REPORT OF THE PANEL ON SOCIAL ACCEPTABILITY

Prepared for
the Office of Technology Assessment

PANEL MEMBERS

Jacquelyn A, Ingersoll, Chairman
Ralph Jackson
Alain L, Kornhauser
Rodney K. Lay
John B. Schnell
Reed H. Winslow
George V. Wickstrom

CONTENTS

Introduction

Any assessment of the social acceptability of automated transit can only be speculative at this time. The Social Acceptability Panel offers the following comments and opinions to illustrate issues that need further research and consideration rather than to attempt a definitive or authoritative review of the subject. Indeed, the most significant conclusion this panel can offer is that there is at least as much research work to be done on the potential social and environmental impact in urban areas of automated guideway transit as there is on the technological developments.

The evidence of recent and current local studies on automated transit indicates that planning and decision-making at the local level on the use of automated systems is an exceptionally difficult process in automobile-dependent communities.1 Achieving an "acceptable" plan involving massive capital investment, uncertain operating cost, and educated guesses about the resultin impact on transortation, the environment, and urban form is a formldable task. The process must not only involve a complete analysis of all possible alternative approaches to transit—automated, non-automated, and mixed—but must also be responsive to a broad range of community interest groups. It must be strongly related to comprehensive regional land use planning. If the reserach efforts of the Federal government are to result in actual urban use of automated systems, it must be recognized that communities need a great deal more than test track technological developments with which to judge the merits of these automated systems. They must have better answers about human engineering issues, costs, effects on land use and environmental impact. At this time, it may be appropriate to apply existing automated technology to urban and specialized settings to get some of those answers before committing the bulk of available research funds to more advanced technology ies. It must be remembered that local decision-makers are more likely to be politicians than technical experts. The negative consequences of their last venture into major transportation 'improvement" (i.e., urban freeways) has made them very wary.

This panel agreed that raising the level of confidence concerning the social acceptability of automated transit will require:

- R&D programs directed at the process of predicting, interpreting, and communicating the social consequences of transportation improvements.
- clear indication of long-term Federal financial commitment to automated transit.

---

1 "Development of Performance Specifications for the Regional Fixed Guideway System," Simpson & Curtin/Midwest Planning, Inc. for Twin Cities Area Metropolitan Transit Commission. Reports 74-1 & 2, January 1974.
"Automated Small Vehicle Fixed Guideway Systems Study," prepared by DeLeuw-Cather for Twin Cities Area Metropolitan Transit Planning Commission, #75-03 (Preliminary Draft), January 1975.
"The Transit Issue," Thomas Todd, presented to the House Local and Urban Affairs Committee, Minnesota Legislature, January 22, 1975.

The and members gratefull acknowledge numerous contributions from their colleagues and the generous response of specialists, particularly:

- **Earl Putnam, General Counsel, Amalgamated Transit Union.**
- **Frank Caiatl, GM Transportation Systems Division.**
- **Larry Dallam, Director of Transportation Planning, Twin Cities Metropolitan Council.**

The appendix summarizes the professional experience of the members of this panel, Social Acceptability of Automated Guideway Transit in the United States.

The question of the overall social acceptability of automated guideway transit must be viewed within the context of the comprehensive transportation challenge facing many emerging metropolitan communities today. Until fairly recently, the combination of cheap land, cheap energy, strong economic growth, and lack of concern about pollution and urban decay, coupled with relatively high personal income and widespread auto ownership , led inevitably to the wide dispersion of homes, jobs, stores and urt an activities. In most cases, the only link now joining these elements is an extensive network of highways and streets. Public transit systems, coomposed mainly of buses, carry only a tmy fraction of travelers even m communities which are pursuing aggresslve upgrading of service.

8lowly people began to notice that the resulting urban form with its accompanying auto congestion was causing roblems both in the suburbs and central cities. Public awareness or the plight of those with no access to the auto developed. The first step taken to combat the ills was localized opposition IO new urban freeways. Renewed interest in improving public transit marked the beginning of a new era. Environmental concerns, shortage of oil, inflation and the threat of economic slowdown boosted the cause and elevated transportation issues into general public consciousness. Current man-on-the-street interest in public transit may be shifting from an attitude of "We must have better public transit so that I can drive without hindrance and my neighborhood can be protected from excessive through traffic" to a new focus best expressed as "Can I get to work on time if I have to give up my second car, or, will my family have to face isolation at home during the day?"

This shift in public attitude has major potential for those who must find solutions. The task may no longer be to lure the consumer from his auto by duplicating the characteristics of that auto in the form of regionally deployed true PRT, as was once thought. It now seems more probably e that the challenge of the next thirty years lies in increasing the productivity of *aU* elements of the *existing* investment in road systems. This period will probably be characterized by a reduction in family auto ownership, emphasis on more efficient autos, car pooling, more efficient use of roads, attempts to check urban sprawl, and reduction of total transportation demand through clustered development. The public transit systems will be expected to increase ridership significantly, particularly in peak hours for work trips, and to provide access to transportation for the disadvantaged. In the interest of labor, equipment and energy efficiency, some transit operators can be expected to make a relatively modest, but none the less costly, shift to electrification and automation to boost the productivity of buses. Regional land use planners will be interested in using automated systems as a tool to direct new developments toward more economic patterns of land use.

The 2lst century seems likely to bring a period of major shift from an oil based urban transportation system to one dependent again on electricity. There could, but not necessarily would, be a shift of equal magnitude in modal split between private and public transit. Urban form could change drastically. Life styles, the mechanics of earning a living and personal value systems could undergo changes as radical as were expemenced in the last century's shift from horse and electricity to oil. It is futile to speculate on the exact nature of such changes, but automated transit systems may well become primary elements of urban transportation. Beyond that assertion, one can only see that the nature of such systems will be geared to the unpredictable human needs and urban form of that time. Current resumptions that such systems must inevitably be of the pure PRT type are based on a debatable determination that this is the ideal response to the needs, values and urban form of today, which is not a very reliable guide for the future.

