

Moving People on Urban Highways

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Mr. Turner was appointed Federal Highway Administrator by President Nixon in February 1969. Forty years earlier he joined the Bureau of Public Roads upon graduating from Texas A&M with a B.S. degree in Civil Engineering. Since that time he has served continuously in various capacities throughout the United States, in Canada on construction of the Alaska Highway, and in the Philippines. He is a member of many professional organizations and the holder of many awards. In 1969, he was named World Highway Man of the Year by the International Road Federation, and in 1970 he received the Highway Research Board's Roy W. Crum Distinguished Service Award.

THERE are a number of controversies going on today in some of our metropolitan areas. While controversy is normal and the rational resolution of it healthy in a democracy, irrational resolution based on misconceptions is not. The purpose of this article is to shed some light on one of the controversies we hear so much about—urban highways versus transit.

It is our contention that this really is not a controversy at all if we get our definitions straight. First of all, when we talk about urban transit travel we must recognize that urban transit is to a great extent highway travel. On a person trip basis, 75 percent of the public transportation travel in this country is by bus, which is to say, in highway vehicles. On a person mile basis, 70 percent is by bus. Examination of Table I, which breaks urban travel modes into "private" versus "public" and "highway" versus "other" categories, points this out.

TABLE I—U.S. URBAN PERSON TRAVEL—1968

Mode			Trips (percent)	Travel (percent)
Private	— { AUTO } — Highway		94.3	91.7
Public		— { BUS } — Highway	4.3	5.8
	— RAIL — Other		1.4	2.5
			<u>100.0</u>	<u>100.0</u>

It can be argued, and quite reasonably so, that the above is not giving a scale that represents the situation in the areas where the problems are the greatest and where rail transit can and does

function most effectively. Another cut at this, by looking at Central Business District trips in the morning peak period for urban areas over one million in population, shows that bus transit is slightly over one-half of the magnitude of rail transit. If we exclude only the New York data, which are unique due to its extensive amount of rail travel, we can see that bus transit is almost twice the magnitude of rail transit. Table II scales this situation.

TABLE II—URBAN AREAS OVER 1,000,000 POPULATION
BREAKDOWN OF CBD-ORIENTED TRIPS BY MODE—A.M. PEAK

			<i>Include N.Y. City (percent)</i>	<i>Exclude N.Y. City (percent)</i>
Private	—	AUTOMOBILE	} Highway	} Highway
		BUS		
Public	—	RAIL TRANSIT	} Other	} Other
		COMMUTER RAIL		
			100.0	100.0

Having a look at this scale, it is obvious that we should not be thinking or talking about highways *versus* transit, but instead highways *and* transit.

Even with this clarification, there still is an emptiness to the discussion of the topic in that we still have not brought in the most important element—people! We provide highways primarily for the movement of people (and also goods), not just for the sake of providing highways. Transit is provided for the same primary reason—the movement of people. Our concern then in the highway program is: What can the highway program do to move people most effectively? With this introduction and groundwork established, let us take a brief look at what the federal highway program has done and then more importantly what it is striving to do to encourage more effectiveness in moving people on urban highways.

HISTORY OF THE FEDERAL HIGHWAY CONCERN WITH TRANSIT

Twenty years ago, Joseph Barnett, then Chief of the Urban Road Division of the Public Roads Administration, in rebuttal to the discussion of his 1947 ASCE paper "Express Highway Planning in Metropolitan Areas," stated:

When properly designed, operated, and controlled, mass transportation can do much to relieve traffic congestion simply by reducing the number

of vehicles on the streets and in parking spaces. . . . Use of expressways by buses is the more likely pattern into which transit will fit, particularly for rush hour express type of transit operation between outlying sections and downtown areas.

Three years later in presenting a five-point program to relieve urban congestion at the Northwest Conference on road building, Mr. Barnett stated:

The transit vehicle, while it is moving, is a much more efficient user of street space than a private car and the improvement of the transit system stands high in the work to be done for the relief of traffic congestion.

Statements expressing the position of the federal highway program on exclusive or preferential bus lanes were made by Edward (Ted) Holmes in a 1964 paper, "Transit and Federal Highways." Some significant excerpts include:

The Federal Government as a matter of policy is for improved transit. The Department . . . and the Bureau of Public Roads are for transit. . . . The most likely use of freeways by transit is by buses, however, presumably in some form of express service. . . .

