ATTITUDES TOWARD AND EVALUATION OF CARPOOLING

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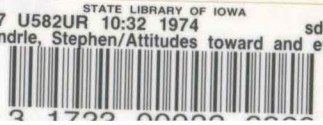

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PREFACE

The energy crisis of 1973-74 precipitated a national effort to conserve energy in as many ways as possible. People were officially requested to turn down household thermostats, reduce the use of electrical appliances, and to be energy-conscious at all times. In addition, the nation was officially requested to limit automobile use, to travel at reduced speeds, and some states reduced speed limits to enforce a more economical rate of travel. Although there was definitely a shortage of available fuel, energy planners announced that conservation measures could make existing supplies adequate. Small savings by everyone were stressed rather than massive savings in a few areas.

Out of this milieu came renewed interest in an old idea--carpooling. It neatly fits the needs of the day. Small groups of people cooperating to save energy can generate large energy savings at the national level. The sacrifice is minimal for each individual, yet the benefits are large.

Happily, unlike some conservation measures, carpooling is advantageous for both the participating members and for the society at large. It took a crisis to point the way, but carpooling is now recognized as a valuable practice, energy crisis or not.

INTRODUCTION

Three manifestations of this nation's automobile transportation system are fast becoming critical problems--congestion, energy consumption, and cost. Congestion defeats the automobile's prime advantage of providing personalized, highly flexible transportation. The car originally freed people to travel much more widely than ever before and allowed them to take advantage of a wider range of opportunities. Overloading highways negates the speed and flexibility advantage of auto transit. Building more roads to accommodate for autos has become both an economic and an environmental strain. We are losing the freedom and ease of transit that the automobile once provided.

Congestion is not a 24-hour problem however. Existing street and highway capacity can easily handle or be modified to handle well-distributed traffic flows. The problem lies in the uneven distributions of traffic--rush-hour traffic. Rush-hour traffic, both morning and evening, is the result of highly regularized work schedules which put the majority of the working population on the road at the same time.

If a city has public transportation, it too is generally strained during the rush periods. The only way to increase the capacity of mass transit facilities is to add expensive hardware--more buses, railroad tracks, subway lines, etc. If each person continues to drive his own vehicle to work, adding additional road capacity is the only solution. However, this nation's transportation program has been adding road capacity steadily for twenty-

five years in an effort to do this and has still not succeeded. The alternative is to devote time and energy to increasing the occupancy of each existing vehicle, thereby reducing the traffic demand and still providing highly flexible, rapid personal transit. Most of the original advantages of automobile transit can be retained, and the disadvantages reduced. Carpooling is a logical way to increase vehicle occupancy.

It is the work trip then, on which efforts must be concentrated if congestion is to be reduced through increased vehicle occupancy. The work trip also is the most adaptable to organization because it is a highly regularized trip for most people and the place of work provides a convenient instrument for organization. Large numbers of people ultimately congregate at the work place, so logically with minimal effort at grouping a collection process can occur at the residential end of the work trip. It is estimated by the Highway Users Federation that increasing the average vehicle occupancy from 1.6 to 2.0 persons per vehicle in urban areas can reduce rush-hour traffic by as much as 20%. This slight mean increase is a significant inroad into the congestion problem.

As indicated in Tables 1 and 2, the automobile transit problem is more than a congestion problem. An excessive number of vehicles consume an excessive amount of energy. In 1970, 24.4% of the nation's total energy consumption was attributed to transportation. Transportation uses consumed 54.4% of the nation's petroleum.* Obviously, transportation is responsible for a

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*Tables 1,2,3 were originally prepared for: Dueker,K.J. and Bair, B.O. "Transportation and the Energy Crisis", Technical Report #21, Institute of Urban and Regional Research, University of Iowa, 1973.

Table 1

Total National Energy Consumption
(BTU's - in trillions)

	1965	Percent of Total	1970	Percent of Total	Percent Increase
Household & Commercial	11,831	22.2	13,988	20.7	18.2
Industrial	17,207	32.3	20,339	30.2	18.2
Transportation	12,714	23.8	16,472	24.4	29.6
Electrical Gen., utilities	11,042	20.8	16,430	24.4	48.8
Miscellaneous	549	1.0	215	0.3	-60.8

Source: Bureau of the Census, U.S. Department of Commerce, The American Almanac, Grosset and Dunlap Inc., New York, 93rd Edition, September 1972.

Table 2

Petroleum Consumption
(1971 - in millions of barrels)

	Fuel Consumption	Percent
Household & Commercial	1,149.6	20.8%
Industrial	982.0	17.8%
Transportation	3,004.9	54.4%
Electrical Generation	386.9	7.0%
Total	5,523.4	100.0%

Source: Department of Interior, cited in Executive Office of the President, Office of Emergency Preparedness, The Potential for Energy Conservation, October 1972.

large portion of our total energy consumption and an even greater portion of fuel consumption. However, where consumption is greatest, the possibilities for conservation also are greatest.

Automobile trips constitute a large part of our total transportation energy consumption. In fact, 57.1% of all transportation energy consumption is attributed to urban and inter-city automobile trips. Thus, more than half of our national fuel consumption is due to transportation uses and more than 57% of that to automobile consumption alone. Finally, the U. S. Department of Transportation has calculated that 34.1% of the total vehicle miles traveled are traveled as work trips. The importance of effecting savings on the work trip begins to become apparent as we realize the quantity of energy that is consumed in going to and from work. Table 3 shows the potential for fuel savings through increased vehicle occupancy on work trips. Increasing the average occupancy by one person per vehicle can reduce the national fuel consumption by 14.2% and the automobile work trip fuel consumption by 41.7%. A less ambitious goal of increasing average work trip occupancy by .6 persons per vehicle can result in a 10.2% national fuel savings and a 30% savings in auto work trip consumption. These are significant savings, especially in times of energy shortage when a savings of a few percentage points in national fuel consumption is the difference between an adequate and an inadequate fuel supply.

The costs of this excessive fuel consumption are borne directly by the automobile commuter and ultimately by society as a whole. Personal

Table 3

FUEL SAVINGS THROUGH INCREASED AUTO OCCUPANCY FOR WORK TRIPS

Basic Data:

Work trips = 34.1% of total vehicle miles

Average Occupancy = 1.4

Total Gallons of fuel = 65,649 mil. gal. (cars only)

Work trips = 34.1% x 65,649 = 22,386 mil. gal.

Average Occupancy per vehicle	Fuel Consumed (millions of gallons)	Fuel Saved (millions of gallons)	Percent Savings	Percent Savings in National Consumption
1.4	22,386.0			
2.0	15,670.2	6,715.8	30%	10.2%
2.4	13,058.5	9,327.5	41.7%	14.2%
2.8	11,193.0	11,193.0	50%	17.0%
3.0	10,446.8	11,939.2	53.3%	18.2%

Sources: U.S. Department of Transportation/Federal Highway Administration, "Highway Statistics 1970," Washington, D.C., U.S. Printing Office, 1970.

Motor Vehicle Fuel Tax Division, Revenue Department, Report of Motor Fuel Tax Receipts, Iowa State Government, Des Moines, Iowa.

fuel and auto upkeep expenses are borne by the auto commuter. The single occupant automobile trip is also the most expensive form of transportation. The Highway Users Federation calculates that the cost of a ten-mile work trip in a metropolitan area of one million people is $2.64 (1973). Table 4 compares this cost to other forms of urban transportation. Although the single occupant auto trip heads the list, the full car trip is at the bottom. Depending on the number of people in the car, the private automobile can be either the most expensive or the least expensive form of transportation. No matter what the cost of a work trip in any area, a car full of expense sharers is the cheapest way to travel to work.

The savings are arithmetic. At $2.64 per trip, the cost is only $0.66 per trip if divided four ways, and only $0.44 per trip if divided six ways. Due to the highly structured pattern of the work trip and the clustering of commuters at various work places, this kind of auto occupancy can be obtained through organizational effort at the work place. The economic savings to the commuter is obvious. The shift to shared transportation facilities and costs may be imperative if gasoline continues to be scarce.

The savings to society-at-large, gained through carpooling, is environmental. Reducing the number of vehicles on the road reduces total auto emissions. In high density urban areas, the necessity of doing this is fast becoming critical. Reducing congestion on existing traffic arteries reduces the need for additional highway construction and reduces the environmental problems associated with that construction.

TABLE 4

PER PERSON ECONOMIC COSTS OF COMMUTER TRIPS

Automobile - One occupant	2.64
Rail transit - Kiss and ride	2.52
Rail transit - walk access	2.46
Rail transit - park and ride	2.13
Rail transit - bus access	1.66
Automobile - 1.6 average occupancy	1.65
Bus - exclusive lanes	0.78 - 2.25
Automobile - two occupants	1.32
Automobile - three occupants	0.88
Bus - conventional	0.86
Automobile - four occupants	0.66
Automobile - six occupants	0.44

Ten mile trip to work in urban areas of over one million population.

