

PROCEDURES FOR INCREASING THE USE OF
CAR POOLS FOR WORK TRIPS

by

Lester A. Hoel
Faculty Research Associate and Chairman
Department of Civil Engineering
University of Virginia

and

John K. Austin
Research Assistant

(The opinions, findings, and conclusions expressed in this report are those of the authors and not necessarily those of the sponsoring agencies.)

Virginia Highway & Transportation Research Council
(A Cooperative Organization Sponsored Jointly by the Virginia
Department of Highways & Transportation and
the University of Virginia)

Charlottesville, Virginia

August 1979
VHTRC 80-R9

TRANSPORTATION PLANNING RESEARCH ADVISORY COMMITTEE

- MR. R. C. LOCKWOOD, Chairman, Transportation Planning Engineer, VDH&T
- MR. G. R. CONNER, Asst. Rail Division Administrator, VDH&T
- DR. D. R. DREW, Professor of Civil Engineering, VPI & SU
- MR. J. C. ECHOLS, Executive Director, Tidewater Transportation Commission
- MR. TOM FAULKNER, JR., Civil Engineering Department, VPI & SU
- MR. D. R. GEHR, Regional Transportation Engineer, VDH&T
- MR. G. W. HESTERBERG, Asst. Planning & Research Engineer, FHWA
- MR. J. N. HUMMEL, Chief, Planning and Engineering Div., Arlington
Department of Public Works
- MR. D. E. KEITH, Resident Engineer, VDH&T
- MR. H. E. PATTERSON, Senior Traffic Engineer, Norfolk Department of
Public Works
- MR. R. N. ROBERTSON, Assistant Head, VH&TRC

ABSTRACT

Car pooling is potentially a highly cost-effective technique for increasing the utilization of existing streets and highways, especially during the peak times of travel to and from work. The benefits of increased ride sharing are energy conservation, reduced pollution, diminished need for new highways and parking facilities, and lower cost for the commuter. Although the concept is simple and the benefits obvious, car pooling has not achieved its potential and has not contributed significantly as a transportation systems management technique.

This report describes methods and techniques that, if used, could result in an increase in the use of car pools in Virginia. Two approaches are described. The first employs those methods that serve as an incentive for persons to form car pools. Among these are incentives such as preferential use of street and highway facilities, parking privileges, etc. The second involves methods that assist people in the formation of car pools. Among these are market segmentation, community car pool coordinators, and computer matching. The report also stresses the importance of management and government's commitment to the establishment of car pool programs. Without strong policy direction, the provision of incentives, and/or commuter assistance, programs are not likely to succeed. Thus, this report is intended as a guide to policy and decision makers where a commitment to car pool programs exists.

0790

PROCEDURES FOR INCREASING THE USE OF
CAR POOLS FOR WORK TRIPS

10797

by

Lester A. Hoel
Faculty Research Associate and Chairman
Department of Civil Engineering
University of Virginia

and

John K. Austin
Research Assistant

INTRODUCTION

In recent years many ideas have been proposed to increase the capacity of transportation systems, reduce the pollution they generate, and save on the energy consumed in transport. Among the most promising concepts are those that seek to increase the number of occupants per vehicle that use existing street and highway facilities. Rail rapid transit and buses on fixed routes and schedules serve this function in large cities, but have little success in small communities and suburban areas of low population density because they lack flexibility or are too costly to build and operate.

The term "Transportation Systems Management" (TSM) refers to a wide range of actions with low capital requirements that can improve transportation efficiency in the short term. A major objective of TSM strategies is to ensure that existing highway and transit facilities are efficiently utilized and to thereby reduce the need for additional investments in fixed facilities.

One category of TSM actions is "Paratransit", a term used to denote all forms of public transit using streets and highways that do not fall within the traditional services furnished by fixed bus and rail transit. The basic characteristic of paratransit is its inherent operating flexibility. Among the many paratransit modes are arrangements such as jitneys, van pools, bus pools, car pools, dial-a-ride, and taxis.

As part of the Council's research program in the field of paratransit, studies have been completed on the role of van pools^(1,2) and the extent of ride sharing in Virginia. These studies described the benefits of commuter ride sharing and illustrated procedures for

identifying persons who could potentially join a car or van pool. The studies also showed that car pools represent the majority of ride-sharing activity in Virginia and hold the highest potential for the development of new programs.(3)

Despite the high promise that car pools offer in the arsenal of TSM techniques they have had a minor impact on travel. Car pooling represents one of the least costly and most environmentally acceptable ways to increase the efficiency of the state's transportation system. Yet, its acceptance has not been widespread. This report addresses the question: What measures can be taken to increase car pool utilization?

The report describes promising strategies that can be used to increase car pool activity. Also discussed are issues related to consumer motivation to car pool, characteristics of car poolers, and conditions necessary for the car pool alternative to be seen as an attractive one. The report also contains a review of incentives to car pool furnished by industry or government that might be effective.

GOALS AND OBJECTIVES OF CAR POOL PROGRAMS

The potential benefits to be gained through increased ride sharing are so diverse that no single goal has been favored by all federal, state, local, or private organizations.

The federal government's statement of the goals to be accomplished through car pooling is expressed by various agencies within the administration. The Department of Transportation includes car pooling as an element of TSM designed to increase the efficiency of existing highway facilities. The Environmental Protection Agency (EPA) promotes car pooling as a short-range approach to achieving air quality standards through reductions in the total number of vehicle miles traveled (VMT). In its effort to reduce the nation's consumption of energy, the Department of Energy (DOE) has adopted the objective of reduced VMT as a direct measure of fuel consumed for commuting purposes. All federal agencies hope to reduce the total cost of transportation without sacrificing mobility.