The Bureau of Public Roads takes the position that such reservation (bus lane) is reasonable if the usage by bus passengers exceeds the number of persons that would normally be moved in the same period in passenger cars—say 3,000 per hour. . . .

Records of the Bureau of Public Roads show a long history of interest in transit as a transportation tool in our ever-growing urban areas. A major policy document describes the 10 basic elements of the urban transportation planning process. One of these is the inventory and analysis of transportation facilities including those for mass transportation.

The guidelines for the new federal-aid highway program, TOPICS (Traffic Operations Program to Increase Capacity and Safety), list some of the eligible items as separate bus lane controls and lanes for loading transit passengers including platforms and shelters.

The guidelines for administering Public Roads planning programs (Highway Planning Program Manual) devote a full chapter to the subject of public transportation planning in urban areas.

Numerous internal documents were issued throughout the 1960's to spell out the "clear intent of the Bureau . . . to give full

recognition of public transportation in the planning, design, and operation of urban highways," to describe the basis of federal-aid highway fund participation in rail transit in the median of the Chicago expressways, to determine the extent of exclusive or preferential bus lane use, to disseminate information relating to innovative bus operations on urban highways, and to point out the highway engineer's responsibility to seek out ways to increase the efficiency of highway systems by using them as a more effective means of mass transportation, thereby benefiting both transit and automobile users.

THE CURRENT INVOLVEMENT

One project which has been given considerable attention and publicity (primarily because in late 1969 it became the first place in the nation where we actually have buses running exclusively on a freeway lane) is on the Shirley Highway, Interstate Route I-95, linking northern Virginia with Washington, D.C.

The history of the Federal Highway Administration involvement in making special provision for bus transit on the Shirley Highway is extensive. Starting in early 1964, we entered into serious discussions with the District of Columbia and Virginia Department of Highways, the Washington Metropolitan Area Transit Authority, the Washington Metropolitan Area Transit Commission, and the bus operators, concerning proposals for incorporating express bus service and bus turnouts into the design for the planned reconstruction of this road. These discussions led to the redesign of three interchanges to allow exclusive bus access to the reversible lanes that were planned for the reconstructed route.

The issuance of a Federal Highway Administration policy statement in August 1967, which encouraged consideration of reserving a freeway lane exclusively for buses during peak periods, provided an incentive to consider making provision for preferential or exclusive bus lanes on this facility. In early 1968, agreement was reached on the scope of a "Feasibility Study of Bus Rapid Transit in the Shirley Highway Corridor."

The study consists of evaluating all travel in this corridor to determine the feasibility in two time periods. The first or interim

period is during the completion of the reconstruction where the highway is being rebuilt to provide two reversible lanes plus three directional lanes. The second or long-range period is after the completion of the reconstruction.

In September 1969, as a result of an interim recommendation of the study, a plan was put in effect whereby buses were permitted exclusive use in the morning peak of the portion of the reversible lanes that had already been constructed. This means that each bus saves between 12 and 18 minutes on its morning run. There is no time saving on the afternoon operation. After two months of operation, the ridership increased from 15 to 20 percent and the bus operator pressed more buses into service. Most of the runs now have some standees. There have been no observed violations of the exclusive lanes by automobiles even though to use them would mean bypassing a three-fourths-mile length of slow-moving cars and trucks.

In November 1969, the details of a plan were presented that will involve the construction of a temporary bus roadway through the remaining four-mile section north from the point where the constructed reversible lanes end to the Potomac River. During the Shirley Highway construction work, this will provide an additional 15-minute time saving for buses. It will be used in both the morning and afternoon peak periods. With this situation, the buses will be able to have a 30-minute time advantage over automobiles for the line haul portion of the trip. An estimated additional 100 buses will be needed to handle the diversion of people. Associated with this proposal are recommendations for fringe parking, new bus routes, and a downtown circulation plan. To implement successfully all of the pieces of this recommendation requires coordination of the two highway departments, the transit operators, the transit regulatory agencies, as well as the Federal Highway Administration, and the Urban Mass Transportation Administration within the Department of Transportation.