From: Carpools and buses - Highway Users Federation

Carpooling is a means of making the most of what exists. Congestion problems, energy shortages, personal costs and social costs all need long-term attention, but they also need immediate attention. Carpool organization is within present technological capabilities and can produce benefits far beyond the costs of implementation.

The question remains: if carpooling is so advantageous from both a personal and social viewpoint, why isn't it more common? There are three parts to the answer. First, carpooling requires organization. It is not enough that a group lives close together and travels to the same place (or close to the same place) each day. The members of that group must also be aware of each other. It is this awareness of carpooling possibilities that is so often lacking, thus, the need for organization.

Second, there must be sufficient incentive inducing people to forego the convenience of private auto transit. This incentive can be negative in nature, i.e., undesirable existing commuting conditions, or may be positive, i.e., inducements by an employer.

Third, negative attitudes toward carpooling must be overcome by efficient operation of carpools. This study examines these problems through an attitudinal study of the willingness to carpool displayed by employees of three different firms. It addresses itself to the question, "Why isn't carpooling more common?"

Methodology

In order to answer this question, three different categories of work

place in Iowa City, Iowa, were selected; a predominately white collar firm (American College Testing Service), a predominately blue collar firm (Sheller-Globe Company), and the faculty-staff of the University of Iowa. The predominately white collar firm will hereafter be referred to as "WC", and the predominately blue collar firm will be referred to as "BC".

Carpools for commuting students at the University had been formed independently, but they were not included in the study.

A survey questionnaire was prepared that included both attitudinal questions regarding carpooling and specific work trip questions. From these surveys, carpool groups by work place were compiled and made available to employees. An analysis of respondents' attitudes was then conducted to determine current feelings about carpooling, barriers to carpooling, and factors people consider important in carpool formation. A follow-up evaluation questionnaire was later distributed to determine the efficiency of the carpooling organizational effort.

Carpool Formation

Very little information is necessary to form carpool groups by industry. The essential information is common time, origin, and destination (TOD). Consequently, the survey of employees determined the time each leaves the home, the time his/her shift begins, quitting time, variation in this work pattern, home address, phone number, and interest in carpooling. Although the survey instrument contained considerably more than this, this information

was compiled first so that carpools could be formed as soon as possible. The management of each firm involved cooperated by reproducing, circulating, and collecting the questionnaires.

The compiled questionnaires were then manually sorted according to willingness to carpool. Those willing were plotted on a map and coded for different starting times. Both a city and state map were used because some employees drive fifty or more miles to work. The mapping process revealed significant clusters of residences both in Iowa City and in surrounding small towns. The people with similar TOD's were compiled into suggested carpool groups. Persons living along an obvious route to work were also included. These lists were then made available to each person on the list. The responsibility for forming the carpool was then theirs. This investigation merely performed the function of grouping people interested in carpooling. Subsequent evaluation indicates this is insufficient.

Employer Incentives

Once the matching lists are provided, whether carpools will be formed or not depends on a number of factors. Among these are the attitudes of each employee toward carpooling, each employee's personal obligations, the success of contacts with other members of the potential carpool group, and the degree to which carpooling can save the employee either time or money. These elements may or may not provide sufficient incentive to carpool. Often the incentive is not sufficient due to existing commuting conditions. However,

if the employer is committed to carpooling, he has the power to introduce additional incentives. Preferential parking for carpoolers, either closer to the plant or at a cheaper rate has been an effective incentive in large plants. Sometimes if parking is in short supply, employees have a problem finding a parking space at all. The employer may then be spared the expense of purchasing additional land for parking if the number of employee cars can be reduced.

Another incentive that appeals to employees is company-provided emergency transportation. If an emergency or unscheduled trip must be made during the day, a carpooler is stranded. The company can demonstrate its commitment to carpooling by providing for this contingency. Sometimes an existing company vehicle can be set aside at little or no cost to the employer. Other employers have preferred to pay cab or bus fare to increase the incentive to carpool. An example of extreme company commitment to carpooling exists at the 3M Plant in St. Paul, Minnesota. The company purchased vans for selected employees and made them vanpool drivers. They then collected employees for the work trip to work during the week, and were permitted to use the vans for personal use on weekends.

The particular incentive obviously varies depending on the resources of the employer; the scope of the carpool project, and the degree to which built-in incentives are a factor. Providing added incentive demonstrates the employer's commitment to carpooling because the employee must make some gain if he/she is to carpool. But the incentive is not a giveaway

because often, it is to the employer's benefit to encourage carpooling. As mentioned earlier, additional land purchases may be unnecessary or green areas may not have to be paved over for parking if the volume of cars can be reduced. A small investment to monitor preferential parking or to provide emergency transportation can definitely be advantageous.

Three firms participated in this study. The University of Iowa distributed the carpool matching questionnaires with the applications for next year's faculty/staff parking permits. The University is in a good position to offer a parking incentive because of the highly structured parking permit system used on campus. Faculty and staff are assigned to lots based on rank and seniority. In the past, parking permits cost $60 per year ($5 per month) and have been increased to $78 ($6.50 per month) for 1974-75 and will be $96 ($8.00 per month) in 1975-76. Carpoolers will be able to divide this cost among themselves and the University will offer them second highest priority, next to handicapped, for lot assignment.

The white collar firm is located on the urban periphery and is on the brink of a parking shortage. Unlike the University, it does not have a highly structured parking system, so any preferential treatment would be based on voluntary compliance by the employees. The parking lot is not large enough to make close-in parking an attractive incentive and parking is free (viewed by management as a fringe benefit) so reduced rates cannot be an incentive either. The firm was unwilling to use company vehicles in the project. They did promote the carpooling idea however, and were very cooperative about

duplicating, circulating, and collecting questionnaires. The personnel office provided space for a large map and provided some staff time for sorting returned questionnaires. Thus the only incentive to the employee in this case is personal saving, and this is a function of his or her present commuting expenses. Those making long work trips have more to gain than those making short trips.

The blue collar firm was similarly cooperative in administering the surveys and in encouraging carpooling among its employees. It does not have a parking shortage, however, nor is there any charge for parking, so reduced fees for carpools cannot be an incentive. It does have a gate guard however, so there is some potential for control over preferential carpool areas. This firm produces small vans and there was some discussion of using these on a limited basis to generate interest in carpools, but no commitment to the employees was made as to the use of vans nor to establishing preferred parking for carpoolers.

Previous experience with carpool matching programs indicates that without incentives, the number of carpools formed will be small. Auto commuters are generally unwilling to give up personal automobile transit unless the alternative is clearly cheaper, about as rapid, and as reliable as private auto transit. The employers in this study were not willing to provide attractive incentives to their employees, thus the attractiveness of carpools was not as great as it might be. However, the energy shortage is producing a built-in incentive by raising gasoline prices. It is within this environment that our carpool matching efforts occurred.

ATTITUDINAL STUDY

After all the respondents to the carpool survey were placed on matching lists, 100 questionnaires were selected from each firm for further analysis. The total number of returned questionnaires from WC was 158; 287 were received from BC. Of these 124 (43%) were already sharing a ride in some form; 90 (31%) were interested in carpooling; 73 (26%) stated they were not interested. The University faculty and staff returned 750 questionnaires with respondents interested in carpooling.

Since the University sample was considerably larger than the other two, in selecting 100 questionnaires for analysis the same ratio of "yes" to "no" responses was maintained. The "yes" and "no" responses were randomly selected with this consideration. One-hundred questionnaires were randomly selected from WC and 100 from BC. The concern was with the general attitudes of employees in different types of firms, rather than in the attitudes of particular employees.

Willingness To Carpool

The overall climate of opinion regarding carpooling was quite good. About half of the three hundred respondents included in the attitudinal study answered that they would be willing to consider carpooling: 70.2% of the WC respondents were affirmative; only 30.6% of the faculty-staff of the University responded affirmatively. Table 5 shows the complete firm-by-firm breakdown of willingness to consider carpooling.

Table 5

WILLINGNESS TO CARPOOL

	Yes	No
Total	51.2%	48.4%
White collar	70.2%	29.8%
Blue collar	53.9%	44.9%
University of Iowa	30.6%	69.4%

The response was quite different for each group. On the average, about half of the people are interested, but a breakdown by firm reveals considerable variation. Several factors that might influence willingness to carpool were hypothesized when the questionnaire was constructed: physical distance from work, travel time to work, car needs during the day, responsibilities to family, variation in work schedule, and present mode of transportation. These characteristics will be examined and compared to willingness to carpool.

The Effect of Distance on Carpooling

Table 6 shows the composition of each firm's employees by distance from work. Eighty-eight percent of WC employees come from the immediate area or from less than ten miles away. BC pulls only 59% of its employees from this inner ring, and the University obtains 71% of its employees from this area. Both the University and BC have a significant group of employees coming in from the eleven to twenty-one mile range, but BC is the only firm with a large group of workers commuting more than thirty miles.

