances, required roadways and connectors can involve major capital expenditures not likely to be justified unless it is part of a broad and vigorous carpool program involving other elements.

Carpool Use of Restricted Roadways - Campuses, industrial parks, office parks and other institutions having restricted internal roadway systems can permit carpool use of restricted roads. This incentive can permit door-to-door service for carpoolers.

Provision of Other Carpool Aids - Company provision of bulletin boards and information kiosks can be of benefit as part of an incentive program. Costs range from an almost negligible amount for the designation of existing bulletin boards for carpool use, to several hundred dollars for the placement of new bulletin boards.

Adjustments to Working Hours

Both public and private employers can apply carpool incentives which will permit employees greater flexibility and freedom to arrange carpools with other employees who may have different work hours. This may be accomplished by changing the shifts of individuals who carpool, or by merely allowing them an earlier start and leave time to meet a carpool.

All of these incentives, however, would require modification of union contracts and working rules if implemented in unionized work sites. The effects on productivity would also have to be weighed by employers.

Shorter Working Hours - Entire carpools could be granted a few minutes earlier leave time as an incentive to avoid waiting lines in a parking lot at quitting time. This essentially would be a reduction in working hours.

A further working hour incentive is an overall reduction in working hours for persons who carpool, perhaps applied to both ends of a shift, or work day.

Other Working Hour Incentives - Other incentives may be related to working conditions, such as shift rotation preferences for carpoolers or even a day or half-day off.

Another approach is for management to encourage the maintenance of normal work hours so that employees will not be subjected to overtime and can meet their carpools. This has been done at the Pentagon, for example.

Flexible Working Hours - This incentive measure would not reduce the total number of working hours by a carpooling employee, but would permit working hours to be arranged so that starting and quitting times fall within a specified range (for example, starting times 8:00 - 9:00 a.m. and quitting times 4:00 - 5:00 p.m.)

This measure can be implemented for little cost other than any initial bookkeeping changes that might be required. On the basis of the popularity of this type of plan in companies already applying it to all employees, it appears to be an effective incentive.

Adjustments in Academic Hours and Policies - Various types of incentives can be offered through variations in policies at colleges

and universities. For example, carpooling students could be given first priority in class registration, a privilege already granted to various special groups at many universities. As large employers themselves, universities are also capable of providing any of the employer-sponsored measures relating to parking convenience, restrictions, cost, etc.

Vehicle Restriction

A series of rather severe measures could be imposed by local governments to restrict entry to entire areas to carpools and buses only, at least during the peak commuter hours. This could be applied to high activity centers such as the central business district of a major city or an airport area (applicable to employees only). Such a measure would eliminate any exceptions and would, of course, require extensive enforcement procedures. Adequate planning, provision of collection points, and possibly even barriers would be required.

Parking Restriction

Carpooling is encouraged if the supply of parking spaces is inadvertently or artificially reduced. This may be done by regulating the number of new or existing parking spaces available through parking authorities or other agencies.

Reduction of Existing Spaces for Non-Carpoolers - A specific reduction in the number of parking spaces available for non-carpoolers could be imposed. Local jurisdictions might permit only carpools in designated public and/or private lots and garages during commuter hours. Restriction might be applied on a proportional basis, allowing some provision for single drivers on a priority basis. This technique is employed at the NASA, GSA, and several other federal office buildings in Washington, D.C.

Restriction of On-Street Parking Supply - Most urban areas presently forbid on-street parking on arterial streets during rush hours; this could be further augmented by restricting all parking in the CBD during the peak hours.

Control of Parking Supply - Local governments can control the number of parking spaces, especially in the CBD, by prohibiting a new increase in the number of spaces. This has been done in Boston where the only new construction of parking space can be on a one-for-one basis to replace existing parking supply. Other centers, such as London,

England, are controlling parking supply by severely restricting the number of parking spaces permitted in any new construction.

Legislative

Local traffic, public works and regulatory agencies could cooperate in a program to aid carpoolers by relaxing rules on no parking, stopping, or standing on city streets to permit carpools to pick-up and drop passengers. As with on-site facilities, a shelter to protect waiting passengers could be furnished. These areas should not interfere with traffic flow. In some places bus loading zones could be extended with carpools restricted to one portion of the bus zone. Existing bus terminals or bays would be ideal locations. Newly constructed bays or islands should be located near parking lots or other high density areas which can be reached easily by foot or car.