All of the agencies that have been involved in the study are working together to carry out the recommendations of the study. The Virginia Department of Highways has revised its contractual arrangements to make provision for the temporary bus roadway, and is modifying the plans for the remaining two contracts that

have not yet been advertised to accommodate the bus roadway. The District of Columbia Department of Highways and Traffic is working out the details for assuring that terminal facilities and preferential treatment for buses on the arterials within the District are provided. The Urban Mass Transportation Administration is working with the Federal Highway Administration and the Metropolitan Washington Council of Governments to determine the best way to assure that the additional buses are provided. They are also designing the necessary demonstration studies that should be undertaken.

In the Milwaukee area, an areawide bus rapid transit feasibility study is nearing completion. Jointly funded by the Federal Highway Administration, the Urban Mass Transportation Administration, the Wisconsin Department of Transportation, and Milwaukee County, the study is an outgrowth of recommendations made by the Southeastern Wisconsin Regional Planning Commission. Its purpose is to provide a foundation for immediate action by the Milwaukee area in expanding and strengthening its mass transportation system. The plan envisions a bus transit system whereby buses would circulate in residential areas to pick up commuters, use a network of freeways in the outlying sections, enter approximately five miles of exclusive bus roadway paralleling an Interstate highway, and then proceed to the Milwaukee Central Business District. The study will develop preliminary designs for the bus roadway, CBD distribution systems, fringe parking facilities for park-ride operation, and a downtown bus terminal. Special attention will be given to urban design and landscaping for the system itself and for areas adjacent to it.

In Pittsburgh, work is under way on the development of exclusive bus highways called PATways. (PAT stands for Port of Allegheny Transit.) These PATways plus a transit expressway called the Skybus or TERL (Transit Expressway Revenue Line) form a 28-mile "early action" rapid transit development program. Implementation of this "early action" program is being accomplished through an "ad hoc" committee composed of representatives of Allegheny County, the Southwestern Pennsylvania Regional Planning Commission, the Port Authority, the state highway department, and others including the Urban Mass Transportation Administration.

The possibility of providing an exclusive bus roadway in the Los Angeles area partly within the median and partly adjacent to the San Bernardino Freeway, Interstate Route I-10, is being studied. The busway plan which was developed by the Southern California Rapid Transit District is being refined by the SCRTD and the California Division of Highways. The Urban Mass Transportation Administration and the Federal Highway Administration are both involved in this plan and have had preliminary meetings regarding the eligibility of the various elements within each Administration's program should the detailed studies show this to be a feasible plan.

A study which was recently completed for the Bureau of Public Roads shed quite a bit of light on the ability of bus transit systems to attract a substantially higher share of the peak-period travel market. Titled "Evaluation of a Bus Transit System in a Selected Urban Area," it looked at a fairly typical medium-to-large-sized urban area's forecasted peak-period travel patterns from the standpoint of what was termed the automobile-oriented and bus-oriented systems.

The automobile-oriented system was composed of the existing bus transit system with sufficient highways to accommodate the forecasted peak demand. The bus-oriented system was composed of the existing plus committed highway network with a significantly improved bus transit system to accommodate the same travel demand. The analysis highlighted the following:

1. The bus-oriented system was able to alleviate the peak-period overloads on the existing plus committed highway system with the exception of the overloads on the outlying highway facilities and on some links where the overload was primarily due to truck and other travel passing out of the metropolitan area.
2. The automobile-oriented system would require an additional \$275 million for highway facilities over and above the highway facilities for the bus-oriented system.
3. No significant difference could be found between either system based on the annual total public sector costs. These consist of the costs for construction and right-of-way of highway facilities, traffic engineering improvements, parking facilities, fixed transit facilities including buses, operating and maintenance costs for highway facilities and transit vehicles, and taxes.

4. No significant difference could be found between either system based on the annual total private sector costs. This was due to the magnitude of the automobile operating costs which dwarfed other quantifiable monetary costs.

5. There was an indication that the bus-oriented system would provide some reduction in automobile ownership costs and would require a partial subsidy to maintain a fare structure low enough to attract sufficient riders.

