A Statement of the Urban Passenger Transportation Problem

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Much controversy and confusion appears to prevail today as to how best to solve the ubiquitous problem of adequate passenger transportation in urban areas. Based on the old saw that a clear statement of a problem goes a long way toward its solution, this paper (a) sharpens up the technical language of this subject area; (b) identifies the conditions in urban areas which give rise to the recurring problem of providing adequately for metropolitan transportation; (c) explains some of the difficulties that arise because this problem has no unique solution; and (d) indicates the different approaches and different types of economic consequences that would follow the adoption of any one of several alternate proposed solutions in any given urban area.

●IN ATTACKS on the ubiquitous problem of providing adequate passenger transportation in urban areas throughout the nation, much controversy and confusion has arisen among proponents of various types of urban mass passenger transport systems. Based on the old saw, that a clear statement of a problem goes a long way towards its solution, the author of this paper is making an effort to present such a statement in a way that will point to effective attacks and practical solutions.

In the current literature on mass transit, there are a number of technical terms that are fuzzy. Other terms while describing significantly different types of passenger transport, are nevertheless used interchangeably because they are assumed to be synonymous. It is this interchangeable use of significantly different terms that leads to confusion, often retards and even paralyzes current efforts to provide adequate passenger transportation in urban areas.

For example, on examination of the widely used term mass transit, it is found that the more generic term is actually mass transport, which means modes of conveying persons or goods, from place to place, en masse or in large volumes. Modes of mass transport that operate underground through tubes, as in subways, and those that travel over streets and highways, as elevated lines, may accurately be referred to as mass transit.

Mass-passenger transport, by land, may be rendered by three distinctly different types of passenger-carrying conveyances: (a) steam or electric trains operating on steel rails, on exclusive rights-of-way, with protected grade intersections generally referred to as railroads; (b) electric trains operating on supported or suspended rails, in subways, or on elevated structures, accurately referred to as rail transit; and (c) free-wheeled vehicles usually of more than seven-passenger capacities, operating on arterials or on freeways, expressways, or in general on limited-access highways, usually sharing lanes with autos and trucks, generally referred to as buses.

Some of the significant differences in passenger services offered by these three types of mass transport are given in the following paragraphs.

Steam or electric railroads offer regularly scheduled services, as shown on their timetables, at rates reduced from single-trip fares, referred to as "commuter" rates, applying usually within metropolitan areas up to about 50 miles from the Central Business Districts (CBD's); these railroads are therefore referred to as "commuter" railroads; they provide seats for most of their regular commuters between suburban stations in their home towns, and railroad stations in the CBD's of central cities.

Rail transit, generally referred to as "subways" or "els", usually operates within close-in areas up to about 20 miles from CBD's, on schedules so frequent as to need no timetables; in rush hours, however, the majority of their passengers must stand between stations of origin and stations nearest their destinations in the CBD's.

Suburban buses serve areas up to about 40 miles from CBD's, on regular frequent schedules, with seats for most passengers but requiring some of their passengers traveling in rush hours to stand, between pick-up locations in home towns, usually within walking distances of homes, and either bus terminals in CBD's or drop-off locations within walking distances of CBD destinations.

All three of these types of mass-passenger transport are referred to in the literature of urban-passenger transportation as public transit. When privately operated bus systems are referred to as public transit, it may be a bit confusing to some. In the interest of a more accurate description of these passenger transport services, the author therefore suggests the term common-carrier mass-passenger transport, the term used by regulatory agencies. This term denotes that these common carriers hold themselves out to furnish mass-passenger transport, along specified routes, on certain schedules, to the general public. Most of these common carriers are regulated as to public safety, routes and fares by Federal, state and sometimes, also, local regulatory agencies. Common carriers of passengers in the urban transportation context may, therefore, be either "commuter" railroads, rail transit carriers or bus routes which may be of the "local" or "city" types, of the "suburban" or "short-haul" types, or of the "intercity" or "long-haul" types.

Often in the literature of urban-passenger transportation, the term "rapid" transit, usually implying rail rapid transit, is used interchangeably with mass transit to endow rail transit with an unspecified but some assumed high speed, often unwarranted by actual performance.

To be sure, mass transport on rails, that has been operated on exclusive rights-of-way, in subways or on elevated structures or even at grade with protected intersections, having had no traffic interferences, could travel faster than autos and buses on streets and highways with numerous traffic-controlled grade intersections and particularly where peak-hour vehicular traffic demands have exceeded the capacities of the roadways. In the past, such mass transport, on rails, particularly subways and "els", warranted the designation rail "rapid" transit, as meaning more rapid than travel in autos, in electric cars on rails, and in buses on public streets and highways.