It maybe well to heed the lessons of natural evolution which indicate that creatures with. the generalized capacity to adapt to a wide range of unpredictable circumstances tend to survive over those not so gifted. Applied to transit technology, it would seem wiser to assume at this time that all possible automated systems types have potentially valid urban application on their own merits and are not simply steps to PRT. This is an issue of overall importance to the social acceptability of automated guideway transit to da as well as its utility in the future. So long as t e "all roads lead to P T" psychology prevails, there will be extreme reluctance to make major capital investment in near-term available automated transit that may shortly be "outdated." This concern, coupled with the doubtful public acceptability of fine-gnd aerial PRT guideway networks in residential areas may cause local commumties to drop consideration of automation altogether. This would be unfortunate, because simpler automated systems could play an important role in meeting the needs of those communities in the next few years.

Public and "expert" percetion of the problem must be turned from the oversold long-term need or an alternative to the automobile to the more prosaic but urgent need to make existing bus and rail systems, as well as the auto, more productive. Discussion and utilization of automated guideway transit can then proceed on a more realistic basis to meet the needs of today and provide sufficient experience to guide the planning for using automation in the future.

Public acceptance is seldom clearly traceable to calm reasoning. Opinions about the influence of major transportation improvements on the quality of life are not necessarily formed from orderly inter~retation of fact. Broad community education and involvement is required before the oinions of incident groups will include an understanding, for exampYe, of economic costs and benefits.

Acceptability in the short term is a function of clearly perceived immediate advantages to the individual. The public consensus, such as may evolve, will be an integration of many narrow viewpoints; the advanta es to the broader society of environmental protections sought by specia interest groups, for example, are generally only recognized with hindsight.

One source of information on public acceptance of new systems is the continuing Bay Area Rapid Transit (BART) Impact Study.

Early evaluations were reported at the annual Transportation Research Board conference in January 1975.[1] Apparent from the study is a time lag between building the system and feeling its effects: very few clear impacts are yet traceable to BART, probably because of the size of the region involved. Certainly, many people ride the system and alternative modes of public transportation have in some cases lost patronage. Effects other than those on the total transportation systems' modal split, however, are less obvious at this early date. Impacts that were predicted, both positive and negative, have not yet materialized. This may be due partly to community accommodations, partly to imprecise techniques for stating and measuring probable Impacts, both by planners and lay citizens.

National interests center on issues of federal involvement in research, development and demonstration of new systems and probable heavy Federal funding of local systems. AGT systems are of national interest because of their potential for contributing to a better balanced urban transportation system and increasing the productivity of money and energy used in transportation. National interests in environmental improvement and improved transit for the disadvantaged are also important considerations. Further, there is national interest in the economic consequences of developing a new AGT industry. The potential of both domestic and foreign markets for U.S. AGT systems and competition for U.S. markets from foreign suppliers is a significant matter of national policy.

Hence, the questions of encouraging or discouraging automated transit technology touch both immediate, individual interests and national interests. Both ends of the spectrum deserve much more careful thought on the part of those who make transit decisions. In particular, ways and means have to be found to ready existing institutions to make the chosen transportation improvements work.

Finally, the panel noted the considerable (if not overriding) influence state and local government wields over transportation decisions. State governments have major transportation responsibilities. They can be expected to be concerned about costs. The rise in the cost of urban road building and maintenance creates interest at the state level in automated urban systems; so does the lack of public acceptance of new highways. The states usually have a responsibility for environmental improvement as well as a concern for the economic health of the state as a whole. The movement of goods is heavily regulated at the state level as is traffic and public safety.

State governments are the ultimate source of the powers delegated to local governments. Structuring metropolitan agencies to make them capable of handling regional problems in a coordinated fashion is a tremendous challenge, particularly in the field of transportation where jurisdictions are typically fragmented and in competition for ever scarcer transportation funds. Extensive reliance on automated transit to meet a significant portion of urban trips would likely require much greater coordination and more centralized authority than is now typical . creating and funding effective, accountable, and responsive metropolitan agencies to handle transportation and land use problems is the most serious challenge facing state governments, and one that is critical to the future of automated transit.

[1] "A Review of Some Anticipated and Observed Impacts of the Bay Area Rapid Transit System," R. Ellis (PMM&Co.), TRB Annual Meeting Conference Session, January 13, 1975.

Chapter 2: Interest Groups and Their Concerns

Assessment of the social acceptability of automated guideway transit systems must proceed from an understanding of the needs and concerns of groups of people, all of whom have a role to play in the local decision making process. The panel selected a short list representing the incident society, whose concerns will govern the "acceptability" of AGT plans and subsequent implementation. The following brief summary of these stakeholders and their interests highlights some of the most important considerations.

TRANSIT USERS

As a group, users can be expected to be concerned mainly about reliability, safety, total trip time, comfort, noise, convenience and accessibility, availability and frequency of service, personal security, out-of-pocket cost, and ease of transfer to and from other modes of travel. Users have a large stake in the question of how soon transit can be significantly improved and how extensive systems will be.

PERSONAL TRANSPORTATION COSTS

Many users and potential users, particularly commuters, have a serious and urgent interest in reducing personal overall transportation costs by reducing the need for a second car.

PASSEN(3ER INFORMATION

An important and frequently overlooked concern of the user and would-be user is the need for information about how to use the transit system. Ready access to complete and specific information about the system poses a challenge to managers in all forms of transit. Not only must information be available in stations and bus shelters, it must be available in the home where most decisions on mode are made. Public awareness campaigns comparable to existing driver education programs are needed.

THE ECONOMICALLY DISADVANTA(3ED

The stake in the potential of automated guideway transit is perhaps greatest for those disadvantaged by lack of access to private autos, especially in communities that are today essentially auto-dependent. These groups comprise the bulk of present transit users and their ranks will grow as more and more famdies are unable to afford private transportation for all family members for all trips. Daily existence, for this group, is tied to the adequacy of the public transit system. Increasing the range of choice of jobs, housing, health care, educational opportunity, shopping, recreational and cultural opportunities for this group can be expected to be an important goal of regional transportation planning. f t is possible that a great number of latent trans-

it users could be found among the disadvantaged. They could easily be overlooked in making patronage estimates, particularly for off-peak travel; though they should be counted.

THE PHYSICALLY DISADVANTA(3ED

If automated systems are to be useful to the elderly, the very young and the handicapped, design features that enable them to use the system easily and safely are of paramount importance. Attendants in stations may be necessary. These factors may add significantly to operating and capital costs of automated systems.