INTANGIBLE, NON-TRAVEL RELATED AND OTHER INCENTIVES

A variety of schemes not directly related to travel can be utilized by employers, civic organizations, universities, and merchants. These may provide incentives in the form of social-consciousness reinforcement or as refunds for purchases of goods or services.

Registration Information at Colleges and Universities

A computer printout listing potential carpool matches can be provided in registration packets given to students with class schedules. This has been done at Metropolitan State College in Denver.

Recreational Areas and Sports Areas

In the Rocky Mountain area two ski resorts offer either reduced lift tickets or a half-day free lift ticket to carpools of four or more. Football, baseball, and other sports organizations could offer free or reduced parking fees for carpoolers attending events.

On-Site Food Facilities

In suburban locations, employers could provide and maintain good facilities for food service so that employees would not need a car to leave the premises for a meal.

A consortium of restaurants in McLean, Virginia, has initiated service to transport workers to and from a research park area to any restaurant in the center of town at the noon hour.

Awards

Recognition or monetary awards may be an incentive to carpooling, such as:

- Listing of carpoolers in company newspaper
- Announcing carpoolers on the radio, especially on "commute" type stations
- Time off or bonuses to carpoolers

Other Incentives

Some personalized techniques could be applied to meet special needs. For example:

- Matchmaking schemes could try to match non-smokers as an inducement to relieve the anxiety of persons who do not like to ride in a crowded vehicle with smokers
- Face-to-face meetings could be arranged on company time for potential carpoolers to get acquainted
- Employers or sponsors could assure potential carpoolers of the safe driving habits and records of the participants
- Community organizations could establish special services, such as:
 - A carpool "Welcome Wagon" for new residents
 - "Hotline" telephone service for general information and matching
 - Public information clearing house
 - Speakers bureau

ORGANIZATIONAL INCENTIVES

It is quite clear that business is beginning to appreciate that promoting car, van, or buspooling is important to them. They are recognizing that assuring access to their property is a fringe benefit they must provide if they are to be competitive. Many companies are now providing their employees with a \$1/day or more fringe benefit

by picking up the bus fare or parking fee, providing vehicles, and sponsoring other incentives referred to in this report.

Although the motivation of organizations, such as businesses, to initiate carpool incentives is somewhat beyond the scope of this discussion on incentives, it is useful to note some of the factors encouraging the organization of carpools and vanpools:

- Limitations on parking space. Many employers and businesses are faced with a worsening shortage of parking spaces.
- Employee pressure. Organizations which originally located at remote sites, due to zoning, land prices, etc., are now faced with increasing competitive pressure (with respect to employees) compared to more advantageously located employers.
- Cost of parking facilities. Even when land is available, rapidly escalating construction costs are an incentive to seek other means of accommodating employee travel.
- Traffic impact. Increased environmental awareness has resulted in closer scrutiny of traffic impacts of large employment centers. Encouragement of carpools is a means of alleviating adverse traffic effects, as well as the related employer-borne cost of street improvements.
- Zoning. There are examples of employers developing carpooling plans in response to requirements by a local zoning board.
- Corporate prestige and good will. For many companies, the "Good Neighbor" incentive is a powerful motivation. Various public relations benefits are derived from some type of carpool and vanpool programs.
- Economic incentives. For tax reasons or for outright net revenues, some companies may find investment in carpooling to be profitable.

SUMMARY OF INCENTIVE MEASURES

Table 1 summarizes the types of incentive measures outlined and discussed in the preceding sections of this report. Included in this table are identification of potential sponsors of the various measures,