To a large extent, Virginia's position on car pooling is supportive of general federal guidelines. The State Energy Office's goal of reducing fuel consumption by five percent and the Air Quality Control Board's goal of reducing auto emissions serve as examples. The Department of Highways and Transportation has dealt extensively with the use of car pooling and other ride-sharing modes as a means of reducing congestion and increasing vehicle occupancy in specific corridors such as the Shirley Highway in Northern Virginia.

Several local governments in Virginia have promoted car pooling indirectly by adopting policies to restrict the amount of parking available to commuters and thus adding parking facilities for shoppers in the central business district without the need to divert additional tracts of valuable land for this use. Although parking restrictions have been implemented in several Virginia cities, the effect of the policy on car pooling has been of secondary importance.

The most commonly cited reason for private industry's promotion of car pooling has been to reduce employee parking demand; however, most firms have adequate employee parking facilities available. Another reason for firms to become involved in car pool programs is to provide an economically feasible means of transporting employees that live long distances from their place of employment. By organizing car pools for these employees, firms can tap otherwise unavailable sources of labor. A commonly cited reason for developing an employer-based program in many of Virginia's firms has been to assure that employees will be able to continue to come to work in the event of another fuel shortage. Experience from the last energy shortage has shown that programs created with this goal in mind are relatively short-lived and generally ineffective.

In summary, car pooling has advantages for almost every sector of society that is in some way affected by commuter work trips. Although a wide variety of goals are defined by different organizations, the basic objective of programs is either to increase vehicle occupancy or to reduce VMT. While both objectives would appear to have similar requirements, the federal government's adoption of VMT as a measure of effectiveness reflects a basic concern for the national and global impacts of energy consumption and air pollution. In contrast, the emphasis in state, local, and private industry programs is on increased utilization of various elements of the transportation system.

Reductions in VMT may be accomplished by increasing car pooling activity or by effecting a general reduction in personal travel. For example, a reduction in VMT as a result of a policy implemented by a local government might be interpreted as a loss of business activity rather than an increase in efficiency of the transportation system. Thus, while the reduction in VMT may or may not reflect increased car pool activity, the measure is well-suited to the purpose of federal agencies such as the DOE and EPA, as it is directly related to the goal of reducing energy consumption and pollution.

STATUS OF CAR POOL PROGRAMS IN VIRGINIA

This section briefly reviews the results of inquiries made in May 1977 concerning the status of car pool activities at various

state agencies. Interest in car pooling at the national level was initiated by the Federal Highway Administration (FHWA) in 1967 as part of its efforts to promote public transit through use of exclusive bus lanes. That agency suggested car pools as a means for increasing the use of these special lanes. Then further development, at the federal level, was motivated by demands for improved air quality and, later, reductions in energy consumption.

The report to Congress required by the Emergency Highway and Energy Conservation Act concluded that on a national basis, car pool programs were not reaching their potential because of (1) insufficient employee involvement, and (2) demonstration projects stressing only (computerized) matching services.⁽⁴⁾ The report stressed the need for a change in attitude by highway agencies toward the provision of preferential treatment for high occupancy vehicles and the improved management of existing facilities as a substitute for building new facilities to create additional capacity. The following sections describe car pool activities within selected Virginia agencies.

State Energy Office

In May 1977, the State Energy Office received a grant from the FEA to develop a state energy conservation program. One requirement was that a car pool element be included, and the Energy Office has allocated staff and appropriate management and clerical support to act as liaison with the Department of Highways and Transportation in the development of this part of the state's conservation plan.

It was expected that the Energy Office and the Department of Highways and Transportation would consider actions such as (1) the establishment of preferential movement and parking facilities for public transit and car pools, (2) the restructuring of public parking fees and highway and bridge tolls to encourage use of car pools and public transportation, and (3) the prohibition of private automobiles from specific areas, particularly in sections of the central business districts of large municipalities where alternative transit exists.

Virginia Department of Highways and Transportation

Although the Department of Highways and Transportation has become extensively involved with the management and coordination of mass transit services, relatively little emphasis has been given to

the development of car pool incentives. One major exception is the Shirley Highway car pool/bus pool lanes in Northern Virginia. A description of this significant project, and an evaluation of its effectiveness, is presented later in this report as an example of the use of traffic control strategies as an incentive to promote the formation of car pools.

Regional Planning Districts

When the effect of the Arab oil embargo began to be felt throughout Virginia, many public and private organizations began to investigate the feasibility of organizing car pool programs. Almost all of this initial activity was directed toward the creation of car pool matching and promotion campaigns. Many of these programs were administered by the regional planning agencies or a transportation district commission. With the return of adequate fuel supplies, most of these programs have ceased to function or are on an emergency standby basis. A telephone inquiry to the major urban planning districts indicated the status of car pool program development as of 1977.

Southeastern Regional Planning District

A low-key and extremely cautious ride-sharing effort is being made together with a few of the area's major employers. The transportation commission is also cooperating with the U. S. Navy to set up a van pool demonstration program.

Peninsula Regional Planning District

A car pool matching program was started in 1973 under the Emergency Conservation Plan. It was revised in November 1974. The program ceased to operate after the shortage ended. Since then efforts have been limited to maintaining contacts with the Chamber of Commerce and the Virginia Employment Commission's employer location information so as to be prepared for another shortage.

Richmond Regional Planning District

The FHWA's computer matching program was implemented during the shortage. Subsequently, the program has been shelved and is available as a contingency measure in case of another shortage.

