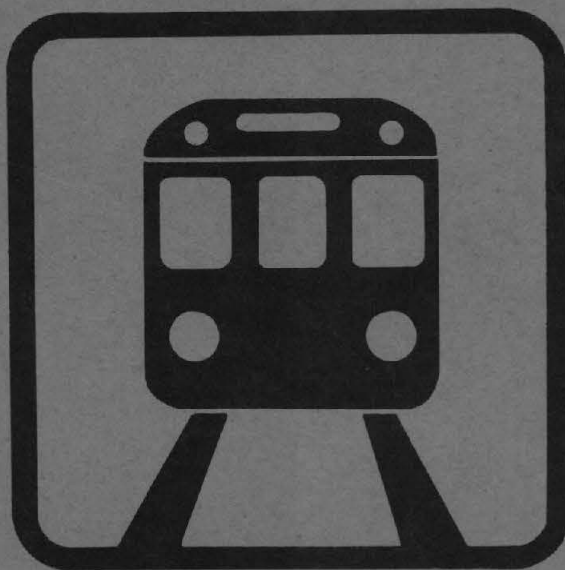


PROCEEDINGS of the THIRD UMTA R&D PRIORITIES CONFERENCE



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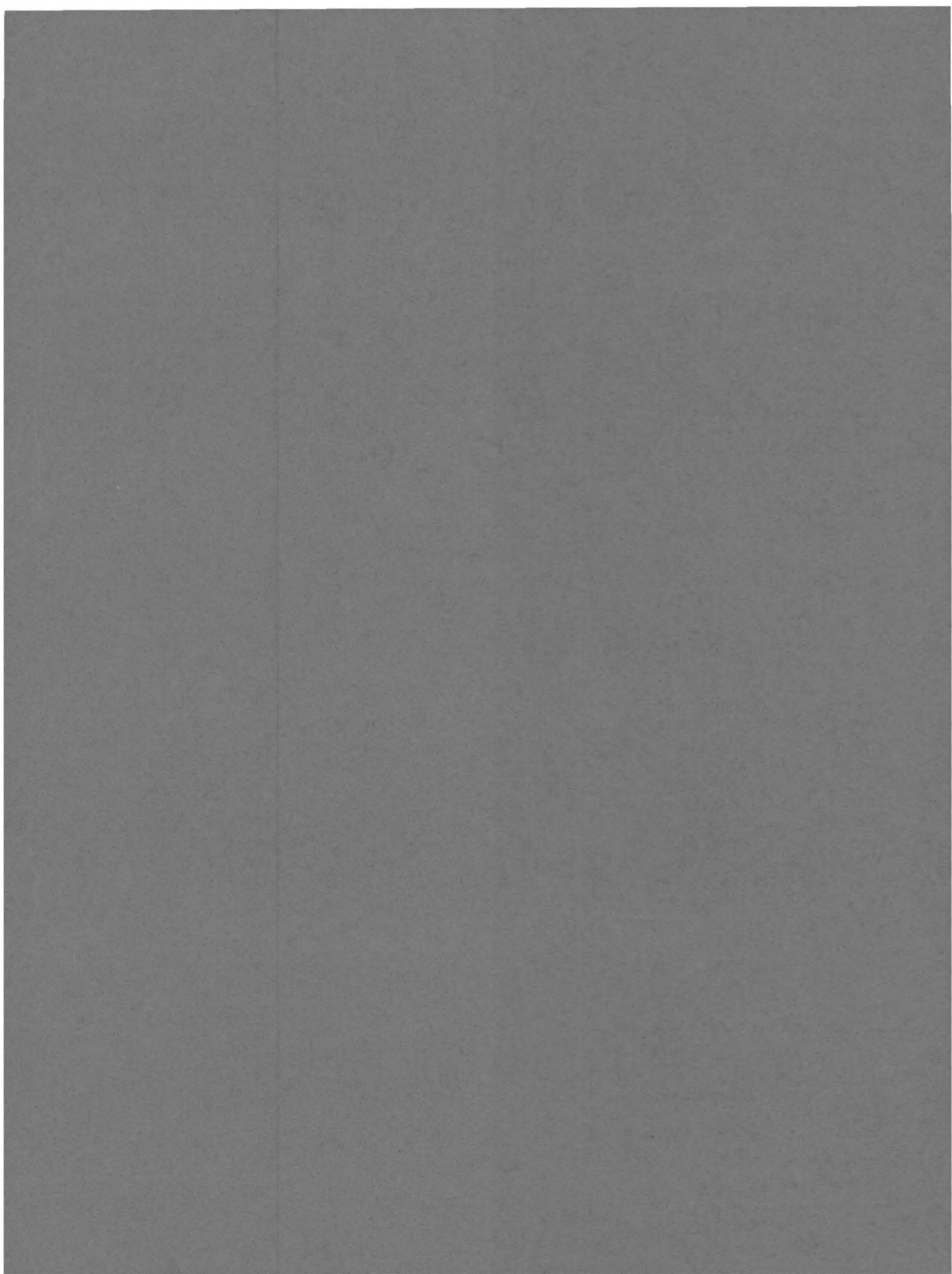
In association with
American Public Transit Association
The Urban Consortium

November 16 & 17, 1978



Presented at the
U.S. DEPARTMENT OF TRANSPORTATION
Research and Special Programs Administration
Transportation Systems Center
Kendall Square
Cambridge, Massachusetts

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of the
THIRD
UMTA R&D PRIORITIES
CONFERENCE**

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Preface

This report contains a summary of proceedings of the Third Urban Mass Transportation Administration R&D Priorities Conference which was held at the U. S. Department of Transportation's Transportation Systems Center in Cambridge, Massachusetts, November 16 and 17, 1978.

These conferences are sponsored periodically by UMTA to enable UMTA to communicate directly with those who represent the views of transit users, operators of public transportation systems, suppliers of equipment and services, the research community, and governments at the State, local, and Federal levels. The purposes of the Third Conference was to provide a current review of UMTA's research and development plans and to solicit recommendations for improving the direction and effectiveness of its program. The conference included general sessions on research and development policy and a total of fifteen half-day workshops on research, development, and demonstrations in urban transportation systems, technologies, planning, management, and services.

This volume contains proceedings of the general sessions and summarized reports of the workshops. Because of the volume of papers, presentations, and discussions, detailed proceedings of the workshops have been compiled into separate reports by subject area and will be available from the National Technical Information Service (NTIS) concurrent with or shortly after publication of this report. A list of the Workshop proceedings and instructions on how to obtain copies are included in Appendix B.

GENERAL SESSIONS

Thursday, November 16, 1978

9:30 a.m.

Transportation Systems Center
Cambridge, Massachusetts

Opening Remarks: *Charles F. Bingman*, Deputy Administrator, UMTA

Relationships Between UMTA's Policy, Programs, and RD&D: *Robert H. McManus*, Associate Administrator for Transportation Planning, Management and Demonstrations, UMTA

R&D From the Federal Perspective: *James Costantino*, Director, Transportation Systems Center

11:00 a.m.

Transportation Systems Center
Cambridge, Massachusetts

Viewpoints on R&D Priorities: *Rountable Exchange*

Moderator: *Lillian Liburdi*, Associate Administrator for Policy, Budget and Program Development, UMTA

Panel: *Arline L. Bronzaft*, Associate Professor of Psychology, City University of New York
Kenneth Fraelich, Sales Manager, Westinghouse Electric Corporation
Francis B. Francois, Member, Prince George's County, Md., County Council
Kenneth W. Heathington, Director, Transportation Center, University of Tennessee
Robert R. Kiley, Chairman, Massachusetts Bay Transportation Authority, Boston
Dan Maroney, International President, Amalgamated Transit Union

Friday, November 17, 1978

2:00 p.m.

Transportation Systems Center
Cambridge, Massachusetts

Chairman's Overview: *George J. Pastor*, Associate Administrator for Technology Development and Deployment, UMTA

Welcome

By Charles F. Bingman

Deputy Administrator, UMTA

The last five years have been perhaps the most significant in the history of mass transportation in the United States. During this period, these major trends have developed:

- the 1974 Federal legislation provided very substantial increases in Federal funding for transit capital investments;

- this same legislation also provided Federal funds for operating costs;

- the buy-out of failing private transit operations has been essentially completed;

- city after city has faced up to the conversion of transit into public responsibility. Transit boards and authorities have been created to report public leadership, and many hard decisions have been made to create stable public funding to finance transit operations;

- transportation planning has matured, become more comprehensive in character, increasingly more professional and competent, and more skilled in providing a common basis of analysis for public decisions;

- states have increasingly become involved in transit matters – including funding – and are moving toward total transportation departments and not just highway bureaus;

- transit ridership has definitely bottomed out and has begun a pronounced upturn;

- major new rail starts, system extensions, or construction improvements are under way in Boston, Philadelphia, Buffalo, New York, New Jersey, Baltimore, Washington, D.C., Atlanta, Miami, and Chicago;

- advance-design buses have been introduced and the foundation laid for the introduction of Transbus;

- tired, obsolete bus fleets have been revitalized and dozens of new maintenance facilities and bus garages have been built or are on the drawing boards;

- valuable work has been completed on the rehabilitation of older rail systems;

- transit has done much to face up to new definitions of its social responsibilities to serve the communities, especially the elderly, the handicapped, the economically disadvantaged, and the minority communities; and

- the first steps have been taken to introduce downtown people movers into the national array of transit system capability.

As I get around the country these days and talk to transit people, I get an increasing sense of confidence—the problems don't seem hopeless; things are being accomplished; there is more *latitude* to try new things, and perhaps a little more willingness to do so.

The highway/transit legislation recently passed by Congress and signed by the President conveys three signals important to this R&D conference.

First, the public debate surrounding this legislation has *confirmed* rather than repudiated the transit program in the U.S. and the manner in which it is proceeding.

Second, both the Congress and the Administration have committed themselves to a further four years of transit funding at increasing funding levels—modest increases, but increases nevertheless in the face of increasingly tense public funding concerns.

Third, the importance of transit has been reaffirmed as an absolutely vital public service. We are no longer debating whether transit is needed or justified—we are arguing instead about how it will be achieved and at what pace.

DOT sought and obtained provisions in this legislation which will give UMTA added flexibility in the use of our Section 3 capital investment funds to undertake specific projects for the deployment of new technology. We will now be looking for opportunities where such deployments can be undertaken where they will help the whole transit system.

You should also be aware of a proposed organizational change in DOT. Secretary Adams has announced his intention to combine the present Urban Mass Transportation Administration and the Federal Highway Administration into a single Surface Transportation Administration. A process of public review and comment has already begun to solicit reactions to the Congress early next year. We are now working on the further definition of the consequences of such a reorganization, including how it will affect our research, development, and deployment strategy and capabilities.

My point is not simply to recite what we've been doing in the office but to suggest that all of these events are bringing a stability and degree of certainty to the transit industry which has not been present for many years. The interesting question I pose to you is whether this increasing stability portends an improved climate for the development and deployment of technology.

As you all obviously know, UMTA has felt that it must maintain a strong Government R&D program in the face of the troubled times in transit in the 1960's and early 1970's. During the last five years particularly, we have attempted to act on the counsel we have gotten from people like yourselves and from these conferences to concentrate more effort on the short-term problems which continue to plague transit facilities, equipment, and techniques.

I am convinced that this strategy is correct and necessary and it must continue. The National Cooperative Transit Research and Development Program, for which we now have approval within the Department, will be another highly desirable step forward in this direction. I personally do not feel that our technology accomplishments have kept pace with the rather remarkable political and financial turn-arounds of the last few years, and it remains very important that transit in the short term become and remain credible by producing soundly conceived, safe, attractive, reliable service at what is perceived to be reasonable cost. This is true not only for its own virtues, but also as a condition precedent to building acceptance for future innovation. Having said all this, I would add something equally important. While our short-run strategy is right, we should constantly test the public climate for further innovation. We can undoubtedly produce new technology faster than we can induce the system to accept and deploy it. If, in fact, there is greater stability and confidence in the transit system, the interesting question is whether, therefore, we can be more entrepreneurial in the pace at which we advance the technology of our program. If the answer to that ques-

GENERAL SESSIONS

tion is "yes," then the next question is, "what technological advances should we press?"

If we pay our dues in the short run by producing sound, reliable systems, I recognize that no R&D program worthy of the name can or should abdicate its other role as the agent for long-term change and the visionary of the future.

President Carter is searching for some posture of this kind—and so should we. In our necessary preoccupation with current problems, we tend to shrivel up the part of our resources which we devote to the future. Can we now

put together a more compelling agenda of next steps in concepts and technologies, and engage in the kind of education which will produce the willingness to innovate? We need the involvement of planners and politicians, transit operators, private sector executives, and government officials. But first I feel we need a clear sense of what is next and how it can be accomplished. I'm sure that this conference will be of great value—as the first two have been—in pointing us all in the right direction.

Relationships Between UMTA's Policies, Programs, and RD&D

By Robert H. McManus

UMTA Associate Administrator for Transportation Planning, Management and Demonstrations

In my memory, the most organized and sustained examination of the relationships between UMTA's policies, programs, and RD&D was occasioned by a request by the Bureau of the Budget that UMTA undertake a special study on the criteria and objectives of its programs, focusing on the capital grant program. This was in 1970. Interest in the objectives of the program and in UMTA's management approach heightened perceptibly when it became apparent that there was to be a quantum increase in the capital grant resource that year. This in fact happened, and the study was presented to the Bureau in December 1970.

The subject at hand was the basic approach to managing the UMTA program—not just development of a statement of purpose. Some of the points at issue were:

- the relative emphasis to be placed on commutation in peak hours, mobility for captive rider and use of transit to support desired development patterns and improve environmental conditions;
- second, the optimum program level and financial plan to meet such objectives for all UMTA programs; and, finally,
- how to apply the results of the research, development, and demonstration program to the capital grant program (today we would add to the Section 5 formula program as well).

A number of programmatic actions flowed from that study. By the way, though it was a staff study, several policy studies financed by Section 6 RD&D funds were input to it. To cite actions taken, after 18 months of consultation with client groups, the Office of the Secretary, and BOB, we published in June 1972 a revised *Information for Applicants* booklet on the capital grant program, containing an extensive section on guidelines for capital grant project selection. Though obsolete in many respects, that section is still a useful statement on the limitations on effectuating explicit objectives in managing our major grant-in-aid program. The guidelines further contained the seeds of our transportation systems management and alternatives analysis policies, and expressed the need for a uniform system of accounts and records to facilitate use of performance indicators in the transit industry. Such a system is now being implemented pursuant to Section 15 of our Act. Organization units have been established to facilitate the management style advocated in the study—in particular, the program evaluation unit in the policy office and the preproject evaluation unit in the Office of Transit Assistance. The technical studies planning grant program was expanded to encompass system planning—a major administrative initiative putting us in a position to introduce transit as a serious option earlier in the transportation planning process. A decision to fund impact studies such as those being done at the San Francisco Bay Area Rapid Transit District in Oakland, Calif.; the Metropolitan Atlanta, Ga., Rapid Transit Authority; and the Washington, D.C., Metropolitan Area Transit Authority was also a result of that study.

With reference to deploying the results of the RD&D in the administration of the capital grant program, there was a great fear at that time that, left unchecked, we would spend huge sums of program resources on conventional technology, just *before* the RD&D program produced far superior systems for consideration. We would therefore lose the whole ball game. The program would be a colossal bust. This is no doubt the stuff of an Office of Management and Budget Director's typical nightmare. But technology development and deployment has a drawn out and deliberate pace of its own, even in the private sector; and is infinitely more complex in the public sector, as UMTA Associate Administrator for Technology Development and Deployment George Pastor has pointed out so clearly in his several statements on this subject—particularly those to the House Committee on Science and Technology. Further, it is essential for a major financial assistance program of the Government to maintain political relevance. In the United States we can't let the peasants suffer with broken down systems for 30 years or so while the intelligentsia devises the perfect society. The peasants are politically literate. Their votes count, and our system responds. We do what is *necessary*, while also trying to ascertain what is possible. So far, as a society, we have been able to afford to do so, though we have to trim our sails and reprogram often enough.

In the OMB study, by the way, we advocated a \$90 million per year program level for 12 years as part of our financial plan. This was 1970 dollars, of course. We never have been able to stick to this—and are currently at approximately \$70 million—but have gotten far more than anticipated for capital grants and have acquired an operating assistance resource.

How programs grow and prosper is a fascinating subject in itself. The UMTA program level is now approximately \$4 billion per year, compared to under \$100 million when I became associated with it in 1965. In the course of the political process, everyone seems to have been able to connect the program with his perception of the urban problem—whether it be congestion, mobility for disadvantaged persons, air pollution, improving urban development patterns, or energy conservation. Our RD&D efforts relate to all these subjects to some degree. And I suppose one should not be so innocent as to fail to take advantage of the political winds of fortune, and to sail with them so that the program prospers. Nevertheless, I suggest we should be quite careful about the promises which are made for the program. We certainly should not delude ourselves. It may be useful and appropriate to relate to purposes which have national importance—currently air quality and energy conservation—but our linkages should be measured. We need to maintain our credibility as informed participants in the political process, to put it one way. And to put it another way, we should avoid being trapped into justifying the program lock, stock, and barrel on tenuous grounds, thereby doing it a disservice.

My own view is that the relationship between public transportation and the objectives of conserving energy and improving air quality appeals to common sense; but it turns out to be tenuous when subjected to rigorous analysis and to cost-effectiveness tests. Other uses of equivalent public funds or other public policies turn out to be more efficacious with respect to these purposes. I believe our rail policy statement deals with these relationships properly. And it does so also with respect to urban development effects.

The more time I spend in this program, the more I feel the basic purposes of the Urban Mass Transportation Act, stated quite briefly in Section 2, are difficult to improve on. They are:

- to assist in the development of improved mass transportation facilities, equipment, techniques, and methods, with the cooperation of mass transportation companies both public and private;
- to encourage the planning and establishment of areawide urban mass transportation systems needed for economical and desirable urban development, with the cooperation of mass transportation companies both public and private; and
- to provide assistance to state and local governments and their instrumentalities in financing such systems, to be operated by public or private mass transportation companies as determined by local needs.

These purposes are preceded by findings referring to the welfare and vitality of urban areas and the effectiveness of other services being dependent on such mass transportation systems. In the 1974 amendments, the Congress also stated among its findings that:

"(4) in recent years the maintenance of even minimal mass transportation service in urban areas has become so financially burdensome as to threaten the continuation of this essential service; (and that)

"(5) the termination of such service or the continued increase in its cost to the user is undesirable, and may have a particularly serious adverse effect upon the welfare of a substantial number of lower income persons."

I suppose we can claim that it is quite a challenge to navigate the cross-currents of public policy contained in the several acts of Congress affecting our program—to sort out the relative importance of sometimes conflicting themes. On the other hand, we may also over-complicate matters, even though we may plead we are driven to doing so in the constant questioning of the merits of the program which takes place in the appropriations and legislative processes. But just looking starkly at the above stated purposes and findings, I can realize peace of mind in concluding that the Federal Government is financially assisting the improvement of public transportation because it is in general a necessary service in an urban society, and because it is in particular a life-line for many people dependent upon it for their mobility. The abiding purposes of the program are social purposes, and I do not quite know why we can't be more serene about this—why we don't at least remind ourselves to regularly start justifying and interpreting the program from this bedrock.

Before I became associated with this program, I was the City Manager of Fond du Lac, Wis., a small city halfway between Milwaukee and Green Bay—and last week I received an invitation from the City Council to participate in a ceremony this morning dedicating the placing in service of their new fleet of buses. I had to decline owing to a prior commitment, but the point I want to make is that the City

Council of that city, I am sure, did not acquire that fleet of 12 buses and get into the public transportation business because of development, congestion, air quality, or energy conservation objectives—rather because there was a political constituency to be served. It is very clear to me that social purposes have predominated in the minds of local officials who make investment and service decisions with respect to public transportation. This is why, in my mind, the percentage of publicly-owned mass transportation systems has increased from 9% in 1967 to 45% today.

Lest I be misunderstood in downplaying other than social objectives with respect to the small city of Fond du Lac, I do not mean to do so for larger cities. I suggest that the more general objective—the vitality and proper functioning of such cities—encompass all the others rather effectively for them in the political process. At least I read that into the Congressional findings and purposes, and the statements of representatives of large cities in various negotiations we have had related to criteria for managing our programs over the years. And I am saying that it has an overriding common sense and acceptance we ought not lose sight of.