The most recent involvement of the Federal Highway Administration is with the Urban Mass Transportation Administration in what is called the Department of Transportation's "Urban Corridor Demonstration Program."

This program proposes to test a variety of combinations of improvements in congested travel corridors in larger cities by the concerted use of the available programs of the Department of Transportation. A total of two million dollars in planning funds, which do not require matching, has been made available to plan these improvement programs. Preferred agencies for these special planning funds are those with regionwide responsibility in urban transportation such as Councils of Governments and urban transportation study groups.

The possible improvements should not consider substantial highway construction on new right-of-way, but should instead focus on improved bus transit operation for the line haul portion of travel by such devices as exclusive or preferential lanes, special ramps and turnoffs, etc. The collection and distribution improvements should be considered as an integral part of the corridor improvement plan. Priority in the allocation of these funds will be based on evidence of a serious intent to carry out the recommendations, the degree of innovation evidenced, the level of coordination by all agencies, and the extent of benefits in relation to costs that might be anticipated.

AN OVERVIEW

Sitting back and taking a look at what has happened in the urban transportation scene, particularly from the highway standpoint, I believe the following emerges:

1. It will not be financially possible, and even if it were, cer-

tainly not socially desirable, to provide all of the highway facilities that would be needed in order to satisfy the peak-period demands, especially in our larger urban areas, for all of the people who want to drive automobiles.

2. It will not be possible for urban transit operations, as they are presently financed and regulated, to provide service quality attractive enough to a sufficient number of motorists to alleviate peak-hour congestion on urban highways.

3. If urban transit continues to remain basically oriented to a fixed-route CBD-oriented system which primarily responds to the captive market, the future for transit will not look bright.

4. Proposed solutions to the peak-hour congestion problem which revolve around banning the automobile from the metropolitan areas will continue to be discussed but will not be implemented.

5. The solutions that will emerge will come about by an evolutionary process that can proceed to improve upon the present transportation system investment.

Recognizing the aforementioned, I am convinced that progress will be made by emphasizing the following:

1. *Soundly based analysis.* Existing travel patterns are complex and different not only for different urban areas, but for different time periods in any one area. The analyses that are made are rooted in observing human behavior or reaction to a set of circumstances and predicting what this behavior will be to a changed set of circumstances.

This means that we cannot fall into the trap of accepting apparent "solutions" that have not been thoroughly analyzed in connection with the facts. A classic example is the case whereby the obvious "solution" to the congested freeway is to build a transit line because the capacity of the transit line is 10 or so times the capacity of one freeway lane in terms of moving people. A soundly based analysis for the particular area may or may not show this to be the solution. If the capacity of the transit line can be utilized because the demands are there or can be developed, it may be a solution. But if the demand cannot be generated, then it is not a solution.

2. *Involving all elements.* It is difficult to conceive of any solution

that involves action by only one agency as having any real impact. While the highway engineer may be able and willing to provide for an exclusive bus lane or preferential bus treatment on a state facility, thereby saving significant time for buses, he would not be inclined to do so if the bus operator were not willing and able to provide the additional buses that would be required. At the same time, the traffic engineer most probably would need to be willing to provide for preferential treatment on the circulatory street system. The transit regulatory authority would have an interest in the additional bus routes or in changes to existing routes that would be required. There would most probably be a need for outlying fringe parking, which could involve still others. It is apparent, therefore, that all the agencies which might have to take part in the implementation of improvements should be involved in the development of the solution. Agreement on agency action rarely comes quickly, if at all, when one group develops a plan and then expects someone else to carry it out. Involvement and input by all from the beginning will assure not only that a better solution recognizing all of the problems is developed, but that the solution will be implemented by all of the affected agencies since it is "their" plan.

3. *Incorporating fresh thinking.* The ability to do this represents the real challenge. All of us, as we have developed within our professional careers, have naturally acquired attitudes and reactions that are conditioned by past experiences or ways of doing things. When someone comes up with a new idea, we sometimes have difficulty in giving it a fair evaluation because we are hampered by a built-in bias. To overcome this requires continued self-discipline. A good example is the idea of promoting more efficient use of urban freeways in peak periods by reserving a lane for buses and car pools. While this was proposed back in 1963, not until now has it been given the type of serious objective evaluation that it deserves. At this time a detailed feasibility study of this concept is under way. The Urban Mass Transportation Administration and the Office of the Secretary of Transportation are working with the Federal Highway Administration on the study.

