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Evaluating UMTA's Work

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Abstract

The period of economic expansion and affluence since World War II created a strong tendency to base planning on unquestioned extrapolation of past trends. This method is acceptable in areas where the developmental trends are in desirable directions. But when this is not the case, this method does not represent rational planning, since its effect is to continue and encourage undesirable developments.

Urban transportation has suffered greatly from this type of planning; many of our national and metropolitan area transportation studies placed a heavy reliance on .continuation of growth in auto ownership, VMT's, decentralization, etc. They failed to set clear goals for public transportation and standards for its service.

Disciplines

Engineering | Systems Engineering | Transportation Engineering

WORKSHOP SIX

Priorities and Balance in UMTA R&D

Friday, February 20, 1976

9:00 a.m. Roanoke Room
Stouffer's National Center Hotel
Arlington, Virginia

Chairman: Walter J. Addison, Administrator, Mass Transit Administration of Maryland, Baltimore, Md.

Panelists: Henry A. Nejako, Jr., Executive Assistant to the Associate Administrator for R&D, UMTA.

Vukan R. Vuchic, Associate Professor of Transportation Engineering, University of Pennsylvania, Philadelphia, Pa.

Edson L. Tennyson, Deputy Secretary for Local and Area Transportation, Pennsylvania DOT, Harrisburg, Pa.*

Arthur G. Raabe, Director, Transportation Research and Engineering, Metropolitan Transportation Authority, New York, N.Y.*

Reporter: Jerry Ward, Director, Office of R&D Policy, Office of the Secretary, DOT

* *No paper submitted.*

Foreword

The intent of the workshop was to deal with the many events and circumstances that impinge on the UMTA R&D program and to attempt to create some order of priority and balance out of them. Chairman Addison suggested that the participants keep a number of questions in mind as the seminar progressed. The concerns included: How can we balance near term fixes versus completely new, integrated systems? Who wants what and how valid are their desires? Is the UMTA program responsive to the needs of these various parties? What should be left to the private sector? And could changes in the procurement system foster more private sector involvement and/or meet needs better?

Priorities and Balance in UMTA R&D: A Briefing

By Henry A. Nejako, Jr.

Executive Assistant to the Associate Administrator
Office of Research and Development
Urban Mass Transportation Administration

Chairman Addison, fellow panelists, ladies and gentlemen, I am pleased to present an insider's view of priorities and balance in UMTA R&D. I joined the Office of Research and Development in 1970, shortly after a major reorientation of UMTA's approach to R&D. Prior to that time, UMTA generally responded to initiative by transit operators and other public bodies and awarded grant contracts for the conduct of R&D and for service demonstrations. Partly in response to Congressional criticism that UMTA's R&D program had yielded no visible results, only paper studies, UMTA launched, beginning in 1970, a Federally directed program of R&D and operational demonstrations in bus transit, rail transit and new systems, relying primarily upon procurement contracts managed directly by the UMTA staff. Congress and the Executive Office of Management and Budget supported the new approach with substantial funding, and major projects were begun which subsequently resulted in demonstration of prototypes such as the TRANSBUS, the State-Of-The-Art Car, and the Morgantown PRT and of innovative transit services such as exclusive bus lanes and dial-a-ride.

We have never issued a public statement that says in so many words, "Here are our current priorities in R&D." Any student of UMTA's involvement in R&D, however, would have no difficulty finding an extraordinarily detailed documentation of UMTA's justification and explanation of its R&D activities in the volumes of hearings issued annually by the House Appropriations Committee. A very complete legislative record is contained therein, including the full text of the budget justification documents UMTA sends to the Congress. Of course, the hearings reflect primarily two points of view: that voiced by UMTA and that voiced by members of the Appropriations Committee. For other views, one must consult papers delivered at conferences sponsored by APTA, the Transportation Research Board and technical societies and an occasional article in one of the trade journals. Occasionally, someone like Professor George Hilton or Professor George Smerk writes a book evaluating UMTA's performance and our R&D performance is scrutinized along with the rest.

If one took the trouble to survey this background material, what would one infer about apparent priorities and balance in UMTA's R&D and how they have changed? The two oldest projects I could find were an eight week experiment to increase the frequency of bus and trolley service on the Detroit Grand River transit line and an assessment of the Seattle Monorail by the University of Washington. (These initial efforts seem echoed today by our service and methods demonstration program and our assessments of existing automated guideway transit installations.) There followed several grants to demonstrate improved commuter rail and bus service and some systems development projects related to the Bay Area Rapid Transit System and the Transit Expressway in Pittsburgh. The early emphasis on service and methods demonstrations gave way by the late 1960's to more emphasis on technology-oriented projects, but funding remained below $20 million annually. The emphasis on developing new, high technology systems prototypes, such as the Morgantown PRT, the Urban Tracked Air Cushion Vehicle and the Transpo '72 automated guideway transit systems, accounted for the large increase in technology-related R&D during Fiscal Years 1971-1974.