Today, however, with limited-access highways, generally available, travel speeds on rails, even though they are on exclusive rights-of-way, but because of numerous station stops and infrequent service, may not in fact be faster than continuous travel on freeways. Besides, in the context of mass transport, in journey-to-work hours, the speed which is significant, which warrants the designation "rapid" and which, in fact, determines the workers' choices of modes of journey-to-work travel, is the over-all speed between homes and common-carrier terminals, stations or street stops in CBD's.

Therefore, the term "rapid" should not derive from the maximum speed between two stations on a common-carrier route, with the longest distance between them. The term "rapid" should invariably derive from an average speed obtained by aggregating travel times, consisting of auto or bus travel time to a railroad, a rail transit or a suburban bus station, waiting time for the CBD common carrier, and travel time (including transfers) to the CBD station or stop nearest the work place in the CBD, and dividing this aggregate travel time by the aggregate distance covered in all vehicles.

For engineers, the term "rapid" transit should not be a term loosely used. Over-all speed is definitely measurable. It can, therefore, be standardized. When the term "rapid" transit is used, it should be applied to any mode of mass-passenger transport, provided the over-all speed between given residential areas and stations or stops nearest clusters of sites of employments in CBD's, exceeded a given predetermined speed. Operating practices could thus place different types of urban common-carrier mass transport into classes of "rapid" or "express" and others into "local", irrespective of whether they operated as steel wheels on steel rails or rubber tires on concrete

or asphalt; whether they operated on exclusive rights-of-way or shared public rights-or-way, with exclusive or perferential lanes, in journey-to-work hours.

Again, mass transit literature frequently makes use of the term "balanced" transportation, just as an engineer would refer to a balanced system of forces in a structure. This term is so used as to leave the reader with the implication that auto transportation must be balanced with mass transit, meaning, of course, rail transit, and impliedly "rapid" transit; otherwise the whole structure of urban-passenger transportation would collapse, as any structure would if certain members were overloaded.

Most urban areas today have some types of common-carrier passenger services. Large metropolitan areas have commuter railroads; some of the largest cities, like New York, Chicago, Boston, and Philadelphia, also have subways or "els" for close-in passenger travel, particularly for journey-to-work travel to and from CBD's. Certainly, these larger metropolitan areas could not exist and function properly without common-carrier passenger services. In fact, few urban areas of any size could exist without some mass transport for journey-to-work travel to and from their CBD's.

But what constitutes "balanced" transportation? For example, in the N.J.-N.Y. Metropolitan District, trans-Hudson passenger movements for the entire year of 1958, distributed themselves approximately as follows: 49 percent in autos, 28 percent in buses, and 23 percent in railroads. Might this be considered "unbalanced" urban transportation? If so, then on all weekdays of the same year, in journey-to-work hours, to lower downtown portion of the Manhattan CBD (Battery to Houston Street), the distribution was 11 percent in autos, 17 percent in suburban buses, and 73 percent via "commuter" railroads. Would this constitute "balanced" urban transportation? (See Table I for distribution of other segments of trans-Hudson passenger movements among alternate modes of transportation.)

To constitute a "balanced" passenger transportation system, what should be the proportions of various segments of journey-to-work passenger volumes to CBD's handled by all types of mass transport on the one hand, and by autos on the other? Should these proportions be 50-50 or close to 90-10? Does a city which does not, at present have rail transit suffer from "unbalanced" transportation, even if it has bus transportation? Should not engineers demand some meaningful quantification of the term "balanced" transportation under specified conditions? Otherwise, this expression will be bandied about loosely and eventually also endowed with a highly desirable quality like "rapid" which in this case, could only produce confusion worse confounded.

Urban-passenger transportation does not constitute a single neat, unique and universal type of passenger transport system. It covers a number of possiblle permutations and combinations of passenger transport. Many of the knotty problems of urban-passenger transportation could be more effectively attacked, if not partially solved, if engineers, in discussions of this subject, would invariably insist on adhering meticulously to precise and uniquely meaningful terms.

PROBLEMS IN PROVIDING ADEQUATE URBAN PASSENGER TRANSPORTATION

There are three really major basic problem areas which most of the problems of providing adequate urban-passenger transportation grow out of.

One problem area arises out of the short periods of arrival and departure times of most workers at sites of employment, particularly in the CBD's of urban areas. As a consequence of this, journey-to-work passenger travel volumes on weekdays, invariably exhibit two sharp peaks, one in the morning, the other in the evening. During the rest of the day, there is much less of a problem of moving people; more of a problem of providing space to park autos. On the other hand, there is little journey-to-work travel on weekends and holidays and so worker traffic volumes, then, present no problem.