When it is recognized that the main reason for being unable to consider exclusive bus lanes seriously except in a relatively few

places is due to an insufficiency of buses, the potential for including high-occupancy automobiles is most apparent. When we appreciate the fact that peak-period automobile occupancy even in areas such as New York is on the order of 1.5 (averaging only one and one-half persons riding in each car) and that 70 percent of the automobiles carry only the driver, we can see that there certainly is a great deal of inefficiency from the automobile use side of the picture. When we look at the bus side of the picture, we find that the vehicle occupancy increases considerably—40 to sometimes over 60 persons per vehicle—but there still is a great deal of inefficiency due to the large headways or spaces between buses.

The idea of reserving a lane for buses and high-occupancy automobiles, therefore, is one that combines the most efficient aspects of both bus and automobile travel in order to maximize the highway use. The fresh thinking lies in not being concerned so much with the type of highway vehicle but with the direct action which can be taken to obtain more efficient highway use by encouraging one-person-per-automobile users to switch modes of transportation.

4. *Thinking of people rather than vehicle flow.* Much has been done in this area but much more can and should be done. It is all too easy to fall into a trap when the person movement element is not related to the vehicle movement element. A vivid illustration of this pitfall occurred not too long ago. In evaluating the possibility of reserving a freeway lane for buses during the peak periods, the evaluator stated, “. . . the first impact would be due to the takeover of the most efficient lane . . . for inefficient use by buses only . . .,” and “. . . an exclusive bus lane . . . should therefore not be implemented unless it was considered equitable to inconvenience all other traffic. . . .”

The conclusion was reached because during the peak hour 67 percent of the vehicles were automobiles and less than 15 percent were buses. When existing vehicle occupancy figures were introduced to enable the evaluation to be made on a *people* rather than *vehicle* moving basis, the situation changed drastically. Now it was shown that during the peak hour only 15 percent of the people were in automobiles and over 82 percent of the people were in buses.

A good example of thinking about people rather than vehicle flow on urban streets is ongoing in the District of Columbia. A

very sophisticated study sponsored by the Federal Highway Administration and the Urban Mass Transportation Administration is under way to determine the optimum traffic signal system which will detect traffic on the approach legs for a large number of critical intersections and relay this to a central computer. The computer in turn will analyze all of the flow data and determine the optimum signal control from a system standpoint. Detection equipment will discriminate between the presence of a bus and an automobile and whether the bus is to stop to handle passengers or to proceed through the intersection. This information will permit the computer logic to optimize the signal system timing on a people flow basis.

Since it will be some time before the system just described will be actually installed and operational, is there any reason that intermediate progress cannot be made with the existing equipment? Existing traffic signal timing procedures are based on the number of vehicles on both the main and cross street approaches. Why cannot these approach leg vehicle counts be factored by the average vehicle occupancy figures for both automobiles and buses to provide a more people-responsive proportioning of the green time? Hopefully the day is not too far off when, in addition to reporting ADT (average daily traffic) volumes on highway facilities, we will be reporting ADP (average daily people) volumes.

In concluding this article, I shall make one more reference to the exclusive bus lane on the Shirley Highway. Figure 1 is a photograph which shows one of the buses moving on the exclusive lane and bypassing three lanes of bumper-to-bumper automobiles. We have heard some people, who see this from a vehicle viewpoint, comment on the apparent underutilization of the bus roadway in comparison to the other lanes which are filled with automobiles and trucks.

Figure 2 was prepared by taking the same photograph and eliminating the cars that are represented by the number of people on the bus. Now the utilization of both roadways can be compared from a people viewpoint. This comparison is still not the best since it is a static one. In a dynamic sense, the 68 persons on the bus were *moving* in their utilization of the highway, while the 68 persons in the 45 cars that were blocked out were *stopped* or *barely moving* in their utilization of the highway.

Viewing the situation from a perspective of people utilization of the highway rather than vehicle utilization of the highway is interesting—is it not?