PERSONAL SECURITY

Personal security is of critical concern to users. Transit crime is a reality in non-automated systems; it poses even greater problems in automated ones. Concern for security must be an Important aspect of design for all types of automated systems. Adequate remote surveillance, good communication and prompt response to incidents may add significantly to labor costs of automated systems. And labor costs may increase proportionately as the size of vehicles is reduced and the number of vehicles and stations increases. [1] Efforts to enhance security must recognize that dangers perceived by the user may not correspond with actual danger. The user must not only be secure, but feel secure. The security problem may be especially acute for small vehicles featuring shared rides where there is neither the safety in numbers characteristic of medium and large vehicles of the group rapid transit and shuttle types, or the privacy of true PRT.

RELIABILITY

Reliability is another critical measure of user acceptability. Reliability of an automated system should be based upon a standard, relevant to the consumer, such as: the passenger should not have to experience a significant delay (30 minutes or more) more often than once in 100 trips.

PEDESTRIAN SUPPORT

In general, users can currently be expected to walk about 1/4 of a mile. [2] This, of course, presumes adequately constructed and maintained pedestrian access—a cost factor frequently overlooked because it falls outside the jurisdiction of transit operating agencies. 1t is possible that if auto usage becomes severely curtailed, longer walking distances will be more acceptable.

TRANSFERS AND INTERMEDIATE STOPS

A major continuing theoretical discussion, relative to acceptability by the user, centers on the events of transfers and interxnediate stops vs. origin-destination service. Transfers have a bad name. This is

---

[1] Preliminary Draft Study Report of the Twin Cities SVS, DeLeuw-Cather and Co., Inc. et al, Report No. 75-03, January 1975.

[2] This, and other characteristics of Transit Users as a class. have been extensively reported and reviewed, e.g.,
"User Determined Attributes of Ideal Transportation Systems," Department of Business Administration, University of Maryland, June 1966.
"Technology Assessment o/ Personal Rapid Transit Systems," The MITRE Corporation, MTR 6664, January 1975,

quite understandable since transfers on the present bus service frequently involve long waits unexposed locations. One response to this problem is to attempt to develop a transit system which carries a passenger from origin to destination on a single vehicle, preferably on a personal basis without intermediate stops. Such an attempt may well exceed public need or expectation and, since it is technically difficult and very expensive to achieve, deserves some re-examination. Studies in Denver indicate that the negative environmental impact of guideway interchanges significantly outweighs the marginal patronage advantage achieved by eliminating transfers.[3]

Investigation may show that what is really important to those currently depending on autos and pressed by increasing auto costs is safe, reliable, frequent service to multiple destination in a reasonable period of time. Transfers that can be accomplished quickly in a climate controlled, secure location may be quite acceptable. If transfer points are laced with opportunities to turn single-purpose trips into multi-purpose ones, so much the better.

Using the station clustering concept—carrying groups of passengers from a cluster of origin stations to a cluster of common estimation stations—the few intermediate stops involved may not add significantly to total trip time. It is possible that this will suffice for "personalizing" service as far as passengers are concerned.

Adoption of these points of view has considerable implication for the near-term utilization of AGT systems. Currently available technology for loop and shuttle systems and medium and large vehicle GRT could probably do an acceptable job in many urban applications. It would no longer be necessary to choose a single vehicle for a system. A regional transit system could be composed of a mixture of AGT systems, each geared to the needs of the area or function it serves. Those beleaguered citizens seeking to replace a planned freeway or reduce its scale with an AGT suitable for coridor service could be satisfied as could those needing a smaller vehicle system to serve a university community with a different set of problems.

Attempting to provide no-transfer non-stop service for an entire region puts all generic types of AGT under severe technological and economic stress. As suggested above, it may not be all that important to the user. Certainly further consideration of true public need and preference is desirable. Such consideration should be based on some real urban experience with AGT.

Regional pr arming agencies, committed to development strategies which encourage living, working and shopping within a single compact subregion, will probably place a premium on short trip transit service. Provision of transfer-free region-wide service would work against short trips.

STANDEES VERSUS SEATED PASSEN(3ERS

Recent improvements to the interior design, and the resultant comfort levels, of bus and rail transit vehicles are assumed for AGT. One particular aspect of AGT vehicle design with broad acceptability and system design implications is the question of standing passengers. A great many technical problems hang on the issue of whether standees should be allowed.

---

3 "Alternatives Analysis Report," Denver Alternative Analyais Study, Denver RTD, April 1975.

Seated, and preferably restrained, passengers would vastly improve safety and comfort features of small vehicles operating at very short headways. Such a requirement has two serious drawbacks. One: requiring passengers to be seated reduces operating flexibility in coping with unanticipated increases in demand on a localized basis and could result in a significant increase in waiting time. Two: a policy requiring seated passengers could be very difficult to enforce. Even low ceilings are not a complete answer because they would not affect young children, Controlling the exact number of passengers entering a vehicle is complicated and expensive for group-ride vehicles. Interlock systems for passenger restraints could cause serious delays in stations. On the other hand, public cooperation may prove easier to achieve with an entirely new mode than has been the case with the auto.

The standing vs. seated question has relevance to acceptability beyond the technological aspects of achieving safety and comfort. If it is presumed that people will not shift from autos to transit unless guaranteed a seat, that presumption should be retested. Studies done a few years ago in an era of higher auto availability and cheap gasoline are apt to be misleading for today in trying to answer this question, and others, Such evidence as exists from current transit usage indicates that standing for short trips or short portions of long trips at peak hours is quite acceptable. An exception would be the elderly, but most travel by the elderly is probably during off-peak periods when seating is not a problem.

If the shift from auto to transit is based on an attempt to reduce personal transportation costs, being seated is not likely to be nearly so important as trip time, reliability, and frequency of service. Auto owners' recent willingness to relinquish automobile comfort and safety features in favor of better mileage and lower capital cost has important implications for this and other operational characteristics of AGT.

Operating Agencies

Operators originally developed an interest in automated transit in the hope of increasing the productivity of labor. Now, in the face of community demand for an expanded role and level of service for transit, the concern for reducing marginal cost is even greater.