I am reminded of a recent executive training session I attended on Federal-state coordination with colleagues from other parts of DOT and representatives of the British, Canadian, and German transport ministries. At one point we asked the representative of the Federal Republic of Germany, who was the Director of their Office of Transportation Investment Policies and Programs, why that government spent the money it did on the national railway system. His answer, in effect, was that it was a form of social security—they were afraid that they'd regret it some day if they failed to keep the system in top shape.

Amid the various policy nuances of the past several years, the urban mass transportation program has in fact adhered rather faithfully to the straightforward purposes of Section 2 of the Act. By our planning and capital grants—and lately our formula grants—we have certainly encouraged the establishment of areawide urban mass transportation systems, which by the terms of the long range program section of the Act, should also be "unified or officially coordinated."

As things have turned out, there has been much more unifying than coordinating. Private systems have been bought out and consolidated, to some extent finessing the intent of the Act that areawide systems be established with the cooperation and participation of private mass transportation companies. They have cooperated in being bought out rather than participating in continuing to offer service within a coordinated system.

Though this has been the main line result of our major financial assistance programs, in our RD&D efforts—they being more detached and the staff more reflective than those in charge of the money pumps—we began viewing our sprawling urban configuration and trying to figure out how to serve it most cost effectively with public transportation modes. We began looking at paratransit modes—such as dial-a-ride, shared-ride taxi, and vanpooling—and as demonstrations of these concepts grew in number, accompanied by a growing dialogue among opinion leaders through conferences which we supported, we found ourselves reconsidering the definition of public transportation. In our social service studies and demonstration projects—particularly those related to elderly and handicapped persons—we have begun to see opportunities for major efficiency payoff by concentrating on coordinating the program resources of other agencies (particularly the

R&D PRIORITIES

Department of Health, Education and Welfare) with our own, and by working with the numerous providers of special transportation services in a more organized way. We have focused on such programs as fleet insurance problems, regulatory impediments to offering shared-ride taxi service, user subsidy methods to be used in conjunction with provider subsidies, and brokering of services.

Stemming from these activities, we see opportunities for policy development and program management to help maintain the vitality of privately operated taxi service as part of a more effective total public transportation system.

Collateral technology efforts directed at providing the most cost-effective mix of public transportation modes areawide have included the development of computer algorithms to facilitate demand-responsive services and their linkages with fixed-route modes; and dual mode system studies in particular. Advanced guideway technology development, looking toward definition of what advanced technology can offer in the way of cost-effective areawide service for the future, is difficult to take into account at the moment; but the DPM program is a good example of RD&D efforts showing promise of pay-off in large scale redevelopment of the core areas of our central cities.

When all is said and done, and first-rate RD&D efforts identify the most cost-effective systems, techniques, and methods to employ in providing the unified and officially coordinated areawide systems the Act has charged us to encourage, we are still left with vexing questions: Will such systems be affordable by the user? Will their costs be acceptable to the community when in competition with other public sector functions for tax support? Will they be used? How much is necessary for a well functioning society? How much for equity for people dependent on transit for their mobility? Is *any* form of public transportation an inferior good in the sense that people will substitute private transportation for it for most trip purposes?

I suggest that we not try to answer such questions in the next two days. Except for one, perhaps. I have no problem recognizing that transit is a service for which people will substitute for most trip purposes. Even poor people do so when their disposable income increases marginally. We found that out in demonstration projects years ago, and it is observable in all countries of the world. May I suggest that the declining ridership experience of transit may not have been "bad." It may mean that our society as a whole has been a big success—more and more people have been able to enjoy a higher quality of life, in the sense of enjoying superior technology in the form of the automobile. The fact remains that transit is still a superior good for certain important trip markets—particularly the central business district-oriented work trip—and for inner city circulation when a system is well designed for it (as in the case of WMATA). It is in any case an *essential* service for our society, and can be catalytic with respect to important reactions within urban societies if it is sustained at a respectable level and quality. Cities do rebuild themselves—Wilfred Owen's several books give us great examples of this phenomenon around the world—and as they do, the connection between the quality of living and transit services becomes more apparent and demonstrable. Notwithstanding my earlier remarks about tenuous connections between energy conservation and better air quality and transit, recent studies of Canadian cities have clearly demonstrated such direct effects of high modal splits in favor of transit which came about because of close correlation of land development and transit infrastructure. Even favorable

national balance of trade effects are claimed, owing to lesser oil consumption.

In a recent conversation with some of my colleagues in UMTA on computer software for paratransit projects, we fell into a general discussion and the thought was expressed that technical people like to do what's possible, rather than just what's necessary. If we have too clear a view of what we want to do, it's not RD&D. There must be some tolerance for uncertainty, overlap, and ambiguity. I note from press reports that President Carter, despite tight new Federal spending restraints, intends to give special protection to research and development programs in his 1980 budget. And, that he has expressed special concern that the basic research aspect of RD&D be protected—this being the end of the spectrum where no specific application is in sight. I'll go along with the President on that.

If we maintain a vigorous RD&D effort to determine what is "possible" to be offered in the way of technology—or techniques and methods—we just may achieve systems which are more affordable, and therefore assist policy resolution on what service can be offered. The history of technology development clearly demonstrates that we constantly do more with less. So we have reason to be confident that various efforts to improve system productivity, quality, and life-cycle costs may very well affect the outcome of such questions as affordability and such value judgments as how much is enough for a civilized society. In other words, value systems may get rearranged.

With respect to techniques and methods—the use of traffic authority, pricing policy, and mixes of modes—which may be inexpensive trade-offs for capital intensive investments in transportation supply, it is often difficult to bring into service, even for demonstration and evaluation, concepts which are otherwise "possible." Demonstrations of congestion pricing, brokering, fare integration, changes in labor work rules, for example, encounter different kinds of obstacles from those present in hardware development. Affecting behavioral patterns is part and parcel of conducting such demonstrations, and the political prices paid for the future, measured in terms of public acceptance of a concept, are high. The value of negative results is harder to sell. In recognition of these conditions, we are particularly grateful to local officials, whose collaboration is absolutely vital to our making any headway with this whole category of our RD&D program, the part which my own office oversees and which accounts for approximately \$20 million of our \$70 million Section 6 resource.

In spite of the many obstacles to innovating in the public sector, there can be little question that the RD&D activities of UMTA have had substantial impacts on the policy framework and conduct of our main line financial assistance programs. The TSM programming requirement in the 1975 joint planning and programming regulations of UMTA and FHWA is credible because the demonstration program produced a family of techniques for affecting preferential treatment of buses and high occupancy vehicles in the traffic stream, because of paratransit demonstrations, and the run cutting and scheduling and service inventory and maintenance system programs—all of which suggest what is doable—and make some programming of these techniques a reasonable requirement for Section 5 and Section 3 assistance. Our urban transportation planning system outputs facilitate planning of such improvements and are being continuously designed to do so. We may have some trouble defining exactly what we'll settle

for, but there are enough examples of what's possible to ensure the vitality of the policy. These same examples, and others, also support our joint efforts with the Environmental Protection Agency to ensure compliance with Clean Air Act standards.

The special efforts requirement of UMTA's 1976 elderly and handicapped regulation was made credible by virtue of our special user-group demonstrations, some dating from the late 1960's, and by the status of our bus technology program. This is all the more true of the credibility of the proposed regulation to replace the 1976 regulation. The feasibility of bus lifts alone shapes many choices in considering the final version. The paratransit vehicle project is another example of a clear linkage.

The capital grant program today is being administered in a much more explicit way with reference to equipment requirements than we had talked about in the BOB report of 1970 which I mentioned earlier. We are more clearly recognizing the extent to which the Federal Government affects the market and can foster innovation. We are trying to employ a more interventionist management style without being too overbearing. This is alternately, it seems, a test of will and diplomacy, which we hope can be managed successfully in the public interest.

In the latest legislation, Section 3 was amended to make

it clear that the capital grant program could also be used to deploy technology by financing some of the latter stages of product development. We had been proceeding under an UMTA order, which this provision of the law now re-enforces. The expansion of the Morgantown project with capital grant funds and the DPM programs are examples of more speculative uses of this program resource.

A companion amendment authorizes a special resource to deploy innovative techniques and methods, within an amount equal to 5.5% of the capital grant resource. This allotment must be divided between planning grant funds and this deployment activity. The amount is expected to range from approximately \$15 to \$25 million per year for the deployment function. The idea is to get services, methods, and techniques launched for follow-on financing under the Section 5 program. This proposal was a direct result of the growing maturity of our service and methods and transit management programs, which now have more deliverables. Offering this deployment resource is a softer, more promotional approach to encouraging the use of deliverables than the specifying which is more acceptable with respect to hardware. Yet, it tends to remove excuses for minimal activity under the TSM programming requirement of the planning regulations.

R&D From The Federal Perspective

By James Costantino

*Director
Transportation Systems Center*

Research, development, and analysis are the key tools for bringing about desirable changes in the nation's transportation system. R&D, in its broadest sense, improves our understanding and knowledge of the present system, develops improved technologies where needed, defines methods of predicting impacts of transportation system changes, and permits experimentation with and demonstration of improved technologies before they are rigidly implanted in operating systems.

The Department of Transportation is not the principal user of most of its own R&D, except in its operational administrations, namely Federal Aviation Administration and the Coast Guard. A tremendous diversity of large and small transportation companies and authorities throughout the U.S. are the principal users, but there is no requirement that they use any of it. From an R&D perspective, that makes all the difference in the world. Obviously, new technologies, techniques, or knowledge have no impact on the transportation system until they are actually used. Thus, the purpose of transportation R&D is to improve the productivity of both the capital and labor that goes into our transportation systems and to try to convince the operators and users of the thousands of local systems, who have the final "say," that it's all worthwhile.

We at the Transportation Systems Center in Cambridge are an element of the new Research and Special Programs Administration. It may be worth commenting on the recent organizational change that brought RSPA into existence. About one year ago, various program offices, in research and other areas, were detached from the Office of the Secretary and were drawn together and established as RSPA. Unlike the modal administrations within the Department which conduct and sponsor R&D activities in their own fields, RSPA is a cross-cutting organization, with none of its programs confined to a single mode of transportation. RSPA research draws upon the results of the modes' work to ensure that comprehensive solutions are found to real-world transportation problems that cannot be classified along modal lines. In some cases, RSPA conducts the high-risk exploratory R&D in advanced systems which, when the results are favorable, it hands off to the modes.

The largest single component of RSPA is the Transportation Systems Center. We have an annual budget of some \$70 million, 650 Federal employees, and 350 support contractors. The Transportation Systems Center is DOT's only multimodal R&D facility for highway, air, rail, pipeline, and marine transportation. Its function is to conduct research, development, and analysis in support of DOT policy formulation and, in addition, to provide program management and technological support to the modes. I want to emphasize that TSC is a systems center, not just a designer of black boxes. The build-a-new-mouse-trap-syndrome no longer characterizes the majority of the Department's work. We are just as interested in the front end of a problem—such as economic viability, environmental impact, energy costs, and social acceptance—as we are with the development of hardware.

Thus, we have become well aware that technological change can succeed only if it fulfills quality of life improvements by meeting economic and social demands. The human dimension is perhaps most vital when it comes to planning for transportation research and development. We must know more than the answers to questions such as: "How do I build this?" or "How do I construct that for less money?" We must ask, "Will people use it?" and "Will it contribute to the social good?" On our technical programs, we are asking such questions as "Are the advantages of a supersonic aircraft outweighed by the disadvantages of noise and community disruption?" "Will extension of a public transit system in a particular community be cost-beneficial?" "Will cutting back branch line rail service to save money mean economic disaster for rural areas?"

Although we can build complex, coordinated networks of transportation systems and computer automated vehicles, we have learned that transportation technology is inextricably entwined with societal evolution.

A particularly good example of the government's role in designing a desirable future is the way in which the downtown people mover program is being implemented. Although the technology being applied so skillfully is state-of-the-art, the real test in this DPM effort is in the area of deployment. This test is continuing, since a level of uncertainty remains to cloud the view of success we all have for DPM.

The major uncertainties in the case of the DPM, as we see them, are not technological problems but are related to institutional, social, and economic issues which could inhibit capital investment. This serves to underscore the Federal role in providing the framework and incentives within which this new transportation alternative can be realistically judged. What remains to be completed is the appraisal of DPM's impact on its host communities. That impact can be significant when we consider DPM together with its very innovative component . . . joint development downtown. If we can prove these systems to be reliable, safe, and economical, they could become imaginative solutions to local circulation problems in congested downtown areas. They could serve as revitalizing forces for urban centers.

The success of the DPM program, I believe, is very much tied to the success of the other modes in performing their regional transportation roles. Unless we take a comprehensive view of how DPM's fit into regional systems, I believe that DPM's may be considered poor transportation investments by the public.

Specifically, we must maintain and improve our traditional line-haul modes—commuter rail, express buses, and rapid transit lines—to entice downtown-bound passengers to leave their cars at home or at suburban park-and-ride stations. We must strategically locate DPM stations to intercept passengers arriving downtown by these traditional means. We must design facilities that make these intermodal transfers attractive and convenient.

As we look forward to the deployment of DPM's and the new possibilities they create for our urban environ-

ments, let's not lose sight of the enormous need for innovations in our conventional transit technologies. The message for transit from Proposition 13 seems clear. The road out of this financial squeeze and to transit rejuvenation is through productivity enhancing innovations—innovations that lead to increased ridership and improved labor efficiencies.

Let's look at the origins of Federal transit support—the commuter railroads. A couple of years ago, I rode the Media Line in Philadelphia. Incredibly, the cars were actually built in 1906, three years after the Wright Brothers made their historic flight, and they are still in use. Com-muter rail is perhaps the most neglected technology in transit research today. That's a shame, because commuter rail accounts for nearly one-fifth of the nation's transit passenger miles, providing approximately one million passenger rides every weekday to people who would otherwise use their automobiles to get into the central business district. And remember, getting and keeping people out of their automobiles is one of the key goals of any transit program.

As a technology, commuter rail lies at the opposite end of the spectrum from DPM's. Today, there are 15 railroads providing service for commuters from the suburbs to the central cities in six of our seven largest metropolitan areas—Los Angeles being the one exception. For the next decade,

we face the challenge of renewing commuter rail rights-of-way and fixed facilities—a program estimated to cost \$4 billion. We will need good research and good ideas to ensure that this modernization program is carried out cost effectively. Rising operating costs will have to be attacked by introducing new operating and maintenance practices that enhance labor productivity. This, too, will require good research and good ideas. And since every major metropolitan area has some sort of rail freight delivery system, and the opportunities for shared use of tracks, I believe it is also appropriate to investigate new opportunities in commuter rail services.

In investigating these and other possibilities, rigorous analysis of alternatives is essential. The analysis must convince everyone that, on balance, the proposed system is cost-effective in meeting transportation, environmental, energy conservation, and urban development objectives. R&D has an important role to play in alternatives analysis by adding to the menu of transportation solutions that planners can choose from. R&D should be providing new ways to enhance the effectiveness of transportation investments. One of the key roles of Federal R&D today is not just to keep inventing new mousetraps, but to make the ones we have work better.

Viewpoints on R&D Priorities: Roundtable Exchange

The following statements were prepared for the roundtable discussion chaired by UMTA Associate Administrator for Policy, Budget and Program Development Lillian Liburdi.

Arline L. Bronzaft

*Associate Professor of Psychology
Herbert H. Lehman College, Bronx, N.Y.,
and consultant on passenger safety and services
New York City Transit Authority*

It took little effort to realize that subways and buses in New York were not designed, planned, nor operated for *people*. Subway maps, while graphically pleasant and colorful, totally disregarded the necessity for a print size that could be readily seen or the use of symbols easy enough to understand by those with less than a doctorate in graphic design. Subway signs didn't coordinate with maps, nor did any of the information aids in the underground work together in some uniform fashion. Subway seats in the new cars were not built for the average rider unless the derriere of that rider was "twiggy-sized." Train delays were not announced and passengers could not depend on getting to their destinations on time. Filth, crowdedness, and noise were three words readily called to mind in describing subway conditions.

Passenger complaints fell on deaf ears as the Metropolitan Transportation Authority, the managing agent, assumed the attitude of arrogance and distance. Public hearings, which the authority called reluctantly, and only because it had to in order to meet the Federal requirement of holding hearings when funds are requested, were nothing more than confrontations between angry consumers and disinterested board members. There had to be a better way. I then decided to direct my skills as a psychologist to advocate for a more humanized transit system.

I wondered if New York were atypical in its attitude toward transit riders and looked at how other cities were treating their riders. I soon learned that consumer concerns were of little interest to transit managers across the country. While citizen involvement and participation were called for by Federal statutes, these requests could be met by holding an occasional public hearing or placing a citizen on an advisory committee. In a report prepared by Julie Hoover this year for the firm of Parsons, Brinckerhoff, Quade and Douglas, Inc., it was found that over 250 of the 279 regions Hoover surveyed failed to initiate meaningful citizen involvement in transportation planning. Hoover concluded her paper by asking why the Federal Government refuses to oversee the implementation of its policies.

Stephen Dobrow of Fairleigh Dickinson University and I are presently examining information aids such as maps and schedules from over 150 cities in the United States and Canada. While there appears to be an increasing awareness that transit riders are to be provided with maps, pamphlets, bus stop signs, and other information aids, there doesn't appear to be any evidence that these materials were tested out for effectiveness. The emphasis is on producing aids and not on evaluating them.

In February 1978, the Transportation Research Board, at the request of the Urban Mass Transportation Administration, brought together groups of transit users, transit

managers and operators, government officials, planners, and union representatives to discuss consumer needs and concerns. The report summarizing the findings of this workshop should be ready for distribution at the end of the year. It highlights the areas where transit agencies have neglected consumer needs, concerns, and feelings in planning and operating transit systems.

Yet, it is not only transit managers and operators that lack sensitivity to the more consumer-oriented aspects of public transportation—comfort, reliability, convenience, and a voice in policy decisions. The Federal Government is as equally insensitive to community involvement, giving it no more support than the mere passage of policies asking transit systems to "provide the opportunity for community development." Why hasn't the Federal Government monitored compliance to these requests? What weight does the Federal Government place on statements aired at public hearings? Does citizen testimony play a role in the allocation of Federal funds?

Has the Office of Research and Development promoted research in those areas where rider attitudes and interests play a paramount role? On page 82 of the Proceedings of the Second R&D Priorities Conference held in 1976, there was a recommendation that "users of transit services should be represented at the next conference." This is the next conference and I doubt whether this recommendation was given serious thought.

My feelings are reinforced when I glance through this year's UMTA University and Research Training Program announcement. While it is possible to design a study to fit one of the research topic areas listed in the announcement, it is exceedingly difficult. A study on citizen involvement would be virtually impossible. The Department of Transportation's call for research programs is even less interested in consumer attitudes and interests. Its bulletin essentially discourages anyone from attempting to examine transit riders' interests and attitudes by requiring survey clearance for all questionnaires designed to do so. While survey clearance by itself does not imply total rejection of questionnaires, stating such clearance may take up to a year clearly discourages an investigator from submitting a proposal including a questionnaire. DOT attempted to get around the problem of the development of new questionnaires by urging investigators to use existing data to garner the necessary information. However, that is exactly the problem—existing data don't focus on consumer interests and feelings.

In reading the 1975 and 1976 directories of research, development, and demonstration projects funded by UMTA, I sensed a lack of interest in consumer input into transit decision-making. Although it may be argued that the funded projects were concerned with passengers, for

example, reducing transit noise and providing dependable service, there is little, if any, evidence that these projects included citizen responses as part of the design.

Lillian Liburdi in inviting me to speak today asked me to focus on what consumers want in terms of R&D. All you have to do is ask them. Once we become aware of their

needs, we should be able to translate these needs into effective programs. We already have the psychological tools and techniques to permit consumer input. Consumers are tired of research, particularly research ignoring their needs; they want action, not finely tuned-up reports.

K. H. Fraelich, Jr.

General Sales Manager

Westinghouse Transportation Division

At the risk of giving a short commercial, I believe we in Westinghouse have a unique insight into some of the problems associated with transit industry R&D and, in particular, the specific problems of converting R&D concepts to delivered production hardware. As you know, we pioneered in the application of DC chopper propulsion control technology, solid state signaling and automatic train control technologies, and automatic people mover systems. I am glad to report that all of these technologies are currently in revenue service, in the U. S. and abroad, and are daily establishing new standards of excellence in safety, reliability, and availability.