Conventional transit modes were not overlooked. By FY 1974, R&D funding for bus and rail transit systems collectively began to exceed funding for unconventional systems, a trend which continues. The transit test track and related facilities at the Transportation Test Center in Pueblo, Colorado required substantial funding during the early 1970's. More recently, the development of the Advanced Concept Train and development of improved tunneling techniques and other rail supporting technology projects have required a fairly constant R&D investment in the rail transit category. Investment in bus technology peaked in Fiscal Year 1973 when nearly all of the bus transit R&D funds were used for TRANSBUS development. With the completion of testing and demonstration of the TRANSBUS prototypes, our funding for bus and paratransit technology has diminished. Most recently, our principal efforts in this area have been development of two prototype, low pollution paratransit vehicles and preparation for an urban demonstration of advanced, multi-user automatic vehicle monitoring.

An increase in new systems and automation funding for FY 1977 reflects transition to the prototype fabrication phase of the advanced group rapid transit system development project. Essential R&D in preparation for the urban automated transit system project, a shuttle-loop transit (SLT) deployment and continuing development of areawide demand responsive transit technology will also be funded in FY 1977. Over the past five years, there has been an evident increase in funding for and emphasis on planning methodology, transit management and marketing, service and methods demonstrations and policy-oriented research. These categories account for $30 million of the FY 1977 budget estimate or 44 per cent of total RD&D funding, the largest share devoted to nonhardware R&D in this decade. Table 6-1 offers a break-down of UMTA funding in percentage terms for the fiscal years beginning in FY 1972.

In view of the Department of Transportation's policy that investment in fixed-guideway transit be carefully justified over bus alternatives because of the heavy expense involved, I thought it might be interesting to compare the funding for systems development and technology projects involving fixed-guideway, as opposed to highway-driven transit modes. That comparison reveals that about 80 per cent of the UMTA technology-oriented budget goes for rail or automated guideway transit. One should recognize that developing rail cars and automated systems is inherently more expensive than developing improved bus vehicles or operational control systems for buses. If one takes into account the nonhardware projects in the remainder of UMTA's RD&D program, the balance then shifts to about equal funding for fixed guideway and highway driven modes (inasmuch as most service and methods demonstra-

tions and management, marketing, planning and policy projects are related to transit modes that are not capital intensive).

Another concern frequently heard is that UMTA devotes too much effort to developing products that cannot be implemented in transit service in the near term. To some extent this is true simply because of the long lead times necessary to bring about such conventional new products as buses and rapid rail cars. Table 6-2 attempts to categorize UMTA systems development and technology projects according to the length of time needed to implement results, admittedly a subjective judgment. Table 6-3 lists the projects included in this analysis along with a designation of near-term or long-term in orientation for each. The result of the analysis is to suggest that those projects whose results could be implemented in the near term comprise an increasing percentage of the total funding for hardware R&D, now amounting to about 50 per cent. Funding levels, however, have not increased substantially for near-term R&D during the past five years.

TABLE 6-1
UMTA R&D FUNDING

Percentage of UMTA Research, Development and Demonstration Funding for Systems Development and Technology, Service and Methods Demonstrations, and Other R&D, FY 1972-FY 1977.

Type of Project	FY 72	FY 73	FY 74	FY 75	FY 76	FY 77
Systems Development and Technology	84%	87%	80%	57%	58%	56%
Service and Methods Demonstrations	14%	7%	11%	26%	27%	28%
Management, Marketing, Planning and Policy-Oriented R&D	2%	6%	9%	17%	15%	16%

*NOTE: Transition quarter, July-September 1976, omitted for simplicity.