Rehability of automated systems is perhaps the most important issue to operators. Automated systems that require an army of highly skilled maintenance workers for both preventive maintenance and restoration of breakdowns represent a risk that few operators are likely to be willing to take. At the present time, it ap ears that the risk of high expense for maintenance increases as vehic les get smaller and more numerous, and headways become shorter.

Safety is an important issue to operators. Today's safet~r standards dictate that there be sufficient headway between vehicles to allow for safe stopping distance without collision. Operators have to be concerned that any change in that policy to allow '<soft" crashes (as may well be necessary to achieve adequate system capacity on the smaller vehicle systems) poses serious questions of public acceptability and potentially high insurance costs. The popular solution is to require that all passengers be seated and restrained. As stated previously, this could reduce flexibility in system capacity and add additional costs for

passenger management. The panel noted that a major reason airline cabin personnel are required is to insure passengers are buckled in seats and trays are upright during take-off and landing. Another area of potentia!l~r high labor cost with automated systems is that of personal security~~, Responding promptly to emergencies is an important key to security. It is probable that the cost of that response is tied directly to the number of vehicles and stations.

It has been assllmed that the development of automated fare collection systems and superior methods for informing and managing passengers would eliminate the need for attendants in stations. It is possible, however, that the interaction of patrons and the system is more complex than realized. At this time, operators will probably have to assume that stations must be manned, especially in high crime are~s, until it is proven unnecessar~-. This represents another potential cost to operators, one that is directly related to the number of stations involved and the number of hours of daily operation.

The panel was asked to examine the impact of providing free transit on automated s~-stems. A few examples of no-fare transit systems have been in continuous operation for a number of years. These include the service at Colonial Williamsburg, which operates in a continuous one-way loop from the visitor center, and the M&O subway in Fort Worth, Texas which although primarily intended to serve shoppers, has developed a significant commuter load. These systems, however, are relativel~" limited in size and scope.

No-fare systems also operate on a number of college campuses and into the surrounding areas. One such system, at Kent State University (Kent, Ohio), has all the characteristics of a conventional bus system, with a number of routes, and seven day per week operation. Ridership is limited to students, faculty, and employees of the university, and is financed through a levy on riders,

Fare boxes, particularly the registering type, have proved to be a persistent maintenance problem on buses, and a common source of road calls. By definition, a no-fare system eliminates the need for a transit company to handle cash, and no monitoring of assengers is required b~" the operator, except where ridership is rimited to a specific group of users.

The impact of a no-fare system on ridership is difficult to estimate. It is possible that ridership will not increase significantly at peak times, since there is evidence that peak-period riders tend to select their transportation on the basis of convenience rather than cost. I.arger increases in ridership are to be expected at off-peak times, when cost is a more critical factor than convenience. This minimal experience (in addition to the example of elevators in buildings and the majority of operating automated systems in airports) points to a no-fare policy being acceptable when: (1) The system serves special interest groups or enhances a commercial enterprise, (2) there is no reasonable alternative mode, (s) the typical trip is short, frequent, and many-to-many, (4) handling money, operating and maintaining fare box equipment, and the associated security problems outweigh the value of the revenue, and (5) the operators' expenses are offset by other economic advantages, which is not likely to be the case with urban systems.

Beyond the questions of labor costs, reliability and safety, operators have to consider capacity, patronage, revenues and energy requirements. Effectively coordinating automated transit service with other public systems and private transportation is important. Operating flexibility and the ability of the system to expand are of serious concern. Operators must consider staging strategy for capital investment. They must also consider development costs, a significant item even for so-called '(existing" technology. The are anxious to reduce technological and acceptance risks and 100 to the federal government for help in this area as well as capital funding, especially those considering "first" applications of new technology.[4]

For the long run, operators have to consider how systems they might install in the near future can gracefully adapt to new technological developments. They have to consider the possibility that public transit will one day be the most dominant element in urban trans ortation and perhaps the only element along with walking, within se Yected urban settings.

THE COMMUNITY AND THE GENERAL PUBLIC

At the community level, the interests of all the stakeholder groups come together in the local decision-making process. The lack of sohd information about the technological feasibihty, capital and operating cost, social and environmental impact and public acceptance of automated systems makes that process very difficult. It must be emphasized that balancing all of the interests involved would be a difficult political task, even if good information existed. Communities are considering a major shift in travel behavior when they examine transit options. Depending on the option chosen transportation costs could shift from the private to the public sector, as education costs did decades a o. Certainly, this would be the case with extensive deployment of automated systems. The complex impact of such shifts cannot be overestimated and it should not be surprising if communities are hesitant to make quick decisions. People want assurance that automated systems will solve more problems than they create.

The following is simply a sample of community concerns about the possible consequences of automated transit. These must not only be Identified, but also weighed against one another in any assessment of AGT.

- Impact on achieving compliance with air quality and noise level standards.
- Impact on regional energy consumption and conservation.
- Impact on present land use and property values.
- Impact on the pattern and extent of future development.
- Impact on existin and future road systems.
- Impact on regiona7 economic growth.
- Impact on personal m!bility and op ortunity.
- Impact on citizen artlcipation in urt an planning.
- Impact on regionar bonded indebtedness.[6]
- Impact on local and state taxes.

---

4 uestions Of Multi-modality and Incremental planning were central to the item of a Nent UMTA/TR% workshop: see "O ning Remarks by C. Kenneth Omki, before the Conference on Evaluation of Urban Transportation A Pernatives Airlie House, Warrenton, Virginia, February 24, 1975".

t ~~Th, Au~mated Small VeMcle 'Fixed ~ufdeway Study," (P. *). A Report to the '975 b"k"e "' the Stab of Minnesota, Metropolitan council of the T~n ci~le.s Area, April 1975,

Individuals who choose not to use automated transit will nevertheless face higher transportation costs in the form of increased taxation to pay for the system since it cannot be assumed at this time that either capital or operating costs will be met by revenues. It is possible that if installation of automated transit is accompanied by economic penalties or disincentives for auto usage, costs for this group will climb even higher. Resentment and opposition from this majority group could be a serious acceptability problem, particularly if transit is viewed as a '(welfare" program.

The unserved public can be expected to pressure for expansion of service, just as is now the case with bus service. Such expansion maybe uneconomic or out of phase with system implamentation strategy and severe political and economic problems cou d result.