Fifth Regional Planning District

This agency is attempting to integrate car pooling within its TSM element, an effort undertaken at the initiative of the agency's staff. The agency expects to summarize experiences of ride-sharing programs in cities throughout the United States. They have also sent out a questionnaire to firms located in the Roanoke area concerning their interest in car pool programs.

Central Virginia Regional Planning District

During the 1973-74 crisis, area industries approached the regional agency to request that a car pool program be implemented for their employees. A matching program was set up using the Census DIME files and the FHWA matching program. Over 2,500 matching forms were sent out and an unusually high return rate, 93%, was achieved. Half of these respondents stated that they were interested in car pooling, while 20% stated that they already were pooling.

When the energy crisis was over the number of persons involved in the program dropped significantly. Two major employers withdrew from the program and it was forced to terminate. The computer matching program is still available as a contingency plan.

Northern Virginia Planning District

The area's car pool program is administered by the Washington Metropolitan Council of Governments (COG). Northern Virginia's role in car pooling activities is limited to coordination between the COG and local governments.

The COG has been operating a car pool matching program, the Commuter Club, since 1973. Since its inception, the Club has produced over 115,000 computer matches for car pool applicants. There were approximately 41,000 names on the computer file, of which 16,000 were from the Virginia suburbs. As a result of the matching program, approximately 8,900 applicants formed car pools, 1,800 of them between January and November of 1976. A variety of matching program techniques have been devised for the COG program, including matching from both place of employment and residence, matching along the route to work (termed "downstreaming"), contact with individuals by means of car pooling displays at area banks and savings and loans, and by use of a phone service in the offices of the Board of Trade.

STRATEGIES FOR INCREASING THE USE OF CAR POOLS

This section describes various strategies that could be considered in Virginia to increase the use of car pools. There are three types of approaches that can be identified. These are (1) strategies that assist people in forming groups or identifying others who wish to car pool, (2) strategies that furnish incentives for persons to begin to car pool, and (3) strategies that penalize solo driving. A list of car pool strategies is shown in Table 1. This report will focus on those strategies that assist in the formation of car pools and furnish incentives to form or maintain car pools. These are strategies that government and industry can implement without major policy and legislative changes. On the other hand, making adjustments in the price of gasoline and/or its availability would have a significant impact on transportation patterns and the use of public transit facilities. This strategy is a complex one; it involves issues of energy availability and public policy that transcend the objective of increasing car pool ridership. For this reason a discussion of the use of gasoline rationing or increased taxation to promote car pools is beyond the scope and purpose of this report.

Table 1

Techniques for Increasing the Use of Car Pools

- I. Strategies that Assist in Car Pool Formation
 - A. Information and Promotion
 - B. Matching Programs
- II. Strategies that Furnish Incentives to Form or Maintain Car Pools
 - A. Subsidy of Car Pool Costs
 - B. Mandatory Programs
 - C. Priority Treatment in Traffic Flow
 - D. Preferential Parking
 - E. Subsidy of Parking Costs
- III. Strategies that Penalize Solo Driving
 - A. Gasoline Rationing
 - B. Increased Taxes on Gasoline

Strategies That Assist in Car Pool Formation

Information and Promotion

Car pool marketing strategies are designed to increase awareness on the part of the commuting public of the purpose and benefits of car pooling and to help convince solo drivers of the individual and collective advantages of ride sharing.

The type of campaign used to promote car pooling will vary based on the number of participants, the size of the sponsoring organizations, etc. Small firms would probably limit their informational and promotional efforts to bulletin board notices, staff meeting talks, and memos, whereas larger firms might include employer publications, pay envelope stuffers, etc.

When a firm is considered to be a major employer in an area, or if it has developed a particularly interesting car pool incentive, the local media may be able to provide feature coverage or favorable editorials. Such exposure through the media can be very effective in presenting pooling in a positive light to both the community and the firm itself.

Some people claim that promoting a car pool program requires a sales presentation that motivates people through enthusiasm. Others claim that promotion of car pooling to employers without major incentives is futile, because marketing is successful only when there is an attractive product to sell, and without adequate personal reasons a solo driver will choose not to car pool in spite of advertising and promotional campaigns intended to raise his awareness of its benefits.

For example, in Portland, Oregon, a car pool promotional campaign was considered to be a major portion of the overall transportation program strategy. The main objective of the effort was to create an atmosphere conducive to car pooling. An attempt was made to inform the community of the availability of a matching system and of the easiest way to gain access to the system. Promotion was on an area-wide scale for the initial stages of the program, while later activities were centered on specific population groups thought to be particularly well-suited to car pooling. (5)

Car Pool Matching Programs

A wide variety of methods are used to provide commuters information about people who live near them and whose working hours are similar. Most of the techniques practiced require some degree of involvement by the employer. These range from car pool matching

systems totally organized by the employer and operated from a single place of work, to regional efforts run by a central agency in which the employer's role is limited to assistance in collecting and distributing matching information. Techniques include computerized and non-computer-based information filing and retrieval systems, and self-service type methods such as locator boards and pin maps.

Car pool matching is a relatively low cost activity compared to many other types of strategies. Major expenses are for the staff, computer service, printing, mailing, mass media time, and office space. The tendency in pre-1975 programs was to concentrate the greatest effort and expense on technical aspects and substantially less on personalized marketing and training of coordinators in participating organizations.

Car pool matching is by far the most widely practiced activity directed toward encouraging ride sharing. Matching programs were especially dominant during and directly after the fuel embargo. An FHWA survey in September 1974 reported that 147 urbanized areas had some form of ongoing, areawide matching assistance. Nearly all car pooling demonstration projects (77 out of 81) funded under the Emergency Highway Energy Conservation Act involved car pool matching assistance.