TABLE 6-2
NEAR-TERM FUNDING

Funding of UMTA Systems Development Projects Oriented toward Near-Term Implementation, FY 1972-FY 1977

Category	Fiscal Year 1972	1973	1974	1975	1976	1977
Bus and Paratransit:						
Funding (millions)	$0.3	$0.1	$1.3	$1.1	$2.0	$2.4
Near-term project funding as percentage of all funding for this category	10%	1%	10%	25%	56%	67%
Rail Transit:						
Funding (millions)	$9.6	$8.3	$5.9	$4.5	$4.4	$7.1
Near-term project funding as percentage of all funding for this category	85%	79%	49%	41%	33%	56%
New Systems and Automation:						
Funding (millions)	$0.7	$2.7	$3.7	$1.0	$4.2	$6.6
Near-term project funding as percentage of all funding for this category	2%	10%	16$	13%	40%	42%
Total, Near-Term Projects:						
Funding (millions)	$10.6	$10.9	$10.9	$6.6	$10.6	$16.2
Near-term project funding as percentage of all funding for systems development projects	23%	21%	22%	28%	39%	50%

NOTE: Transition quarter, July-September 1976, omitted for simplicity.

I have briefly summarized the balance of funding among the various categories of UMTA R&D through the forthcoming fiscal year. What of priorities? I use the term to mean the relative emphasis in top management attention, manpower and criticality of need for the results, not merely relative fund allocation. (A high priority project may need little funding at first except for planning and feasibility analysis, whereas a large project of lesser priority may require considerable funding at certain times in its development cycle, particularly if any fixed construction or prototype fabrication is involved.)

To arrive at indicators of priorities other than dollars, one may resort to techniques similar to those used by newsmen in trying to divine political changes in closed foreign societies; how many people and at what hierarchical level are involved in supporting the effort?

How frequently is the topic mentioned in public statements by top officials? How much activity is evident in attempting to win support or disseminate the results?

Using such indirect analysis, the author concludes that current R&D priorities lie in the following areas:

- service and methods demonstrations involving both low-density suburban areas and downtown areas where restrictions on auto traffic or preference for high-occupancy vehicles might be implemented;
- improved marketing and management of transit service;
- greater system and product assurance to reduce start-up failures and downtime and to maintain adequate service levels when a new transit product is introduced into service;
- evaluating the potential of automated guideway transit to improve labor productivity and attract new riders to public transportation;
- decreasing the cost, time and disruption of urban tunneling;
- reducing the life-cycle costs of ownership and operation of rail transit systems by making them easier to maintain and more energy-efficient;
- improving analytical and simulation techniques for transit planning and alternatives analysis; and
- conducting forward-looking program design studies as an aid to policy-making and UMTA program planning.

This simplified recitation of the highlights of our current R&D thrust by no means does justice to any of them, but it might be sufficient to assist the distinguished panel members and workshop participants in dealing with the issue of R&D priorities and balance. ■

TABLE 6-3
SYSTEMS DEVELOPMENT AND TECHNOLOGY PROJECTS ORIENTED TOWARD NEAR-TERM VERSUS LONG-TERM IMPLEMENTATION

Project	Potential Implementation: Near-Term	Potential Implementation: Long-Term
Bus and Paratransit Technology:		
Transbus		X
Articulated High-Capacity Bus		X
Small Bus Study		X
Flywheel Energy Storage		X
Paratransit Vehicles		X
Diesel Taxi	X	
Bus Supporting Technology	X	
Automatic Vehicle Monitoring	X	
Rail Transit Technology:		
State-of-the-Art Car (SOAC)	X	
Advanced Concept Train (ACT-1)		X
Energy Storage Cars		X
Gas Turbine-Electric Cars	X	
Light Rail Vehicles and Systems	X	
UMTA Test Facilities	X	
Test and Evaluation of Rail Vehicles	X	
Track Research		X
Noise Abatement Technology	X	
Tunneling Technology	X	
New Systems and Automation:		
Morgantown PRT System		X
Advanced GRT System Development		X
Urban Automated Transit (SLT) Project	X	
Automated Guideway Transit Technology	X*	X*
Accelerating Walkway	X	
Dual Mode Transit System Design		X
Urban Tracked Air Cushion Vehicle (TACV)		X
Local Dial-A-Ride	X	
Areawide Demand Responsive Transit	X	

* Contains both near-term and long-term tasks, each assumed to be about 50 per cent of total effort.

#8-41

Evaluating UMTA's Work

By Dr. Vukan R. Vuchic
Associate Professor of Transportation Engineering
University of Pennsylvania

The period of economic expansion and affluence since World War II created a strong tendency to base planning on unquestioned extrapolation of past trends. This method is acceptable in areas where the developmental trends are in desirable directions. But when this is not the case, this method does not represent rational planning, since its effect is to continue and encourage undesirable developments.

Urban transportation has suffered greatly from this type of planning; many of our national and metropolitan area transportation studies placed a heavy reliance on continuation of growth in auto ownership, VMT's, decentrali-

zation, etc. They failed to set clear goals for public transportation and standards for its service.