Most of the basic R&D effort and prototype and production testing for these technologies was performed on a self-funded basis; or as we refer to it, on a strategic expense basis. In fact, one of these programs was once described by our corporate management as "one of the largest, unplanned strategic expenditures in the history of the corporation." But, I am also glad to report that we can now see the market to recover our strategic investment, and it is our intent to aggressively pursue that market. So much for the commercial, let me now briefly state my observations and conclusions.

Over the past 10 years, there have been many times when it has appeared to the supply industry that the UMTA R&D priorities were designed to emphasize the long range revolutionary solution at the sacrifice of short range evolutionary solutions. As I indicated before, this trend appears to have been generally corrected and R&D programs are now truly starting to serve the needs of industry. However, it is my contention that continuous attention must be paid in the allocation of priorities to achieve the proper balance between revolution and evolution.

Again, in the past, UMTA R&D priorities appear to have been aimed at supporting the entry of new suppliers into an already over-supplied industry. This has been justified by a collage of catch-phrase rationales such as "the reason the current state-of-the-art of the industry is in its present state of decay is because of the lack of innovation on the part of current suppliers," and "if they can design a rocket to get to the moon, they can design a transit car for system X." While this theme seems to have abated somewhat, it has not, in my opinion, completely disappeared, and there continues to be a lack of recognition of the contribution of the old line suppliers to the advance of transit technology.

And, a final observation which I believe gets to the crux

of the problem. It has been stated many times that there are not sufficient financial incentives in the marketplace to encourage the private sector investment in R&D programs aimed at improving current transit technology. Unfortunately, this is basically true. However, I would suggest that this is not as much a function of the size of the marketplace as it is a function of the procurement practices in the marketplace. These practices are aimed at ensuring that as soon as a supplier develops an innovative improvement in transit technology, he will not be able to receive a sufficiently large order to allow him to completely recover his investment without first divulging the details of the idea so he will receive maximum competition in attempting to reduce his innovative idea to production hardware. This process ensures that he will *possibly* receive an order for the production run at a price level which will guarantee non-recovery of his investment. While I recognize these words are contrary to motherhood and all that, I would suggest that the established process transfers R&D expense from the private sector to the public sector and introduces a more inefficient delivery system.

Now my suggested change. As has been discussed at great depth in many meetings of this nature, the current delivery system for UMTA-sponsored technology improvements contains a substantial gap between prototype testing and production hardware. This gap introduces several levels of technological and financial risk which can seriously impact both the user and the supplier. UMTA has indicated that they plan to attempt to deal with this problem in Fiscal Year 1979 through the use of a process called a controlled capital grant. While this process may deal with some of the problems resulting from the gap, it does not, in my opinion, provide the necessary incentives to stimulate more private sector participation in transit technology R&D. I would suggest consideration of a process allowing the property and the supplier to form a joint partnership in the development of a solution for a specific technical need and to provide the supplier at the onset with a contract large enough to recover his investment. This process would involve UMTA providing the authority with sufficient funds and contracting latitude to be able to contract for a large enough quantity of a technological improvement so that the supplier could know what his market was at the onset of the program. Checks and balances would have to be built into the process to allow the continuous monitoring of program cost and progress.

R&D PRIORITIES

Francis B. Francois

Member

County Council

Prince George's County, Md.

I'm here primarily to talk about priorities and problems as they're viewed from the standpoint of state and local government in this country.

We just heard one list of priorities and, I dare say, there's no one in this room who couldn't give their own list. I suppose if I were to concentrate solely on Prince George's County—which is a large urban county with both rural and urban problems—I would deal with such researchable issues as the need to provide both an urban and a rural transportation system for our people, and how to do it, especially in the rural part of our county.

I would also want to deal with other issues, like lower-cost ways to build high-quality roads, especially with Proposition 13's floating around, and transporting the elderly and the handicapped population with special transportation assistance, especially how best to do it and how to do it without destroying the taxicab industry in the process.

There are a lot of things of that kind that I have to work with every day.

Turning to the Washington Metropolitan Area Transit Authority, as you know, is that wondrous new train set that we have in the basement of Metropolitan Washington.

We at WMATA have our share of state-of-the-art problems, too. Like wheels that won't last but about 50% of what we were told that they would, and little things like brake systems that sometimes malfunction and back a few thousand people up in rush hour. And, of course, something known as the automatic fare collection system, which you may have read about.

The difference between your light rail vehicle and our Metro is that you say the people perceive the LRV's as working. Believe me, they do not perceive the farecard machines as working in Washington.

One of the reasons I'm in Boston is to see if I can negotiate a trade of a few hundred farecard machines for a few thousand milk cans.

In all seriousness, the farecard machine problem is a very serious one. It's one that goes to many issues, not just state-of-the-art, but to things like contract writing: what is a mistake and what isn't; what is an error and what is a failure.

The operational failures as defined by the contract we have with the Mitre Corporation essentially mean that the machine only fails when a part breaks. If it jams up because of a wet farecard, that's a malfunction and doesn't count. We have a failure rate that is very low. We have a malfunction rate that is very high. We're trying to wrestle with that.

The point of it is that each of us has our own priorities. And the problem is, how do you bring all this together.

My principal reason for being here this morning is to talk about another organization which I'm involved with, known as the Intergovernmental Science, Engineering and Technology Advisory Board. This is a Congressionally established Federal advisory committee.

Whom do we advise? The Office of Science and Technology Policy within the White House. It was organized in late 1976 and we spent our first year trying to figure out who and what we are. The membership of ISETAP is drawn from state government, local government, and other agencies involved with state and local government around the nation.

We have governors on it, several mayors, some very competent city managers, and others. We spent the first year trying to organize, and we've now organized ourselves into five panels—or task forces, as we called them—to deal with a variety of Federal research and development issues.

The charge of ISETAP is to try to identify and define problems of state and local government that can be addressed with R&D to establish priorities for those programs, and to try to improve the transfer mechanisms involved with them.

One of the groups is known as the transportation, commerce, and community development task force; and I co-chair it with Mayor Ken Gibson of Newark.

Over the past year, we have talked with the Federal Department of Transportation and some of the people in this room about their programs and their priorities. The more we got into it in 1977, the clearer it became that the most crying need was for a way to bring together all the different priorities of all the elected officials in this country.

The Urban Consortium has its list of priorities, the Congress of Mayors has its list, the National Association of Counties has its list, and so it goes.

We tried to come up with a process that would do precisely this: attempt to consolidate the research and development needs as they are perceived, to set priorities for those needs, and eventually come up with a delivery system that will work. We wanted a priority identification process that makes some sense for all of us.

Now, to do that, in January 1978, we called together the staffs of several of the national public interest organizations, the ones I've named, and, in addition, the Governor's Association, the Urban Consortium, and representatives from the various state and regional innovation groups that are in existence around the country.

We asked them to come up with what they perceived to be the research needs of state and local government, and we got a shopping list of some 600 problems, each with an identifiable work program attached to it.

We boiled those down to less than 25% of that, and we have met in Washington over the last several months to try to bring those down to a priority list. In the field of transportation, we came up with essentially six topic areas. I won't go into them in detail here, except to outline them, and none of them are new to you.

First on our list was something known as transit system productivity.

Second was the transportation planning and impact forecasting tools. The concern here was twofold: the red tape we all must live with, which we only seem to learn to cut lengthwise; and impact forecasting tools that work.

We've all been through the processes of trying to design a system which won't do what we have thought it would.

The next two items were small community mass transportation systems and the integration of paratransit with conventional transit.

A fifth item on our agenda for transportation purposes is road and bridge construction and maintenance, including finding a permanent winter repair material to solve a problem which is becoming critical for many of us.

And item six, of course, is transportation financing.

Now, those are six items I think any of you in this room could have easily assembled. But the importance of them, for our purpose, is that they came from the bottom up. This is what people said they were most concerned about.

Taking those, we are now massaging them through a process which involves the American Association for the Advancement of Science, a number of people from the Federal research and development establishment, state and local practitioner lists, and the academic world. They will be coming together in a series of workshops, the final of which will be held in February 1979, which will refine these six items to identify those that are really researchable, those which have a potential payoff, and those which can be transferred and that are meaningful.

From that effort, we hope to evolve, by this time next year, a list of priorities that will help UMTA and the other Federal agencies working in the transportation field to shape their research and development programs to be more meaningful for all of us.

We believe that if we can bring together the state and local governments in a program that they want, that they've helped create, then the results will be used and there will be a more usable product at the other end.

The bottom line, of course, as we recognize in local government, is that the programs must produce results that work. The state-of-the-art isn't good enough. I'm sorry.

You've seen it, I've seen it, when state-of-the-art just won't work in actual use. What we're doing is turning state and local government officials off on new ideas, by putting into use things that just don't quite work. We must get things that deal effectively with the cost issue, for the cost issue is really the paramount one we're all faced with.

All over this country, starting in June in California, a

number of elected officials were propositioned by something known as Proposition 13. It caught on, it's going nationwide now, and I think all of you here are fully aware of that.

We're being made, as elected officials, offers we can't refuse, offers to cut the budget or else. And in all seriousness, it is a very serious problem.

We are being faced, in state after state, with demands to cut back on services, including transit services. To avoid cutbacks of service, we must find ways to do it cheaper, and we must find them fast. That means increased productivity. It means in the process, however, coming up with systems which do preserve employment to the greatest extent possible, but which get us a higher yield from the public tax dollar that is spent.

Let me close with just one comment as to how far this goes. The new Governor of Wisconsin ran on the theme that Washington has only three duties:

- deliver the mail;
- defend the shores; and
- get the hell out of my life.

And, I note syndicated columnist George Will's quote that: "Washington eagerly awaits Dreyfus' visit, during which he will, presumably, beg that Wisconsin be released from the bondage of various subsidies, and that Washington get the hell out of the lives of Wisconsin communities by withdrawing the aid to education and revenue sharing."

All of which says that this world is not quite as simple as we sometimes make it out to be. We do have problems, and research can help. State and local governments intend to support the research budget, provided we can get meaningful results from it.

Kenneth W. Heathington

*Director
Transportation Center
University of Tennessee*

A public sector organization can hope to gain the most from research and development where it is the procurer of the results. That is, if the Federal Government is providing funding for a research and development program, then the Federal Government should be the procurer of the results. An example of where this has been reasonably successful, of course, is in the military area. The Federal Government has been the user of its own R&D programs, thus making these programs desirable from a military point of view.

It is questionable whether or not the Federal Government should provide R&D programs for which a different level of government would be the procurer of the results. The Federal Government may have a strong desire to develop some new concept or technology through its R&D program, but would require that implementation would be performed by state government. There are in existence several R&D programs, such as in highway safety at the Federal level, for which the states are responsible for implementation of the results. While one can point to a few good R&D programs including implementation, there are numerous R&D programs which produced good results but were never implemented by another level of government. Almost without exception, one can show that where states did implement the results of an R&D program, it was because the Federal Government required that the

states do so. That is, the Federal Government established standards which the states had to meet; to meet the standards, results were implemented from R&D programs funded at the Federal level. An example of this is in the highway safety area controlled by the Federal Highway Administration.

Research sponsored at the Federal level designed to aid the private sector is often less rewarding than might be expected. It has also been questionable as to how much influence the public sector can have in deciding the direction in which the private sector will go other than through regulations. If the market for a product or service is thought to be of reasonable size, then the private sector will, with little hesitation, provide the funding for the R&D. If the market is not of sufficient size, then even if an excellent R&D program produces outstanding results, the utilization rate will be so small that the cost-effectiveness of the R&D program will be in question.

The basic question that should always be asked in the planning of any R&D program of the Federal Government is: who will procure the results of the R&D? If the Federal Government is not going to be the procurer, then further thought must be given as to whether or not this is an appropriate R&D area for funding by the Federal Government.

R&D PRIORITIES

There is an additional concern in planning R&D programs. This concern is related to whether the results will require manufacturing capabilities to ensure the distribution of other than prototype models. The current policy of the Federal Government to hold the rights to all products of research makes it unattractive for the private sector to invest large sums of resources to produce something for which they cannot obtain a patent or exclusive manufacturing license. If the Federal Government pursues an R&D program and maintains the policy that anyone has the right to manufacture and distribute the results of that R&D program, they will find themselves in need of providing the start-up capital for manufacturing of the new technology if it is to be available for use by the consumer. Of course the Federal Government is not in the manufacturing or product distribution business, and it is not likely that they will become heavily involved in this area in the near future.

A change in this licensing policy could make a Federal R&D program more desirable in several areas. Some of these problems developed in the R&D programs which UMTA has sponsored in the past. These problems also exist with other R&D programs of the Federal Government, such as in the National Highway Traffic Safety Administration. The introduction into the marketplace of new safety vehicles, taxis, or other vehicles for which funding has been provided for the development of their technology has not occurred.

If these concepts presented here are valid, then the parameters can be defined for a Federal R&D program whether it be UMTA or other Federal agencies.

In most small to medium-sized urban areas, about 96% to 98% of all trips are made by the private automobile. Only 2% to 4% are made by public transportation. In the large urban areas, public transportation's share of the market is increased to around 6%-10% for all trips. Of course, these ranges vary depending upon the type of trip being made and the time of day at which that trip is made. However, the share of the market is one measure of the consumer's acceptance of a particular product or service. Public transportation services are currently receiving a very small share of the total travel market. The competition with public transportation services, that is the automobile, is of course an excellent means of travel.

More R&D programs are needed in the area of consumer needs and desires. Public transportation will never attain a large share of the travel market, thereby reducing traffic congestion, inducing energy savings, and improving air quality unless it meets the needs and desires of the consumers.

Policy research should be one of the highest priorities in the UMTA R&D program. Policies which are promulgated by UMTA, the Department of Labor, and Congress have a far greater impact on public transportation services and ridership than the development of hardware or any other type of research. There is not enough emphasis given to evaluation of the impact of various policies that are in force or are proposed. Better methodologies need to be developed to analyze proposed policies and to ascertain the probable impact of these on public transportation services and consumers.

Public transportation, of course, is very labor intensive and is heavily unionized. There has been very limited funding available to support research in the labor area. It would almost appear that UMTA is attempting to shy away from analysis of the impact of labor on public transportation services and consumer needs. R&D in the labor

area should be of assistance to Congress in reviewing past legislation and in the development of new legislation in the public transportation area.

Transportation is one of the more regulated industries in the U.S. While there have been some funds expended for R&D in the regulatory areas, there is not a sufficient amount being spent to enable substantial progress to be made in this area. It is interesting to note that all of the arguments relative to the deregulation of the air industry are not supported, whether they be pro or con, by a sufficient amount of research.

There needs to be more R&D relative to the financial support of public transportation services in all modal activities. This would include traditional transit as well as paratransit services. There was little research to forecast the impact that Section 5 would have on the transit industry. In fact, there was little research to indicate the impact that the Urban Mass Transportation Act of 1964 would have on public transportation services. Many of the assumptions under the Act, while not necessarily stated, but implied, have not proven to be true.

The lack of understanding of the working environment of local governments on the part of the Federal bureaucracy is amazing. Having spent most of my working life at the local and state levels of government, I find that the problems there are not really understood at the Federal level of government. Money is not always a carrot to local communities, and it is becoming even less of a carrot to local communities now than in the past, particularly where matching funds are required or where the program is expected to be continued after Federal support has been dropped. Appropriate research could help the Federal bureaucracy have a better understanding of the environment under which local planners, researchers, and operators must operate.

There should be an increased level of R&D in developing performance standards in the vehicular area. It is interesting to note that NHTSA requires or will require certain safety measures on vehicles, such as passive restraint devices and seat belts, without having an R&D program to support the development of the particular product. There is logic to this methodology in that each individual company in meeting the regulations can develop its own patents and, therefore, protect its investment through the free enterprise system. Similar concepts for the provision of safety are provided in the airline industry, with the airlines providing the funds for and conducting the research, thereby having an exclusive patent on the results of their work. Research should be conducted which would address the issue of performance standards as opposed to R&D on the product itself.

In addition to vehicle performance standards, there should be R&D programs related to employee productivity and performance. It would seem that if one is providing a substantial amount of the financial support of transportation system activities, one should be able to specify in some format the productivity levels that should be gained for the dollar spent. If this does not occur, then the cost-effectiveness of one program can be substantially less than that of another.

I would personally place R&D programs on hardware development at a much lower priority than the other areas. While there is a definite need to improve bus and rail vehicle design, including a reduction in energy usage, improved ease of maintenance, a reduction in maintenance costs, improved operating speeds, and improved safety, it is questionable whether or not research on these characteristics should be financed and developed by the private

sector or by UMTA funding. In many instances, UMTA is not a procurer of the products of R&D programs in this area. It is questionable that some of the products from R&D in this area would be purchased by local communities, unless it were through regulatory controls attached to grants.

We have seen emphasis in UMTA on the development of such things as computer packages—whether they be software or hardware, the development of prototype vehicles for use by the taxi industry, personal rapid transit vehicles, or people movers. There have been many millions of dollars spent for R&D in these areas. The questions that must be asked, and should be asked frequently, are: how many of the worthwhile results from these R&D programs have been implemented and are currently being used? How widespread is the use of these R&D programs; or have the results of very large R&D programs been limited to one or two small applications? Realism and logic should prevail in the development of all R&D programs. Without these, many millions will be spent because something is interesting to do or would be nice to know.

There cannot be a general role in UMTA R&D described for the university community at large. There are as many differences from one university to another, as there are from one company to another in the private sector. The size of the university makes a difference in some instances; a smaller university may have the greatest expertise in a research area. However, the larger universities often have more facilities to support a wide variety of research activities.

In the future, research will be more heavily emphasized in major universities, particularly those having graduate programs. This emphasis will be due in part to the need for financial support to maintain excellence in graduate education. Currently, many public universities receive only about 40% of their budget from state funds. Some 20% to 40% of their budget comes from research activities. The forecast for state funding is that it will not increase in the near future, but may even drop as a percentage of the total budget of a university. Student enrollment is decreasing in many universities, and often the amount of funding received from a state is tied directly to student enrollment. Research funding is one of the more viable ways for many universities to maintain their staff and programs in many areas, including transportation. Realizing that future state funds will be limited, many universities are expanding their research capabilities in terms of staff, facilities, and other support services necessary to sustain a large, ongoing research program.

We often argue that universities are more stable than many other research organizations. The stability comes from the academic requirements of the institution and the state funds that go to support the university. Thus, there is not as much of a problem in increasing and decreasing staffs on a relatively frequent basis as occurs in other types of research organizations.

Many universities have at their disposal more diverse and expanded expertise than any other group. This expertise can be accessed at low cost relative to other organizations. That is, within the university framework one can secure engineering, economics, law, planning, sociology, or any other discipline that is needed to address a particular problem in combination or singularly without having to hire on a fulltime basis a person with a given expertise. One has a tremendous amount of interdisciplinary capabilities in a university which would be difficult to obtain in other types of organizations.

Universities, of course, still have certain constraints relative to conducting research. Many universities are not organized to respond to short time requirements on requests for proposals. That is not the case with the Transportation Center as we have worked to overcome this constraint in our own organization. Also, many universities have difficulty in beginning a project other than at the beginning or end of a term. Some universities do not feel that it is an advantage to them to participate in short-term projects of three to six months. Most universities would like to be involved in research that is at least of one year duration. Some of us who are associated with research centers or institutes do overcome many of these constraints found in universities. We have done so in order to make our particular unit more responsive to the needs of research sponsors.

At the present time, many universities can perform any type of research that can be conducted by anyone else. In fact, there are some universities that have both staff and facilities to provide research capabilities that cannot be found anywhere else. One can now find universities in an operating mode as part of a research or demonstration project, employing drivers, buying vehicles, building buildings, and doing many things which would not normally have been thought to be of interest to universities. We ourselves have been involved in all of these types of activities. I would argue that UMTA should not exclude universities from bidding on any type of research. In fact, the bidding list for R&D programs of UMTA should be greatly expanded to ensure that all possible qualified bidders could have the opportunity to participate in the programs.

UMTA should have fundamental principles applying to Federally sponsored research. These principles should guide the establishment of priorities for R&D programs. The cost effectiveness of certain areas of research sponsored by the Federal Government is highly questionable. A summary analysis of previous research by UMTA would show that this applies to the transit area as well as to many other areas of the Federal Government.

Universities can and will have an even greater impact on research in the future. Most major universities will increase their research output because of the necessity to obtain funding to maintain excellence in graduate programs. This is a healthy situation and should encourage competition in the research community.