An assessment of program effectiveness was received by the FHWA from 32 of the state and local sponsoring agencies. Only 8 of the 32 projects were considered to be moderately or very successful by the sponsors. The other 24 were judged not to be effective.(6)

"Caretaking" is an important function that helps ensure the continued success of the implemented program. As a rule, the maintenance function includes removing the names of employees who have moved, are no longer interested, or have formed car pools, and the addition of new employees interested in considering pooling or other workers who might have just become interested.

The various methods of car pool matching range from simple manual techniques to the use of computer programs. It is not the intent here to furnish detailed technical descriptions of each method. A discussion of matching techniques appropriate to car pooling is contained in reference (2). The following sections furnish some examples of car pool matching program experiences of selected areas.

El Segundo, California

An example of a highly successful and well-documented employer sponsored matching effort is the joint Aerospace Corporation/SAMSO program in El Segundo, California. This facility employs 6,000

persons and 20% of these applied for car pooling matches. In May 1974, a 25% random sample was taken by phone interview to evaluate the effect of the matching program. Sixty percent of the applicants formed car pools in 1974 and of these only 15.5% later dissolved the pools. The average vehicle occupancy rate for newly formed car pools was 3.09. Of those who formed car pools, only 28% named the matching list as the primary reason for pooling, although most agreed that the promotion created an atmosphere conducive to pooling. A rough accounting of costs incurred by the company estimated about \$2.00 per employee, or approximately \$13.00 per person joining a car pool. (6)

Dallas, Texas

The Texas Instruments Company in Dallas, which employs 23,000 people, instituted a comprehensive car pooling program in 1973 to meet the EPA transportation requirements for the area. With a car pool matching effort and parking priorities (and additional inducement from the fuel shortage) the average vehicle occupancy rate increased from 1.20 in October 1973 to 1.64 in April 1974.

Hartford, Connecticut

In 1972, the Connecticut Department of Transportation developed a UNIVAC computer program for a car pool matching service available to public and private employers in the state. Initially over 7,000 employees from 45 state agencies in Hartford submitted data forms for matching. Over 1,000 employees ride in car pools, and most of them park in spaces reserved for car pools. The approximately 100 companies from across the state that joined the program contacted between 80% and 90% of their employees. (6)

Portland, Oregon

This areawide project entitled CARPOOL was administered by the Oregon Department of Transportation, and was supported by an FHWA car pool demonstration grant of \$250,000 authorized in January 1974 as the first project in the nation to be funded under the Emergency Highway Energy Conservation Act. The project attempted to implement four general strategies: (1) mass media promotion; (2) assistance to employers and organizations in carrying out car pool matching, promotion, and incentives; (3) computer matching service to any individual submitting an application form; and (4) development of arrangements whereby existing suburban parking lots could be used for park and ride facilities by bus riders and car poolers.

The public phase of the marketing program was formally initiated in March 1974. This phase was based on a community-wide media campaign and computer system. Participation in the program was minimal, in spite of the substantial promotion effort. The result supported the belief that programs aimed at the general public have little chance of success.(5)

Boston, Massachusetts

In August 1973, WBZ, a Boston radio station, launched one of the nation's first regional car pool programs. Extensive promotional efforts accompanied the distribution of over a million application questionnaires. By the end of 1973, 7,537 completed questionnaires had been processed and 1,756 commuters had been matched. The low percentage of successful matches (23%) was well below the goal of 50%. By March 1975, at the height of the shortage, the number of applications had increased to about 13,000 with a 29% match rate.

The experience of such a low ratio of applications received (13,000) to questionnaires distributed (over a million) during the height of the energy shortage could indicate commuter disinterest in a regional car pool program. Only a fraction of those who were matched actually formed pools, primarily due to the use of zip codes to indicate home locations.

Iowa

A survey of commuters in Iowa found that the results of a car pool matching and promotion program, in terms of the number of car pools formed, was very disappointing. Up to half of those respondents who had initially indicated an interest in pooling stated in a follow-up survey that they were really not interested. Thus, when it came to actually forming a car pool, the disincentives proved to be too strong. From these figures, the Iowa study concluded that those who really want to be in a car pool already are, and those who are marginally interested are not provided with sufficient incentives to change their present commuting habits.

Results of Matching Programs

Car pool matching assistance and promotion is applicable to a wide range of sizes and types of urban areas. The high degree of success achieved in medium to large urban areas is probably attributable more to the organizational abilities of those involved than to city size. Within a large city, the application of

car pool matching is best focused on places having large concentrations of employees, such as the central business district, major activity centers, or large individual employers. Small firms, as a rule, are less willing or capable to participate in a matching program.

A wide range of results have been obtained in car pool matching assistance ranging from total lack of interest and impact in some places to highly successful programs by some employers. Active involvement by employers seems to be an important element in employer based programs, but car pool matching assistance by itself is not sufficient to cause a significant increase in car pooling. Successful efforts in increasing the levels of car pooling have virtually always been accompanied by other identifiable motivating forces such as the energy crisis, gasoline price increases, parking restrictions, or high parking cost or inconvenience.

There has been a tendency to rely on car pool matching and not pursue the development of more comprehensive programs of car pool incentives. Mass distribution of matching applications, such as that carried out in the Boston regional program, tend to be of limited effectiveness, whereas programs based on an identified affinity group (such as place of employment) will result in a consistently high rate of positive responses.

Finally, dial-in services seem to fulfill a need among persons desiring to car pool but who cannot receive matching service through their employers. The total number using the service is small, but due to their degree of interest availability of the service should result in a high level of car pool formation.