The general public can expect to share in any general community benefits such as lessened auto congestion and environmental enhancement. Residents of the central city and those in the suburbs do not necessarily agree on just what are the transit "problems". The confirmed automobile driver has been characterized as looking to public transportation to bring about a return to the uncontested roads of an earlier privileged era. This attitude (if it ever reflected a significant percentage of auto drivers) is no doubt losing ground as the perceived cost of driving a private car increases. An operating agency, however, can hardly expect support in financing large capital costs solely on the expectation of long term community benefits.

$ Proposals for major capital investment in automated transit, whatever its virtues, must compete with other capital needs in the community. The Metro Council in the Twin Cities[as indicated its support for low capital transit alternatives, basing its case heavily on protection of the regional credit rating.

LABOR

Labor groups can be expected to view the prospect of automated guideway transit in terms of jobs. In general, automation will be viewed as a positive step if it both increases the productivity of labor and enhances job opportunity. Labor groups can be expected to take a strong political role both locally and nationally in transit decision making and the thrust of their efforts will be related to how much consideration is given their interests in the local planning process.

Transit operatmg unions are interested in the potentid of automation for increasing the role of public transit in urban areas and therefore expandin job opportunities. These unions prefer that institutional contro Y of re~onal transit be unified. They also feel that more imaginative approaches to management and labor relations are needed to cope with the complexity automation will bring. They are especially interested in the safety, reliability and personal securit aspects of AGT as well as improved fare collection systems for a 1 elements of transit. These groups have an interest in promotion of equality of mobility for all, and m seeing transit become a completely tax-supported public service available to all without charge, a position which may or may not be altruistically motivated.

Others unions can be expected to have an interest in the potential of automated systems to provide new job o opportunities in the construction and fabrication fields. Unions wiR a major stake in the auto industry may consider the boost AGT could give to public transit as both an opportunity and a threat,

LANDOWNERS AND DESTINATION GROUPS

The possible impact of automated s stems on patterns of urban development and re-development is t 1e principal concern of real estate interests. Its potential effect on the abatement of sprawl and on the clustering of development around stations and in major activity centers will be acceptable or unacceptable to landowners depending on whether they stand to lose or gain. The timing and extent of deployment and its impact on road building will be of concern to this group as will be the manner of assessing costs. The impact on parking needs is important. It could be expected that "downtown" interests might be in continuous conflict with those in more dispersed locations on the question of the extent and type of deployment of automated systems.

Employers, retailers, and purveyors of professional services have a large stake in transit improvement as have recreational, cultural and educational institutions. They be can expected to take a strong interest m levels of service, extent of networks, location of stutions, comparability with other modes and the timing of deployment. Some in this classification are heavy community taxpayers and will be very concerned about costs. The extent of concentration or dispersion of the facilities these groups control within the urban area wdl greatly influence the type of automated system chosen, if any.

Chapter 3: Impact on the Neighborhood

Predicting, interpreting and communicating the impact that AGT systems will have on the environment and neighborhood is a major challenge. Jerome Lutin put this aspect of AGT development into context as follows: ~

"Research in urban planning and physical design for PRT systems has lagged far behind that of a more purely technological nature. This is indeed unfortunate, for architects and urban planners have a unique opportunity to predict and plan for long-term urban growth by utilizing an innovative form of transportation as a determinant for the placement of activities. Although many of the technical problems of PRT have yet to be resolved, the physical and performance parameters are known. By relating these parameters to the attainment of goals for structuring future urban society, it may be possible to achieve an orderly progression to future forms of urban development. Present conflicts between transportation systems and urban form may be eliminated, and future conflicts prevented. Clearly, there is a need to involve the planning and design professions more closely in the development of PRT. Such an involvement should not merely be that of mediating the effects of systems which constitute an imposition on urban life, nor should it be one of applying superficial cosmetics. The inquiry of the design professions should be addressed to a much more fundamental issue, that of fitting the system to the needs and aspirations of society, and bringing together all the elements in a unified physical form. "

Recent studies in the Twin Cities and Denver indicate that well designed aerial guideways are probably acceptable in major transportation corridors (highway or rail), along purely commercial arterials, and in areas subject to redevelopment where an opportumty exists to truly integrate guideways with new land uses. Aetual guideways in the metropolitan centers (downtowns) of the Twin Cities are unacceptable for aesthetic reasons, but there the opportunity exists to use cut and cover techniques under pedestrian malls, in an economical way.

In Denver, downtown aerial guideways are preferred to the disruptions inherent in underground installation.[2] Acceptability in residential areas, particularly the low-density, and suburban ones, is a questionable proposition. The problem is deeper than aesthetics and visual intrusion, important as those two factors are. Preservation of personal privacy in the home and yard in the face of a stream of prying eyes at second-story level is a serious matter. Concern for the protection of the trees which canopy the streets, is another. Perhaps the most important concern is for the stability of property values and land use in the guideway path and the vicinity of stations. This worry is closely followed by a well-founded concern that stations could bring on an increase in auto traffic in affected neighborhoods, especially if provision is made for park-and-ride.

---

1 "A Methodology for Integrating p RT Networks into the Urban Environment," Jerome M. Lutin, *PRT II*, University of Minnesota, 1974.
2 "Environmental Overview Report," Denver Alternatives Analysis Study, Denver RTD, April 1975.

All of these concerns are potentially as important as the similar set that leads impacted neighborhoods to oppose freeways. It is important to remember that in the Twin Cities (and probably elsewhere) the life style inherent in this kind of housing which emphasizes privacy and tranquility is prized above all other considerations including transportation. It is possible that the positive features developed by the urban design study team such as inear parks along guideways, that themselves are confined to side streets, and integration of stations into neighborhood shopping facilities, could improve acceptability, but no one is taking any bets. Experiences in t\ e Twin Cities and Denver bring into question whether fine grid networks can be im le-men ted and raise some doubt about the eventual regional deployabiYity of the smaller vehicle types of AGT that require such networks. It ap ears that deplo ment will have to be limited to major corridors, ruf ing out small ve i icle systems in residential areas.