Robert R. Kiley

Chairman

Massachusetts Bay Transportation Authority

My title is Chairman of the Massachusetts Bay Transportation Authority, but I also head what is probably the biggest research and development center in public transportation—the light rail vehicle at Riverside Carhouse.

We didn't plan it to be an R&D operation. Boeing Vertol didn't. No one did. But that is what happened. We have in passenger service 91 prototypes, none of which is identical to the other. The research into the properly functioning parts, and the development of the light rail vehicle, is now in its third year of passenger service.

About the only part on the LRV which isn't new is the radio. And that, I'm told, is now obsolete—although it works pretty well.

There have been over 200 modifications which have progressively altered the original vehicle. No one car has had all those modifications. One part has been modified five times.

Now, the passengers don't realize all this. As far as they are concerned, the new light rail vehicle accelerates smoothly, looks nice, is quiet, and comfortable. Ridership is increasing. But the passengers are concerned that there aren't more of these LRV's operating. They are concerned that they still have to get on an old PCC car. They are concerned when an LRV has its brakes lock in the subway, tying up the subway for 20 minutes or more. I'll say more about that situation in a minute.

The basic problem with the LRV—in retrospect—is that the 1972 contract did not require that a prototype be made and tested thoroughly before the production line was started.

I agree fully with what Art Hitsman, the LRV project manager for Boeing Vertol, said in June at a conference in Sweden,

"The most significant lesson learned from the LRV program is that the lack of an adequate prototype development and test program proved a serious deficiency. The LRV contract schedule required delivery of the first six vehicles in 526 days, with subsequent deliveries quickly increasing to a peak rate of 20 per month.

"This required committing to production hardware early in the program—before adequate testing could be completed. When test results indicated that changes were appropriate, production commitments had to be changed and modified hardware had to be incorporated by retrofit into completed vehicles.

"Boeing would recommend that such a program provide for separate prototype development and a test program scheduled sufficiently ahead of the production delivery program. This would provide adequate time to design and fabricate two or more prototype vehicles that could be subjected to extensive developmental and operational testing.

"It would then be possible to engineer modifications and incorporate them into prototype vehicles and retest. Production commitments would be made only when the tests results indicate complete satisfaction and prospective customer approval is secured. Boeing recommends that any new vehicle development program utilize this prototype approach."

MBTA joins in that recommendation of a prototype. In this case, at least, the technology of the early 1970s didn't

get us ahead; it gave us a headache.

What needs to be stressed in a research and development program for mass transit vehicles is that the vehicle has to be designed for maintenance, for operations, for safety, and for training. It happens to make a nice acronym: M—O—S—T. Putting the most into R&D.

Putting the most maintenance, operations, safety, and training as possible into R&D means that what is important is not whether the wheel is new, but that the wheel works in an operating environment.

I think the single most important thing any R&D program can do is hire some top-notch people who have had direct experience in operating vehicles, meeting transit schedules, maintaining vehicles, and being responsible for the safety of passengers.

These experienced operating personnel would try to recreate operating conditions to test prototype vehicles. Operating conditions means real live passengers. We found out a lot about the LRV once it began carrying passengers that we never found out when it was carrying sandbags as simulated passengers.

You might get the idea from all this that I am against new technology. Not so. Skeptical, yes, but not opposed. Indeed, I wish the LRV had a bit more technology in some places.

For example: the brake wind-off tool. There are scores of pushbuttons on the LRV, but there is no pushbutton to release brakes which have automatically brought the car to an emergency stop because a safety feature was triggered by a leak in the air pressure.

By the way, brakes on the 37-year old PCC cars can be reset by pushing a button. But when the LRV has been automatically and safely stopped like that in the tunnel at Kenmore Square before the separation of the Riverside, Beacon Street, and Commonwealth Avenue Lines, the operator has to get out of the car, get the special mechanical tool, and manually wind off six separate sets of brakes—one on each axle. If it's a 2-car LRV train, there are 12 sets of brakes to release.

Traffic in the past has had to be stopped on all three lines when this happens at that particular point—as it has several times. It requires about 20 minutes—sometimes up to 35 minutes—in a cramped subway to unwind the brakes mechanically with the special and somewhat awkward tool. It is difficult to verify that all the brakes are completely released.

Twenty minutes at that point in the rush hour means about six 2-car trains carrying about 2400 people should pass by in that time. It means that traffic in the dark tunnel may be halted as far back as Auditorium and Copley Stations. If the delay is all the way back to Copley, it can foul up the fourth branch of the Green Line, the Arborway Line.

There obviously is tremendous pressure on the operator to get the job done as quickly as possible. If he or she improperly unwinds the brakes most of the way—but not all the way—on each axle, several precious minutes can be saved. If done improperly, the brakes drag, creating flat spots on the wheels. If that happens, the 12 wheels on each car have to be made round again on the wheel truing machine, a process which takes about 24 man hours per vehicle and reduces the life of the steel tires by up to two years.

All that for the lack of a pushbutton and a technological system.

MBTA has applied for Federal funding for a hydraulic emergency brake release system. A hand pump inside the car would apply hydraulic pressure to release the brakes. It is estimated to cost about \$400,000 for the 175 cars. We would have liked to have had that technology many emergencies ago.

Now, I must mention that Boeing has been unbelievably cooperative in helping us deal with this series of unique vehicles. We, Boeing, the San Francisco Municipal Railway, and the Urban Mass Transportation Administration are involved in a development program on this vehicle.

We hope we will have a great vehicle after a few more years, when all the bugs are out. But the point I want to make is this:

- don't design without a prototype;
- don't design for the state-of-the-art of technology;
- do design for maintenance;
- do design for operations;
- do design for safety; and
- do design for training—the training of the mechanics and operators of the vehicle at the particular transit organization.

Design for the people who are mechanics, operators, and passengers. You know as well as anyone that our successful rivals in Detroit would do their darndest to avoid having a vehicle that is totally new, in almost every part, go on sale to the public. Transit designers must keep that in mind; I think many now do understand this.

Please, put the MOST into R&D.

Dan V. Maroney, Jr.

*International President
Amalgamated Transit Union*

The Amalgamated Transit Union has about 150,000 members in the U.S. and Canada employed in the city transit and over-the-road industries. On this side of the border we participate to the fullest extent in the federal transit legislative process—we find that certain of our views are shared by the industry, while others are not. Perhaps, as much as any interested group in the transit industry, we understand that the Federal Government must be apprised of the rank-and-file workers' viewpoints on matters which may affect their employment and ability to feed their families. This is just as true in the UMTA research and development, technology, innovation, and improvement fields as the operating or capital grant assistance areas.

For many years after the passage of the Urban Mass Transportation Act, our members wondered where the devil those sums of money for R&D projects were going, especially in the years prior to the operating assistance program. Workers drove and repaired old buses and railcars, most of which were in the dying private sector. Therefore, their immediate priorities seemed to indicate basic funding needs. For example, I am a West Virginian and have never appreciated the fact that from 1964 to date, about \$157 million has gone into transit in my state. Of this money, \$127 million was used for the Morgantown automated guideway transit system. There are only so many dollars available, and with that kind of division, the worker and the general public will receive very little from the tax dollar spent.

AGT notwithstanding, I can tell you that UMTA, including the R&D section, appears to be hearing the worker's voice. ATU has pushed for no-fare demonstrations for a number of years, and now we are beginning to see projects such as those in Denver and Trenton funded. There are problems; but data clearly indicates the basic soundness of the concept—ridership increases tremendously without fare constraints.

Another key factor which we believe directly affects the operator's quality of life is UMTA's recent indication to ATU that it is willing and able to finance a demonstration grant in the area of driver security. This may not sound like an exciting R&D field to many people, but to

drivers and passengers under harassment, it is of vital importance. Those of us in transit labor realize that to achieve basic job security for the rank-and-file worker, the transit system must be successful and carry passengers. People in our urban areas who now drive alone to work in their cars will not ride public transit if they fear for their safety. At least that is one more reason.

The issue of job security brings me to an important area which the union believes has not received enough attention in the R&D Program. This is the need to develop the off-peak ridership. From our point of view, substantial increases in off-peak ridership will lessen the financial weight of the peaks on the system. It will also help to eliminate the hue-and-cry for part-time workers and other controversial provisions such as spread time and guarantees. This would be accomplished by scheduling more straight runs rather than splits. It would be less expensive for the system and better for the workers' lifestyles.

One of the areas of innovation which UMTA seems to have been placing a great deal of emphasis on in the last couple of years is the introduction of a wide range of paratransit services. These include almost any kind of organized ride-sharing: demand-responsive transit service, shared-ride taxi, subscription bus, vanpools, carpools, and special categories of services provided to such groups as the elderly and handicapped. Each of these subgroupings of paratransit services has its own set of operating characteristics, manpower requirements, and labor implications. The rank-and-file worker, and this union in particular, believes that most paratransit services should be integrated into the established main line transit system services; paratransit vehicles should be operated and maintained by employees in the bargaining unit represented by the union. Paratransit services should not be used to compete with, displace, or replace main line transit routes and services. Further, paratransit services should not be used as a tool to depress established wage rates and working conditions.

UMTA can play an important role in lessening the potential for institutional and labor conflicts in the paratransit area by adopting, in conjunction with the Department of Labor, an appropriate and acceptable paratransit

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labor policy. I believe that everyone present understands that a paratransit policy ignoring the labor issues is doomed to failure. The individuals whose lives and livelihoods are involved in providing transit services to their communities are people who cannot be regarded as movable cost factors in some economic equation, to be selected or discarded at will. Obviously, the worker and his union will not look with favor upon every proposal for innovative change. Much depends on the facts and circumstances of each particular situation, especially in the field of paratransit services.

Another area where the union likes to see additional monies funneled into R&D is the area of overall system speed increases. Anything that can be done to improve the overall speed of the system, whether through automatic vehicle monitoring, land use policies, or auto restricted areas, will be an improvement factor in attracting more riders. As previously noted, more riders translate into additional employment opportunities and job security for the worker.

In recent times, ATU has been interested in labor cost data collection by UMTA, especially since the advent of the Section 15 FARE Program. Again, it might not be the most exciting thing to transit hardware and software contractors and consultants, but we believe for the stability of labor relations in the long run, additional funding for transit labor data collection would be helpful.

As we have said at other public forums, collective bargaining is perhaps the single most important process which is available to innovation planners for the reduction of industrial conflicts. Here, I am talking about collective bargaining in the traditional sense, which sets forth the wages and other basic terms and conditions of employment for a stipulated period of time. This is in contrast to collective bargaining under Section 13(c) of the Urban Mass Transportation Act, which seeks to work out an appropriate employee protection arrangement that will carry out the purpose of the statute. I cannot emphasize enough the value of accurate data for collective bargaining purposes in

the mass transit industry which is performed on a fairly sophisticated level.

I would add that the area of innovation in transit has always been supported by ATU as long as appropriate employee protection standards apply. In this regard, we believe it is significant that Congress has recently extended Section 13(c) bargaining for innovative projects. In the years since 1964, thousands of Section 13(c) agreements have been successfully negotiated, including many involving such so-called innovative transit projects. In only half a dozen cases have applicants failed or refused to enter into appropriate protective arrangements.

In summation, I think it is natural for people, especially in these times of high unemployment and inflation, to be distrustful of government planners and innovators who come forward with a variety of proposals for tearing up established ways of doing things. The worker often sees all this as a conspiracy to deprive him of his job, his seniority, his pension, and his modest but adequate standard of living. It does nothing to help the situation that there are many irresponsible individuals—both inside and outside government—who seemingly make a career of attacking Section 13(c) protections on a variety of political and economic grounds. Meanwhile, other attacks are being made on union work rules, cost-of-living clauses, wage and benefit levels, arbitration provisions, and strike authority, all of which appear to be nothing less than a deliberate onslaught on all that public transportation employees hold dear. Therefore, the rank-and-file worker believes that the transportation planner must be able to demonstrate to the union and the affected workers that his purposes are benign and consistent with the worker's expectations for continued employment and a better standard of living.

We will fight to preserve our jobs, rights, and benefits when R&D innovations are introduced which destroy existing employment opportunities. Where R&D innovation is coupled with employee protections, we are happy to work with all planners and innovators.

By G. J. Pastor

*UMTA Associate Administrator for
Technology Development and Deployment*

In my opinion, this was the most successful of the three R&D Priorities Conferences that have been held. Each one reflected different development and a different stage of evolution of our R&D program. The first one was held to make peace with APTA and was somewhat restricted by a predominantly invited audience. The second one was broader, but I came up with only two major conclusions from it: that UMTA did a poor job of communicating and that we did not put enough emphasis on near-term problems.

This third conference is even broader in its participation than either of the first two, and it shows maturing on the part of all of us in that it has been far more controversial than either of the other two. And that is good; that is what we want to hear.

In spite of occasional emotional and perhaps defensive reactions, the purpose of the conference is to permit you to have the opportunity to tell us what we are doing wrong and what we could do better. We probably did not allow for enough time for participation from the floor. This is a problem, since it is difficult to hold a conference such as

this without giving you a baseline. We intended to provide you with a very brief baseline by providing copies of publications on what we have been doing and what we are planning to do. However, 90% of you haven't the time to read all of these publications in advance of a conference, so, in order to have a starting point for each session, there is a necessity to try to replay, in a summary fashion, what we are doing. There are various interpretations of what this really means. Some session chairmen have gone into extensive descriptions of the program instead of giving only the highlights and soliciting more criticism.

With my usual hindsight, I know now that the opening general session, which included that superb roundtable discussion, raised issues and criticisms and then dropped them. No one had a chance to answer, comment, support, or disagree. I think each one of those talks could have been a workshop session issue because they all entailed very major ingredients of the UMTA program.

Also, there appears to be some confusion, which is understandable. We, too, are very often confused about what R&D is. Many people consider R&D in its broadest

sense as including policy studies and anything else that requires study, and so do we in UMTA. There are a number of people to whom R&D is synonymous with technology, be it hardware or software. Then there is a great deal of confusion between R&D and having satisfactory products in use. This is tied in very heavily with a presumed Federal role.

Whenever a product being used in public transportation is not satisfactory, many people will blame the Federal Government for it. It is very interesting that when the Surface Transportation Administration proposal addressed the UMTA and Federal Highway programs, these programs are primarily the assistance that the Federal Government provides to states, local communities, and public organizations. A large part of the STA plan identified support organizations, both within UMTA and the Federal Highway Administration. Research, development, and demonstration; or technology development and demonstration; or service and methods demonstrations are support activities to the UMTA program. We really do not have a Federal urban mass transportation research and development program in the same sense that we have a Department of Defense or aerospace research and development program. In these programs, it is the total, complete responsibility of the Federal Government to provide the necessary R&D for this nation for survival, or to provide all of the research and development, procurement, and operation of all systems to keep this nation in space, both to whatever degree our political leadership decides.

In urban mass transportation, on the other hand, Federal RD&D is a selective supporting activity to the program which, in turn, is an assistance to the private sector which depended totally on private initiative until 1964. I stress this because there is a great deal of confusion between what an R&D problem is, what a product development problem is, and what a product improvement problem is.

At the Second R&D Priorities Conference, we particularly addressed delivery systems. We made some progress in this area, but we still can make a great deal more. I believe it is the role of R&D, after critical review, to encourage the deployment of feasible, good results of R&D. I also believe that in the public marketplace, as opposed to the consumer marketplace, this will not happen by itself, purely on the merits of the innovation, unless the Federal Government becomes an active participant. It hinges on two things: available risk capital and initiative from the private sector, whether that is a manufacturer or an operator. If either of the two is missing, then it becomes a tremendous obstacle.

Nevertheless, I also want to go on the record as saying that I, personally, am not a believer in mandating things. I was a strong advocate of the Transbus mandate, not because it was a technology delivery issue, but because I felt our position satisfied the law of the land. But, in principle and in general, I do not believe you can mandate to the public sector or to the civilian market the use of any device or technology.

I have learned a great deal here in the past two days, and we will be digesting it for some time to come. It will undoubtedly affect our program, and that is the purpose of this conference.

I have made some decisions in the past four-and-a-half years, and I believe our program will continue to support the near-term needs of the constituency. I still sense that the word technology has become a bad word in America. I like to believe that I am not an advocate of technology for technology's sake, but I am getting a little worried. I think

the United States became the most powerful and prosperous country in the history of the world mostly through natural resources and a wisdom on how to exploit these resources, as well as fantastic technological achievement that has characterized America. I am worried because today many people believe that we are in our decline.

During my trip to Russia last month, there were two things the Russians were interested in—western currency and western technology. I am afraid that we have lost our know-how and technological leadership in the world.

We just legislated a "Buy America" policy in the new Surface Transportation Assistance Act which will protect our labor, but if I assume that the lowest bidder wins in the latest railcar procurement, the profits will end up in Germany. We must do something about it, and I am not very optimistic as to the outcome.

We have a national characteristic of self-criticism, which is good, but we sometimes carry it beyond reason. Remember the panic after Sputnik when we would have done anything to get to the moon first. I think we had the same kind of reaction to the blunders we made in the later 1960's and early 1970's after Vietnam and the internal agonies we went through at that time.

I wonder how many of those who criticize the Morgantowns, the tracked air cushion vehicles, the SLRV's, and the San Francisco Bay Area Rapid Transit Districts remember the 30% unemployment in Seattle which resulted from the cutbacks in defense and aerospace spending, and which caused Congress to write into the Urban Mass Transportation Act that we should make use of the spare capability of the aerospace and defense industry to introduce this kind of ground transportation revolution. It was a conscious congressional mandate to our predecessors to bring in new manufacturers. The hope was that they could learn the totally different needs and requirements of the transit industry. And there was a period of five to seven years where tomorrow's transportation dominated the UMTA program, but we attempted tomorrow's transportation today. We promised and overpromised repeatedly and we underperformed repeatedly. I think the damage is so serious that it will probably take us a generation to live it down.

Today, our most successful export commodities are agricultural products. That is strange for an industrial society and the world's leader in business. Our position in the world market is partly due to our natural riches, but is just as much due to our decades old, Federally sponsored and directed research and development effort which has taught us how to disseminate the results of R&D. How do we obtain the participation of the constituency, which has spent as much money as anyone else in disseminating and putting to use the findings of research and development?

I suggest that you think about these issues between now and the next R&D Priorities Conference. Consider them when we make statements such as "policy should lead technology." I believe that means that policy should lead decisions on deploying technology. I do not think policy can totally dictate or lead technology because you cannot legislate and you cannot mandate invention and inventive minds. Exploration, particularly in the artificial marketplace where private investment is scarce, will not be done. This must be a process like a chemical reaction in which two elements combine to become a single compound and, at the same time, the compound decomposes to a degree into its elements.

In other words, it must be a simultaneous process. Policy can lead and should dictate the deployment of proven, available, safe technologies when they are cost beneficial.

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But, on the other hand, technological exploration must go on to provide policy decision makers with options, or at least information as to what is potentially possible.

One is often reminded of the famous Einstein letter to President Roosevelt which resulted in the atom bomb. We

may debate whether the atom bomb was good or bad for humanity; nevertheless, it was the potential of what technology could offer that provided policy makers with the information to make the decision which led to development of that technology.

Bus and Paratransit Technology I

Chairperson: *Daniel Roos*, Director, Center for Transportation Studies, Massachusetts Institute of Technology

UMTA's PARATRANSIT INTEGRATION PROGRAM: *Bernard E. Blood*, Chief, Traffic Management Branch, Transportation Systems Center

Panel: *Donald Somers*, President, Yellow Cab Company, Red Bank, N.J.
Peter E. Hannishin, Transportation Coordinator, City of Cincinnati, Ohio
Karla H. Karash, Assistant Secretary, Executive Office of Transportation and Construction, Commonwealth of Massachusetts
Joseph S. Silien, Executive Director, Rochester-Genesee, N.Y., Regional Transportation Authority

Reporter: *Ann Muzyka*, Traffic Management Branch, Transportation Systems Center

SUMMARY

In the opening presentation, "UMTA's Paratransit Integration Program," given by Bernard Blood, UMTA's research in operational technologies—as distinct from vehicle and propulsion system development—was described. This effort is concerned with the application of modern mobile communications, computer technologies, and command and control theory for improved transit planning and management. It comprises 50% of UMTA's bus and paratransit budget. The two major programs are the automatic vehicle monitoring (AVM) project and the paratransit integration program. These programs are designed to improve conventional fixed-route bus systems and innovative, flexible, demand-responsive transit service.