The second problem area arises in CBD's which are spread over large areas. In such large CBD's, distances are too far to walk between suburban common-carrier terminals and stations and ultimate destinations within CBD's. There are usually a

TABLE 1

HOW SEGMENTS OF ANNUAL TRANS-HUDSON PASSENGER MOVEMENTS WERE DISTRIBUTED AMONG ALTERNATE MODES OF TRANSPORTATION

Trips	By All Modes (Mil)	By All Modes (%)	In Autos (%)	In Buses (%)	In RR's (%)
All days	276.8	100.0	49.3	27.8	22.9
Weekdays:					
N.Y. residents to and from N.J.	55.0	100.0	64.0[1]	18.9	17.1
N.J. residents to and from non-CBD	31.7	100.0	74.8[1]	15.1	10.1
Manhattan CBD:					
Off hours	45.8	100.0	23.1	44.3[1]	32.6[1]
Rush hours:					
Upper CBD (34th-59th)	24.7	100.0	15.4	57.5[1]	27.1[1]
Middle CBD (Houston-34th)	13.5	100.0	20.7	34.1[1]	45.2[1]
Lower CBD (Battery-Houston	19.9	100.0	10.6	16.6	72.8[1]
Weekends:					
N.Y. and N.J. residents	86.2	100.0	67.5[1]	22.4	10.1
Long haul areas	21.2	600.0	68.4[1]	17.4	14.2
Short haul tributary	65.0	100.0	67.2[1]	24.0	8.8
Upper N.J. area to GWB	23.9	100.0	84.5[1]	15.5	0.0
Middle N.J. area to LT	24.1	100.0	51.9[1]	45.2[1]	2.9
Lower N.J. area to HT	17.0	100.0	64.7[1]	5.9	29.4[1]

[1]Major mode of transportation.

number of clusters of sites of concentrated employment. On weekdays in journey-to-work hours, there is also usually acute vehicular congestion on the local street system. Considerable delays are therefore encountered by passengers in vehicles traversing local streets, in reaching their ultimate CBD destinations.

The third problem area arises out of the fact that patterns of urban travel have become more diffuse. Resident zones and zones of economic and social activities have now become more widely dispersed throughout urban areas than a decade ago. This dispersion is likely to continue into the future by reason of the expected low densities in both residential and non-residential developments.

THE PROBLEM OF TWO SHARP PASSENGER VOLUME PEAKS

It is common knowledge that urban dwellers, in pursuit of their livelihoods, create diurnal movements of masses of people who travel between residential areas and benches and desks in employment areas. Most workers, both of the blue- and white-collar types, concentrate their daily journeys-to-work regularly, on weekday mornings, 7:00 to 9:00 a.m. to their sites of employment and on weekday evenings between 4:30 and 6:30 p.m. from their work places, usually bound for their homes. These sharp work travel peaks, in periods of an hour or less, occur both on rail and on highway routes that focus on zones of concentration of economic activities.

It is also common knowledge that in most urban areas, CBD's are usually the single districts, with the largest volumes of concentrated employment. Manufacturing, commerce, business as well as governmental, educational, cultural and recreational activities are those usually found in CBD's. Consequently, rail and highway routes that focus on CBD's, are particularly subject to these extremely sharp passenger volume peaks, in periods of one hour or less. Moreover, passenger volumes that converge on CBD's are so much larger than those that converge on other single areas of concentrated employment, that they usually tax most of the existing railroad, rail transit and highway

passenger (bus and auto) travel routes, both in the morning and evening rush hours.

In some urban complexes, there are also, of course, other areas such as beaches, parks, amusement and recreational areas, and other places of public assembly, that constitute foci of heavy passenger volume concentrations in leisure time periods—on Sundays and holidays. These are special problems that need consideration, but only in specific instances.

The usual controlling passenger volume peaks, however, are found on those rail and highway routes that focus on CBD's, on weekdays, in journey-to-work hours. On such routes, passenger volume hourly peaks are usually of the order of 30 percent to more than 50 percent of the total day's passenger volumes to the CBD, as compared with an average hour's passenger volume which would be only about 4.2 percent of the 24-hr daily volume. This means that to accommodate, adequately, journey-to-work peak-hour passenger volumes, capacities of such railroad, rail transit or highway routes must be of the order of 7 to 12 times the capacities needed to accommodate average hourly (of 24-hr) passenger volumes. For example, if one expressway lane is needed to accommodate average hourly passenger volumes in autos at less than two persons per auto, then some 7 to 12 lanes would be needed if the expressway accommodated largely journey-to-work passenger volumes in autos to the CBD, in the morning or from the CBD in the evening. These journey-to-work passenger volumes would thus produce daily route efficiencies, passenger-wise, of only 8 to 15 percent.