It seems likely that a person's willingness to carpool would be in part a function of distance to work. This is indeed true for the aggregated data, but is not reflected in the results when disaggregated by industry.

Table 7 clearly shows that willingness to carpool is lowest among employees living in town, and becomes a more acceptable idea among workers living in outlying areas. This evidence supports the hypothesis that distance is an important factor in carpooling. The data does reveal, however, that

Table 6

HOME-WORK DISTANCE BY FIRM

Distance	Total	White	Blue	University of Iowa
Iowa City area	60.3%	63.0%	52.0%	66.0%
< 10 miles away	12.3%	25.0%	7.0%	5.0%
11-20 miles away	13.3%	6.0%	16.0%	17.0%
21-30 miles away	6.0%	1.0%	8.0%	9.0%
31+ miles away	8.3%	5.0%	17.0%	3.0%

Table 7

CROSS TABULATION OF DISTANCE BY WILLINGNESS TO CARPOOL

Distance		Yes	No	Row Total
Iowa City urban area	#	64	105	170
	%	37.6	61.8	60.5
Less than 10 miles away	#	24	11	35
	%	68.6	31.4	12.5
11-20 miles away	#	21	14	35
	%	60.0	40.0	12.5
21-30 miles away	#	17	1	18
	%	94.4	5.6	6.4
31+ miles away	#	18	5	23
	%	78.3	21.7	8.2
Column Total	#	144	136	281
Total	%	51.2	48.4	100.0

the relationship is not one to one. For example, 88% of WC's employees live within ten miles of their work place and 70.2% of them will consider carpooling. BC draws only 59% of its employees from within the ten mile range, and only 53.9% of BC employees are willing to consider carpooling. This is 25% less than at WC. This discrepancy indicates that factors other than distance play an important role. It also can be explained in part by the fact that existing carpoolers tended to respond "no" to this question, and BC has the largest proportion of its employees in existing carpools.

Travel time data supports the basic hypothesis that distance from work is an important factor in willingness to carpool. Travel time to work is a function of distance, and prople's willingness to carpool is related to the amount of time involved in the work trip. Figure 1 shows the pattern of growing interest in carpooling as distance from work increases. The data becomes irregualr as travel times approach two hours because the number of people in these extreme categories is small. Travel time was calculated from responses to the question, "What time do you leave for work?", and the question, "What time does your shift begin?", so missing cases in the travel time data are due to missing responses to these questions. The pattern of increasing interest does seem very apparent for those traveling $1\frac{1}{2}$ hours or less.

Attitudes by Present Mode of Travel

The present mode of travel to work does not seem to be a particularly

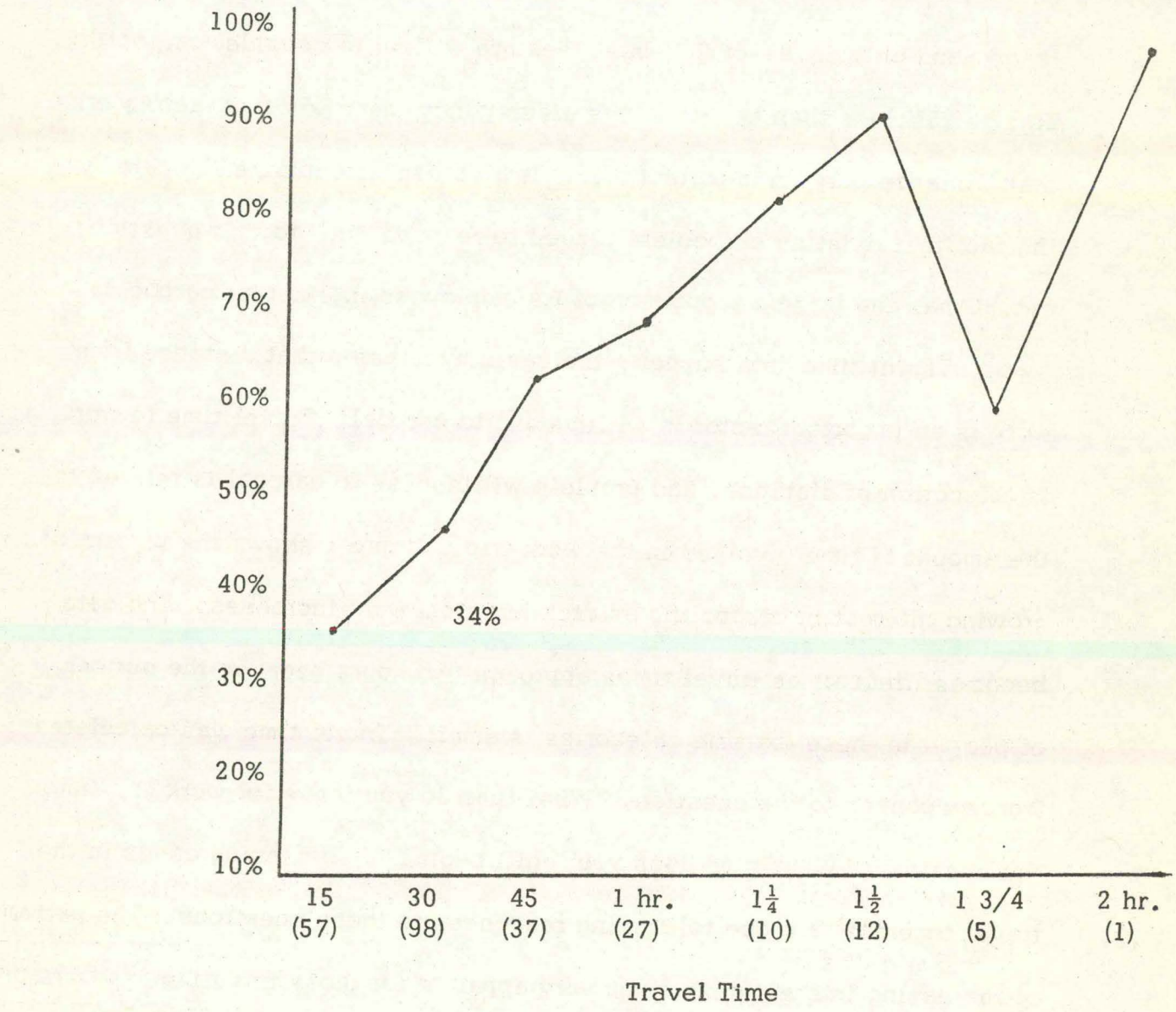

Figure 1. Willingness to Carpool as a Function of Travel Time

good indicator of willingness to carpool. Of those who drive alone, 48% are willing to carpool. While 47.5% of auto riders are willing to carpool, 79% of those alternating driving and riding are willing, 23.5% of present bus riders are willing to carpool, and 35% of those using some other mode of transportation (eg. bicycle, motorcycle) are willing to carpool. Obviously, those sharing rides in some form are more willing to carpool because some of these people are already in carpools or are in some way dependent on others to get to work. Others that fit into the ride-sharing categories ride with family members and answered "no" to the carpooling question. Bus riders in this sample seem particularly opposed to carpooling. They frequently remarked that they would much rather ride the bus than carpool. People in the "other" category are usually in special circumstances. Often they live close enough to work that a bicycle or walking is practical and are not good candidates for carpooling.

Table 8 shows the present commuting patterns for the three firms and total sample. BC is unique in that 49% of its employees already share a ride. Thirty-nine percent of the WC employees are presently sharing rides, while only 33% of the University employees surveyed do so. This higher rate of ride-sharing at BC supports the distance and travel time data discussed earlier. BC has more employees coming from a distance, and indeed, more ride-sharing goes on there than at the other two firms. However, the predominant mode at all three is still the single driver, and 48% of these drivers indicated that they are willing to carpool. This is the target group for expand-

Table 8

PRESENT COMMUTING HABITS

	Total	White	Blue	University of Iowa
Drive alone	55.4%	60.6%	48.0%	57.6%
Ride only	23.5	25.3	30.0	15.2
Share driving and riding	17.1	14.1	19.0	18.2
Take bus	5.7	8.1	0	9.1
Other				
Motorcycle	3.0	3.0	1.0	5.0
Walk	3.3	1.0	2.0	7.0
Bicycle	0.7	0	1.0	1.0
Carpool driver	1.3	0	4.0	6

ing carpooling.

Variability in Work Schedule

Variability in work schedule would seem like another factor influencing a person's ability to carpool. If work schedules are too erratic, half of the basis for forming a carpool group is gone--common departure and return times. However, slightly more than 47% of those people indicating a variable work schedule said they would be willing to carpool, and 57% of those with a constant work schedule said that they would consider carpooling. This is in line with our hypothesis, but probably not very helpful. The people with variable work schedules are willing to carpool in the abstract, but they didn't respond to efforts to make pooling easy. Sporadic overtime or flexible work scheduling is an extremely difficult hurdle to overcome when carpooling. The variability of work schedule reflects only slightly in carpool attitudes, but it is a massive hurdle in actually forming carpools. (More will be said about this in the section on evaluation.)