The AVM system provides for central control of bus movements, automated fleet performance data collection, and continuous communication for system security. The present project was initiated in 1975 with formulation of the system concept and engineering specifications at TSC. Initial deployment of six bus routes is planned in Los Angeles this year. The system manufacturer, Gould Information Identification, Inc.; the system operator, the Southern California Rapid Transit District; and TSC will implement this demonstration and evaluate the system.

The paratransit project began with the development of software and the computer systems for dial-a-ride bus demonstrations in Haddonfield, N.J., and Rochester, N.Y. The proliferation of paratransit initiatives throughout the nation has mandated the development of critical information, systematic procedures, and advanced technology for the planning and operation of demand-responsive transit. Current tasks include the preparation of a comprehensive handbook for paratransit planners and operators, computer models for

analysis and candidate system evaluations, and automated technology for vehicle dispatching and management information systems. In addition, door-step service for the elderly and handicapped, checkpoint services for general circulation and feeder service to line-haul buses, and shared-ride taxi technological requirements are under investigation.

Donald Somers illustrated the capability of private taxi operators to provide flexible transportation services by relating the history of Yellow Cab Company of Red Bank, N. J. In addition to responding quickly to specialized transportation needs, such as handicapped student transportation, intercity and intermodal share-a-cab, package delivery, and limousine service, the private operator performs these activities without subsidy. The taxi industry is an important element in our national transportation resource and includes vehicles, drivers, operations and management expertise, and equipment. Taxi companies, therefore, should participate in the development of national policy and Federally funded transit demonstrations.

Peter Hannishin described the automatic vehicle monitoring project shared by the city of Cincinnati and General Motors Corporation at the Urban Transportation Laboratory. This public-private involvement was designed to protect the interests of the municipal government and the incentive of the corporation. The automatic vehicle monitoring technology provides a great deal of data on bus operations, including on/off loads, running time, and schedule adherence. This data then can quickly be processed into management information. In fact, the limitations are the human limits on ability to use all the data gathered, rather than the limits of sorting and assembling the data. Improvements in the bus service can then be im-

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plemented rapidly. To obtain and process the same amount of data as frequently and manually would not be practical because of manpower requirements, reliability, and time constraints. The development of management information systems is a major research priority for improved transit operations. Hannishin also recommended that the ultimate user of the AVM system be involved in system design.

Karla Karash described the share-a-cab program at Logan Airport. The operation is extremely labor intensive and so the service must be subsidized. Automation in communicating with the passenger has the potential for significant cost reductions. If passengers in various airport locations could request service directly from a central computer and receive the necessary taxi identification and arrival time, considerable savings in labor cost could be realized. In addition, cost-effective techniques are needed for grouping patrons to minimize trip time. Automated system performance data collection and the generation of management information is needed to understand and improve the service. Karash said that the introduction of automation in share-a-cab could result in more reliable service and increased demand as well as reductions in the unit cost of providing service.

Joseph Silien described the automated dial-a-ride service in Rochester, N. Y. This UMTA demonstration is a field site evaluation of: the optimal computer dispatching system developed by the Massachusetts Institute of Technology, available small transit vehicles, institutional issues involved in system expansion, a variety of service concepts, and the complex economics of the service.

Silien identified the major research priorities: the development of improved automated vehicle dispatching systems, the determination of the cost-effective role of the computer in operations of various size, and the development of a satisfactory small vehicle for such services.

Audience participation focused on the following seven issues:

- high cost and limited range of AVM systems for taxi operations;
 - long time spent in developing AVM systems;
 - relative importance of cost and reliability in advanced technology;
 - size of critical mass in research projects;
 - involvement of the user in system development;
 - transfer of public initiatives into the private sector;
- and
- involvement of private industry in providing para-transit services.

Robert Samuels of Planco, Inc., suggested that the high cost and limited range of AVM systems were major concerns of the taxi industry. Hannishin replied that the implementation of a multi-user system (police, fire engine, bus, and taxi) could be a practical solution to the cost problem. Karash commented that a Boston taxi operator predicts a 30% to 40% improvement in its operation if the cost can be reduced to \$200 per vehicle.

Sumner Myers of the Institute of Public Administration observed that AVM has been a long time in coming and this may be attributed to excessive caution in the public sector in insisting on deploying the optimal system. In addition, he said, excessive attention to cost reduction could delay progress needlessly, as the user of a new technology is more concerned with reliability than cost. Chairperson Roos replied that the government is often accused of trying to do too much and should proceed in smaller increments. Hannishin noted that in Cincinnati, they were able to achieve a workable program by confining the AVM project to the development of a management information system for improved operations.

Bus and Paratransit Technology II

Chairperson: *Anthony Carrano*, Chief Bus Engineer, New York City Transit Authority

UMTA's BUS TECHNOLOGY AND PARATRANSIT VEHICLE DEVELOPMENT PROGRAM: *Bernard Vierling*, Director, Office of Bus and Paratransit Technology, UMTA

UMTA's FLYWHEEL ENERGY STORAGE SYSTEM PROGRAM: *Frank Raposa*, Chief, Electric Power and Propulsion Branch, Transportation Systems Center

Panel: *Frank Venezia*, Superintendent, Vehicles and Industrial Equipment Design, Chicago Transit Authority
Edward Tanski, Vice President, Maintenance and Equipment, Niagara Frontier Transit Metro System, Buffalo, N.Y.
Daniel Morrill, Assistant General Manager and Director of Operations, Southeastern Michigan Transit Authority, Detroit, Mich.
Richard J. John, Chief, Energy Programs Division, Transportation Systems Center

Reporter: *Frederick M. Seekell*, Transit Systems Branch, Transportation Systems Center

SUMMARY

Bernard Vierling, Director of UMTA's Office of Bus and Paratransit Technology, said a great deal of work remains to be done to increase the efficiency of bus and paratransit services. Among the energy conservation methods which are under study are: heavy-duty small buses, U.S.-built articulated vehicles, buses which can be operated in trains and in dual modes, separated busways, automated guideway systems for buses, improved communications systems, and automated vehicle monitoring systems.

New high-capacity vehicles are anticipated for transit in the future. UMTA's role to this point has been limited to determining that the articulated bus is more practical than the doubledeck bus for U. S. cities. It is conceivable that Transbus could also be manufactured as an articulated vehicle, although the development of an articulated Transbus is hampered by the fact that the position of the engine in current articulated buses prevents a low floor. Mounting the engine in the rear of the trailing section is being studied, and prototypes of a German rear-end pusher are being reviewed.

Although the market for the small bus (under 30 feet) has not been large enough to attract the major manufacturers, some heavy-duty small bus prototypes are being manufactured; further development may require some special encouragement from the government, although manufacturers—rather than the government—should spearhead the design effort.

In the paratransit area, the market—despite annual purchases of 30,000 to 50,000 new vehicles—is not attractive to manufacturers. Presently available vehicles must be adapted to fulfill the varied paratransit needs. For elderly and handicapped service, adaptations of other vehicles have not been entirely satisfactory. UMTA has tried to encourage a paratransit vehicle for both, but may have to underwrite more activity in this area.

Electric, hybrid, flywheel, and gas turbine engines are also in the long-range planning for all transit vehicles in an attempt to limit fuel consumption and provide reliable systems. A number of tests are already under way by UMTA and selected transit operators.

Roadway sharing and on-line passenger stops reduce the potential of line-haul buses. Station planning and design will be worked on and of particular interest to dispatching strategy is the current automatic vehicle monitoring testing beginning in Los Angeles. Dedicated highway testing with potential for "trains" of buses and dual mode vehicles hold potential for R&D, as does the use of paratransit systems and joint paratransit/line-haul service in smaller cities.

Frank Raposa, Chief of TSC's Electric Power and Propulsion Branch, described how the promise of efficiencies for recovery and reuse of energy through R&D in flywheel technology is being pursued at TSC. Sponsored by UMTA and DOE, this work is expected to continue into prototype

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work during Fiscal Year 1979 with AiResearch Manufacturing, General Electric, and selected bus operators.

The program's goals and objectives are to reduce dependency on petroleum fuels, to increase fuel energy efficiency, to minimize the impact of noise and pollution on the environment, to decrease life-cycle costs, and to simulate development of cost-competitive urban transit motor vehicle propulsion systems.

The feasibility of flywheel with application to urban transit motor vehicles was studied in Phase I and reports were published in October 1977. Summarizing the Phase I conclusions, these systems can be competitive in life-cycle costs. They can meet or exceed transit property maintenance requirements, require less energy, and can be independent of petroleum. They do offer substantial noise reduction compared to the diesel bus and eliminate or minimize emissions in the local environment.

The prototype phase is intended to apply this technology to the current (new look) city bus. The two applications under the upcoming Phase II contracts will:

- entirely replace the diesel engine in a current transit bus; and
- act as an accessory power source in a city trolley bus.

Both of these tests are expected to show approximately 25% savings in energy over the current standard diesel bus; and, performance is expected to compare favorably with the standard bus. Data for life-cycle costs will be taken to support estimates.

A multiple disk, steel flywheel is surrounded by a containment housing and is used to save and deliver energy in conjunction with one of three power source options: 600 vc/c trolley wire, battery pack, or small diesel engine. A module containing the flywheel and its motor-generator could be coupled to any of these.

Street testing simulating revenue service will begin in the Cambridge area about January 1982. Technical risks which will be probed during this second phase fabrication and testing will be: integrity of the rotor over its 30-year expected life, ability to contain a ruptured rotor, homopolar inductor alternator design, design of bearing/cooling/lubrication/vacuum elements, and reliability of the power electronics.

Raposa cited three technical challenges: designing to cost, preserving the component modularity to ensure suitability for several applications, and verifying that the flywheel's effects on bus operations are not disruptive.

Raposa said the results expected from the Phase II program will be to have demonstrated performance in a full-size bus, to have developed a realistic basis for estimating production costs on two systems of competitive design, to have verified the energy economy of the system, and to have done some simulated transit operations testing in Cambridge.

Follow-on possibilities for R&D include actual revenue service for several buses in a few cities for approximately 50,000 miles.

Richard R. John, Chief of the Energy Programs Division at TSC, said the U. S. will still be dependent on the diesel engine for the next 10 to 20 years. There will be little competition from the gas turbine or Stirling engines, and various forms of electric propulsion will be very limited. The 50,000 U. S. buses use only very little of the current total

fuel for vehicles, and fuel cost is only a small part of operating costs.

On the other hand, there is a growing concern with regard to particulate and other organic emissions of these engines; there is an ongoing debate with the Environmental Protection Agency on the prospects for the diesel's future. Late in 1979, EPA is expected to state a position on the diesel in the passenger automobile and to establish standards for the medium and heavy duty engines for 1983.

Therefore, a rather urgent priority for R&D on the diesel would be how to clean it up. Possible directions for this might involve the following:

- tighter controls on the fuel content and quality;
- turbocharger applications;
- carburation system refinement; and
- catalytic converters.

Another approach which may become economical (as costs continue to rise) could be a diesel-flywheel hybrid which would run the engine at optimum efficiency and emission rates by using the flywheel to even out the power demand. As automobiles meet increasingly stringent fuel economy rules, buses must also adapt to continue their higher passenger miles per gallon advantage.

Frank Venezia, Superintendent of Vehicles and Industrial Equipment Design at the Chicago Transit Authority, said CTA operates a very extensive system handling two million riders per workday. CTA, therefore, is very concerned with serving the heavy passenger load and that heavy demand as it influences costs and the maintenance burden.

Transbus is good in concept, but can it be built and easily maintained? It will have reduced seat capacity and, conversely, CTA would rather look at articulated buses to fit their heavy demand. At the present, CTA is planning to test the 40-foot AMG bus because it utilizes proven technology; their foreseeable interests in a small bus would be for special services (elderly and handicapped) only.

Venezia is convinced the diesel is here to stay and, while other technologies are attractive, they are a long way off. The new technologies and developments must be simple for maintenance purposes and costs. For the present, CTA must concentrate its funds on existing proven products.

Edward Tanski, Vice President for Maintenance and Equipment at the Niagara Frontier Transit Metro System in Buffalo, said current vehicles have had substantial down time and schedule delays due to the extreme winter weather.

Buffalo's interest in new automotive vehicles would be limited to the possible use of articulated buses on two line-haul routes, and the larger attraction of a heavy-duty small bus. The last purchase of small twin coach vehicles were useful on narrow streets, crosstown routes, and feeder service. The manufacturer is now out of business and life-cycle costing is not possible.

They would be definitely interested in a new heavy-duty small bus.

Daniel Morrill, the Assistant General Manager for Operations with the Southeastern Michigan Transportation Authority in Detroit, said his system is interested in R&D in many areas: downtown people movers, commuter rail, buses, and a yet-to-be-determined local transit project for which UMTA has approved \$600 million.

AGT and Advanced Systems I

Chairperson: *Robert M. Coultas*, Executive Director—Technical Services, American Public Transit Association

AGT SOCIO-ECONOMIC RESEARCH: *Howard D. Evoy*, Office of Socio-Economic and Special Projects, UMTA

AGT APPLICATIONS: DOWNTOWN PEOPLE MOVER, MORGANTOWN PEOPLE MOVER, AND AIRTRANS: *Steven A. Barsony*, Director, Office of AGT Applications, UMTA; *John Marino* and *Vincent R. DeMarco*, Office of AGT Applications, UMTA

Panel: *Julie Hoover*, Assistant Vice President and Manager of Planning Division, Parsons, Brinckerhoff, Quade & Douglas

J. Douglas Kelm, Secretarial Representative—Region V (Chicago), U. S. DOT

Robert Maxwell, Transportation Group Manager, U. S. Congress Office of Technology Assessment

Frederick W. Walker Jr., General Manager, Transportation Systems Division, General Motors Corporation

Michael A. Powills Jr., Barton-Aschman Associates, Inc., and Chairman, Advanced Transit Association

Reporter: *Arthur Priver*, Automated Systems Branch, Transportation Systems Center

SUMMARY

Howard Evoy, of UMTA's Office of Socio-Economic and Special Projects, gave an overview of the UMTA AGT socio-economic research program, which is designed to examine the feasibility of AGT systems in comparison with conventional transit technologies.

It was found that major impediments to AGT system adoption, as perceived by local officials, are of a nontechnical nature. The most critical of these issues appear to be:

- will the appearance of elevated AGT guideways be acceptable to the general public in the central business district and residential locations?
- can installation and operation of AGT systems have favorable impacts on economic growth and desirable urban development and land use patterns?
- can automation result in increased labor productivity and lower operating and maintenance costs?
- will the capital investment required for AGT systems dampen local government interest in urban installations?
- is AGT technology sufficiently reliable to ensure safe operation in the urban environment?
- will AGT systems prove to be energy efficient and can they lead to a reduction in the use of petroleum based transportation?

- will AGT systems prove to be a relatively nonpolluting form of urban transportation?

The AGT socio-economic research program has been organized into five major program activities: assessment and costs activities will collect and evaluate information on existing AGT systems; the generic alternatives analyses activity will perform comparative trade-off analyses of AGT and other urban transportation modes; the markets activity will apply the findings of the generic analyses to specific U. S. urban sites; and the communications activity will disseminate the findings of the various activities.

Results available from the program to date suggest AGT systems installed in urban locations have the potential for generating environmental improvements, encouraging desirable urban development and land use impacts, minimizing petroleum consumption, and reducing transit operating and maintenance costs. However, local officials indicate the major impediments to urban AGT systems are based on the uncertainty of achieving these benefits. In attempting to resolve these uncertainties, UMTA will continue to focus its efforts on an array of hardware research and development programs, demonstration projects, and socio-economic research.

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The capital and operating costs derived from assessments of 10 AGT systems were presented, with the average operating and maintenance costs being 23¢ per passenger-mile and \$1.13 per vehicle-mile. It was noted that these numbers were not based on any urban deployments, however.

Steven Barsony, Director of UMTA's Office of AGT Applications, gave an overview of the AGT applications area. He indicated that the DPM project is designed to deploy existing systems in a relatively straightforward manner. The process is much more complex than originally anticipated, primarily due to institutional problems. It is becoming apparent that even though the Federal Government is slow, the local governments are even slower.

Next, John Marino of the Office of AGT Applications reviewed the Morgantown people mover program and the Airtrans project in Dallas. The Morgantown Phase IB system carried 4.5 million passengers from the start of revenue service in October 1975 until the shutdown for expansion in July 1978. The system matured over time and the reliability increased. The Phase II expansion is covered by a \$63.6 million capital grant to the West Virginia Board of Regents. This effort includes new construction, additional vehicles, and some major improvements in the system.

Among the improvements are a new power rail and collector system, more reliable steering, hydraulic, and pneumatic systems, improved brakes, and a new fare collection system.

The Airtrans Urban Technology Program was also described. This \$7 million program, authorized by Congress in 1976, is designed to maximize the adaptability of the system for urban deployment. A new urban prototype vehicle is being constructed.

Vincent DeMarco, also from UMTA's Office of AGT Applications, discussed the DPM program. The objectives were summarized and it was indicated that funding will be through controlled capital grants. Among the objectives were:

- the need to demonstrate operations and maintenance savings of DPM's;
- assessment of DPM's economic impact;
- testing DPM's as feeder systems for existing or new regional systems;
- demonstration of DPM's reliability, maintainability, safety, and viability; and
- demonstration of public acceptance of DPM's.

Of particular concern to UMTA in the implementation of these projects is the need to establish and conduct an adequate technological qualification program for each of the selected system designs. Only proven technologies will be deployed and sufficient in-house testing will be required. A special procurement policy will be employed to ensure that at least three different system designs will be selected.

Among the first 10 cities, the most advanced are St. Paul and Los Angeles, which have nearly completed their preliminary engineering phase. Capital grants for their construction phase could be awarded during the fourth quarter of Fiscal Year 1979.

The first part of the ensuing panel discussion focused on some additional areas to consider in the AGT programs. Panelist Julie Hoover of Parsons, Brinckerhoff, Quade and Douglas felt that there was a lack of emphasis on two important issues. One was the question of whether transit investment serves as a catalyst for revitalization of the central business district. There is some negative evidence available, such as a study for Newark, and Hoover advocated research on AGT and land-use development relationships. However, another panelist cited the economic stimulation in St. Paul as a positive impact.

Hoover's second concern was the need for public involvement in the DPM deployment process. Public support is required to gain approvals, and often leads to better planning. How is public involvement to be achieved?

Another point was made by a panelist who said it is fair to conclude that Morgantown was a success in terms of patronage, availability, and technology. The question was whether the service could have been provided by a simpler system.

In a different area, one panelist expressed concern about whether systems can be developed that will win public acceptance. It is incumbent that everything be done in advance to be certain that the system will work.

Another panelist felt that the goal of automation is to reduce costs and increase efficiency. But he wondered how cost comparisons should be made; what system should be selected to compare with DPM's? How are savings and efficiency to be determined? Currently planned deployments are designed to develop technology for the 1990's. It is important for future efforts that R&D does not stop at current concepts, but continues ahead to allow further progress. Suppliers wish to be involved in this process because they need to know how to allocate their resources.

AGT and Advanced Systems II

Chairperson: *Robert M. Coultas*, Executive Director—Technical Services, American Public Transit Association

AGT AND ADVANCED SYSTEMS AND TECHNOLOGIES: *Charles Broxmeyer*, Director, Office of New Systems and Automation, UMTA; *Duncan MacKinnon*, Chief, Advanced Development Program, UMTA; and *Aldo DeSimone*, Chief, Systems Development Program, UMTA

Panel: *Julie Hoover*, Assistant Vice President and Manager of Planning Division, Parsons, Brinckerhoff, Quade & Douglas
J. Douglas Kelm, Secretarial Representative—Region V (Chicago), U. S. DOT
Robert L. Maxwell, Transportation Group Manager, U. S. Congress Office of Technology Assessment
Frederick W. Walker Jr., General Manager, Transportation Systems Division, General Motors Corporation
Michael A. Powills, Jr., Barton-Aschman Associates, Inc., and Chairman, Advanced Transit Association

Reporter: *Arthur Priver*, Automated Systems Branch, Transportation Systems Center

SUMMARY

The three formal presentations in this session addressed the subject of AGT and advanced systems and technologies. Charles Broxmeyer, Director of UMTA's Office of New Systems and Automation, gave some background information about the advanced group rapid transit program. He noted that the AGRT program is based on concepts which have been around since 1960. The American approach is more conservative than that in some other countries, with headways only down to three seconds. Passengers are not concerned primarily with headway, but rather with the service provided. Broxmeyer believes that the 3-second headway provides the potential for vast service improvements over conventional systems or automobiles.