It is these sharp journey-to-work passenger volume peaks or extremely low passenger-carrying route efficiencies, that are responsible for the formidable economic burdens on urban areas. These economic burdens may come to rest on common carriers—commuter railroads, rail transit operators or bus operators. Or, they may come to rest on the local urban economies, themselves, which must bear part of the burden either through subsidies to rail transit and/or commuter railroads or through extra user taxes for the expansion of predominantly journey-to-work expressway routes. Thus, if most expressway passengers in journey-to-work hours travel in autos, then these expressways are really under-utilized, passenger-wise. How to reduce this formidable economic burden, brought about by the extremely sharp journey-to-work passenger volume peaks, becomes the great challenge that taxes the ingenuity of transportation engineers.

To put one's finger on the sharp journey-to-work passenger volume peaks as one of the major problem areas of urban-passenger transportation, whatever the modes of mass-passenger transport system may be, is to open up some avenues of approach, at least, toward partial solutions.

THE PROBLEM OF PASSENGER DISTRIBUTION IN CBD'S

The second problem area (namely, CBD's which are so large, in extent, that the distances between their suburban rail or bus terminals and important destinations within them, are too far to walk) should be examined. In multinucleated CBD's, it is not unusual for common-carrier terminals and stations to be more than 2 mi from important clusters of activities. This means altogether too long a walk, more than 25 min. On the open highways, it would take less than 5 min. In the usual existing CBD common-carrier vehicles traversing congested stop-and-start local streets, in journey-to-work hours, it usually takes all of 15 to 20 min. This is a substantial addition to the weekday morning and evening travel time between suburbs and sites of employment in CBD's.

The problem consequently is this: To devise the most economical way of bringing the CBD-bound worker, with a minimum of travel delay, to within easy walking distances of concentrations of sites of employment within such extensive CBD's.

THE PROBLEM OF DISPERSION OF HOMES AND SITES OF EMPLOYMENT

The third problem area is that of dispersion of homes and sites of employment in urban complexes. The movements of persons traveling between suburban homes and sites of employment and places of business not in CBD's, but scattered throughout urban complexes, present a diffused travel pattern: multitudinous points of home origins

linked with another set of multitudinous points of destinations for economic and social activities. Concentrated generating points at origins or concentrated attractors at destinations are lacking; individual travel flow lines are very thin. Flow lines usually yield no definite linear traffic flow patterns but rather area-wide patterns.

This type of peripheral travel could be served, to only a very small degree, by linear mass transport such as railroads and rail transit, particularly of the types that focus on CBD's. Any fixed linear inflexible right-of-way rail system, either old or new, to serve such area-wide origins and destinations is therefore inevitably foredoomed to failure. Common-carrier mass transport, even by buses than can travel on an area-wide network of highways would find it difficult, on an unsubsidized private enterprise basis, to serve this type of diffused peripheral travel.

The problem is not only how to retard or arrest dispersion but also how to concentrate such sites of employment in the future; otherwise, providing for the transportation requirements resulting from the wide dispersions will become highly uneconomical and too burdensome on urban complexes.

TYPES OF MASS TRANSPORT SOLUTIONS TO MEET JOURNEY-TO-WORK PEAKS

The status of present mass transport in cities, to a large extent, determines the types of mass transport solutions that will best fit them.

For example, consider the cities that are now being served by "commuter" railroads that offer journey-to-work passenger transportation to and from their CBD's, that are burdened with sharp rush hour peaks, that handle little more of other types of passenger travel, that are greatly under-utilized, that consequently incur continual deficits from their commuter passenger operations. Such cities should, of course, make every effort to encourage the most effective use possible of their commuter railroads. These railroads do represent considerable sunk capital. If the continued operations of these commuter railroads were to obviate the necessity for building alternate highway facilities primarily to serve journey-to-work passenger travel to and from CBD's, then state and municipal subsidies could be economically justified to cover such rail operating deficits as do result from meeting these work travel needs. Also, some public urban redevelopment projects might deliberately be located in areas tributary to such commuter railroads, so as to use them more effectively. This would permit them to develop more revenue passenger traffic of a type that might reduce their passenger deficits.

Again, consider cities with rail transit facilities than handle, largely, close-in journey-to-work travel to and from CBD's, that suffer from extremely low route efficiencies. These cities should make every effort to stimulate use of rail transit by other than work travel. In many instances, housekeeping improvements, such as cleaner, better lighted, safer and more attractive stations would, in themselves, induce greater use of rail transit. Greater use, particularly if in previously under-utilized periods, would reduce the usual operating deficits, and at the same time, reduce the need for more parking spaces on high tax properties in CBD's.