Table 9 gives a breakdown of variability in work schedule by employer. WC employees have a very high incidence of variability. Many people explained on their questionnaire that they work as the job demands and not within strictly set hours. That this has an effect on ability to carpool but not necessarily on willingness to consider carpooling can be seen by comparing the people presently sharing rides at WC to the general willingness to carpool. From Table 5, 70.2% of WC employees are willing to consider car-

Table 9

VARIATION IN WORK SCHEDULE
(ADJUSTED FREQUENCY)

Variation?	Total	White	Blue	University of Iowa
Yes	61.7%	70.7%	59.8%	54.5%
No	38.3%	29.3%	40.2%	45.5%

Missing - 5 missing out of 300

pooling, but only 39.4% presently share a ride there. The incidence of single drivers is highest there as well. BC employees ranked much lower on willingness to carpool (53.9%) but more people there presently share rides (49%). Apparently, variation in work schedule plays a more important role in the actual ability of a carpool to function than in people's perceptions of their willingness to carpool.

The reasons for variation in work schedules is another interesting facet of the issue. The time between leaving for work and actually starting the job is used for many purposes--shopping, taking children to a sitter, errands--as is the time immediately after work. These factors influence the schedule of travel to work and consequently affect carpool formation. Table 10 shows the reasons given for variable work trip patterns. Note that work itself is the primary reason given for variation.

The demands of the job are the most frequent cause of variability. Often, overtime work is done by the day with no advance notice. As mentioned before, WC works until a particular job is done, rather than strictly by the hour. BC employees at the opposite extreme again, rank work reasons as a less important source of variation than do either the University faculty/staff or WC employees. BC employees give more weight to personal reasons as a source of variation than do the other employees surveyed, and weather is an important factor for more BC people. Remember that BC draws 17% of its work force from more than thirty miles away. Comments on the questionnaires from these people indicate that bad weather is indeed a consideration

Table 10

REASONS FOR VARIATION IN WORK TRIP SCHEDULE

	Total	White	Blue	University of Iowa
Work Reasons	40.6%	50.5%	29.8%	41.2%
Family Reasons	4.9%	5.2%	5.3%	4.1%
Personal Reasons	11.8%	13.4%	18.1%	4.1%
Weather	2.4%	1.0%	5.3%	1.0%
Other	0.7%	1.0%	0	1.0%
Not Applicable	39.6%	28.9%	41.5%	48.5%
	100%	100%	100%	100%

Not applicable responses correspond to people answering "no" to the question "is there any variation in your work schedules?"

for them. They are sensitive to road conditions and time their departure for work accordingly. Family matters, on the other hand, appear to be an infrequent and relatively stable source of variation among all three groups.

Present Automobile Needs

Variations in work trip patterns and daily uses of the automobile are related variables. Table 11 illustrates present automobile needs during the day for the three groups of employees. Only a very small percentage of the employees surveyed always need their cars for business reasons or for personal reasons. The combined figure for all employees is 3.8% and 5.5% respectively. The percentage of people responsible for getting other family members to school or work is very consistent for the three groups. About 20% are regularly responsible for other family members. The combined figure for employees brought to work every day by other family members is about 5%, varying from 2.1% at WC to 7.3% at BC. These four categories of car needs affect generally only a small percentage of the employees in this survey and thus constitute no serious block to carpooling. It may be more difficult to change the habits of the approximately 20% group regularly responsible for transporting other family members.

On an irregular basis, many people do need their cars during the day. Those that always need personal transportation during the day are generally beyond the reach of carpools anyway, but the people who only occasionally need their cars during the day are prime candidates for carpooling. However,

	Always				Sometimes				Never			
	Total	White	Blue	U of I	Total	White	Blue	U of I	Total	White	Blue	U of I
Need car days for business	3.8	2.1	2.1	7.2	35.9	46.8	11.5	49.5	59.6	51.1	86.5	41.2
Need car days for personal reasons	5.5	0	7.1	9.3	79.4	90.6	72.4	75.3	15.1	9.4	20.4	15.5
Deliver family members on way to work	21.1	20.2	22.7	20.4	29.1	35.1	20.1	31.6	49.8	44.7	56.7	48.0
Family members deliver you to work	4.4	2.1	7.3	5.3	34.7	43.6	34.4	26.3	59.6	54.3	58.3	66.3

Table 11

STRENGTH OF REASON FOR VARIATION IN WORK TRIP SCHEDULE
(EXPRESSED IN PERCENT)

the desire to meet this occasional need may constitute an important obstacle to carpool formation. When an occasion does arise that requires a personal automobile trip, people want to be free to respond. Eighty percent of the combined employees said that they need their car sometimes for personal reasons. About 30% of the total sample sometimes are responsible for getting other family members to work or school, and about 35% of the sample are sometimes brought to work by family members. Carpooling would be feasible for the latter two groups of people because a car would be freed for other family members to use in one case, and would free the family from taking the carpooler to work in the other. However, the desire to freely make personal trips as needed does present a problem. Since this group includes almost everybody at some time or another, advance arrangements would have to be made with the other members of the carpool in order to achieve the flexibility provided by private auto transportation.

The same kind of problem arises with business uses of one's private car during the day. About one-half of the University employees and WC employees need their car sometime during the day for business reasons. Since the percentage of people who always need their car for business is much smaller, it seems that arrangements could be made to use a company vehicle for sporadic trips. This is a case pointing up the necessity for management's cooperation in facilitating a carpooling program. This obstacle to carpooling could be easily removed by making a company vehicle available for occasional business-related trips. Further, a company vehicle for private

use during the day, such as for medical appointments, emergency calls home, etc., could free a large number of people who are reluctant to carpool precisely because of possible unforeseen or occasional car needs. Only at BC are business considerations always a minor factor in private car use. All three employer groups exhibit high response to occasional personal needs for the car. Combined, these obstacles to successful carpooling could be eliminated by management coordination of a carpooling program, providing access to a vehicle during the day if a carpooling employee should have the need.

Table 12 and Figure 2 indicate the variation in willingness to consider carpooling according to present car needs. Each reason has about the same weight within each of the three frequency categories except for employees who always need their car for business reasons. This group is both unwilling and unable to carpool. Otherwise, there is little variation percentage-wise within each category. Collectively, willingness to consider carpooling increases as car needs during the day decrease.

Motivations to Carpool

Table 13 shows the importance to employees of various carpooling motivations. Clearly saving on commuting expenses, conserving energy, and reducing pollution emerge as important reasons to carpool. More than 50% of the employees in each industry responded to these advantanges as either important or very important. In some cases the figure approaches 80%.

Table 12

AGGREGATE DAILY CAR NEEDS AND WILLINGNESS TO CARPOOL

	Willingness to Carpool	
	Yes	No
Need car days for personal use		
Always	(4) 27%	(11) 73%
Sometimes	(113) 51%	(109) 49%
Never	(25) 66%	(12) 44%
Take others to work		
Always	(26) 43%	(34) 57%
Sometimes	(35) 46%	(42) 54%
Never	(78) 58%	(55) 42%
Family takes you to work		
Always	(5) 42%	(7) 58%
Sometimes	(48) 52%	(44) 48%
Never	(87) 54%	(74) 46%
Need car for business days		
Always	(4) 40%	(6) 60%
Sometimes	(41) 41%	(59) 59%
Never	(94) 59%	(64) 41%

(Number in parenthesis is the raw data figure)