Aldo DeSimone, Chief of UMTA's Systems Development Program, addressed the AGRT program which was planned to take existing technology and extend it; to develop systems from the technology and test them.

The goals to be achieved from the beginning included performance, safety, cost, and dependability. It was not sufficient to provide a high level of service; it had to be done at a reasonable cost; the service had to be safe and dependable.

The program has evolved in three phases. During Phase I, three contractors produced preliminary designs. In addition, each contractor designed a test track system for installation at Pueblo, Colorado. Simulations also were specified for system verification, and critical subsystems were identified by each contractor.

During Phase II, each contractor—Boeing, Otis, and Rohr—conducted design and test of critical technologies and simulated the behavior of their system design on a simple network. Other studies conducted during Phase II-A included guideway-vehicle cross-section minimization and trained system operation. Phases I and II-A are now complete.

In the next stage, Phase IIB, two contractors will each develop an engineering prototype system at their own test tracks over 48 months. The post-engineering prototype effort will run an additional 20 months. Since both contractors are developing bottom-supported systems, they will use the same guideway cross-section. Boeing is developing a rubber-tired vehicle and Otis is developing an air-cushion vehicle.

Duncan MacKinnon, Chief of UMTA's Advanced Development Program, summarized the automated guideway transit technology program. The objectives of the AGTT development effort are to establish the service and cost characteristics of all classes of automated guideway transit systems and to develop the critical technologies that are required for the successful deployment of such systems, with particular emphasis on control, safety, reliability, and maintainability.

Five major efforts are under way. In the system technology area, the system operations studies program is being performed by General Motors, and the system safety and passenger security program is being conducted by

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Dunlap and Associates. In the subsystem and component technology area, Otis/TTD is performing work on two programs—vehicle longitudinal control and reliability and vehicle lateral control and switching. In the wayside technology area, the guideway and station technology project is being performed by De Leuw, Cather.

In addition to the major projects, a number of smaller research projects are being funded under the AGTT program addressing: hardware reliability and service availability, station security features, personal rapid transit, vehicle guideway dynamics, vehicle control, automated transit technology requirements, automated mixed traffic vehicle technology, hydrostatic drive development, and vehicle data acquisition.

In the general discussion following these presentations, one comment from the audience was that passenger concerns, such as safety, privacy, mobility, and simplicity, should be paramount.

One opponent of automated guideway transit wanted to know where the market is, and who would accept the intrusion in their neighborhood of the guideway and vehicles passing every three seconds. A supporter felt that AGRT was necessary to provide a viable alternative to the automobile. Another proponent said that with \$3 billion per year in subsidies to mostly labor-intensive transit, a way to gain in productivity is to aim at AGRT. Thus, the participants disagreed about the AGRT R&D program.

Panel member Julie Hoover of Parsons, Brinckerhoff, Quade and Douglas addressed the cost area. The major factor in AGT was considered to be operating costs. Most people she interviewed wanted self-supporting systems. Hoover also felt that UMTA should look at the question of operating subsidies.

One panelist indicated that it is necessary to keep the ultimate mission in mind, and identify what we are trying to accomplish. In this context, two kinds of R&D priorities were suggested: first, the need to do more socio-economic and planning studies to determine public decision-making criteria; and second, the need to do R&D on information transfer, to keep the public informed about what is available.

Another panelist felt that UMTA's technological R&D is not matched by a corresponding program to develop a better understanding of problems in the area of economics and public acceptance. Such an effort should not displace, but rather complement the technological program. It was stated that the situation should be placed in perspective. For comfort and convenience, the public wants automobiles. However, due to factors such as congestion, energy, and pollution, they cannot always get what they want. So alternatives are needed to respond to these pressures.

An additional concern was the establishment of priorities in terms of people. For example, what happens to bus drivers when systems are automated?

Service and Methods Demonstrations I

Chairperson: *Phillip J. Ringo*, President, ATE Management and Service Company, Inc.

FARE AND PRICING DEMONSTRATION AND RESEARCH CONCEPTS:

Bert Arrillaga, Chief, Pricing Policy Division, UMTA

Panel: *Mr. Arrillaga*

David T. Hartgen, Head, Basic Research Unit, New York State Department of Transportation

Howard Slavin, Chief, Evaluation Branch, Transportation Systems Center

Roy Remy, Deputy Mayor of Los Angeles, Calif.

Reporter: *Marion Ott*, Urban Analysis Branch, Transportation Systems Center

SUMMARY

Philip Ringo, President of ATE Management and Service Company, opened the session with some observations on pricing from the transit community's perspective. He commented that the community applauded the overall direction of UMTA and others in the area of pricing, especially in their efforts to increase the usage of off-peak transit.

He noted that there appears to be a widely felt concern that the fare box should cover a fixed percentage of the cost of transit. As a result of this philosophy, one-third of his clients have raised their fares in the last three years. However, Ringo noted that ridership seems to be less sensitive to fare increases than in the past.

Ringo is opposed to systemwide fare-free transit because he feels transit has a value and, therefore, should charge for its services. Furthermore, he expressed concern that fare-free transit may often encourage vandalism. However, he was amendable to the concept of fare-free zones limited to the downtown; they decrease congestion and get new people on buses.

Next, Bert Arrillaga, Chief of UMTA's Service and Methods Pricing Division, described UMTA's pricing program as a coordinated series of experiments in metropolitan communities. The program has evolved primarily into two major areas: transit pricing and service variation demonstrations and pricing disincentives for using the auto. The purpose of the experiments is to demonstrate and evaluate the extent to which a wide range of pricing policies can help increase transit ridership, achieve social goals, and improve the efficiency of existing transportation systems by controlling selectively the volume, the pattern, and the modal composition of traffic.

Arrillaga then provided an overview of current and future UMTA pricing demonstration projects.

In the transit pricing and service variation category, work is being performed in low-fare or reduced-fare tran-

sit, fare pre- or post-payment instruments, price and service improvements, and general fare and pricing policies.

In the category of auto pricing management techniques, demonstrations are being considered in the areas of parking pricing, corridor and spot pricing, and areawide road pricing. Because of social, political, and institutional resistance to areawide congestion pricing, Arrillaga said this concept will probably take more time to be implemented than the other strategies.

Future demonstration concepts include: fare prepayment instruments, fare integration for intermodal/interagency coordination, self service/self cancelling fare collection, automatic fare collection, token reinforcement incentives for off-peak ridership, promotional fare incentives, transfer fares/network simplification, graduated fares by level of service, price and service variation to improve route performance, parking pricing, areawide congestion pricing, corridor and spot pricing, and transportation pricing management through households.

In order to determine the aggregate impacts of different levels of fare increases on ridership, revenue, and cost, a study on fare increases was started early in Fiscal Year 1978. The information in the study will assist transit operators in establishing balanced fare policies that will not only include fare discounts, but also include premium fares for specific traveling markets, Arrillaga said.

Ray Remy, Deputy Mayor of Los Angeles, spoke on the city's parking management plan. The U. S. Environmental Protection Agency, for air quality reasons, had suggested that no more parking lots be built in Los Angeles. The City has packaged a set of strategies, currently before the City Council for approval, for a citywide approach to managing existing and future parking spaces. One objective is to free spaces for shoppers by offering incentives for off-site parking to central business district workers.

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In order to assist in securing the cooperation of the business community in the parking management effort, the city needs to do something about the many government employees who now receive subsidized parking. The city has compiled a set of options to change the balance of subsidies for public employees, partially by giving preferential treatment to carpools and vanpools. However, most changes from the current parking policy will be a matter for collective bargaining.

Remy suggested subsidized transit passes for city workers might be used to replace parking benefits, but that Proposition 13-induced budget cuts would complicate the situation.

Howard Slavin, Chief of the Transportation Systems Center Evaluation Branch which is responsible for the evaluations of service and methods demonstration projects, pointed out that the demonstrations and their evaluations are cooperative efforts among the Federal, state, and local agencies. He added that the evaluations of UMTA's pricing

experiments should be responsive to issues and questions of greatest relevance to both transit operators and local decision makers.

UMTA's service and methods demonstration program offers a unique opportunity to obtain very accurate and detailed measurements of the impacts of urban transportation pricing policies, Slavin said, and an ambitious evaluation program is under way.

The session highlighted the need to examine fare policies from both the social welfare perspective of the public official as well as the efficiency and economic perspective of the operator.

Other suggestions made during the workshop include the need to better disseminate information on pricing studies and innovations, particularly information pertaining to the implementation of innovations, and the need to test the conventional wisdom concerning the elasticity of demand with respect to fare in the 1978 environment.

Service and Methods Demonstrations II

Chairperson: *Morris Rothenberg*, JHK and Associates

CONVENTIONAL TRANSIT SERVICE INNOVATIONS: *Joseph Goodman*,
Conventional Transit Service Innovations, UMTA

PARATRANSIT: *Paul Fish*, Office of Service and Methods Demonstrations,
UMTA

Reporter: *Carla J. Heaton*, Evaluation Branch, Transportation Systems
Center

Summary

This session, chaired by Morris Rothenberg of JHK and Associates, dealt with service and methods demonstration program activities in two areas: conventional transit service innovations and paratransit services. The broad charter of the service and methods demonstrations program is to develop, demonstrate, and evaluate demonstrations of innovative transit concepts and to disseminate the findings and operational experience from these demonstrations to a broad audience, including transit operators, transportation planners, and local officials.

Joseph Goodman, Chief of the Conventional Transit Service Innovations Branch within the Office of Service and Methods Demonstrations, described a variety of current and planned demonstrations aimed at improving transit service operating on fixed routes and fixed schedules. The demonstration concepts can be grouped into the following categories:

- priority techniques for high occupancy vehicles—for example, reserved lanes, ramp metering, and signal pre-emption;
- traffic management techniques such as auto restricted zones and transit malls;
- suburban services including timed transfer and circumferential freeway bus service; and
- service improvements or strategies designed to alleviate common problems facing many transit operators, such as techniques to improve service reliability and simplification of transit networks.

In describing each of the demonstration concepts, Goodman focused on the particular traveler and/or operator concerns which the innovation was intended to address; in the case of individual travelers, key areas of concern are the speed, reliability, coverage, and convenience of using transit; from the operator perspective, major issues are the peak-to-base ratio, ridership and revenue levels, and operating cost.

With respect to priority techniques, Goodman pointed out that several of the priority techniques which have been demonstrated under the program are already being adopted throughout the country. The near-term emphasis in the

program is to test refinements to or variations on those strategies which build on the experience obtained from recent demonstrations; for example, a demonstration of a concurrent-flow reserved freeway lane is planned which will incorporate the principles learned from two unsuccessful applications of the "diamond lane" concept in Los Angeles and Boston.

Increased emphasis and attention is being placed on demonstrations on improving suburban transit services because a relatively small percentage of home to work trips are central business district bound, Goodman said. In a typical urban area they comprise 10% to 15% of the total. The largest single cell of tripmaking is between suburb and suburb, that is, made by people who live in the suburbs and have destinations in the suburbs. Goodman added that the transit penetration of this market, the suburb-to-suburb market, is about 2% across the country as a whole.

Among the service improvements being considered for demonstration projects are: improved reliability monitoring and zoned bus routes to simplify transit services within a corridor by utilizing feeder buses and one main arterial route.

Paul Fish, Project Manager of the Paratransit and Special User Group Division, described activities and some recent results in the paratransit area. The 18 active demonstrations or planning studies under way at the present time span the following categories:

- demand-responsive transit;
- integrated paratransit/transit services, for example taxi feeders to fixed-route service;
- commuter rider-sharing services, including carpooling, vanpooling, and customized subscription bus service; and
- transportation brokerage for commuter, community-based, and special user group services.

Fish said the major change which has occurred over the last few years in the demonstration program is the fact that UMTA now focuses on demonstrations in much more complex situations in larger urban areas, bringing in a range of services and service types which were not included before.

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In general, the thrust of these service concepts is to provide cost-effective services in low-density settings which are complementary to and well coordinated with conventional, fixed-route services.

Fish commented that recent projects involving demand-responsive transportation have emphasized greater involvement of the private operator (through competitive contracts); variations on the basic concept (such as route deviation and point deviation); more integration of demand-responsive service with existing fixed-route services; and experimentation with computerized dispatching.

Fish said that one of the major conclusions UMTA has made about demand-responsive transportation is that it is not going to be cheap, but that it may be cheaper than fixed-route transit in some cases.

With respect to commuter ridesharing, Fish noted that the four ongoing demonstrations of vanpooling (one of which involves brokerage) have shown the need to promote a range of commuter services (including the provision of information on fixed-route services) rather than focusing on just one mode.

Three projects in Knoxville, Tenn., Westport, Conn., and Chicago served as examples of how the program experiments with a basic concept—in this case transportation brokerage—in widely different geographic and institutional settings and with varying service components. Fish said the major thrust of future service and methods demonstration activities in the paratransit area would be the application and integration of a broader mix of paratransit services in larger, more complex urban environments.

The discussion period following each presentation was intended to solicit suggestions from the consultants, transit operators, and representatives of state and local government on additional service concepts which might be demonstrated and potential sites for some of the concepts under consideration. There were several questions and comments regarding innovative suburban services—in particular services operating within suburban communities or between suburban activity centers. In addition, there was considerable discussion related to transportation brokerage. Gordon Aoyagi, Executive Director of the Westport Transit District, described the approaches utilized by his organization to provide and market a wide variety of integrated services. Then Ned Gage of the Metropolitan Transit Commission described the brokerage approach being used in the San Francisco Bay area: each county has its own paratransit coordinating council responsible for planning and implementing coordinated services for various target groups. Paul Fish commented that the brokerage concept is not limited to one broker serving the entire region but could involve a network of brokers for different geographic areas or market segments.

There was also some discussion of information dissemination under the program. Goodman explained that one or more reports are published on each demonstration project describing the findings of an objective, comprehensive evaluation performed by the Transportation Systems Center. He indicated that 20 to 30 evaluation reports are produced annually and that copies could be made available to persons requesting them from his office.

Special Programs I

Chairperson: *Cline W. Frasier*, Deputy Director, Office of Ground Systems, Transportation Systems Center.

UMTA's SAFETY PROGRAM: *William J. Rhine*, Director, Office of Safety and Product Qualification, UMTA

PRODUCT QUALIFICATION AND NEW PRODUCT INTRODUCTION:
Mr. Rhine

LIFE-CYCLE COSTING IN UMTA PROCUREMENT: *Patricia Simpich*, Office of Socio-Economic and Special Projects, UMTA

Panel: *Rod A. Johnson*, Vice President-Transit Sales, Chance Manufacturing Company, Inc.
Donald Raskin, New York Metropolitan Transportation Authority
Deborah Roberts, Science and Technology Policy Study, Syracuse Research Corporation
Emerson Harris, Chief, Special Studies Branch, National Transportation Safety Board

Reporter: *Richard H. Robichaud*, Transit Systems Branch, Transportation Systems Center

SUMMARY

William J. Rhine, Director of UMTA's Office of Safety and Product Qualification, pointed out that U. S. DOT was given responsibility for rail rapid transit safety in February 1978, which then sparked the formation of a safety task force to establish a safety plan and develop a rail rapid transit accident/incident reporting system.

The safety plan will apply to all rapid rail and light rail systems, but not to commuter rail and downtown people movers. The main elements of the plan are an information reporting system, and investigation capability for unsafe conditions (monitoring system safety programs and safety training), and performing R&D on standards and human factors. Current activities in these areas consist of safety and system assurance reviews for new properties and the voluntarily prepared safety program plans that have been completed by all U. S. rapid rail systems. Rhine said UMTA has been instrumental in having several safety and security courses implemented for the industry.

Rhine said UMTA is working to make the accident/incident system useful to the transit community, as well as to UMTA. He added that unsafe condition investigation procedures need to be developed, training courses need to be restructured with more industry participation, safety and system assurance reviews need to be defined and strengthened, and further safety research should be conducted to ascertain priorities and implementation methods.

Discussing the product qualification and new product introduction program, Rhine said the objective of the program is to help ensure the acquisition of satisfactory

equipment by the transit community. He defined "satisfactory" as referring to the reliability, maintainability, safety, suitability, efficiency, and cost of equipment. One example of a product qualification project Rhine discussed was the transit reliability information program (TRIP).

TRIP in its broadest sense includes the acquisition of field failure data; the screening of this data; the tabulating, sorting, and analyzing of the data; and the dissemination of the results to potential users.

In dealing with product qualification, Rhine said UMTA daily faces issues on the role it should play, what constitutes qualification, and how priorities can be set.

New product introduction focuses on two areas: ongoing improvements and major innovations. Both require appropriate acceptance criteria, with the responsibility for testing resting with the suppliers to get UMTA funding, Rhine said. The main issues Rhine said UMTA faces are in categorizing products, establishing acceptance criteria, and obtaining adequate funding.

Deborah Roberts, who has been studying public sector markets for Syracuse Research Corporation, compared the public sector market as a whole with the transit industry by itself. Roberts said transit manufacturers have tremendous ability, resources, and commitment, both in terms of transit public policy and the abilities of the firms. But, she said, manufacturers serving the transit market are extremely depressed.

Most public sector markets—such as those for police or fire equipment—are fragmented, but Roberts found that

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transit systems have more information transfer and organization than other public services.

The paradox is that the transit industry—which has seen in recent years the introduction of significant Federal aid and the introduction of new systems, new manufacturers, and new products—is depressed. Roberts said this introduction of Federal aid has created instabilities between the old suppliers and how they look at the market. The new suppliers have introduced new products and new ideas, Roberts added, and the transit industry market has changed remarkably in a few years.

Roberts stressed that companies act for their interest, not the public interest.

Because of the unstable nature of the industry and the urgency of the public interest, she said, UMTA has a vital role to play in the research, development, and deployment stages. However, Roberts added that there is a need for the manufacturing firms to interact with the ultimate users—transit properties—both very early and throughout the development process. UMTA can set the stage to encourage this interchange, she said, but it should not be the final arbiter in what technologies will merit private sector investment.

Don Raskin of the New York Metropolitan Transportation Authority discussed New York's program for introduction of the flywheel energy storage system.

The New York system first procured two flywheel energy storage cars in order to determine what kind of energy savings could be obtained from the equipment. Following the hardware tests, New York proposed that UMTA fund the procurement of 20 vehicles in order to obtain maintenance information about a production-lot of the vehicles.

The APTA Special R&D Delivery System task force recommended that:

- a separate source of funding be provided for the implementation of ideas beyond the R&D stage;
- a market survey should be conducted, at an early stage, to determine potential product viability;
- suppliers should be involved in the beginning to determine their capabilities, interest, and facilities required to implement the idea;
- there should be parallel development to enhance competition and options for several applications;
- the program should be of an appropriate scale to adequately test the concept as well as the maintenance and operational capabilities on production level equipment; and
- data collected in evaluation programs should be oriented toward a purchase specification.

Patricia Simpich discussed UMTA's two efforts in the life-cycle costing area. The first project deals with the procurement of small buses where there are several manufacturers, a life expectancy of approximately six years, and little performance history. The second project involves the procurement of standard large buses where there is only a small number of manufacturers, a life expectancy of 15 years, and a significant performance history.

Because of the differences between the small and large buses, two distinct life-cycle costing approaches have been taken. The small bus approach is to have the authority develop a performance specification, procure three buses from each of several manufacturers, and operate the vehicles for 18 months while closely monitoring operating and maintenance costs. After the test period, the authority calculates the ownership cost of each vehicle, projects that cost over the expected life, and purchases additional vehicles which are selected on the basis of lowest expected

total ownership and operations cost. Simpich said UMTA plans to conduct an experiment using the small bus life cycle costing methodology.

The large bus life-cycle costing methodology requires an authority to collect approximate cost experiences on 60 bus maintenance items and make those cost histories available to the bidders. The bidders are then to make savings claims against the cost figures.

Simpich said the manufacturer must justify his claims using a set of guidelines and tests that allows the property to evaluate the claims, adjust the bid prices accordingly, and calculate the life-cycle cost by adding the ownership and operating costs to the adjusted bid price.

Simpich said UMTA plans to *simulate* this type of procurement at three properties where standard buses are to be purchased on lowest initial price basis.

She added that the two methodologies are being tested to assure UMTA of their acceptability and fairness to all parties.