TABLE 1. SUMMARY OF INCENTIVES

	Potential Sponsor					Cost to Sponsor		Implementation	
	Government Agency	Employer	Citizen Group	University/College	Other Organization	Initial Cost	Continuous Cost	Operational	Planned
Cost-Related Incentives									
Parking Cost	*	*		*	*	Low	Low (or net revenue)	*	
Automobile Ownership Cost	*	*		*		High	Varies, can break even	*	
Automobile Operating Cost	*	*		*		High	Low (or net revenue)	*	
Travel Time Incentives									
Vehicle Priority Traffic Control	*					Moderate/High	Moderate/High	*	
Convenience Incentives									
Preferential Parking Space Allocation	*	*		*		Low	Low	*	
Facilities for Carpoolers	*	*	*	*	*	Low/Moderate	Low	*	
Adjustments to Working Hours	*	*		*		Low/Moderate	Moderate High		*
Vehicle Restriction	*					Low	Moderate		*
Parking Restriction	*	*		*		Low	Low		*
Legislation	*					Low	Low		*
Intangible, Non-Travel Related and Other Organizational Incentives	*	*	*	*	*	Variable	Variable	-	-
	*	*	*	*	*	Variable	Variable	-	-

as well as broad ranges of initial and continuing costs associated with their implementation.

In the following sections, some important elements common to all incentive measures are identified. An understanding of the nature of these elements is helpful in developing new and innovative incentives.

Sponsor

A sponsor is an agency, organization or individual having the capability to provide incentives for carpooling. Major existing and potential sponsors include the following:

- Local Government, Transportation and Planning Agencies. Transportation-related agencies include traffic engineering departments, parking departments and authorities and toll facility authorities. These agencies exist at the local, regional, county and state levels. Planning agencies include planning departments, Councils of Government, multijurisdictional planning councils, zoning boards and local government legislative bodies.
- Employers. Almost all employers are potential sponsors of carpool incentives. Public employers and large private employers are particularly likely sponsors of incentive programs.
- Citizens, and Transportation-Related Groups. Various types of organizations not related to employment or governmental agencies can sponsor carpool incentives. Typical of this type are neighborhood associations, volunteer agencies, property owner consortiums, retail merchant associations, automobile clubs.
- Universities and Colleges. The large concentration of employees and students attracted by universities makes possible the use of some incentive measures not generally feasible elsewhere.
- Other Organizations. Other organizations capable of offering carpooling incentives include military installations, labor unions, recreational facility operators, sporting events promoters, transportation terminal operators, radio stations, apartment owners and managers.

Basic Motivation Employed

In any discussion of carpool incentives, it is helpful to consider the basic motivation for forming or joining carpools:

- Travel Cost is one of the most powerful factors in the decision to carpool. Cost-related incentives include those which reduce the parking cost, the driving cost or both. Examples of parking cost incentives are the reduction in parking costs for carpoolers, or, conversely, an increase in parking cost for non-carpoolers. Driving cost incentives include reduction in tolls or provision of company vehicles.
- Travel Time is also a strong factor in the decision to carpool. Examples of incentives related to travel time include the allocation of preferential parking spaces, the allocation of reserved street and freeway lanes, priority ramps for carpoolers, and reduced working hours.
- Convenience motivating measures include, for example, the allocation of close-in or weather-protected parking to carpools or the allocation of first choice of working hours to carpoolers.
- Intangible Factors, such as the image of carpooling as a highly desirable activity, can be significant factors in decisions to use carpools.

Impacted Trip Segment

With respect to the journey itself, there are three points at which carpool incentives are applied:

- Origin: Incentives can be applied to the gathering of carpoolers prior to the beginning of the carpool trip. (Example: "Park and Ride" facilities for carpoolers.)
- Trip Itself: Many incentives can be applied to some aspect of the journey. (Example: Reserved freeway lanes for carpoolers.)
- Destination: A number of incentives are applied at the destination point. (Example: Preferential parking for carpoolers.)

Duration of Incentive

The duration of incentives is dependent on the type used.

- "One-Time Incentives" are those measures applied only once or infrequently. (Example: Promotion campaign.)
- Continuing Incentives are those measures which apply continuously or at frequent intervals. (Example: Preferential parking plan.)

Degree of Restrictiveness

Most incentive measures can be applied in either a positive or negative manner:

- Positive Incentives are designed to render carpool travel more attractive than non-carpool travel. (Example: Lower parking fees for carpool vehicles.)
- Negative Incentives are designed to render non-carpool travel less attractive than carpool travel. (Example: Higher parking fees for all non-carpool vehicles.)

Both types are presented in this section. Positive incentives which reward carpoolers are more acceptable than negative incentives which, in essence, punish non-carpoolers.

Careful consideration should be given by all potential sponsors as to which specific incentives are implemented as to effect, cost, ease of implementation.