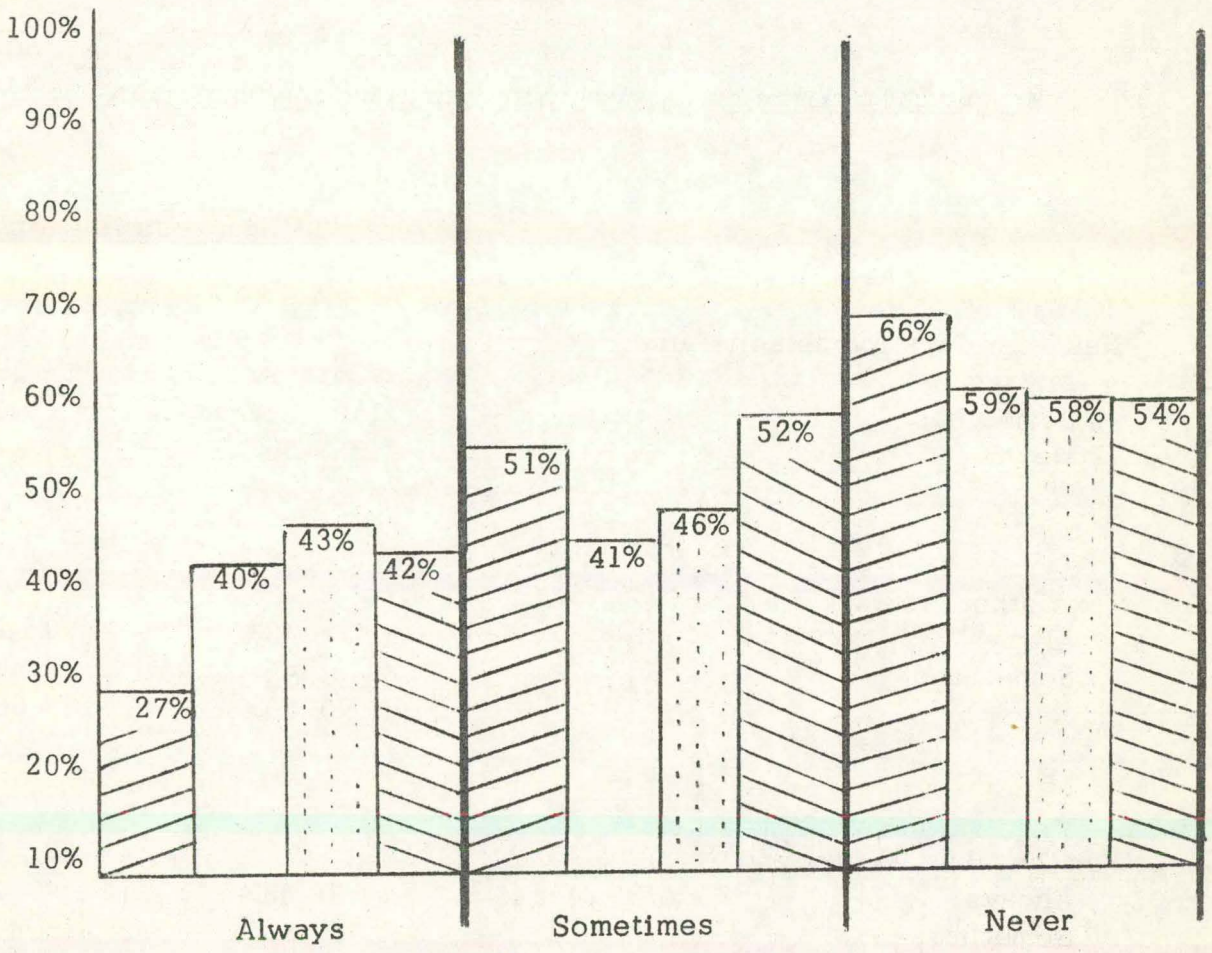

Figure 2. Willingness to Consider Carpooling According to Present Car Needs

	Expense				No Second Car				Conserving Energy				Low Pollution				Parking			
	Total	White	Blue	U of I	Total	White	Blue	U of I	Total	White	Blue	U of I	Total	White	Blue	U of I	Total	White	Blue	U of I
Very unimportant	16.1	6.3	13.7	13.7	30.8	31.1	24.7	36.5	5.2	1.1	7.3	7.1	6.4	1.1	9.5	8.2	8.3	5.4	4.0	15.5
Unimportant	10.0	9.5	9.5	16.1	20.1	21.1	19.4	19.8	4.2	2.1	8.3	2.0	4.6	3.3	9.6	1.0	4.8	8.6	--	6.2
Indifferent	23.2	22.1	21.1	26.3	24.4	23.3	24.7	25.0	11.5	12.8	16.7	5.1	21.2	20.7	28.7	14.4	15.9	24.7	--	23.7
Important	34.4	44.2	29.5	31.3	10.8	16.7	11.8	4.0	49.0	51.1	39.6	56.1	43.1	50.0	34.0	45.4	25.5	13.0	--	35.1
Very important	19.4	17.9	25.3	15.2	12.2	7.8	18.3	10.4	28.8	33.0	27.1	26.5	23.3	25.0	17.0	27.8	11.4	18.3	--	16.5
Not applicable	1.9	___	1.1	3.0	1.4	___	1.1	___	1.4	0	___	3.1	1.4	0	--	3.1	34.1	___	96.0	3.1
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

How important to you are the following reasons for carpooling?

Expense — reducing auto operating expenses
No Second Car — eliminating need for a second car
Conserving energy — conserving energy
Low Pollution — reducing pollution
Parking — reducing parking problems

Table 13

MOTIVATIONS TO CARPOOLING
Percentage Responding to Different Motivations, by Firm, by Importance

For instance, 82.6% of the University employees sampled felt that conserving energy was either important or very important. Seventy-five percent of BC employees felt that reducing pollution was either important or very important. Significantly, the primary motivations to carpooling are not only personal savings, but include environmental and social savings as well.

Eliminating the need for a second car and reducing the demand for parking turned out to be fairly insignificant considerations in carpool formation. Apparently, people are not interested in eliminating a second car if they have one, because the responses in this category ranged heavily toward the very unimportant end of the spectrum. Those without second cars were eliminated as either missing values or not applicable.

As mentioned earlier, parking is not a drastic problem at WC in the sense that employees do not have long distances to walk from the parking lot or high parking rates to pay. The University, on the other hand, has a highly structured campus parking system. Considerable advantage is to be gained from preferential parking privileges. Responses from university employees reflect this fact. They exhibit more interest in parking considerations than do employees from other firms.

Factors in Forming Carpools

Table 14 indicates the kind of things people look for in forming carpools. Closeness of the other members received the strongest showing. More than 40% of the employees surveyed felt closeness to be a very impor-

	Close				Friends				Car Type				Same Company				Employment Type				Same Department				Same Sex			
	Tot	Wh.	Blu.	UI	Tot	Wh.	Blu.	UI	Tot	Wh.	Blu.	UI	Tot	Wh.	Blu.	III	Tot	Wh.	Blu.	UI	Tot	Wh.	Blu.	UI	Tot	Wh.	Blu.	UI
Very unimportant	6.8	6.5	11.0	3.2	15.9	16.0	12.2	19.4	31.5	29.0	32.3	33.3	7.0	7.6	NA	14.1	39.2	46.2	33.3	37.6	41.2	46.7	34.5	41.9	41.8	45.2	34.5	45.2
Unimportant	3.2	3.2	5.5	1.1	18.4	20.2	16.7	18.3	23.8	29.0	21.8	20.4	6.3	5.4		14.1	24.5	28.0	26.4	19.4	24.3	30.4	27.6	15.1	24.2	31.2	24.1	17.1
Indifferent	6.8	5.4	9.9	5.3	33.9	37.2	34.4	30.1	26.0	29.0	24.1	24.7	15.5	18.5		29.3	28.9	23.7	31.0	32.3	26.1	21.7	28.7	28.0	26.4	19.4	33.3	26.9
Important	38.8	46.2	33.0	37.2	18.4	19.1	18.9	17.2	10.3	9.7	12.6	8.6	19.0	35.9		22.8	3.3	2.2	6.9	1.1	3.7	0	5.7	5.4	2.9	3.2	4.6	1.1
Very important	41.0	38.7	39.6	44.7	10.1	7.4	16.7	6.5	5.1	3.2	6.9	5.4	14.1	32.6		10.9	0.7	0	1.1	1.1	1.5	1.1	2.3	1.1	1.5	1.1	2.3	1.1
Not applicable	3.2	0	1.1	8.5	3.2	0	1.1	8.6	2.9	0	1.1	7.5	38.0	0		8.7	3.3	0	1.1	8.6	3.3	0	1.1	8.6	3.3	0	1.1	8.6
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

What criteria would you prefer in forming criteria?

Close — nearness to home
Friends — friends
Car type — type of car
Same company — same campany

Employment type — same employment level
Same department — same department
Same sex — same sex

Table 14

CRITERIA FOR FORMING CARPOOLS
Percentage Responding to Different Criteria, by Firm, by Importance

tant consideration. In addition, nearly 40% responded that while not very important, close proximity to other members in the group was important, making closeness a consideration for about 80% of the employees.

About one-third of the employees are indifferent to whether or not they carpool with friends, and roughly another third feel that it is either important or very important. Many felt that organizing the carpool for one company was moderately important, but the uni-corp emphasis didn't receive a strong response.

The type of car, the type of employee (worker, foreman, executive), having all carpool members from the same department of sex were unimportant considerations to the employees surveyed. From this we can infer that the composition of the carpool is not nearly as important as the speed and efficiency with which it can function. Carpoolers also consider the proximity of group members to be very important in forming carpools. By comparison, all of the other factors are relatively unimportant.

Deterrents to Carpooling

People in this survey were quite willing to give up the amenities such as radio, trunk space, tape deck, etc. to carpool. Privacy, too, ranked very low in people's hierarchy of carpooling disadvantages. (See Table 15).