According to most proponents of personal rapid transit, the popular concept of small vehicle automated systems is that they will function best in a uniform gridded network. In such systems, particularly those using one-way guideways, one finds a configuration which seeks to provide a uruformly high level of accessibility to all sections of the urban area. Many PRT advocates feel that ubi uitous service and coverage is the most important attribute of the%RT conce t; that only by providing service to the majority of dispersed trip enzs in the urban area can PRT be an effective transit competitor to the auto.

In many respects, PRT and auto networks share similar attributes. Each expects small vehicles with low vehicle occupancy. Each functions best on a guideway system with relatively even spacing. Neither favors on-line stations, and both seem to have low tolerances for congestion. The similarity between PRT and the auto is a conscious effort to emulate the most "successful" transport mode history has ever seen. Yet how far should this similarity go? By replacing autos with a transit system so similar in operating characteristics we run the risk of propagating many of the adverse impacts of the system we seek to dis lace, including the low load factor typical of autos.

8 y attempting to create a uniform level of accessibility throughout the urban area, the PRT planner allows, and in fact encourages, activities to be dispersed throughout the urban area. At the same time, the guideway system like the auto will encourage a uniform distribution of po ulation and activity density throughout the area. In both auto and $RT systems, this is the logical consequence of networks which attempt to minimize congestion by adding links, and thus, as a consequence, foster urban sprawl.

Before one advocates a transit network whose form guarantees the continuation of the present urban form, one must examme the factors which underly the creation of that form. Contemporary low-density cities may not be the reflection of consumer preference as to house type and location, neighborhood references, and travel desires. A more diverse range of choice may {e in order. Even if cities were the exact sum of all appropriate consumer preferences, can we assume that these preferences are an adequate statement of human desires? The main point of this argument is that one should not begin planning

PRT systems with assumptions about gridded networks or uniform population densities, at least, not without careful testing of those assumptions.[3]

Demonstration and deployment of the larger GRT systems should shed some light on guideway acceptance. P T advocates insist that the less bulky guideways of small GRT and PRT systems will solve the problem, but as indicated above, aesthetics is not the only issue, and perhaps not the most important. The panel sees evidence that neighborhoods will accept loss of personal convenience in driving and even lowered response time for fire and police service in order to keep traffic volumes down. They will go to court over even imagined threats to land-use and property values. The potential for aerial guideways to be accepted in residential neighborhoods is very low, judging from reactions to similar intrusion.

It is important to note that unless neighborhood groups are included in the regional transit planning process, the full dimensions of opposition to and support of AGT systems in residential areas is not likely to surface until the environmental impact statement stage, It would be well not to repeat this mistake, too frequently made in freeway planning, The procedure tends to coalesce the opposition and leave the support disorganized, regardless of the merits of the project.

The challenge of integrating an AGT guideway into the environment has been the subject of numerous papers. Among the more significant is a study by Jerome Lutin [4] and a review by H. Riley of several additional studies.[5]

---

[3] The four paragraphs above are the rationale behind and stimulus for an architectural design workshop held at Princeton University reported in "Using PRT to Shape Suburban Growth", Transportation Program, Princeton University, 1974.

[4] "A Methodology To Integrating p RT Networks into the Urban Environment," Jerome M. Lutin, *PRT II*, University of Minnesota, 1974.

[5] "The Assessment of Visual Intrusion," H. Riley, Warwick University/Manchester Polytechnic, Urban Transportation Research Group, Working Paper No. 17, August 1973.

The Social Acceptability Panel reached the following conclusions in its discussion about the direction of federal research, development and demonstration programs in the field of automated transit,

(1) We suggest that the first order of business is the establishment of specific sets of national and local goals on the role of transit in urban transportation and its desired impact on urban form. The focus, direction, and funding level of R, D&D should be based on those goals. In the interest of public and private economy, provision of mobility for the disadvantaged, oil conservation, environmental improvement, and liveable urban form, transit must be given an increased role, particularly in those metropolitan areas of moderate size which are now almost totally dependent on automobiles. The needs which arise out of national and local goals provide the basis for the necessary R, D&D programs.

(2) Recent surveys by regional planning authorities and by Congressman W. Frenzel (R.-Minn.) indicate that public interest in investing in transit improvement, as opposed to other public needs, is quite high. Public willingness to use existing transit, however, does not appear to be assured. Transit ridership is declining in many communities.

The major response to the gas shortage was a cut back in travel, not a shift to transit. Some panel members felt strongly that even the higher service levels possible with automated systems will not attract increased patronage without strong government regulation of auto use. Other members felt that the natural rise in auto costs alone will ultimately have a significant impact on transit usage, assuming high levels of service. In any case, the possibility that annual costs for automated systems could be lower than operating costs for bus systems justifies continued research and development at least until the cost issues are settled.

(3) The panel does not, at this time, see any likelihood of regional deployment of automated systems. There appears good reason, on the other hand, to believe that the most likely deployment of automated systems will be in downtown and major activity centers. Some corridor applications coulcl occur. Such applications, both downtown and corridor, will be for the purpose of increasing bus productivity}", allowing remote parking interception, improving air quality, promoting clustered, mixed use development, and overcoming deficiencies in highway and street capacity.

(4) Consideration of a national policy to increase transit usage a significant amount carries with it the implication of far greater investment of public funds to subsidize both operating and capital costs. It is not likely that fare revenues in a given region will cover

---

[6] A Mass Transit Survey by the Comprehensive Planning Organization for San Diego Region's Council of Governments, January 1975.

"1974 Attitude Survey," memorandum to the Technology Advisory Committee from the Transportation Staff of the Twin Cities Metropolitan Council, February 1975.

"Summary Report," Denver Alternatives Analysis Study, Denver RTD, April 1975.

system operating expenses, although some segments may more than pay their way. Low out-of-pocket cost to the user appears to be as essential as high level of service if transit is to attract new riders and meet the needs of the disadvantaged. Unless the commitment at all levels of government exists to provide the billions required to develo , construct, and operate both the automated and non-automated x elements of effective transit systems in a significant number of cities, there is little point in spending any money on research and technolo ical development of automated transit.

(5) The amount of money proposed by the Administration for research in automated technology 1s far too small if the intent is to provide new options for current problems.