Strategies That Furnish Incentives to Form or Maintain Car Pools

Car Pool Cost Subsidies

Car pool cost subsidies involve payment by employers of direct or indirect subsidies to their employees in order to encourage the use of car pools. The most widely practiced car pool cost subsidy by employers is the provision of free or low cost parking only to car poolers. Other forms of car pool cost subsidy include direct cash payment to car poolers, payment of all or part of the cost of a company sponsored subscription van or bus pool service, and the provision of special fringe benefits having tangible financial worth to employees who car pool.

Car pool subsidies represent programs voluntarily undertaken by an employer. In any given firm, a program could be developed rapidly. The cost of the program would be about \$20.00 per month per employee, but if it were instituted with the elimination of parking subsidies, this cost would be reduced considerably.

In order to avoid inducing existing transit patrons to shift to car pooling, subsidies should be provided to transit riders as well as car poolers. In fact, transit subsidies are presently in more widespread use than car pool subsidies.

Only a small percentage of firms are presently offering financial incentives to car poolers. Of these, few have been capable of isolating the effect of the incentive to provide a clear indication of the resulting changes in commuting behavior. Examples of firms providing incentives are cited in the following sections.

Port of Portland

This public authority began its program in December 1973 to encourage car pooling during the fuel shortage. The program included monetary subsidies to groups of three or more persons forming a car pool at a rate of \$10.00 per month parking fees and 11 cents a mile for round-trip commuting mileage up to 20 miles. Bus riders were given up to \$1.00 per day in fares. A total of 214 employees were eligible for the program; 78 were riding in car pools, and 24 in buses as of April 1974. There is, however, no indication of how many of these pools were formed as a result of the program. The program could be provided to only nonunion employees due to problems that would have been encountered in labor contract negotiations. There was, as could be expected, some public criticism of the program by persons objecting to what was considered to be the misuse of public funds, but the objections were not great enough to cause cancellation of the project.

Arundale Manufacturing, Inc.

A small plastics company outside St. Louis, Missouri, began a car pool subsidy program in March 1975. The company pays drivers 2 cents per mile for the first rider served, and 3 cents a mile for each additional rider. Approximately 40% of the company's 60 employees are participating in car pools, and it is estimated that for a forty-mile round trip, a driver and two passengers receive \$500 a year in benefits.

AiResearch

A manufacturing company in Phoenix, Arizona, has awarded prizes to car poolers in order to stimulate the use of car pools. Initially, color TV's were given as the prize for the drawing, but this prize was replaced by four \$100.00 dollar savings bonds. No evaluation of the effect of the program has been provided.

Mandatory Car Pool Programs

In mandatory programs government action requires employers to engage in car pool programs involving such activities as matching assistance, promotion of ride sharing, sponsorship of employer based incentives, etc. Experience has shown that while employers who have become involved in car pool programs could have a positive effect on car pooling in their firm, too few have become involved to significantly affect VMT. Therefore, the primary purpose of mandatory programs is to increase the number of employers engaged in car pool programs.

Mandatory provisions could be implemented by federal, state, or local government units. The EPA, under authority of the Clean Air Act Amendments of 1970, incorporated mandatory employer car pool programs in several of its metropolitan area transportation control plans. These programs have been one of the least objectionable elements of the EPA's regulations to employers, especially as compared to mandatory parking constraints, which were strongly opposed. In general, however, federal mandates to reduce urban area travel have been ineffective.

Legislation and regulation at the state level could potentially be the most effective means of mandating action. In Colorado, for example, companies are required to engage in car pool matching and incentives. State level action appears to be more effective than local controls because of the multitude of government jurisdictions in most metropolitan areas.

A mandatory program would be most equitable if it were implemented simultaneously for all sections of an entire urban area rather than for selected parts. The program could logically be staged over time, however, with priority being given to firms employing large numbers of people.

The mandatory program requirement could be implemented fairly quickly, and employer programs would be required to achieve maximum potential in 2 to 3 years. Continuous efforts would have to be provided beyond that time to maintain the program's effectiveness.

The cost of administration and coordination in a mandatory program would be moderate, and a larger share would be borne by the individual employer than by the coordinating agency. The coordinating agency's costs are primarily for specialized staff to promote marketing and technical assistance to the employer. A successful program might significantly reduce the need for additional highway facilities in many urban areas.

Mandatory employer car pool program regulations are in effect in a limited number of places, but the programs have produced few conclusions regarding their effectiveness relative to either voluntary employer programs or areawide matching programs.

Transportation Control Plans

Under EPA regulations promulgated in 1973-74, employer mass transit and car pool incentive programs are progressing in several urban areas. Substantive plans have been submitted and implementation is under way in areas such as Boston, the New Jersey suburbs of New York, Phoenix, Baltimore, Houston, and Pittsburgh. Early EPA directives included provision for reductions in the employers' parking spaces as a part of their car pool programs, but these requirements were suspended in 1975.

Boston

The mandatory employer car pool program in Boston required under the EPA regulations is the most comprehensive example available. The plan requires that employers with 50 or more employees at a single location and educational institutions having 250 or more student and employee commuters carry out a series of measures aimed at a target reduction of 25% in single-occupant commuter cars. The elements include:

- Making available any pass offered by the local transit agency
- Disseminating information
- Publicizing any applicable on-street parking restriction in the vicinity of the facility
- Offering bicycle incentives
- Working with the transit agency to obtain enhanced services

0812

- Conducting car pool matching and promotion in firms having 250 or more commuters
- Providing van pool vehicles to employee groups of 8 or more who can support their operation (this applies only to firms of 1,000 or more employees)

Colorado

The Colorado Air Quality Control Commission Regulation Number 9 formulated in 1974 requires companies employing 250 or more persons at one location to engage in car pooling matching and incentives. Firms with 50 or more employees are required to comply at a later date.