Then there are cities where rail transit facilities are available but which are used to capacity in journey-to-work hours. There, every effort should be made to encourage the reduction of the sharp journey-to-work passenger volume peaks at CBD stations. This may be done by either one or both of these methods: (a) through the spreading of arrival and departure times of workers at individual sites of employment, or (b) through the staggering of arrival and departure times of workers in selected clusters of sites of employment. Greater margins of liberated rail transit capacities, in peak periods, would thus become available to absorb expanding passenger travel in rush hours with the present equipment. In this way operating deficits would be reduced.

On the other hand, cities that do not now have available railroad or rail transit services may need an entirely different type of mass-passenger transport solution.

In urban areas, where most or substantial proportions of the journey-to-work passenger movements to and from their CBD's are presently made in autos, on expressways, the problem becomes one of converting the sharp passenger volume peaks

into much flatter vehicle volume peaks (Figs. 1 and 2). This means squeezing passengers out of autos into a much smaller number of buses in journey-to-work periods. Otherwise, continual and increasing vehicular traffic volumes will bring about acute traffic congestion in the morning and evening rush hours if such congestion does not already exist. At that point the inevitable question would arise: more freeways or rail transit?

At such a time, before giving consideration to sinking new capital in fixed linear inflexible rail facilities, those urban areas should first consider the feasibility of bringing into being publicly acceptable express bus routes between suburbs and their CBD's, particularly where such routes fan out over 180 deg or more from their CBD's. In journey-to-work hours, it may even be desirable to provide preferential or exclusive lanes on urban expressways which have been or will be built. Otherwise, such urban areas will have to keep providing a much larger number of additional expressway lanes that will be needed to accommodate the expanding CBD-bound journey-to-work passenger volumes in autos, than the much fewer lanes that would be needed to accommodate the same expansions in journey-to-work passenger volumes, if accommodated in CBD-bound express buses.

Urban communities must also constantly keep these facts in mind. Serving the two sharp weekday morning and evening journey-to-work passenger peaks only, will invariably turn out to be deficit operations. This will be so even if journey-to-work passengers to and from CBD's could be squeezed out of autos into express buses on expressways, either through traffic regulations or through special local taxes. This

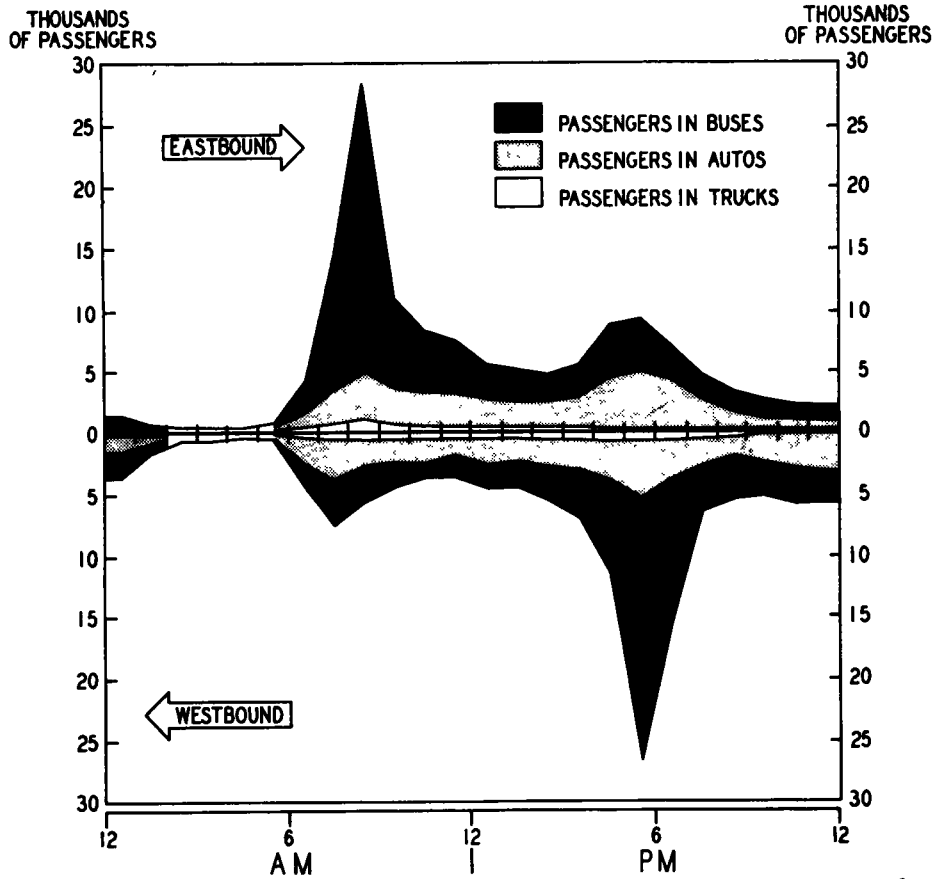

Figure 1. Hourly passengers in autos, buses and trucks through the Lincoln Tunnel on an average weekday in 1958.

will also be so even if all journey-to-work travelers used only common-carrier mass transport and autos were actually prohibited in journey-to-work hours. This will also be so unless these buses could attract substantial volumes of supplemental revenue passenger traffic, such as weekday non-rush hour and "reverse" travel (that is, from central city to suburban locations), as well as leisure time weekend travel and charter bus passengers.