(6) Time is of the essence. Automated transit cannot hope to be a significant factor in near-term national energy, transportation and environmental policy unless system de loyment in urban areas can begin within the next few }-ears. It must\ e remembered that planning, fabrication and construction of local systems is itself a lengthy process. That recess cannot even begin until technological feasibility and reliabr e cost estimates are clearly established. A significantly heavier investment than is now being made in development of low technology AGT systems over, say, the next five years, coupled with assurance of adequate capital and o crating funding concentrated in the next fifteen years, would give !oth private industry and local communities the kind of fiscal assurance necessary to undertake the massive job of alterin travel behavior. If this cannot be agreed, it should be stated clearY y that automation is not considered a viable option for meetin transit needs for the remainder of the Xlth century—that locaY communities will have to concentrate on other means.

(7) In addition to an increase in research and development funding and assurance of adequate ca ital and o crating funds based on a clear national policy for AG?, the SociaY Acceptability Panel feels that Congress needs to give more direction to research efforts it supports. To date, efforts have failed to yield market-ready systems, primarily because the research has not provided sufficient answers to establish the necessary levels of confidence about technological feasibility, reasonable and predictable costs, and social acceptabdity and impact for urban decision-makers. VVe reject uMTA's contention that the technology for Shuttle-Loop Transit and medium-to-lar e vehicle GRT is "here" today and that the bulk of currently availab! e research money should be spent at this time on the small vehicle GRT type commonly called HPPRT. It is our opinion that this approach is not based on an assessment of near term need by local communities and will unnecessarily delay implementation of automated systems. Current local studies imply that simpler and more nearly available systems can do an adequate and even su erior job with much less risk of acceptability. It would be very help F1 from a social acceptance viewpoint if policy direction clearly favored the regional im lamentation in this century in a number of urban areas of SLT and GRT systems operating at headways which allow safe sto ping distance without collision and can achieve adequate capacity witt out deployment of fine grid aerial guideways. If such systems are supplemented with strong and innovative programs for feeder and express bus and all forms of para-transit, the transit needs of many communities can probably be met. under such a policy, research funds

should be primarily devoted to the list of AGT programs directed at improving reliability and safety proposed by UMTA and heavily supplemented by urban demonstration projects aimed at problems of social engineering, guideway acceptability and costs, proper integration with other transit modes, and land-use controls.

It is our belief that this approach for transit research is the most consistent with the broader goals of improving the productivity of existing transportation resources, meeting the established standards for air quality and noise levels, beginning the transition from oil as a transportation fuel, and providing adequate mobility for urban populations. We believe a new focus for AGT research is also a necessary step in determining the role and form of public transit for the 21st century. Specifically, it is necessary for determining the need, impact and acceptability of regional application of PRT.

(8) An understanding of the thinking of comprehensive regional planners about the urban form of the future is basic to determining regional transit needs in the future. One approach being suggested, most notably in the Twin Cities and Denver, is that, in the interest of public economy and reduction of the anxiety of urban life, more individuals should be enabled to live, work, shop and meet most daily needs within fairly small subregions.[7] Public transportation investments and housing policies should be directed at encouraging short trips, a broad mix of housing for all income groups, and clustered industrial, commercial and high density residential development. This approach is completely opposite from recent patterns which tend to encourage long trips and dispersed development. Whether such a shift on a significant scale is either possible or desirable will be the subject of lively debate. Exactly what its implications are for public transit, particularly automated transit, is not clear at this time. Certainly adoption of a transportation and development policy which encourages short trips would not be likely to lead to a transit system which provides single vehicle origin to destination service over an entire metropolitan area. Such a policy could favor that kind of service on a local basis and provide it in a number of ways, including both automated and non-automated modes, paratransit, and walking. Requiring transfers to make longer regional trips would be a positive strategy under such a policy. Traditional line-haul service would probably not receive priority for the most superior service. Express buses would probably be used extensively for line-haul to major activity centers wherever freeways are available to accommodate them. Under this sort of planning, automated transit could play a useful role in circulation systems for activity centers and downtowns and in providing local service within subregions. It could also provide line-haul service, particularly in areas where freeways are not yet built or are seriously deficient in capacity.

It is the consensus of this panel that the concept of favoring the short trip and clustered development has merit, although there is doubt it can be successful if the constraints on regional travel are applied only to transit. We also feel the short trip concept drastically eases the strain on technological development of automated transit. Creating compact systems to serve a particular area or purpose

---

[7] "Metropolitan Transportation Development Guide Policy Plan," Metropolitan Council of the Twin Cities Area, as revised March 1975.
"Summary Report," Denver Alternatives Analysis Study, Denver RTD, April 1975.

without having to interconnect them physically would obviously make all phases of operation easier and probably much less expensive.

(9) We question the wisdom of anticipating extensive regional implementation of HPPRT or PRT. Local studies in Denver and the Twin Cities have shown that extensive deployment of aerial guideways and stations is probably unacceptable in most residential, and some downtown, areas. Requiring that all passengers be seated would be a drawback. Such systems may require high expenditures for labor for preventive maintenance, breakdown response and security forces, thereby negating one of the principal reasons for automation. 1t appears at this time that both the high order of reliability required and the extensive guideway needed will be very costly.

The personalized non-stop service provided by these systems can probably be handled adequately at lower cost in the near future by para-transit, innovative use of taxis, and specialized services. We do not feel that public transit is going to have to duplicate the level of service offered by the auto in order to be successful in the next thirty years. The rise in auto costs will in and of itself lower public demand for luxury service. The general rise in the cost of public services, which is outstripping the growth of public resources, will dictate economy. 1t does not seem reasonable that the ublic will be able to bear the cost of what amounts to a double set of roadways—one for PRT plus the existing one for conventional vehicles. The emphasis on encouraging short trips and clustered development could answer the need for PRT levels of service.

(10) We particularly question the utility of HPPRT from a social acceptability oint of view. It seems to offer the greatest likelihood of serious pro(lems of personal security of all the automated types because of the high probability of forced shared rides with one or a few strangers.

Simulation in the Twin Cities and Denver studies indicated that small group service even to and from a cluster of stations involves significant longer waiting time than either scheduled GRT service or true PRk A number of studies have shown that waiting is the most irritating aspect of transit service to the user as well as the most dangerous in terms of transit crime. Further, the weight of the HPPRT eight to 12- passenger vehicle would seem to make the task of achieving reliable anx safe performance at very short headways much more difficult than it would be for true PRT with a smaller, auto size vehicle.