Priority Treatment in Traffic Flow

A variety of traffic control techniques may be used to give high occupancy vehicles preferential treatment. If travel time is shorter for riders in high occupancy vehicles than in low occupancy ones, the relative attractiveness of car pooling and other ride-sharing modes will increase.

Most preferential lanes and ramps are generally low cost projects that involve the installation of traffic control devices; some have involved new construction or the allocation of a lane for high occupancy cars only. Exclusive freeway lanes such as the San Bernardino busway and the Shirley Highway involved major construction.

Most bus priority projects can be implemented quickly, but a region-wide development for a total system will take several years or longer. Preferential treatment concepts are still considered experimental by most agencies, but operation, enforcement, and safety records of existing facilities have generally proven the viability of this strategy.

There are several examples of lanes constructed within an existing freeway right-of-way that are physically separated from the general traffic lanes and assigned for exclusive use by buses and car pools. One of the best examples is the Shirley Highway in Northern Virginia. A discussion of this project follows.

Interstate 395 south of Washington, D. C. has a two-lane roadway constructed in the median strip for an 11-mile section from the beltway (I-495) into Washington, D. C. Buses have been permitted to use the lane since its opening in 1969, and car pools with four or more occupants have been allowed to use the lanes since December 1973. However, car pools were not allowed to travel the entire distance but were required to exit at the Roslyn ramp and take a circuitous route into the city. In October 1974, the exclusive lanes were opened to car pools for the entire length of the facility.⁽⁷⁾

Daily corridor bus ridership increased steadily from 14,300 in mid-1973 to 24,300 in November 1974. Transit's share of the total travel in the corridor increased from 27% prior to the project's implementation to 40% in mid-1974. Bus travel times were virtually cut in half as a result of the bus lane.

Use of the lane by car poolers rose from approximately 300 vehicles in December 1973 to nearly 3,000 vehicles in March 1977. The travel time advantage, while difficult to determine, is known to be considerable.⁽⁸⁾

Preferential Freeway Lanes

Existing freeway lanes can be converted into preferential lanes for buses and car pools. There are several examples of preferential freeway lanes in the U. S., and some of these are discussed below.

San Francisco

On the San Francisco Bay Bridge two approach lanes to the inbound toll plaza are reserved for car pools having three or more occupants during the morning commuting period (from 6 to 9 a.m.). A third lane is reserved for buses. Car pool vehicles initially qualified for large reductions in the daily 50-cent fare by purchasing a \$12.00 annual pass. As of March 1, 1973, this nominal charge was dropped, and car poolers can use the bridge toll free so long as they use the two reserved lanes through the toll plaza. The reserve lanes are 1/2 mile long and permit the priority vehicles to pass most of the congestion. Car pools and buses save approximately 5 minutes during the peak period.

The Bay Bridge reserve lanes were first used in December 1973. The number of three-person carpools immediately jumped from 1,000 to 2,000 vehicles during the 6 to 9 a.m. period, and later stabilized at 1,800. Some enforcement difficulty was experienced in the operation of the reserved lanes.

0814

The total cost of implementing the Bay Bridge reserve lane system was \$400,000, of which \$350,000 was spent for the special signal system. Toll revenues decreased by \$25,000 per month due to reduced tolls for priority vehicles.

A recent study of the San Francisco transportation system noted that a large portion of the increased number of car-pooling vehicles were actually commuting vehicles which had changed their original trip path to take advantage of the reduced Bay Bridge fare. It was also found that a certain portion of the increased rate came from people who adjusted their travel times to take advantage of the rush hour discount. Therefore, it is not exactly clear whether the priority lanes actually increased the level of car pooling or merely redirected it.

Honolulu

On the Moanalua Freeway in Honolulu a with-flow preferential lane was opened in October 1974 to buses and car pools with four or more occupants. The reserved lane is provided for 2 miles upstream of a major bottleneck point. Vehicles in the reserved lane save 10 to 15 minutes traveling through the congested section. No documentation of the effects on levels of car pooling has been provided.

Boston

On Interstate 93 entering Boston, a short section of with-flow preferential lane approaching the bottleneck at the interchange with the central artery was opened in 1974. Car pools having three or more occupants save about 5 minutes of delay at this point during the peak period.

Portland

Preferential lanes for buses and car pools having three or more occupants were opened on December 15, 1973, on the Banfield Freeway in Portland, Oregon. The median lane in both directions is reserved 24 hours a day for buses and car pools on a 3-mile eastbound and 5-mile westbound section. These sections were widened from two to three lanes to accommodate the preferential lanes by expanding onto the median strip.

Seattle

A preferential lane for buses and car pools operates on the 2-mile approach to the Evergreen Point Floating Bridge. The bridge toll is 10 cents for car poolers compared to 19.5 cents for the usual commuter discount. The result has been an increase in car pooling from 7% to 15% of the total persons crossing the bridge.

Los Angeles

The provision of preferential treatment for car pools on freeway ramps is a newer concept than preferential lanes, but early experience shows positive results.

As of October 1973, 13 freeway ramps in the Los Angeles area had been adapted to provide preferential access to vehicles carrying two or more persons. The first of the preferential ramps were opened in Los Angeles in June 1973 and April 1974 on the Lakewood and Hawthorne ramps to the San Diego Freeway. Implementation costs were very low, involving only signaling and pavement markings. Car poolers save an average of 5 minutes. The average occupancy per car at the Lakewood ramp increased from 1.23 to 1.56, and that at the Hawthorne ramp increased from 1.18 to 1.38.