On the other hand, the inconvenience and extra time required to carpool were considered a strong deterrent to carpooling. The inconvenience

	Inconvenient				Too Much Time				Amenities				Independence				Privacy				Park Close*	Park Cheap*
	Tot	Wh.	Blu.	UI	Tot	Wh.	Blu.	UI	Tot	Wh.	Blu.	UI	Tot	Wh.	Blu.	UI	Tot	Wh.	Blu.	UI	UI	UI
Very unimportant	8.0	9.4	8.3	6.2	10.8	10.6	12.6	9.3	52.3	54.8	38.7	62.9	8.0	10.5	5.3	8.2	27.3	36.2	18.9	26.8	9.4	10.6
Unimportant	14.2	10.4	24.0	8.2	19.6	24.5	21.1	13.4	20.8	16.1	30.1	16.5	7.3	8.4	9.5	4.1	21.3	19.1	26.3	18.6	7.3	10.6
Indifferent	15.9	22.9	12.5	12.4	25.9	28.7	22.1	26.8	17.7	22.6	16.1	14.4	13.9	16.8	10.5	14.4	30.8	28.7	27.4	36.1	18.8	27.7
Important	33.2	36.5	24.0	39.2	26.2	25.5	23.2	29.9	2.8	2.2	5.4	1.0	38.3	37.9	36.8	40.2	9.4	8.5	11.6	8.2	34.4	26.6
Very important	27.7	20.8	30.2	32.0	16.1	10.6	20.0	17.5	4.6	4.3	8.6	1.0	30.7	26.3	36.8	28.9	9.4	7.4	14.7	6.2	24.0	18.1
Not Applicable	1.4	0	1.0	2.1	1.4	0	1.1	3.1	1.8	0	1.1	4.1	1.7	0	1.1	4.1	1.7	0	1.1	4.1	6.3	6.4
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

*Appeared on University Questionnaire Only

How important to you are the following deterrents to carpooling?

Inconvenient — (interferes with errands, etc.)
Too much time — increased commuting time
Amenities — amenities (radio, stereo tape, trunk space, etc.)
Independence — having to rely on others
Privacy — lack of privacy
Park Close — preferential parking - closer
Park Cheap — preferential parking - cheaper

Table 15

DETERRENTS TO CARPOOLING
Percentage Responding to Different Deterrants, by Firm, by Importance

factor was a little stronger, with 61% considering it either very important or important, while only 42% of the respondents felt that time was either very important or important.

The lack of independence was a very strong deterrent for about 70% of the combined employees. Nearly 40% of each employer group felt that this was an important reason not to carpool, and about 30% of each group felt it was very important. Clearly, the independence/inconvenience problems of carpooling must be overcome if successful carpool programs are to be established.

Conclusions - Profile of a Potential Carpooler

The challenge to carpool organizers is clear. It is the person who presently drives alone to work that is of greatest concern. He/she must have a fairly regular work schedule. A person is more likely to be interested in carpooling the farther he/she lives from work. This person will be extremely concerned about the inconvenience of carpooling, and the independence that may have to be sacrificed, but is not overly worried about privacy or comfort. Potential carpoolers will want the members of the pool to live nearby. Saving money is an important consideration in the decision to carpool, but conserving energy and reducing pollution are important as well. Although there is some variation between different categories of workers on the magnitude of these attitudes, the same attitudes seem to be significant for all of the employer groups.

In organizing carpools, then, the matching lists and incentive structure of the program are very important. Care should be taken that no more than ten to fifteen minutes additional travel time is required to collect the members of the carpool. Table 16 gives the breakdown by industry of how much additional time people are willing to spend on the trip to work. Clearly, anything over fifteen minutes is unacceptable.

There must be some provision as well for emergency transportation because a large majority of the respondents indicate that they sometimes do need their car for private uses during the day. If this is done, the independence deterrent can be somewhat ameliorated.

Since environmental and energy saving considerations rank quite high among respondents, it is important to make people aware of the impact carpooling can have. The impact on rush-hour traffic, on fuel consumption, and on pollution levels can be significant. People must be made to feel that the sacrifice in time and independence is worth it in environmental terms as well as in personal savings. Getting people on the bandwagon is the best thing that could happen to carpooling.

EVALUATION

For each employer, employees expressing a willingness to consider carpooling were grouped according to common TOD. A listing of the group names and phone numbers were provided each employee to facilitate organizing car loads. In the case of WC and BC, evaluation questionnaires were

Table 16

MAXIMUM INCREASE IN TRAVEL TIME
RESPONDENT WOULD CONSIDER

	Total	White	Blue	University of Iowa
0 minutes	1.1%	1.1%	2.5%	0%
5 minutes	11.3	15.7	12.7	6.1
10 minutes	17.3	25.8	15.2	11.2
15 minutes	18.4	23.6	21.5	11.2
20 minutes	3.0	6.7	0	2.0
Not applicable	48.9	27.0	48.1	69.4
	100.0%	100.0%	100.0%	100.0%

distributed to determine the use of the lists provided to facilitate carpool formations.

In the case of the University, a follow-up survey was not undertaken. Parking permit applications, to which the group list of potential carpoolers was attached, were distributed in April for the 1974-75 academic year. As of August 1, 356 carpool applications have been received.* This is not an appreciable increase over last year. Although it is too early for a full assessment, it is clearly insufficient to merely provide a list of potential carpoolers. with common TOD's. Some additional mechanisms to trigger carpool formation are necessary such as meetings or follow-up phone calls to assist in organization.

American College Testing (WC)

The response to the carpool matching effort at WC was poor. This is somewhat surprising since 70.2% of the employees responded on the initial questionnaire that they were willing to consider carpooling. Only 52 evaluation questionnaires were returned. Of these, 49 were usable. (158 responses to the initial survey were received.)

About three months elapsed between the time carpool matching lists were made available and the follow-up evaluation. People had ample time to consider carpooling and make necessary arrangements. Only four people

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*Carpooling is not as widely used as these data would indicate, because many applicants use carpool permits as a means of registering a second family car.

formed new carpools. Of these, three responded that carpooling was extremely inconvenient and that they had already given up carpooling. No one expanded an existing carpool.

The problem seemed to be a general lack of interest in making the effort to from carpools, even though a majority stated that they would be willing to consider carpooling. Only one person claimed that he/she had been contacted by at least two people. Obviously, little effort was made to use the information on the matching lists. Eight of the evaluation respondents who answered "yes" to the willingness to carpool question in the initial survey answered "not really interested" on the second survey as a reason why they hadn't formed carpools.

The method of distributing the carpool matching lists might have been part of the problem given the low level of actual interest in carpooling. It was made known through an in-house newsletter that the matching lists were available. Interested parties could then obtain the appropriate list. Of the 49 usable questionnaires returned, only eleven people said that they obtained a list. It seems that contrary to the initial figure of 70.2% willing to consider carpooling, the number was drastically inflated. Perhaps if the lists had been distributed to the respective employees and meetings had been held to introduce the members of each group, some of the reservations about carpooling could have been overcome. One-to-one discussion about scheduling problems may have resolved some apparent conflicts.

From this response, it appears that much more than avowed willingness

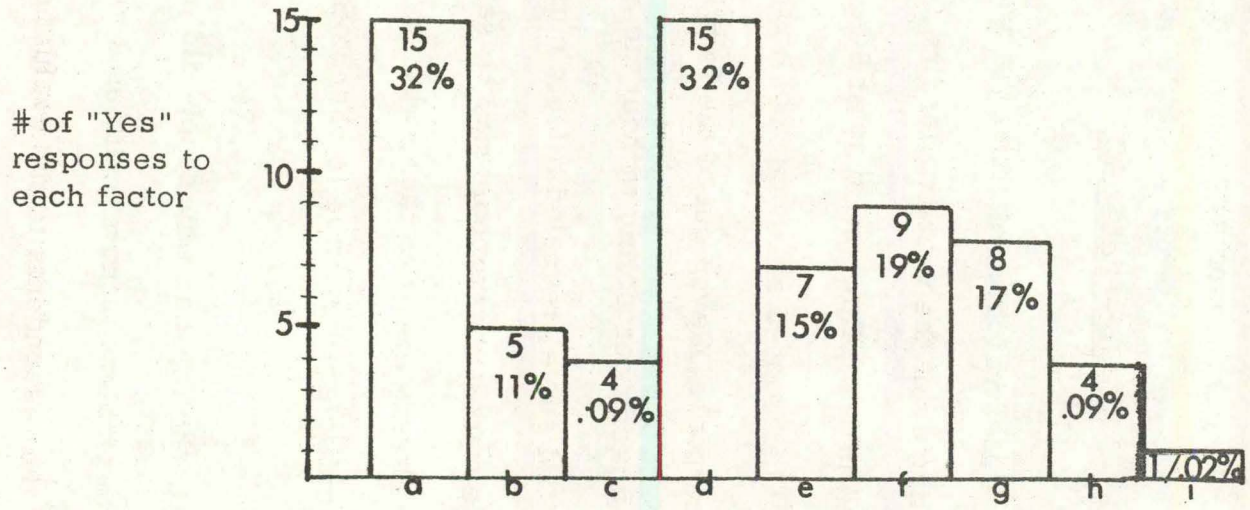
and matching lists are required to insure carpool formation. There must be a perceived need and real incentive must be provided either by the employer or by the savings inherent in carpooling. If the combination of full costs, distance to work, traffic congestion, and parking difficulties is not enough to constitute a built-in incentive, additional incentives must be provided by the employers and government.