Rod Johnson of Chance Manufacturing Company, Inc., said his firm will participate in UMTA's small bus life-cycle cost program. He pointed out that the Surface Transportation Assistance Act of 1978 provides that after September 30, 1979, equipment contracts may consider performance, standardization, life-cycle cost, and other relevant factors in awarding contracts.

He went on to say that life-cycle costing must be made fair and equitable and must meet social and operational needs in addition to the pure economical factors it is designed to evaluate.

Johnson said the present, low-bid process causes manufacturers to respond to the initial price, leaving no incentive to innovate or be socially responsible.

Johnson said the life-cycle costing criteria should be expanded to create price value offsets for:

- very long-term cost saving options such as vandal resistant finishes, 24-volt electrical systems, or quick-change skirts;
- options such as large destination signs or double wide doors; and
- social features, such as lower floor heights, lifts, and ramps.

Johnson requested that UMTA keep R&D money out of small buses for a while and not go into competition with the manufacturers for the design of heavy-duty, small buses.

Emerson Harris of the National Transportation Safety Board said that from the safety standpoint, there is very little interest or concern as to whether the emphasis in rapid transit is placed on the development of new systems or the improvement of existing systems. Harris said that:

- safety research and development should be very limited since this discipline is generally supportive;
- there must be a safety input to R&D as well as the design, manufacturer test, and operation of both new system development and modernization of existing systems;
- the safety of any public transportation is the direct responsibility of the authority undertaking the development and operation of the system;
- safety, like reliability and maintainability, is achieved by the application of an engineering effort; thus, the allocation of resources—both funds and manpower—is required if a safe system is to be realized; and
- the major difficulty faced by UMTA in safety is the assurance that municipal authorities involved in public transportation systems recognize and fully assume this responsibility.

Special Programs II

Chairperson: *Henry Nejako*, Executive Assistant, Office of Technology Development and Deployment, UMTA

CONSUMER INQUIRY TECHNOLOGY: *John S. Durham*, Office of Socio-Economic and Special Projects, UMTA

NATIONAL COOPERATIVE TRANSIT R&D PROGRAM: *Mr. Nejako*

TECHNOLOGY SHARING AND COMMUNICATION: *James R. Dumke*, Technology Sharing Office, Transportation Systems Center

Panel: *Deane N. Aboudara*, Director, Department of Technical and Research Services, American Public Transit Association

Alinda C. Burke, Vice President, Public Technology, Inc.

Deborah S. Rudolph, Program Analyst, Technology Sharing Division, Office of the Secretary of Transportation

Michael L. Noonchester, Washington, D.C., Metropolitan Area Transit Authority

Reporter: *Patricia M. Rudman*, Technology Sharing Office, Transportation Systems Center

SUMMARY

Henry Nejako of UMTA's Office of Technology Development and Deployment identified consumer inquiry technology as a means by which transit consumers can obtain information on how to get from here to there on public transportation.

John Durham, also of the Office of Technology Development and Deployment, said the office is primarily concerned with ways of improving telephone information service and with service improvements offered by interactive systems which use computers, such as the trip planning kiosk in the Portland, Ore., new transit mall and the remote terminal developed in Germany by MBB for dial-a-bus operations. Currently, UMTA's emphasis on consumer inquiry technology focuses on a closely related group of projects directed at improving telephone information service to consumers who call for information on transit service availability.

Durham described the project UMTA has with the Washington, D.C., Metropolitan Area Transit Authority—the automated transit information system (ATIS) or automated information directory system (AIDS). ATIS is a computerized data base which provides information on transit schedules, routes, and fares to transit riders in response to telephone inquiries. WMATA has a prototype ATIS in operation.

Michael Noonchester of WMATA said the system had a successful prototype demonstration and that the operators were enthusiastic. He added that WMATA is trying to determine the costs and benefits of the program, its ef-

fect on response time and the quality of the responses, and the system's overall flexibility.

James Dumke of the Transportation Systems Center's Technology Sharing Office discussed improving communications between UMTA and its constituency. He said information on UMTA's research and development activities is available in three forms:

- project information such as technical reports, summaries, or conference proceedings;
- information services such as search services, direct mailings, and RD&D directories; and
- user-oriented activities where information is specially obtained or organized to meet the needs of user groups.

Dumke set the following goals for achieving more effective communication:

- defining UMTA's constituency and determining their information needs;
- increasing the proportion of services and reports which start with user needs rather than individual R&D projects; and
- decreasing the time between document completion and dissemination of project results.

Among the audience suggestions for improving communications were:

- summarize R&D project results for nontechnical specialists;
- strengthen user-oriented dissemination by making better use of existing communication channels, such as

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local government and transit organization journals and newsletters; and

- design pamphlets or flyers which identify reference sources for obtaining information on R&D projects.

Deborah Rudolph from DOT's Technology Sharing Division outlined the objectives of the Intergovernmental Science, Engineering, and Technology Advisory Panel task force. She said primary near-term objectives in the field of transportation are to improve Federal responsiveness to state and local needs and to evaluate and improve technology delivery mechanisms and local technical capacities.

Rudolph identified three levels of technology sharing documents that are now becoming available to user communities: introductory overviews, technical summaries, and detailed technical reports.

Alinda Burke of Public Technology, Inc., commented on the progress of UMTA's technology sharing network as it has developed since the last R&D Priorities Conference. Although many of the recommendations have not yet come to pass, she said linkages have been established between Federal and local agencies and that several communications initiatives are now under way.

Nejako described the National Cooperative Transit Research and Development Program which is ready to begin. NCTRP is a direct result of the 1976 R&D Priorities Conference, Nejako said, and will enable transit operators and local governments to participate in the identification, implementation, and resolution of near-term problems that could be accomplished in the form of research and development projects. In addition, it will provide a means of ad-

ressing particular problems in transit without requiring formal Federal Government involvement, and it will improve communications and technical information exchange on both R&D results and ongoing projects.

Contracts have been, or will be, awarded to several organizations for technical services. The American Public Transit Association and the Urban Consortium for Technology Initiatives are in the process of developing a technical steering group to identify problems and set priorities. The Transportation Research Board will establish technical panels for each funded project. Their responsibility will be to generate work statements in support of each project and monitor progress to ensure that the objectives are being met.

In addition, Nejako said an independent review and evaluation contractor, the Onyx Corporation, will be working closely with UMTA to determine if the process will achieve the defined program objectives.

Deane Aboudara explained APTA's responsibilities in support of NCTRP and identified the APTA members for the technical steering group.

Sumner Myers, Director of the Institute of Public Administration, suggested that perhaps some mechanism could be provided so that the best ideas which cannot be covered under NCTRP funding could still be pursued by local agencies. A mechanism that could provide very small grants without red tape would help develop research and engineering capabilities at the local level and, at the same time, demonstrate the use of technology in solving real operating and maintenance problems.

Rail and Construction Technology I

Chairperson: *Stewart B. Hobbs*, Director, Office of Ground Systems, Transportation Systems Center

UMTA's RAIL AND CONSTRUCTION TECHNOLOGY PROGRAM: RAILCARS AND EQUIPMENT, POWER, SIGNALS, AND COMMUNICATIONS: *Stephen S. Teel*, Acting Director, Office of Rail and Construction Technology, UMTA

OFFICE OF TECHNOLOGY ASSESSMENT'S PERSPECTIVE: *Robert L. Maxwell*, Transportation Group Manager, U. S. Congress Office of Technology Assessment

Panel: *David Gunn*, Director of Operations, Massachusetts Bay Transportation Authority, Boston

Kenneth Fraelich, Sales Manager, Westinghouse Electric Corporation

Deane N. Aboudara, Director, Department of Technical and Research Services, American Public Transit Association

Thomas O'Brien, Boeing Vertol Company

Albert Dzingelis, Senior Electrical Engineer, New York City Transit Authority

Reporter: *Robert J. O'Connor*, Transit Systems Branch, Transportation Systems Center

SUMMARY

Stephen Teel of UMTA's Office of Rail and Construction Technology emphasized UMTA's objectives of life-cycle costs, improved performance, reliability and safety, energy and environmental conservation, and service for elderly and handicapped persons.

Among the criteria Teel listed for setting priorities for rail research were market size, relative effectiveness, R&D phasing of research, and maintenance and operation costs.

Teel said previous UMTA R&D budgets reveal an emphasis on rolling stock programs, which was not representative of what the technology being developed could do.

Teel noted that a shift in the apportionment of capital grant funds for the next 10 years may occur, sparking an increase in the spending on rights-of-way and fixed facilities while the proportion of funding for rolling stock will decrease.

Teel added that new technology will be developed to improve productivity through better equipment and procedures. Also under way are railcar standardization guidelines, procurement guidelines, light rail vehicle specifications, programs to standardize railcar subsystems, railcar flywheel units, and the track geometry measurement system.

Teel said the final element of UMTA's rail technology program is the Transportation Test Center at Pueblo, Colo.

Robert Maxwell of the Congressional Office of Technology Assessment said his office conducts studies and gathers data for legislative decisions. As a result of some of these studies, he said his office had determined that there has been insufficient emphasis placed on the development of key components and that any new component development must not be attempted simultaneously with a new vehicle design. He said he was pleased to learn that UMTA is concentrating on subsystem technology and that emphasis has been placed on the application of existing technology to the solution of current problems.

Maxwell added that his office must identify alternative technological methods of implementing specific programs, identify alternative programs and policies for achieving goals, and make estimates and comparisons of the impacts of alternative methods and programs.

One of the major roles of R&D for urban rail systems, Maxwell said, would be to ensure that proven technology is available to improve the service and performance characteristics of these systems so that energy consumption can be reduced and so that alternatives to systems that utilize petroleum can be developed and more extensive use made of them. In addition, he said R&D should strive toward reducing the life-cycle costs of these systems and provide

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means to make the systems more attractive so that increased ridership will be ensured.

David Gunn said the Massachusetts Bay Transportation Authority's internal R&D program is based upon want and need. He cited specific examples on how MBTA is converting old equipment to more modern equipment and standardizing a fleet of cars.

Kenneth Fraelich of Westinghouse Electric Corporation said there are more effective ways in which the current contracting methods can be changed to benefit industry, specifically by establishing different forms of incentive. Fraelich also said that industry is unaware of projects that are currently in existence and that industry should get more involved in planning and setting priorities for these projects.

Deane Aboudara, representing APTA, said he has seen very little change in R&D priorities and technological innovation during the last 14 years. Aboudara said transit is a growth market which can be competitive, profitable, and still provide value to the purchaser and user. He added that standardization will no longer yield significant economic advantages. Rather, Aboudara recommended efforts to standardize the application of hardware, particularly development of hardware modules.

Vehicle testing is an area in which changes must take place in order to increase the reliability of products,

Aboudara said. He advocated realistic schedules in order to properly check out and test items and to provide timely feedback into the production line.

Aboudara added that the previous technology delivery system—private industry—has vanished and that recent legislation to fund this area is a milestone.

Thomas O'Brien of Boeing Vertol Company said poor reliability and the maintaining of systems, subsystems, and vehicles is the major problem facing transit systems. He proposed an increased emphasis on hardware design and development and said the national design guidelines program must be accelerated. O'Brien said reliability problems stem from overspecification of requirements and recommended that the current procurement bid process be revised to allow for more flexibility, specifically in the development of hardware.

O'Brien said the STARS program has been beneficial because it concentrates on subsystem development. He proposed reducing the number of R&D studies to shift concentrations to hardware development.

Albert Dzingelis of the New York City Transit Authority said near-term problems are most critical to transit systems. He discussed hardware development and explained that unreliable hardware has caused many operating problems and delays in the NYCTA system.

Rail and Construction Technology II

Chairperson: *Stewart B. Hobbs*, Director, Office of Ground Systems, Transportation Systems Center

UMTA's RAIL AND CONSTRUCTION TECHNOLOGY PROGRAM: CONSTRUCTION TECHNOLOGY, WAYS AND STRUCTURES: *Russell K. McFarland*, Director, Office of Rail and Construction Technology, UMTA

Panel: *Richard E. Thayer*, Manager-Design and Engineering, Metropolitan Dade County Transit System, Miami, Fla.

Harry Sutcliffe, Project Manager, Bechtel, Inc.

Richard S. Fountain, Senior Industry Representative, U. S. Steel Corporation

John F. Hoban, Director, Rail Transportation Department, Port Authority of New York and New Jersey

Reporter: *Robert J. O'Connor*, Transit Systems Branch, Transportation Systems Center

SUMMARY

Russell McFarland, Director of UMTA's Office of Rail and Construction Technology, said UMTA has structured the construction program into three areas: requirements analysis and evaluation, technology, and systems integration and deployment. In requirements analysis and evaluation, McFarland said, UMTA attempts to determine the need for a project and the payoffs for an investment. He added that one of UMTA's biggest problems is trying to confirm estimates for new systems that are coming up for capital funding. McFarland predicted that the rehabilitation and modernization of rail systems is an area where Congress will be putting more money in the near future.

In the design and construction area, he explained that UMTA is looking at ties, track standards, and elevated structured design criteria. McFarland also explained the UMTA tunneling R&D program, discussing studies in instrumentation being done by the Massachusetts Bay Transportation Authority, the University of Illinois, the Washington, D.C., Metropolitan Area Transit Authority, and the San Francisco Bay Area Rapid Transit District. Also part of the tunneling program, McFarland said, is an emphasis on environmental and socio-economic factors.

Systems integration and deployment, he said, is an area which will ensure that the technology UMTA invests in is put to use and stressed that it is UMTA's plan to get operating systems directly involved in implementing research results with their own engineering staff or consultants.

Panelist Richard Thayer of the Metropolitan Dade County, Fla., Transit System suggested that more emphasis be placed on the design aspects of transit systems and advocated more sophisticated applied research programs

in the areas of corrosion, electrical conductivity, and current suppression. Thayer also said the environmental impact statement process should be reviewed to reduce construction costs and long time delays it fosters.

Richard Fountain of U. S. Steel proposed that a concentrated R&D effort be undertaken to study the noise attenuation problem. In addition, he also suggested that an in-depth study be initiated to discuss the problems of structural loading.

Harry Sutcliffe of Bechtel said community participation rules are becoming expensive and time consuming management problems in getting a project to the construction stage. He further suggested that the government should be supporting construction efforts for concrete tunnel liners, concrete rail ties, and geotechnical site studies. Sutcliffe said collecting nationwide data on construction costs is not beneficial because the scope of contracts varies so widely and site-specific details change construction methods and costs.

John Hoban of the Port Authority of New York and New Jersey said the transit industry must be concerned with development in contrast to pure research, and that the development and delivery of cost-effective technology focused on the current capital and operating needs of the transit industry should be a high-priority joint effort. Hoban added that the artificial separation of R&D programs, capital grant programs, and operating assistance programs is not a reflection of the real world of public transportation. Finally, he proposed that some formal R&D effort should be conducted of the costs that are imposed through arbitrary procedures and processes that serve but limited purposes.

Transit Management I

Chairperson: *A. B. Hallman*, Chief, Operations and Maintenance Division, UMTA

PROGRAM OVERVIEW FOR UMTA'S OFFICE OF TRANSPORTATION MANAGEMENT: *Brian J. Cudahy*, Director, Office of Transportation Management, UMTA

TRANSIT OPERATIONS AND MAINTENANCE MANAGEMENT SUPPORT: RUN-CUTTING AND SCHEDULING (RUCUS) SOFTWARE DEVELOPMENT SUPPORT: *Dennis Goeddel*, Traffic Management Branch, Transportation Systems Center

Panel: *Richard E. Ward*, Associate Professor, Industrial Engineering Department, West Virginia University
Houston P. Ishmael, Executive Director, Memphis, Tenn., Area Transit Authority, and President, American Public Transit Association

Reporter: *Gwendolyn R. Cooper*, Office of Transportation Management, UMTA

SUMMARY

Brian J. Cudahy, Director of UMTA's Office of Transportation Management, said his office is charged with developing skills and techniques for the U. S. public transportation industry and assisting operators in adapting these skills and techniques for their own purposes. He added that the principal emphasis of his office will involve the implementation of already developed techniques into the ordinary operations of transit properties through workshops, seminars, and other outreach programs.

Cudahy said programs are planned in human resources, marketing, operations and maintenance, and information services.

In the human resources area, Cudahy said, activities will focus on the recruitment and training of blue-collar candidates for transit employment, research on adapting automated teaching and testing techniques to a transit environment, programs to control absenteeism, and work reforms to improve productivity.

UMTA's marketing program involves organized and formal training sessions for newcomers to the field; workshops and publications whereby more experienced professionals can profit from each other's ideas; site-specific demonstrations of marketing concepts and ideas; and critiques and evaluations of actual programs and projects. Cudahy added that special emphasis will be placed on marketing paratransit services and creating a national transit awareness campaign.

The priority for operations and maintenance programs, Cudahy said, is increased efficiency through automated management information systems. Also, UMTA's Transit

Research Information Center will become the repository of national operating data reported under Section 15.

A. B. Hallman, Chief of the Operations and Maintenance Division in UMTA's Office of Transportation Management, said current and planned activities include regional productivity workshops, development of a specification for maintenance manuals, development of software for Section 15, maintenance needs analysis, development of an automated bus diagnostic system, and continuation of the Chicago transit security demonstration.

Mary Roos, Operations Research Analyst in the Urban Systems Branch at the Transportation Systems Center, said the principal objectives of the technical assistance support for operations and maintenance management are to conduct a comprehensive analysis of transit operations and maintenance functions and define the need, design, and application of management systems. She added that detailed requirements will be identified for improved operations, management systems, and control techniques to improve management operating efficiencies. Initial emphasis will be directed at light rail systems, Roos said.

In operations analysis, Roos said the program will develop practical techniques to survey, describe, and analyze current operations and maintenance functions. Substantive recommendations will be made to improve service delivery and reduce operating costs. Roos added that the program will establish working descriptions of operating and maintenance functions and complete in-service profiles of vehicle utilization and passenger flows. Through simulation and modeling techniques, she said, improved schedules

of service operations and maintenance activities will be developed.

The next step, Roos said, will be to use the results of the operations analysis to identify candidate applications for information systems.

Then maintenance management alternatives will be evaluated through on-site observations and discussions with maintenance personnel. The evaluation will focus on the effects and utility of all phases of light rail maintenance program development, organization, processes, and techniques, Roos said, and will be based on case studies of Boston, San Francisco, and Toronto. Roos added that the evaluation will focus on development of conclusions for consideration by other properties anticipating either new or modified maintenance programs.

Dennis Goeddel, Systems Analyst in the Urban Systems Division at the Transportation Systems Center, said there are 36 sites in the United States and Canada that have installed the UMTA-developed Run-Cutting and Scheduling (RUCUS) program; 28 are operational in the United States.

In the latter part of Fiscal Year 1978, TSC initiated a contract for a RUCUS system software improvement study to collect, organize, and document the status, results, and experiences of the current RUCUS implementation. Goeddel added that the study will develop specific improvements to the program software and disseminate them to state and local transportation agencies, metropolitan planning organizations, and transportation consultant firms. Among the items to be produced are:

- a RUCUS implementation handbook setting guidelines and alternatives for the program's planning and installation;
- a RUCUS system catalog documenting existing program modifications; and
- system software enhancements to improve the service planning/trip scheduling, vehicle scheduling, driver run-cutting, schedule data maintenance, and management system reporting functions of RUCUS.

In the latter part of Fiscal Year 1979, Goeddel said, there will be a workshop to present the major findings and results of the RUCUS system software improvement pro-

gram. This workshop will also provide a forum for further exchange of information regarding implementation, he said.

Richard E. Ward, Associate Professor at West Virginia University, said the university has the most current version of the RUCUS system. He said WVU plans to initially conduct test runs of both the blocks and runs programs to create driver run assignments with good finishing times and minimum contractual penalty payments for overtime and excess spread. The experiment will first attempt to schedule the afternoon peak and late night runs and then complete the solution with pieces of work from the morning peak period and early morning runs. A set partitioning technique is also being proposed to identify feasible points for the splitting of vehicle blocks into driver runs, subject to such work rule constraints as minimum/maximum piece sizes and swing time allowances. All program software developed as part of this research effort will be compatible with the current structure of the RUCUS runs program, Ward added.

He said WVU also plans to validate the effectiveness of the proposed driver run-cutting technique by conducting test evaluation runs using actual transit operating and schedule data. The types of schedule data and operating conditions such as trip and vehicle schedules, operating procedures, and driver work rules required for the test cases will be identified. The data for the test cases will be acquired from current RUCUS transit implementations.