MASS TRANSPORT SOLUTIONS FOR EXTENSIVE CBD'S

Any extensive multinucleated CBD, if it is to continue to be viable, must have a fast local circulating expressway or rail transit system to distribute commuter railroad, suburban bus and local intra-CBD bus passengers who must complete their journeys, within the CBD, to reach their ultimate CBD destinations.

CBD's that do not have a fast circulating system may, at first, make use of exclusive bus lanes on selected existing CBD streets in rush hours. Eventually, however, an underground or overhead mass-transit system may be needed, looping the CBD with stations located within 1,000 to 1,500 ft of important CBD destinations.

TRANSPORTATION SOLUTIONS FOR DISPERSED LOW DENSITY DEVELOPMENTS

To accommodate existing peripheral passenger travel demands between homes and sites of employment in low density areas, only an extensive network of highways and the private auto could meet this type of demand universally and adequately.

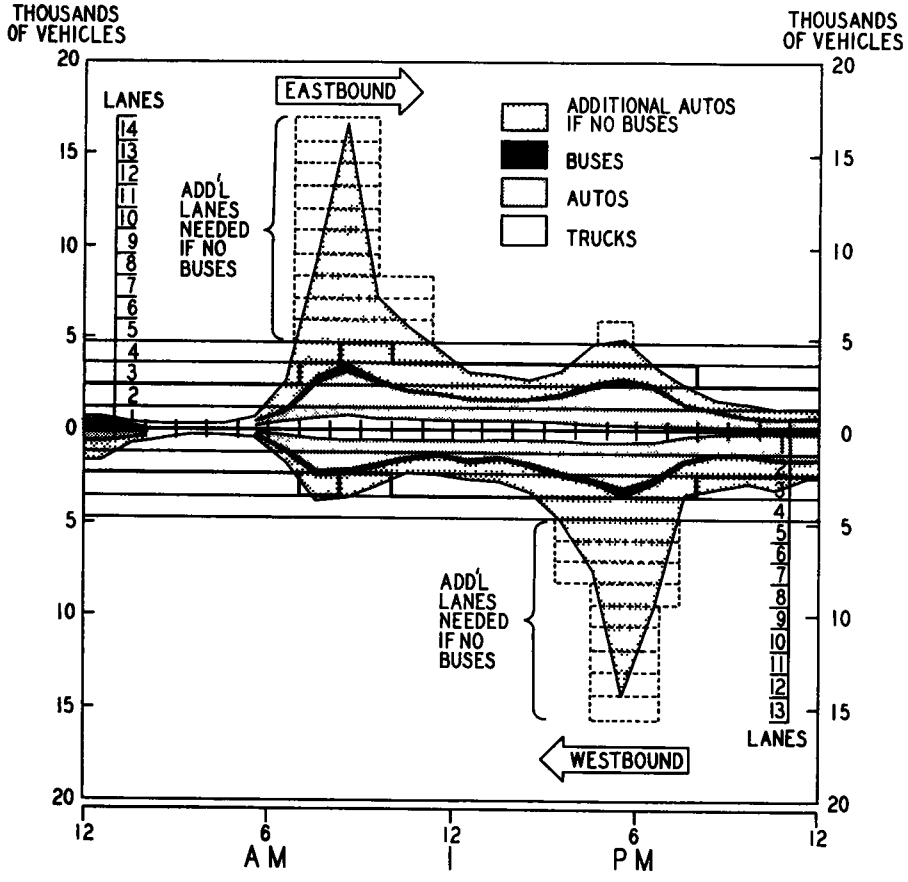

Figure 2. Hourly autos, buses and trucks through the Lincoln Tunnel on an average weekday in 1958.

In a minority of instances some opportunities for group travel in journey-to-work hours could develop to bring about a more efficient passenger-carrying utilization of the intensely used sections of the highways.

If efforts were made to cluster new work sites, more of such opportunities could be developed. Some sections of highway routes could build up enough passenger traffic densities between given residence areas and given clusters of sites of employment, to warrant establishment of bus services. Such bus services would increase, significantly, the passenger-carrying capacities of these sections of highway routes, perhaps sufficiently to obviate the necessity for expanding them, at least for some years ahead.