Sheller-Globe (BC)

Results of the carpool matching effort at the primarily blue collar firm were as disappointing as at the white collar firm. Forty-seven evaluation forms were returned in the follow-up study at BC. None of the respondents reported that they had formed a new carpool and none of them had expanded an existing carpool. Eleven out of the forty-seven respondents replied that they were already carpooling without the aid of the matching service. Since the initial survey revealed a large number of employees already carpooling, the market for carpools may be saturated. Those who really want to carpool already are, and those who are marginally interested, are not provided with sufficient incentive to change their present commuting habits.

Figure 3 reveals the reasons why people did not form carpools. The variable work schedule problem appears again as a major stumbling block. Thirty-two percent of the respondents to the evaluation cited variable work schedules as a reason why they did not form a carpool.

Figure 3. Frequency Distribution of Reasons For Not Carpooling
(Follow-up Survey of Blue Employees)



Response*

a - Work schedules too variable
b - People live too far apart
c - No convenient pick-up route
d - Not really interested in carpooling
e - Caprooling involves too much travel time
f - Carpooling involves too much waiting
g - Difficult to reassemble group after work
h - People on list could be better picked up by others
i - Favorite people not on your list

*Multiple responses allowed

Significantly, lack of interest is an equally important reason. Thirty-two percent of the respondents replied that they really aren't interested in carpooling. This response was even stronger at WC; a large number of people who initially indicated that they would be willing to consider carpooling, responded on the evaluation form that they hadn't formed a carpool and really were not interested in doing so. Of the 47 BC respondents to the evaluation questionnaire, only 18 had indicated on the earlier questionnaire that they would be willing to consider carpooling. Forty-four percent of these people responded on the evaluation form that they really weren't interested in carpooling. It seems, judging only from this small sample, that nearly one-half of the people at one time indicated an interest in carpooling really did not seriously consider formation.

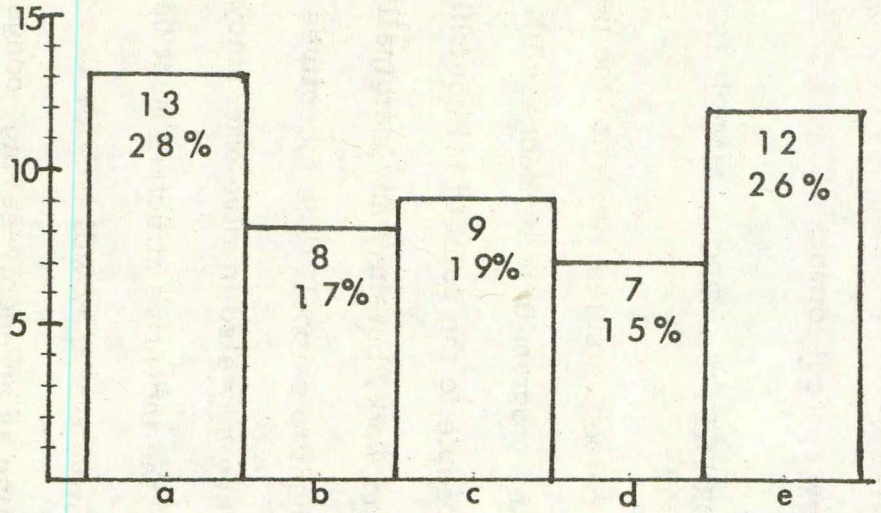
There also appears to be some problem in the distribution of the completed carpool matching lists. All of the 18 evaluation respondents who also responded "willing to consider carpooling" on the initial questionnaire should have received a matching list. However, 14 of those 18 people never received one, and seven persons who responded that they were not interested did. This latter problem is due to the fact that some people who already carpooled at the time of the initial survey responded "not willing to carpool". Obviously, people who are already carpooling are willing to consider it. Consequently, these "no" responses were coded as affirmative responses. This had the effect of including existing carpoolers in the matching system so that their carpool membership could respond to personnel changes at the

plant. Thus these people receiving a matching list was not an error. However, there did seem to be a problem in getting lists out to interested parties. Of the 47 respondents, 12 did receive lists but at least 25 people should have.

Figure 4 indicates the kind of additional information people would have liked in forming carpools. Knowing the members of existing carpools in the area and receiving a small map with the questionnaire received the strongest responses. Twenty-eight percent of the respondents wanted to know about existing carpools, and 24% wanted a small map. (37 out of 47 felt no additional information was necessary). A large map of the city and a state map on which each affirmative carpool respondent was plotted was available in the personnel office, but few employees bothered to use it.

Knowing the make of the car available to each carpooler, whether he would rather drive, ride, or share, and knowing the route each person takes to work received moderate and uniform response. Between 15 and 20 percent of the evaluation respondents felt these factors to be helpful in deciding whether or not to carpool. Clearly, although these three factors are of some importance, the interest in existing carpools is most significant. Perhaps people with only marginal interest in carpooling feel more comfortable about joining such a commuting arrangement if it has been functioning adequately for some time. This apparently lessens the fear of unreliability and saves the trouble of organizing one's own carpool. Twenty-one percent of the respondents said they would be interested in joining an existing carpool.

Figure 4. Frequency Distribution of Additional Information Desired
(Follow-up Survey of Blue Employees)



Responses*

a - Know the members of existing carpools
b - Know the size of car available to each person
c - Know if each person would rather drive, ride or share
d - Know each person's general route to work
e - Receive a map of each person's residence

*Multiple responses were allowed.

The actual interest in carpooling at BC is further revealed to be slight among non-carpooling employees by the number of people who reported that they were contacted about forming a carpool. Only one person reported that he had been contacted by two or more people. Two people said that they had contacted two or more people. Obviously, the amount of effort directed toward carpool formation was slight, reflecting the lack of actual interest and the absence of new carpool formation.

RECOMMENDATIONS FOR FUTURE CARPOOL MATCHING EFFORTS

1. This study, and previous carpool studies, indicate the necessity of a viable incentive structure if the program is to be successful. Rising fuel prices do tend to push more people to the point of relinquishing their private auto as the means of getting to work, but the many marginally interested people need an extra inducement to carpool. The incentives may involve savings in money or time. They may also involve emergency transportation for carpoolers. In any case, the incentive structure must be provided by the firm involved. The incentive that they will provide is a measure of the firm's commitment to carpooling as an energy-saving, congestion-reducing tool.

2. When organizing carpools by firm, management generally handles the in-house distribution of information. Since many employees of both firms evaluated in this study reported that they never received their matching lists, some care must be taken in the future to insure adequate distribution.

There is a problem with the distribution of the matching lists, because unlike the blanket coverage of the questionnaires, they must be sorted and delivered to specific people. This requires more administrative time than distributing questionnaires. Simply "making the lists available" means that some people will never pick theirs up or will never hear that they are available. The effort must be made to actually deliver the appropriate list to each employee involved.

3. Existing carpools are a resource that must be utilized. Some people claim that they want this information on the matching lists, and that they would be more willing to join an existing carpool than form a new one. Although some existing carpools are full, those that are not provide a valuable existing resource. Organizers must be aware of existing carpools at the time the survey instrument is designed. People should be asked if they already carpool. If possible, the names of the members should be obtained and the neighborhood served by the carpool. Then on the matching lists, people already pooling together can be identified. Other potential carpoolers can then determine if they want to join a particular existing carpool or form a new one.

4. Distance is the most significant factor in dealing with regional carpools. In small metropolitan areas, many workers will be from surrounding towns. These are the people most interested in carpooling as evidenced by the fact that many already do carpool. In-town workers do not have very far to travel and as such have less to gain by pooling. In-town workers are not willing to sacrifice as much time and trouble to carpool as out-of-town workers. As

such, special attention should be given to workers living outside of the primary metro area.

5. Firms with extremely variable work schedules are not as amenable for carpooling. If carpool members can't count on regular start and finish times, the efficiency and reliability of the carpool is reduced to a point that it cannot function.

If work schedules are variable in the plant, but consistent within each department, there is still the possibility of forming carpools. This information should be determined before designing the survey instrument. If it is a factor, people should be asked in which department they work. This information then appears on the matching lists, enabling the employee to pick people with whom he is sure to share a common work schedule. In large plants, one department or a few coordinated departments can provide a large enough pool of people that some successful carpool matches are likely.

6. A meeting to acquaint potential carpoolers and to work out the details of scheduling appears necessary. The evaluation indicated too few people were willing to make the initial contact. A meeting over morning coffee would help overcome that initial hesitancy. Employers must be willing to facilitate the personal contact of potential carpoolers so that the distributed information will be utilized.

IN CONCLUSION

The results of this investigation demonstrated the importance of information and incentives. Information as to common Time - Origin - Destination (TOD) is insufficient. Individuals are not using the information. Further effort to facilitate the organization of carpools is necessary.

Employers will have to make greater commitment to carpooling to make it work. Administrative support in distributing information, organization of meetings for potential carpoolers, and incentives for carpooling are all necessary ingredients. Allowing their employees to be surveyed is insufficient commitment.