(11) Since the majority opinion of the Social Acceptability Panel finds neither sufficient need for, nor public acceptance of, hi~h technology, area-wide small vehicle systems at this time, we suggest that such systems receive less research priority unless funds are virtually unlimited, Should this class of AGT later become more viable, it will have done so in large degree from urban experience gained with simpler technology, and from any deficiencies found in experiments with systems favoring short tri s. The funding and program proposed for HPPRT is not unreasona-le when viewed as long term preparatory research. To spend limited research funds on HPPRT instead of taking steps to meet real current needs with lower technology seems unreasonable.

(12) There are a number of reasons why urban demonstration of AGT system prototypes should be considered as much a part of a research program as test track technological developments:

- How well the system serves actual passengers must be explored for a wide range of operational problems.
- The full scale impact of stations needs to be assessed in a variety of settings.
- Land-use controls along the guideway and near stations need to be developed and effectively demonstrated.
- The opportunity to integrate stations and guideways properly into redevelopment projects and new development needs to be explored.
- The impact of AGT service on auto congestion and parking in activity: centers and near stations needs to be determined.
- The ability~ to move goods, of all kinds, needs to be developed for AGT systems and demonstrated in an urban setting.
- The extent to which the system can accommodate needs of the young, the elderly and the handicapped economically needs to be determined so that communities can judge what supplementary specialized services will be required.
- The true labor cost of AGT needs to be established for maintenance, security, station management, controls, and other functions.
- Work needs to be done on the coordination of AGT with other modes: buses, rail systems, para-transit, private autos, taxis and pedestrian systems.
- The nature of psychological resistance to automation *per se*, if any, on the part of potential passengers needs to be evaluated.
- The impact of AGT on housing choices of the poor needs to be assessed. It is possible that land values in AGT service areas could rise so high that pressures for redevelopment would push the poor out of. the area and defeat the basic goal of improving moblhty for this group.
- The securitv risk of AGT in high crime areas needs to be assessed as does the cost of vanda'i'ism.

This list is by no means complete, but its scope does indicate the nature of important unknowns for automated systems that simply cannot be handled on a test track or in simulation. Automated transit cannot be considered market ready until such work is done.

Every effort should be made to do as much evaluation as possible of social impacts of existing automated and near-automated systems. This work will have to be supplemented by more urban demonstration in the near future.

(13) A number of service features assumed for AGT systems could be tested using conventional transit and para-transit including:

. The effect of saturating an area with high qualit~- demand responsive service.
. The effect of transfer reduction and/or provision of climate controlled transfer points.
. The effect of improved passenger information programs.

(14) An important aspect of urban transit demonstration and planning for transit improvement in general, that is frequently overlooked, is involving the community in the planning and allowing for a multidisciplinary approach to design and impact assessment. Transportation is not an isolated element, the exclusive realm of technical experts, but a basic part of urban life. We urge that more effort be made to involve local communities in helping to set priorities for research.

APPENDIX

BIOGRAPHIC SUMMARY OF PANEL MEMBERS

Jacquelyn A. Ingersoll, Chairman
Citizen Advisor on Urban and Transportation Planning
St. Louis Park, Minnesota

Mrs. Ingersoll has been very active in civic planning and transportation matters in the Twin Cities for several years. She is past chairman of the St. Louis Park Planning Commission which serves a community of 50,000 people. She also serves as a member of the Citizens Advisory Committee on Transit of the Twin Cities Metropolitan Transit Commission.

Ralph Jackson
Director of Planning
Regional Transportation District
Denver, Colorado

Mr. Jackson returned to his home town of Denver in September, 1970, to accept the position as director of planning for the Regional Transportation District (R D). Previously, he was a senior associate engineer with Barton-Aschman Associates, Inc., of Chicago, where he participated in transit planning and traffic engineering studies in over 20 cities. Prior to his employment at Barton-Aschman Associates, Mr. Jackson was a research associate with the Department of Urban Stidies, University of Illinois at Chicago.

Alain L, Kornhauser
Assistant Professor of Civil and Geological Engineering
Princeton University
Princeton, N.J.

Professor Kornhauser has taught courses and conducted research on Transportation for the past five years, specializing in automated forms of mass transportation. He is co-editor of *Personal Rapid #ran.sit Z* and author of journal publications on design of automatic control systems, network design and analysis methodologies, energy impacts and attitudinal considerations in predicting the demand for new technologies.

Rodney K. Lay
Group Leader, Transportation Systems Planning
The Mitre Corporation
McLean, Va.

Dr. Lay has conducted and supervised the evaluation of a broad range of ground transportation systems as a member of MITRE's consultant systems engineering staff supporting the USDOT Urban Mass Transportation and Federal Rail R, D&L) Programs. He has directed a recent technology review and an assessment of the state of the art of Personal Rapid and Dual Mode Transit Systems.

John B. Schnell
Manager-Research
American Public Transit Association
Washington, D.C.

Mr. Schnell has served in this position with APTA for five years and specializes in all of the technical maintenance and operation aspects of urban mass transportation. He previously was involved in both mass transportation and automobile transportation with the Institute of Traffic Engineers, the Keystone Automobile Club and has been a County Engineer and a Township Engineer.

Reed H. Winslow
Department Head
Transportation Systems Planning
The MITRE Corporation

Mr. Winslow's experience includes twenty years of progressive development in transportation management, planning, and engineering. Under a contract with the Urban Mass Transportation Administration, Mr. Winslow has been involved in research and development projects for demand responsive transportation, bus propulsion systems, methods for granting priority to transit buses in traffic, automatic vehicle location and monitoring systems, urban transportation planning, and software and advanced technology for rapid transit systems.

George V, Wickstrom
Director, Office of Technical Studies
Metropolitan Washington
Council of Governments
Washington, D.C.

Mr. Wickstrom has been actively engaged in the practice of urban transportation planning for over 20 years. He has served as Director of several large-scale urban transportation studies in Philadelphia, Delaware and Washington, D.C. A registered professional engineer, he is also active in transportation research, and has authored over 20 published articles on land use and traffic planning.