To capitalize on the advantages of bus transportation for journey-to-work travel, however, employment clusters would have to be concentrated in areas such as industrial parks, instead of in individual plants scattered over the landscape. Industrial parks, for example, would have to be large enough to concentrate some 5,000 to 10,000 employees, before bus transportation could become economically practicable to serve largely journey-to-work travel in low density areas. Such bus operators would also have to develop other types of off-hour, leisure time and charter bus travel, as well. Public utilities commissioners might wish to encourage the establishment of such journey-to-work bus services under proper circumstances.

In anticipation of such clustering of sites of employment in industrial parks, highway departments should design expressways so as to facilitate operation of express buses thereon, and thus encourage bringing into being mass transit by express buses as an effective means of obviating the necessity for expanding expressways to meet expansions in passenger travel in autos in journey-to-work hours.

SUMMARY

1. Precision of language, in this widely discussed controversial subject of urban-passenger transportation, will help to clarify this subject. It will bring into bold relief specific problem areas. It will indicate types of solutions that will meet the problems effectively, economically.

2. Today, no large urban areas can depend solely or even largely on autos, for weekday journey-to-work travel to its CBD. Some types of common-carrier passenger transport are essential.

3. Existing railroads and rail transit facilities that represent substantial sunk capital, that handle, largely, weekday journey-to-work passenger travel to and from CBD's, should be used most effectively, even be subsidized if necessary. Their continued operation could obviate the need for expanding highway facilities to absorb expanding journey-to-work travel to CBD's.

4. Where there are today no existing rail facilities, but where there are radial expressways into CBD's which will have to be expanded in the future, an entirely different type of solution is needed. Before considering fixed, linear, inflexible rail facilities, serious consideration should be given, first, to the feasibility of bringing into being, suburban express routes to CBD's with preferential or exclusive lanes for these bus routes in journey-to-work hours.

5. Where the CBD is extensive, ways should be found to give preference to buses on selected arterials in journey-to-work hours, so as to deliver workers, with a minimum of delay, to within 1,000 to 1,500 ft of important clusters of sites of CBD employment. Where underground or overhead structures are feasible, considerations should be given to such facilities for really fast circulation within CBD's.

6. In the suburbs, clusters of economic activities should be encouraged to make bus transportation economically practicable in journey-to-work hours. Highway departments should so design expressways as to encourage fast bus transportation, even in journey-to-work hours.

Discussion

DAVID M. GLANCY, Engineer-Economist, Bureau of Planning, Ohio Department of Highways — The following comment expresses the personal opinion of the writer and and does not attempt to state the opinion or policy of the Ohio Department of Highways, by whom the writer is employed.

As Mr. Cherniack so ably points out in his latest paper, there is no unique solution to the problem of urban-passenger transportation. He does indicate, and has in previous papers published elsewhere, that bus transit, properly planned and designed, could offer a reasonable solution to this problem in many urban areas.

In the opinion of the writer, this solution may be placed beyond reach, if some immediate action is not taken. Today, with the Federal-Aid Interstate and Urban programs, urban expressways are being built at a rapid rate. If provisions in plans and designs are not made for future bus transit pick-up, discharge and transfer points at urban interchanges, it will be impractical, if not impossible, to develop integrated bus transit systems at a later date.

Only slight modification of present designs would be necessary to allow for such future facilities. The added cost of right-of-way and construction would be small compared to the costs of revamping interchanges later and even less compared to the economic losses that could result from the inability to have integrated transit facilities for the movement of passengers in urban areas. This all boils down to what planners have been saying for years, planning more than pays for itself.

J.W. McDONALD, Director, Engineering and Technical Services, Automobile Club of Southern California, Los Angeles — The author immediately strikes a responsive chord in the first part of his paper dealing with the "fuzziness" or lack of definition for terms describing forms of passenger transport.

As another example of an approach to this problem, definitions suggested in California for clarifying thinking on mass transit are as follows:

Mass Transit—Scheduled public transportation in vehicles capable of carrying large groups and operating on specified routes—normally confined to an urban or metropolitan area. (In transportation discussions this term should probably be synonymous with "transit" and "public transit".)

Local Transit—Mass Transit generally operating on public streets and designed to furnish service to all areas adjacent to the routes by stops spaced at frequent intervals. (Typical examples would be buses, trolley coaches and street cars. The word "local" here should not be construed to mean necessarily a more limited area of service.)

Rapid Transit—Mass Transit operating on grade-separated rights-of-way and providing limited-stop, express service.

Rail Rapid Transit—Rapid Transit using rails or other fixed system of guidance for the vehicles and operating over exclusive rights-of-way.

Flexible Rapid Transit—Rapid Transit which may use but is not dependent on fixed system of guidance and/or exclusive rights-of-way.