APPENDIX 1

Carpool survey instrument,
including sample coverletter.

THE UNIVERSITY OF IOWA
IOWA CITY, IOWA 52242

Transportation and Security

Dear Faculty or Staff Member:

The attached questionnaire is designed to determine interest in a carpooling system for the employees of the University. The study is being conducted by the Institute of Urban and Regional Research, with the cooperation of the Transportation and Security Department.

Carpooling has the potential of increasing car occupancy, which is one of the best ways of saving travel expense, energy, and reducing pollution while still maintaining a high degree of personal mobility. All this can be accomplished without tremendous investment in new transportation systems.

If sufficient interest is indicated, the University will attempt to aid in organizing carpools and implementing incentives to make them work.

We would appreciate your response to this questionnaire. Please respond even if you are not able or unwilling to participate in a carpooling program. There is no commitment implied by your answers. Please return the questionnaire via campus mail to the department of Transportation and Security, 131 South Capitol Street.

Thank you.

Sincerely,

John D. Dooley

John D. Dooley, Director
Transportation and Security

Kenneth J. Dueker

Kenneth J. Dueker, Director
Institute of Urban and Regional Research

JDD/mf

For office use - do not complete this section.

Employer code _____

Work location _____

Name _____ Campus Telephone Number _____

Address _____

_____

If your address is a rural route, please provide fire district code, section number or subdivision name. _____

_____

1. Yes ___ No ___ Is the above address the one from which you commute daily?

2. If not, what is the address? _____

Work Trip Habits

3. Time you leave for work: _____ AM PM

4. Time work begins: _____ AM PM

5. Time you leave for home: _____ AM PM

6. Is there any variation in this pattern? (Such as rotation of shift) _____ Yes _____ No

7. If so, what? _____

Present Mode of Travel to Work

	Yes	No	
8.	___	___	Are you a licensed driver?

Check one of the following:

9. _____ Auto - drive alone

10. _____ Auto - rider

11. _____ Auto - share ride/driving

12. _____ Bus

13. _____ Other (specify) _____

Automobile Needs

		Always	Sometimes	Never
14.	Do you need a car during the day for University business?	_____	_____	_____
15.	Do you need a car during the day for personal reasons?	_____	_____	_____
16.	Do you deliver other household members to work or school on the way to work?	_____	_____	_____
17.	Does another member of your household deliver you to work?	_____	_____	_____

Following is a list of several statements. As you read each statement indicate the degree of importance to you by circling the appropriate number.

Reasons for Carpooling

How important to you are the following reasons for carpooling?

		very unimportant	unimportant	indifferent	important	very important
18.	Reducing auto operating expenses	1	2	3	4	5
19.	Eliminating need for a second car	1	2	3	4	5
20.	Conserving energy	1	2	3	4	5
21.	Reducing pollution	1	2	3	4	5
22.	Reducing parking demand	1	2	3	4	5

Reasons for not Carpooling

How important to you are the following deterrents to carpooling?

23.	Inconvenient (interferes with errands, etc.)	1	2	3	4	5
24.	Increased commuting time	1	2	3	4	5
25.	Amenities (radio, stereo tape, trunk space, etc.)	1	2	3	4	5
26.	Having to rely on others	1	2	3	4	5
27.	Lack of privacy	1	2	3	4	5

Incentives

How important are the following incentives?

		very unimportant	unimportant	indifferent	important	very important
28.	Preferential parking - closer	1	2	3	4	5
29.	Preferential parking - cheaper	1	2	3	4	5

Criteria for Forming Carpools

What criteria would you prefer in forming carpools?

30.	Nearness to home	1	2	3	4	5
31.	Friends	1	2	3	4	5
32.	Type of car	1	2	3	4	5
33.	Same firm	1	2	3	4	5
34.	Same employment level	1	2	3	4	5
35.	Same department	1	2	3	4	5
36.	Same sex	1	2	3	4	5
37.	Other (specify) _____	1	2	3	4	5

38. Are you w.'ling to consider carpooling? _____ Yes _____ No

If yes, what is the maximum increase in travel time you would consider?

(check one)

5 minute increase	_____
10 minute increase	_____
15 minute increase	_____
20 minute increase	_____

If yes, would you prefer:

(check one)

to drive only	_____
to ride only	_____
to share driving	_____

THANK YOU

APPENDIX 2

Evaluation survey instrument

THE UNIVERSITY OF IOWA

IOWA CITY, IOWA 52242

Institute of Urban and Regional Research
102 Church Street
Area 319: 353-3862

CARPOOL EVALUATION QUESTIONNAIRE

Several months ago employees of your company were asked to fill out a carpool information survey. From the results of that initial survey, interested people were provided with a list of potential carpoolers in their area. It was hoped that such information would be helpful to people wanting to carpool but lacking the necessary group of people.

This follow-up survey is designed to (1) discover problems people are having with carpools, (2) discover whether more or different information is needed to form a carpool, (3) and to determine the success of the initial effort. Please take the time to answer these questions.

Sincerely,

CARPOOL EVALUATION QUESTIONNAIRE

Section I

1. Is your home within Iowa City, Coralville, or University Heights?
   Yes ____ No ____

2. Did you complete the initial carpool questionnaire? Yes ____ No ____

3. Did you indicate on that questionnaire that you would be willing to carpool?
   Yes ____ No ____

4. Was a suggested carpool list available to you? Yes ____ No ____

5. Did you expand an existing carpool? Yes ____ No ____

6. Did you form a new carpool? Yes ____ No ____

7. Were you already in a carpool when you received the initial questionnaire?
   Yes ____ No ____

IF YOU ANSWERED NO TO BOTH QUESTION 5 AND 6, COMPLETE SECTION II.

IF YOU ANSWERED YES TO EITHER QUESTION 5 OR 6, GO ON TO SECTION III.

Section II

8. Since you were not able to form a carpool was it because:
   (Check YES if an item is important, NO if unimportant or not applicable)

	Yes	No
a. People's work schedules were too variable.	____	____
b. The people on your list live too far from each other.	____	____
c. No convenient pickup route exists.	____	____
d. You really are not interested in carpooling.	____	____
e. Carpooling requires too much travel time.	____	____
f. Carpooling involves too much waiting.	____	____

Section II - Continued

		Yes	No
8. g.	Even if you could all ride together in the morning, it would be difficult to assemble the group again after work.	____	____
h.	People were on the list who could be more easily picked up by people elsewhere.	____	____
i.	People you would like to pick up were not on your list.	____	____
j.	Other _____		

9. Did you contact two or more people on your list in an effort to form a carpool? Yes ____ No ____

10. Did you contact two or more people on your list and still fail to form a carpool? Yes ____ No ____

11. Once a system of carpools becomes established, might you be interested in joining an existing one? Yes ____ No ____

IF YOU ANSWERED YES TO EITHER QUESTION 5 OR 6, COMPLETE THE FOLLOWING SECTION.

IF YOU ANSWERED SECTION II, SKIP THIS SECTION.

Section III

		Yes	No
12.	Was the carpool list helpful because:		
a.	You did not know who could conveniently carpool with you until you received the list?	____	____
b.	Carpooling had not seriously occurred to you until you received the list.	____	____
c.	You were provided a list of persons interested in carpooling.	____	____
d.	Other _____		

13. Did you contact two or more people on your list in an effort to form a carpool? Yes ____ No ____

Section III - Continued

14. Were you contacted by two or more people? Yes ____ No ____

15. How would you rate your carpool: (Check only one)

    a. As convenient as driving alone; cost about the same. ____

    b. As convenient as driving alone; cost less. ____

    c. More convenient than driving alone; cost less. ____

    d. Not as convenient as driving alone; but cheaper. ____

    e. Extremely inconvenient but will tolerate it for the savings. ____

    f. Extremely inconvenient and I plan to quit (or have quit) carpooling. ____

    g. Carpooling is actually more expensive than driving alone. ____

16. Briefly explain why you answered question 15 as you did.

    _____

    _____

    _____

    _____

EVERYONE SHOULD ANSWER SECTION IV

Section IV

17. Did you know that a map of all potential carpoolers was available? Yes ____ No ____

18. Did you consult the map? Yes ____ No ____ Was it helpful? Yes ____ No ____

19. Did you feel that more information was necessary to make a decision about carpooling? Yes ____ No ____

20. What further information would have been helpful? (Check all that apply, leave those that do not apply blank)

    a. Knowing the members of existing carpools in your area. ____

    b. Knowing the size (eg. full size, compact, sports, etc.) of car available to all persons on your list. ____

    c. Knowing if each person would rather drive or ride. ____

    d. Knowing roughly, what route to work each person had been taking. ____

Section IV - Continued

20. e. Receiving a map along with the carpool list showing each person's residence. ____

f. Other _____

21. Was the suggested carpool list obsolete by the time you received it? (ie. people had moved or no longer worked for ACT. Yes ____ No ____