The unimodal approach to solving urban transportation by private automobile only has had many negative consequences for our cities. An often overlooked one is that it has greatly decreased the knowledge and expertise in public transportation in the whole country.

Before we begin to critically evaluate UMTA's work, we should recognize the fact that UMTA started its work only some 10 years ago, with very few available experts in transit systems planning, design, technology and operation. The transit industry has not had a surplus of them; universities were, and still largely are in an era of reverence for irrelevance; other levels and branches of governments are in most cases dominated by groups which are either uninterested or directly hostile to public transportation. Thus, the present shortcomings cannot be blamed on UMTA alone. Many of us are also responsible for the present lack of capable, experienced professionals who are dedicated to achievement of efficient urban transportation systems utilizing private and public modes in a coordinated manner, who are dedicated to improvement and revitalization of our urban areas in general.

Yet, I am convinced that now, having passed its formation and stabilization stages, UMTA could, should and will have to assume a much broader and stronger role in urban transportation than it presently has. Many recent trends have led to a rapidly increased recognition of the need that our transit systems be drastically improved and modernized.

There are two basic elements which are needed for achieving efficient transit systems–expertise and adequate financial resources. Both of these elements are needed, but I believe that the first one is presently a more serious bottleneck than the second. This is our problem at all levels– from the failure to precisely define the role transit should have in different cities to the methods of fare collection.

In addition to its distribution of finances and monitoring of their use, UMTA is the body which should provide leadership in the planning, development and operation of transit systems. It should take a strong stand against the many forces which work very hard against not only transit improvements, but against our cities in general. UMTA has not, until now, met the expectations of our cities in this respect and this failure to provide leadership has caused the adoption of a very unbalanced and unstable set of priorities.

The extremes and generalizations always have inexperienced people as their prey. Extreme solutions and oversimplifications of relationships are attractive because they catch the eye through new gadgetry, futuristic ideas, etc. They avoid the difficulties of complex real-world relationships.

There was a period when the naive belief was held that technological deficiencies were the causes of our transit problems. Instead of old-fashioned steel wheel and rubber tire, we need some magnetic or air-blowing devices, and the breakthrough will be achieved. UMTA was strongly swayed by this belief for a period of time, but now it has stepped on both feet again.

UMTA has not, however, yet taken a sufficiently strong stand with respect to many other popular but damaging trends in urban transportation, strongly promoted by various interests or extremists. I will illustrate this by only a few examples.

"Americans are in love with the automobile and will avoid transit whenever possible. This popular overgeneralization is true when transit service offered is extremely poor. Modern systems have, on the contrary, proved that people will choose transit over auto when its service is competitive. Current avoidance of transit use should be a reason for increase rather than decrease of transit investments.

The role of transit is to relieve highway congestion during the peak hours. This is highly misleading since the primary role of transit is to provide mobility throughout the city at all times of day, rather than only peak hour service into and out of CBD's. In all medium and large cities, commuter transit should be a supplement, but not a substitute, of regular transit.

"Investments should be made into short-range rather than long-range investments." This is a very myopic approach. We must attack both problems in a coordinated manner. That is more difficult than either solution alone but unless long-range improvements are also undertaken, the urban transportation crisis will continue forever.

"Rail rapid transit is suited to only a few largest urban areas in our country." Quoting that only half a dozen cities presently have rapid transit is used as an argument to demonstrate the insignificant role of this mode. The fact is that the "only half a dozen cities" have some 20% of our country's population. Should the unit be the number of cities, or population benefiting from these systems?

Other deceiving units are comparisons of private auto with a bus with respect to energy consumption. Are vehicles, or passengers carried, the proper units? A similar situation exists at all our intersections where buses and cars are treated on a one to one basis.

I suggest that UMTA should strongly refute and clarify these confusing and damaging statements. UMTA (and DOT) usually not only ignores them, but even introduces them in some of its reports!

The lack of expertise could be alleviated considerably by learning from innovations used in foreign countries. In constructing new rapid transit systems, in street traffic regulation, in transportation system management (TSM)–many things can be learned from the experience of others. The errors, unqualified consultants and unjustified technological complexities are very costly in terms of investments, delays and frequent malfunctioning which have become our chronic problems not only in newly constructed systems, but in some standard buses, auxiliary equipment, etc. The greatest damage is, however, the embarassment from such failures, which is extensively used by the critics of all improvements to public systems.