Note that, as these definitions are set up, the more specific terms depend on the previous definitions. These definitions could, of course, be written in a form where each could stand alone, for example:

Flexible Rapid Transit—Scheduled public transportation in vehicles capable of carrying large groups and operating on specified routes along grade-separated rights-of-way and providing limited-stop express service. The system may use but is not dependent on fixed systems of guidance and/or exclusive rights-of-way.

These definitions are probably not as comprehensive as Mr. Cherniack's but the terms are less cumbersome. Subways as they exist in New York and commuter railroads may not fit, but these definitions could serve to clarify some particularly prevalent areas of confusion. For instance, in most people's minds, the general term "rapid transit" means "rail rapid transit". This is an extremely important distinction as

more and more evidence is gathered indicating the superiority of a flexible rapid transit system in the changing urban areas. In these definitions it is assumed that all agree that the term "transit" refers to the transportation of persons.

Under these definitions, express buses operating on freeways would be a form of flexible rapid transit, even though the same vehicle might operate off the freeway in collecting and distributing passengers at both ends of its run.

It would seem that some commuter railroads could meet this definition of "rail rapid transit" if their rights-of-way were grade separated or protected to the extent that speed reductions were minimized.

Conventional and modified 2-rail rapid transit train systems and monorail systems would, of course, be forms of "rail rapid transit". Some subway systems might be difficult to classify, however, because they operate on exclusive grade-separated rights-of-way but do not necessarily offer an express-type service.

These definitions incorporate the word "rapid" primarily because of its common use. Mr. Cherniack is certainly justified in pointing out that this word as applied to existing "rapid" transit systems and most planned systems is misleading through its inference that high average speeds exist.

The current proposal for a rail rapid transit system for the Los Angeles area suggests trains with a potential top speed of 80 mph. The average speeds, however, from station to station are estimated to be only slightly better than the speeds experienced today by automobile commuters using, primarily, freeway routes lying in the proposed transit corridors. Current freeway construction, when completed, will improve these speeds still further and of course the elapsed time used in calculating speed by automobile is from home to work and return, as opposed to the transit averages calculated from station to station.

Mr. Cherniack questions the loose use of the term "balanced transportation". Experience in Los Angeles again confirms his point. Here it is often broadly inferred that transportation is badly unbalanced because the city lacks a rail rapid transit system. Certainly there are no fixed or standard measures of "transportation balance". "Transportation balance" should be defined as the matching of transportation modes and systems to the real and varying transportation needs of each community.

Following his discussion of need for definition in terminology, Mr. Cherniack points out and discusses three major basic problem areas in providing adequate urban-passenger transportation. Impressions of transportation problems in Los Angeles generally support those which the author describes. With respect to the magnitude of morning and evening peaks, however, these are probably less extreme in the Los Angeles low density area with relatively small CBD.

The problem of dispersion of homes and sites of employment is probably most extreme in the Los Angeles Metropolitan Area as compared with other large areas throughout the country, and as Mr. Cherniack points out, the potential of service for an inflexible rail transit system is extremely limited in such an area.

In considering Mr. Cherniack's suggested means of alleviating the problems of peak-hour movement and dispersion, however, it seems that a caution signal is in order.

First, the author suggests the possibility of "squeezing passengers out of autos into a much smaller number of buses in journey-to-work periods." This infers that one form of transportation may be considered a substitute for another. Some transportation authorities would question whether this is true to any appreciable degree. In Herring's paper, "Metropolitan Growth and Metropolitan Travel Patterns," it is pointed out that the choices made by people as to what form of transportation they use are primarily choices of best fit. To try to change the choice without changing the basic reasons for the choice would seen to be a move in the direction of transportation unbalance. If there is any coercion intended in the author's choice of the word "squeezing", the yellow signal of caution mentioned earlier should immediately turn to red.

The same question of fitting the transportation form to the real need could be raised again when the author suggests that the continued operation of rail transit facilities could "obviate the need for expanding highway facilities to absorb expanding journey-to-work travel to CBD's." It would seem that this might be true in only a very limited number of instances.

Mr. Cherniack does suggest a possible change in one of the basic factors which lead to people's choice of transportation mode—he suggests concentrated industrial parks instead of plants "scattered over the landscape". Undoubtedly there is room for better

planning in this area. However, again the "go slow signal" should be observed. Transportation experts should move cautiously into the area of over-all planning. Some of the more extreme planners have suggested various forms of regimenting a way of life in the name of efficiency and reduced cost of providing public services, among which transportation is one of the more important. The best answer, according to these planners, would be to live above, below, or possibly across the street from place of work. Planning should remain a tool used to enhance but not to regiment a way of life.