Houston P. Ishmael, Executive Director of the Memphis, Tenn., Area Transit Authority and President of the American Public Transit Association, said the transit community has several priorities for operations and maintenance research. They are:

- maintenance procedures to develop an automatic bus diagnostic system;
- performance standards updating a 1950-era study of the costs of running a transit system;
- fare structure studies documenting the concern of passengers regarding present fare structures;
- a survey of the general public on the use/nonuse of public transit; and
- improved information dissemination methods, either through proper training or automation, or both.

Transit Management II

Chairperson: *Frank Enty*, Office of Human Resources, UMTA

TRANSIT INDUSTRY HUMAN RESOURCES PROGRAM DEVELOPMENT: *Dr. Enty*

VALIDATED TEST BATTERY PROGRAM: RESEARCH EFFORT AND INDUSTRY PARTICIPATION: *Chester W. Higgins*, Senior Personnel Administrator, Massachusetts Bay Transportation Authority, Boston

BLUE COLLAR TRAINING PROGRAM: DESIGN AND IMPLEMENTATION: *John R. Spears*, Research Director, AFL-CIO Appalachian Council

Reporter: *Gwendolyn R. Cooper*, Office of Transportation Management, UMTA

SUMMARY

Frank Enty, Chief of the Human Resources Development Division in UMTA's Office of Transportation Management, said that activities under way or planned in this area are based on the training needs of the transit industry and aimed toward improving productivity and effectiveness, upgrading personnel skills, and improving organizational development and management techniques.

Enty said the program will:

- establish an array of training courses and materials that are internally consistent as to subject matter covered, manner of development, and suitability for presentation on an industrywide basis;
- identify and develop standards and qualifications for selected industry occupations as elements upon which training program activities will be structured; and
- clarify organization and management procedures and practices as they relate to personnel management, delegation of authority and decision making, labor-management relations, corporate policy making procedures, and productivity and the work environment.

On behalf of himself and Melany E. Baehr of the University of Chicago, Chester Higgins, Senior Personnel Administrator for the Massachusetts Bay Transportation Authority in Boston, summarized the research involved in the bus operator validated test battery. The test was designed as an aid to equitable hiring procedures. Higgins said the major objective of the study was to establish valid procedures for the selection of applicants who would have the most potential for successful performance as bus operators in an urban transportation authority, within the guidelines of the Equal Employment Opportunity Commission.

Higgins added that the current test is valid only for male operators. Further research is being conducted on a study of female operators, which he said would be complete in January 1979. The final battery consists of three untimed, self-report questionnaires. The battery has no significant adverse impact on any racial group; can be administered in about 90 minutes; is machine or hand scorable; and can be applied to white, black, or Spanish surnamed male applicants.

Higgins said a validated selection test battery for white, black, and Spanish male bus operators has been available since 1974, and that 60 properties have sent representa-

tives to training workshops. He added that in order to qualify to use the battery, transit properties must send persons with responsibility for employment to an intensive, 2-day training program conducted by Dr. Baehr at the University of Chicago. To be certified as test administrators, those completing the program must agree to use the battery in accordance with stringent procedural, professional, and ethnical standards.

Higgins added that the test battery has a tremendous potential for saving money by selecting those applicants best suited to a bus operator's job. The cost savings would come from reducing job turnover, meaning fewer expenses for operator training; reducing accidents by selecting operators who are least likely to have them; and increasing the number of vehicles available at any one time by reducing accidents.

John R. Spears, Research Director of the AFL-CIO Appalachian Council, said the objective of the blue collar training program is to prepare validated, standardized training programs for bus operators and mechanics, and to make them available to the transit community. This effort has focused most immediately on programs for bus operators, he added.

The Council has thus far:

- prepared and administered a comprehensive training needs assessment survey, covering bus properties in the 13 southeastern states in which the council operates (these programs when completed will be made available to the transit community through UMTA);
- developed complete training programs with such aids as manuals, slides, movies, and handouts, for bus operators covering passenger relations and accident and emergency procedures;
- trained 31 instructors and approximately 200 operators at 16 bus properties;
- monitored and evaluated field tests, modifying programs as necessary;
- begun disseminating completed programs to bus operators wanting to use them;
- initiated work on a third training package to cover bus maneuvers and defensive driving; and
- studied methods for developing maintenance training procedures.

Access for Elderly and Handicapped Persons I

Chairperson: *Patricia Cass*, Office of Special Projects, UMTA.

COST AND RIDERSHIP DATA FROM NATIONAL SURVEY OF TRANSPORTATION HANDICAPPED PEOPLE: *Ms. Cass*

UMTA 504 REGULATIONS: *Lillian Liburdi*, Associate Administrator for Policy, Budget and Program Development, UMTA

Panel: *Joseph Revis*, Senior Associate-Transportation, Institute of Public Administration

John Gaudette, Assistant General Manager-Policy Analysis, Regional Transportation District, Denver, Colo.

Reporter: *Bruce Spear*, Evaluation Branch, Transportation Systems Center

SUMMARY

Patricia Cass of UMTA's Special Projects Office said a national survey of transportation handicapped people found that approximately 5% of the urban population in the United States—approximately 7.4 million people—is transportation handicapped. About 5.5% of the transportation handicapped are wheelchair users. Cass also noted that while less than 1% of the transportation handicapped cited lack of transportation as a reason for being unable to work, the opportunity to get a job was cited by more than 10% of the transportation handicapped as a major benefit of accessible public transportation. Finally, Cass presented a model for comparing the overall costs of alternative strategies for providing public transportation to the transportation handicapped, saying that strategies which emphasize system accessibility (such as wheelchair lifts on buses and elevators in transit stations) are lower in cost over the long run. Cass added that greater demand could be satisfied with more expensive door-to-door service.

Lillian Liburdi, UMTA Associate Administrator for Policy, Budget and Program Development, emphasized that the implementation of Section 504 cannot be effectively achieved without substantial technological innovation. Consequently, she said, the regulations give a legitimacy to transit research and development and mandate a national market for the resultant products. Liburdi said the role of technology should not be confined to problems of vehicle accessibility, however; many institutional and operational problems can also be partially alleviated by thoughtful design. She cited safety and emergency procedures for handicapped passengers, vehicle maintenance and security, transit marketing, and labor agreements as areas to be included.

Liburdi added that the complete range of transportation handicaps should be considered in the provision of public transportation service, noting that the target population of the 504 regulations is significantly broader than just wheelchair users.

She urged careful consideration of the section of the regulations which encourages vehicle and service design to accommodate a range of skills, body dimensions, and capabilities of persons with handicaps. Liburdi added that transit systems should be designed to achieve equal effectiveness and convenience rather than equal accommodations.

Liburdi emphasized that the regulations do not mandate a specific design or technology, but that UMTA's intent for local areas to meet the needs of the transportation handicapped in a pragmatic and cost-effective manner. She said UMTA is presently investigating several cost-savings strategies, including life-cycle costing, ways to achieve economies of scale in hardware production, and combining retrofit efforts with facility modernization.

Liburdi said the 504 regulations represent a challenge to the R&D community to produce well-designed, appropriate, and low-cost solutions for a mandated nationwide transit market. Timely success could greatly enhance the image of R&D, she added, while failure could jeopardize future reliance on R&D as a tool for policy implementation.

Joe Revis of the Institute of Public Administration said the role of public transportation has expanded from that of merely linking together parts of an urban area to that of an instrument of social change by providing low-cost mobility to the transportation disadvantaged. If social change is, in fact, the primary objective of public transportation, Revis added, then it may be inappropriate to emphasize cost-minimization.

Revis warned that there is no time for typical R&D efforts (which allow for failures as well as successes) to meet the requirements of Section 504, and that while the issue of wheelchair accessibility has been stressed, many more transportation handicapped people see other problems, such as provision of restroom facilities or driver sensitivity, as more important issues.

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Revis urged the Federal Government, the research community, and transit providers to stop bickering and begin working together to develop effective and equitable solutions.

John Gaudette from Denver's Regional Transportation District said the objection to 504 is that it mandates a policy without providing reasonable mechanisms for implementing it. Many of the proposed hardware solutions have not been adequately developed or tested under typical operating conditions, Gaudette said, meaning transit systems really don't know what the true costs are likely to be. Faced with considerable disagreement over the

estimates of time and cost associated with transit operations required to implement mandated services, he added that transit operators feel they are being forced to initiate a high risk (in terms of cost) R&D program at a time when they are already facing severe financial crises. In many cases, Gaudette stated, this added cost burden could drive the transit property out of existence, thereby defeating the original purpose of the regulations.

The transit operator is not against what 504 is trying to achieve, he said, but is asking for a relaxation of the time limits for those policies which are going to require additional research and development to implement.

Access for Elderly and Handicapped Persons II

Chairperson: *Joseph Revis*, Senior Associate-Transportation, Institute of Public Administration

SERVICE AND METHODS DEMONSTRATIONS TO IMPROVE E & H MOBILITY: *James Bautz*, Office of Paratransit and Special User Groups, UMTA

UMTA PROGRAM OF HARDWARE R&D TO IMPROVE TRANSIT ACCESSIBILITY: *Patricia Simpich*, Office of Socio-Economic and Special Projects, UMTA

CRITIQUE OF SERVICE AND METHODS DEMONSTRATIONS/ E & H MOBILITY DEMONSTRATIONS: *John Crain*, President, Crain & Associates

Panel: *John Templer*, Assistant Dean, College of Architecture, Georgia Institute of Technology
Dennis Cannon, Consultant to the Southern California Rapid Transit District, Los Angeles

Reporter: *Robert F. Casey*, Evaluation Branch, Transportation Systems Center

SUMMARY

James Bautz of UMTA's Office of Paratransit and Special User Groups said the service and methods demonstration program is developing three concepts for serving the transportation needs of the handicapped and elderly. The first concept is user-side subsidy, where the providers are paid only for trips carried rather than for providing the service. Bautz said the concept is easy to administer and offers the flexibility of choosing the target population to subsidize and the amount of subsidy to be offered. In addition to four current demonstrations of this concept, Bautz said the program would test this concept in larger urban areas.

Another concept Bautz discussed is the coordination of specialized transportation services operated by social service agencies. He said the objective is to avoid overlap and duplication of services and to increase the management and operational efficiency. U. S. DOT is working toward a coordinated policy for this concept in conjunction with the Department of Health, Education and Welfare, which has five demonstration projects of this type, Bautz said. He added that barriers to coordination of service can and have been overcome, and that it appears beneficial for the transit operator to be involved in the service.

Bautz said the third concept is the provision of wheelchair lifts on regular, fixed-route buses. The program is sponsoring demonstrations of two fully accessible systems, which will be the first fully accessible systems in the U. S. Utilization and cost information will be developed as well as the potential utilization and desirability of complementary services.

Patricia Simpich of UMTA's Office of Socio-Economic and Special Projects said hardware research had resulted in options to improve transit accessibility, including Transbus. Other projects Simpich discussed include the California Department of Transportation grant to install and test in actual service four different wheelchair lifts and the Booz-Allen and Hamilton contract to study architectural standards for bus wheelchair ramps and bus interiors for the handicapped. Simpich added that ramps have been developed for the 12-inch floor height of the UMTA paratransit vehicle prototypes and are being developed for the 22-inch floor height of Transbus. Other projects that UMTA is currently studying include:

- the safety and operating and maintenance costs of vans;
- advanced concept trains with special features for the handicapped and elderly (including wheelchair tie-down positions and storage room for other mechanical mobility aids);
- lifts for light rail vehicles;
- accessibility of rapid rail stations;
- inclined elevators;
- modification package for escalators; and
- safety of wheelchair passengers in bus accident situations.

John Crain, President of Crain & Associates, commented that Federal research and development activities focusing on transportation for the handicapped seem to be an unorganized program. He said demonstrations often occur

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simultaneously with the decision making process rather than preceding it.

Crain predicted that the first results of demonstration tests will show that ridership by wheelchair users on fixed-route accessible services has been abysmally low, but that there are mitigating factors such as inoperable lifts and the difficulty in using partially accessible systems. In the area of demand-responsive services, Crain stated the focus seems to be on the coordination of social service agency transportation programs. Crain said the central issue is the efficiency of large, coordinated systems and that current indications are that present social agency services may not be all that inefficient.

Crain said that a major deficiency in the demonstration program was lack of information on what was being done and the results of these efforts. Even though the service and methods demonstrations often do not lead the decision making process, Crain said the program can make a significant contribution through cross-cutting studies on behavioral response to implemented services and on the costs of implementing and operating alternative systems. He advocated repeated dissemination of results every six months and called for better transportation service concepts at the Federal level.

John Templer of the Georgia Institute of Technology said there seems to be too much emphasis on wheelchair accessibility, which is only a small part of the overall

elderly and handicapped transportation problem. He said the problems of persons with visual and auditory dysfunctions have not been adequately addressed and advocated better signing methods to help the deaf and better usage of floor surface textures to aid the blind in using public transportation.

Templer called for a total system approach, rather than piecemeal research and development activities, in order to alleviate the problems of the handicapped and elderly in using public transportation.

Dennis Cannon, a consultant to the Los Angeles-based Southern California Rapid Transit District, said many of the barriers to use of public transit by the transportation handicapped were also potential barriers for other users as well and that removal or alleviation of these barriers would help all transit users.

Cannon took issue with the manner in which barrier sensitivity was handled in the national survey of transportation handicapped people, saying that some items listed as barriers should more properly be termed disincentives, such as unhelpful drivers, and should not be equated with a barrier to transit use.

Cannon said the user-side subsidy concept is useful, but that it works best where the user has a variety of modes to choose from. In many instances, there is a financial limitation which restricts the number of trips that can be provided.

Urban Transportation Planning

Chairperson: *Garrison Smith*, Deputy Director of Transportation, North Central Texas Council of Governments

RESEARCH NEEDS FROM THE METROPOLITAN PLANNING ORGANIZATION'S PERSPECTIVE: *Mr. Smith*

RESEARCH NEEDS FROM A TRANSIT MANAGEMENT PERSPECTIVE: *Philip J. Ringo*, President, ATE Management and Service Company, Inc.

DEVELOPMENT AND INSTITUTIONALIZATION OF IMPROVED TRANSPORTATION PLANNING METHODS: *Robert B. Dial*, Director, Office of Planning Methods and Support, UMTA, and *Richard Steinmann*, Community Planner, Office of Planning Assistance, UMTA

Panel: *Thomas Hillegass*, Office of Planning Methods and Support, UMTA
Granville Paules, Chief, Technology Transfer Division, UMTA

Reporter: *Robert Waksman*, Evaluation Branch, Transportation Systems Center

SUMMARY

Garrison Smith from the North Central Texas Council of Governments defined a metropolitan planning organization as the elected officials in an area that make decisions with respect to transportation investment, in contrast to an MPO staff of transportation planners. He noted that in the Dallas/Fort Worth area there is a clear definition that the MPO staff serves the local traffic and transportation engineers, the transit operators, and the local elected officials who serve on the regional transportation council.

Smith said the major issues faced by the MPO and its staff in participating in the urban transportation planning process relate to air quality and potential EPA enforcement policies, analyzing and developing transportation investment priorities for funding decisions, planning transportation services for the elderly and handicapped, and land-use issues.

Smith suggested that R&D activities should be directed in such MPO staff activities as data management and analysis, travel forecasting and impact analysis, delineating transportation alternatives, and computer system management.

Smith suggested that the audience consider the following issues: the level of detail at which the planning process should operate; whether an MPO and its staff are serving local needs; whether planning technology and dissemination of that technology are at the right level; and whether the planning process is well managed.

Smith added that MPO's have money available to assist transit operators, but that the planning capabilities may be way ahead of what the transit operator is ready to use.

Philip J. Ringo, President of ATE Management and Service Company, said planning is part of transit manage-

ment's function and that there is now much more communication between planners and transit managers than there was six years ago. He welcomed the increase of UMTA Section 9 money now flowing to transit managers, but said this may make the MPO staff feel that they have lost some of their functions.

Ringo said transit operators don't feel as comfortable with the transportation systems management process as they did with developing transit development programs. He added that perhaps this is why he has yet to see a good TSM plan. He said he is pleased that transit management is realizing the value of data management.

Ringo outlined four areas of transit operations in which emphasis should be placed in terms of planning and research and development: service design and measurement of effectiveness, manpower utilization, market and consumer research, and data utilization. He stated that there is a need for guidelines and standards in these areas with particular emphasis on service design. Ringo urged that service design be performed at the individual route level and said that will require very detailed specific information.

Ringo said the urban transportation laboratory in Cincinnati has generated very valuable information for making decisions to modify routes along a corridor there. Finally he suggested that more R&D needs to be directed in the area of paratransit.

Robert B. Dial, Director of UMTA's Office of Planning Methods and Support, said research and planning should stress both short- and long-range planning and emphasize multimodality. He said that maybe enough planning methods are available now and the transit community

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should stop building planning methods and begin implementing them.

Dial said transportation systems management is a short-range planning exercise in which implementation actions are spelled out in detail. He advocated connecting short-range data bases and detailed planning and decision making into long-range decisions. Dial said short-range planning cries out for use by the computer and that short-range planning can benefit greatly from the use of systematic network techniques and models and data base management that long-range planners have already been using. To do short-range planning, Dial advocated moving smoothly from the crude descriptions of transit service present in long-range planning to the detail needed to develop vehicle schedule and manpower requirements and said interface with RUCUS and UTPS highway networks would be useful.

Dial said transit operators are very sensitive to costs and their impact on proposed service changes. Vehicle schedule and manpower estimates are needed to obtain costs, Dial said, and cost models are being developed which explicitly consider these parameters.

Dial added that poor data management is a major problem hampering the planning process and that institutional problems could be solved when data management problems have been solved. He said his office is developing data management tools and that information dissemination in the planning field must now be given a high priority.

Dial said that an R&D organization could present a set of productivity measures for transit as R&D results whereas a policy management organization's work would be considered implied policy.

Granville Paules, Chief of UMTA's Technology Transfer Division, said there are now approximately 4,000 people receiving the Federal Government's planning products, including summaries of new projects. Public Technology, Inc., Paules said, has been helpful in relationships with cities and people at the local level who have an interest in planning. Paules added that UMTA now offers several training courses in the planning field.

Richard Steinmann from UMTA's Office of Planning Assistance said his office is working with MPO's on Section 8 and 9 research studies dealing with institutionalizing UMTA-developed techniques. Demonstrations are also being performed on system monitoring techniques in which data is being collected and measures derived from this data are being used to assist in short-range planning. Other projects Steinmann is working on include prototype planning studies to integrate TSM plans into the regional planning process; cost-effectiveness approaches for collecting data for E&H planning; impact studies of the opening of new rail transit systems in San Francisco, Washington, D. C., and Atlanta; and alternatives analysis research.

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Appendix B

Detailed Workshop Proceedings

The following documents have been compiled from papers, presentations and transcripts of the conference:

Title and Subjects	UMTA Report Number
Bus and Paratransit Technology Workshop Proceedings —Third UMTA R&D Priorities Conference, Volume II (PB 300-987), \$5.25	UMTA-DC-06-0157-79-2
Part I Paratransit Integration Part II Bus Technology, Paratransit Vehicle Development, Flywheel Energy Storage System	
ACT and Advanced Systems Workshop Proceedings —Third UMTA R&D Priorities Conference, Volume III (PB 300-988), \$6.00	UMTA-DC-06-0157-79-3
Part I AGT Socio-Economic Research and AGT Applications Part II AGT and Advanced Systems and Technologies	
Service and Methods Demonstrations Workshop Proceedings —Third UMTA R&D Priorities Conference, Volume IV (PB 300-989), \$5.25	UMTA-DC-06-0157-79-4
Part I Pricing Policy Innovations Part II Conventional Transit and Paratransit Service Innovations	
UMTA Special Technology Programs Workshop Proceedings —Third UMTA R&D Priorities Conference, Volume V (PB 300-990), \$5.25	UMTA-DC-06-0157-79-5
Part I Safety, Qualification, and Life-Cycle Costing Part II Consumer Inquiry Technology, National Cooperative Transit R&D Program, and Technology Sharing	
Rail and Construction Technology Workshop Proceedings —Third UMTA R&D Priorities Conference, Volume VI (PB 300-991), \$5.25	UMTA-DC-06-0157-79-6
Part I Railcars and Equipment Part II Construction Technologies	
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