Recent data from all 13 of the preferential ramps showed that car pools saved, on the average, 2.65 minutes. The number of two or more person vehicles increased an average of 45%, and the average occupancy for all 13 ramps increased from 1.24 to 1.33, a 7% increase. No significant enforcement or safety problems have been encountered.

Preferential Surface Street Lanes

The concept of preferential lanes can also be applied to surface arterial highways that are subject to recurrent congestion. While bus lanes on surface streets are widely used, as yet there has been limited use of the technique for car pools.

Miami

On the South Dixie Highway in Miami a 5-mile long contraflow bus only lane and a with-flow car pool preferential lane were implemented in the fall of 1974. This facility is a six-lane divided surface arterial highway. Car poolers save about 3 minutes compared to non-poolers who travel in the congested regular lanes. Evaluation of the data indicates an increase in auto occupancy from 1.2 to

1.5 persons per vehicle. The number of car pools increased from 18% to 28% of the total vehicles, and the car pool lane is now carrying more people with fewer cars than either of the regular lanes.

Northern Virginia

Two arterial highways have been provided with preferential car pool and bus lanes in Northern Virginia. The Wilson Highway, which is a major commuter route into Washington, D. C., has a preferential lane instituted by the Arlington County government. Violations of the lane by non-car poolers is extensive due to a lack of adequate signing and enforcement. Another preferential lane was established by the Virginia Department of Highways and Transportation on Arlington Boulevard.

Parking Incentives

A variety of techniques have been used to enhance the convenience of parking for car poolers, and in some instances have produced significant travel time or cost savings. The techniques include providing a guaranteed space to poolers when parking is scarce, assigning the most convenient spaces to car poolers, and assigning interior spaces to car poolers.

Preferential parking is an incentive that can be implemented voluntarily by many types of employers. It is a low cost, immediate action strategy requiring only that the employer modify his present system of parking allotment. There are a few cases of preferential treatment in public lots but they are much less common than in employee lots.

Preferential parking is a widely practiced form of car pooling incentive and it is often included as part of an employer-sponsored car pool program. Some examples are discussed in the following sections.(5)

National Aeronautics and Space Administration (NASA)

Priority parking rules favoring car pools are practiced in many federal agencies in Washington, D. C. The NASA headquarters instituted a preferential parking permit system in 1964. Spaces are assigned on a point system based on car pool size, government service grade, and cumulative seniority of the car pool members. More than half of the 1,500 employees are regular car poolers and the average auto occupancy of car pools is 3.85 persons. The

Department of Transportation has a similar parking policy. A survey taken among their personnel indicated an average auto occupancy of 2.4 persons.

Government Employees Insurance Co.

In a Washington suburb, the Government Employees Insurance Company (GIECO) with 3,900 employees and only 1,100 parking spaces faced a parking shortage in 1974. Zoning was denied for construction of additional parking facilities. GIECO's solution was to establish priority parking spaces for car pools of three or more persons, a car pool matching service, and a bus pool program. As a result, over 343 parking permits servicing 1,036 employees were issued, raising the overall average auto occupancy to 2 persons per car.

General Electric, Massachusetts

The General Electric plant in Lynn, Massachusetts, as part of a comprehensive car pool program set up a fenced in and guarded lot for car pooling vehicles. This incentive was particularly effective in that the employee lot and surrounding area was experiencing a major crime wave of auto theft and break-ins.

New England Telephone

A 200-space section of Southern New England Telephone's 450-space lot was reserved for car pools of four or more occupants. Competition for the remaining spaces is intense, with some low occupancy cars arriving as much as an hour early to get a space. Commercial parking near the facility costs from \$20 to \$30 per month.

Pentagon

The Pentagon, with 25,000 employees, has a preferential parking policy which allows close access to the building as an effective incentive. Formerly, spaces were assigned solely on the basis of military rank or equivalent civilian grade. A close-in preferential lot was established in 1970 and was expanded several times, until in mid-1975 there were close to 5,000 registered car pools averaging 2.6 persons per car. When other modes of ride sharing are included, almost 80% of the employees are commuting by means other than single-occupant automobile.(5)

Car Pool Subsidies

The payment of subsidies for all or part of the parking cost of car poolers is another incentive to promote car pools. Traditionally, U. S. employers have provided free parking for all employees, in effect subsidizing solo driving more than any other mode. By replacing this practice with a selective subsidy, the differential cost advantage between car pooling and driving alone could be increased.

Both public and private organizations have implemented parking subsidy programs. There are also some examples of public agencies that have provided free parking in publicly owned facilities.

Car pool subsidies are generally implemented through voluntary action with encouragement rather than mandates from government agencies. The most effective method of program initiation would be to begin the parking subsidy at the same time as the general employee subsidy is removed. Some examples of subsidized parking for employees are described in the following sections.

First and Merchants Richmond

The First and Merchants Bank's Central Office in Richmond, Virginia, began a program of subsidized parking to promote car pooling during the 1973-74 fuel shortage. A standard rate of \$20.00 a month was charged to each full-sized car, and \$18.00 per month for subcompacts. Then for each occupant in the vehicle other than the driver, \$5.00 was removed from the bill. Thus a full-sized car with three riders and a driver would pay \$5.00 a month. A subcompact would have to pay only \$3.00 a month. (A limit of \$15.00 was placed on the deduction.) Information is not available as to the number of car pools that were created as a result of the program. It should be noted that at the time the program was first initiated, the F & M lot was not being utilized to its capacity, so the firm's program was not motivated by an employee parking shortage.