UMTA should shift its priorities from marginally promising advanced solutions to the introduction of state-of-the-art expertise and technology. Do we need to test computer controlled fare boxes on each bus when we have not tested the self-service fare collection methods widely and successfully used throughout Europe?

A few other suggestions for changes in UMTA's priorities:

- Place a major emphasis on providing partially or full-separated rights-of-way for transit; that measure, ranging from reserved lanes and curbed medians to fully controlled rapid transit lines, represents the most important physical improvement of transit operations.
- Increase cooperation with the Department of Housing and Urban Development and metropolitan planning organizations in planning coordinated development of transit and urban forms compatible with it.
- Intensify efforts for improved bus operations on urban streets. Presently, it is often more difficult to obtain a reserved bus lane, or any other TSM improvement, than to construct a tunnel under the street. A very active

support from FHWA would be extremely useful in achieving the change in attitudes of local traffic engineering departments, traffic police and other bodies which are now usually opponents of any changes.

These and many other measures needed for the immense task of improving our urban transportation, represent difficult tasks; but they must be undertaken. I believe that UMTA has the duty to take a stronger lead in promoting transit modernization. The task represents quite a challange, but if successfully done, it will contribute to the reorientation in our total attitude toward cities. It is time that we, as a nation, start policies for improvement of cities rather than worsen the existing crisis by ignoring the problems. ■

Summary

Mr. Nejako summarized the trends in UMTA R&D and illuminated some of the reasons for those trends. In response to Congressional desires, the program in the early 1970's expanded rapidly with hardware projects that produced its first results in Fiscal Year 1973-74; bus, rail, Morgantown PRT, dial-a-ride. The trend now is less hardware and more demonstrations, management and planning tool development and policy studies. Work on near-term projects is going up and increasing attention is being given to the delivery-of-results problem.

Professor Vuchic warned against basing planning on extrapolation of undesirable trends into the future. He noted that UMTA is still a relatively young organization working in an area where expertise was very thin. He indicated that UMTA should take a stronger leadership role in providing both expertise and financial resources. In particular, UMTA should defend and promulgate more strongly the role of transit in city development, both in the short and long term. He cited specific changes in priorities: more cognizance of European experience; more emphasis on dedicated rights-of-way; more cooperation with HUD, MPO's and FHWA. With respect to new modes, he cited the need to clearly understand concepts, and to develop subsystems without losing sight of possible application to existing systems (such as automation of existing trains).

Mr. Tennyson placed priority on improving productivity and developing better ways of measuring it. He cited passengers/capita as an important measure of transit effectiveness along with percent of work trips. In terms of work output, he listed passenger miles, vehicle availability, and passenger miles per employee hour. Second, he discussed transit economics: the need for understanding the relative economics of transit submodes and between alternate modes. He discussed ways of reducing costs. At a lesser priority, but still important, is the hardware itself, its reliability, and maintainability. Here he felt suppliers could do some of the R&D. He noted that aesthetics are more important in inter-city than in commuter service, where economy and efficiency are paramount.

Mr. Raabe pointed out that the operator must live with and be concerned with real problems that look mundane to other people. UMTA's first concern should be these problems of today and not assume that they are to be superseded by brand new systems. He indicated that spending UMTA money here was proper: the market is too small to attract the needed R&D from the private sector. The work on near term problems should include operational considerations as well as making existing hardware work better.

Papers from Mr. Raabe and Mr. Tennyson were not available.

The discussion lead to the following general conclusions.

- Future transportation will evolve from today's modes; a revolutionary substitution is unlikely. Therefore, R&D should focus on developing stepwise improvements, starting with solving the problems of today's systems. Longer term research should not be aimed at developing completely new systems but at improvements to the components that are common to all systems. Work on better aerial guideway structures in a general sense was cited.
- The view was presented that transit represented too small a market to justify large R&D by the private sector, and therefore, Federal assistance was necessary if innovation was to occur.
- Operator participation in the development of new equipment specifications was desirable. The PCC car was cited as a particularly good example of such participation. After some discussion, it was generally agreed that detailed performance specifications were preferred to design specifications.
- Arrangements should be derived that permitted some semi-discretionary funding to be made available to respond to operator needs.
- Better communication and dissemination of information between UMTA and its various constituencies is needed.

Recommendations

The recommendations of the workshop are as follows:

- We must maintain a balanced R&D program vis-a-vis long and short term R&D and private versus public funding;
- We must develop an institutional mechanism for cooperative R&D between users, consumers, suppliers and the various levels of affected government;
- We must develop mechanisms for better communication and information flow in the transportation community; and
- UMTA should take a stronger leadership and advocacy role for public transit.