Boston

Prudential's downtown Boston office operates a program of free parking for employees in car pools with three or more occupants. The cost savings per car averages \$2.00 per day when compared to low occupancy commuter rates. Approximately 60% of all commuters participate in the car pool program. The demand for free parking spaces exceeds the available supply, and a waiting list is maintained. This

experience does not conclusively show that the free parking incentive is a contributing factor in the current high levels of car pooling, because the nearby John Hancock parking facility has a higher rate of pooling without the parking incentive.

Seattle

In 1974 Seattle opened a 169-space free car pool lot under an elevated freeway on the edge of the central business district. Car pools having three or more occupants can save approximately \$1.00 per day. Car poolers must obtain certification to be eligible to use the lot, and recertification is required every 3 months. The lot is filled to capacity with cars having an average occupancy of 3.8 persons, and there is a waiting list of about 50 cars.

San Diego

The city of San Diego operates an employee parking facility downtown where rebate coupons are given to car poolers. Each day upon emerging from the lot, the car pool drivers are given coupons worth 20 cents for each passenger. For a three-person carpool, 40 cents in coupons would be collected each day. The regular fee is \$18.00 per month, so that a three-person car pool is refunded almost half the cost.

Portland

Car pools of three or more persons working at the Port of Portland receive \$10.00 per month toward parking fees as part of a car pool incentive program. Also included is an 11-cent-per-mile mileage payment for up to 20 miles round-trip distance, and a reimbursement of transit fares of up to \$1.00 per day.

Car pool parking subsidies appear to be most applicable in medium to large cities and in downtown and other major activity centers where parking costs are high and parking spaces are relatively scarce.

Another parking strategy is to price employee parking at its free market value. No distinction would be made between car pools and other vehicles, but rather the natural advantages of the shared cost of car pooling would enhance its attractiveness. The true market value would depend a great deal on the firm's location. An open suburban lot would be valued at a lower amount than downtown office buildings.

Free parking for employees is a widespread tradition in most U. S. cities. In fact, over 90% of urban commuters do not pay for parking. The basic problem is to get significant numbers of employers to make the transition to car pooling and either eliminate or reduce the subsidy without damaging employee relations. In the past it has been to the employee's and employer's advantage to provide free parking as a tax benefit. This advantage, however, could be eliminated by an Internal Revenue Service ruling that benefits such as free parking constitute taxable income. With the removal of this incentive, more firms might be willing to consider a program of direct salary payment in lieu of a parking subsidy.

The greatest opportunity for the elimination of employee parking facilities is where a third party owns or operates the employee parking facility. In this case a free market value has already been established and the transfer from parking subsidy to salary increase can easily be made.

SUMMARY AND CONCLUSIONS

This report has described the various strategies for increasing car pools that are available to highway and transportation agencies in the state. The principal program categories are car pool promotion and matching; priority treatment on freeway lanes, arterials, and ramps; and parking incentives. Other approaches such as mandatory car pool programs, taxation, and rationing of gasoline are applicable in periods of severe crisis such as wartime or embargoes on imports.

Car pool matching and promotion is a necessary ingredient in a car pool program, but not a sufficient one. Seeking better ways to identify potential riders is essential, but the incentive to car pool must also exist. Improvements in matching programs will involve a personalization of the process that seeks to recruit riders of a compatible nature. The personalization of this process will do much to enhance the value of matching efforts.

Preferential treatment on highways, arterials and ramps represents the most visible public effort to demonstrate a commitment to use the highway system at its highest level of capacity. This technique is most effective where high traffic volumes exist and where the incentive to car pool is created without causing undue hardship on current traffic.

Parking incentives are also an effective mechanism for promoting car pooling in major activity centers or in facilities with

a large number of employees. This strategy is dependent to a large extent on the existence of parking shortages or limitations on expansion. It also requires strong support from management and a rational, evenhanded administration that is perceived by employees as being fair and equitable.

The overall results of car pool incentive programs have been marginal at best, if measured by the increase in average car occupancy rates. The most dramatic results appear during times of extreme stress or shortages. Nevertheless, most car pool incentive programs have resulted in improvements in travel time and cost, and represent an activity that government and industry can pursue if they wish to increase the efficiency of current transportation systems.

0322

REFERENCES

1. Lester A. Hoel and Moreland Herrin, "Organizing and Operating a Vanpool Program," Virginia Highway and Transportation Research Council, VHTRC 77-R15, September 1976.
2. George S. Goodwin III, and R. Neal Robertson, "Methods of Identifying Potential Vanpool Riders," Virginia Highway and Transportation Research Council, VHTRC 77-R40, February 1977.
3. John K. Austin, and Lester A. Hoel, "Ride-Sharing Activities of Virginia Industries," Virginia Highway and Transportation Research Council, VHTRC 78-R6, September 1977.
4. Transportation Research Board, "Executive Summary: Carpooling Seminar," Circular No. 169, August 1975.
5. Jack Graham, Portland Metro Area Carpool Project, Interim Report, December 1974.
6. Cambridge Systematics, Inc., Carpool Incentives: An Evaluation of Operational Experiences, Cambridge, Massachusetts, March 1976.
7. Lew A. Pratsch, "Carpools: How Successful," Civil Engineering, February 1973.
8. James T. McQueen et al., The Evaluation of the Shirley Highway Express Bus on Freeway Demonstration Project, Final Report, August 1975, DOT, FHWA, Technical Analysis Division, National Bureau of Standards, U. S. Department of Commerce.

0924