

STATEMENT OF MR. GEORGE J. PASTOR, ASSOCIATE ADMINISTRATOR FOR SYSTEMS
DEVELOPMENT AND TECHNOLOGY, URBAN MASS TRANSPORTATION ADMINISTRATION,
BEFORE THE
SUBCOMMITTEE ON AVIATION AND TRANSPORTATION RESEARCH AND DEVELOPMENT,
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Mr. Chairman and Distinguished Members of the Subcommittee.

I sincerely appreciate this opportunity to appear before you again this year to present and discuss the research and development program of the Urban Mass Transportation Administration.

With your permission, I will address an overview of the program, its history, some of its problems, and its accomplishments in this prepared statement. I will follow it by describing each program element or major project with a more informal slide presentation.

It is instructive to review the enabling legislation for the UMTA Section 6, Research, Development and Demonstrations Activity (Slide 1). In case you cannot read it, the text is as follows:

"The Secretary is authorized to undertake research, development, and demonstration projects in all phases of urban mass transportation (including the development, testing, and demonstration of new facilities, equipment, techniques, and methods) which he determines will assist in the reduction of urban transportation needs, the improvement of mass transportation service, or the contribution of such service toward meeting total urban transportation needs at minimum cost. He may undertake such projects

independently or by grant or contract (including working agreements with other Federal departments or agencies). In carrying out the provisions of this section, the Secretary is authorized to request and receive such information or data as he deems appropriate from public or private sources."

It can be seen that this is a broad mandate and allows wide limits for interpretation. We in UMTA have not done much to reduce urban transportation needs, but others are doing that. We are doing reasonably well in improving mass transportation service. And one could always do better in meeting total urban transportation needs at minimum cost.

During the past three years, Section 6 RD&D programs were managed by four offices within UMTA as seen on this slide (Slide 2):

- The Office of Policy and Program Development spends typically \$2 to \$2½ million annually for policy and program evaluation supporting research and is also in charge of our Section 11 University Research Program and Training Activity, which runs at \$2 million annually at present.
- The Office of Transportation Planning performs research in support of our urban planning methodology and alternative analysis process at a \$3 to \$3½ million annual level.
- The Office of Transportation Management and Demonstrations is in charge of our Management, Marketing, and Service and Methods Demonstration Program. This program enjoys increasing emphasis as it concentrates on non-capital intensive experiments and demonstrations for operational improvements of

conventional systems and equipments. The FY 1977 budget for these categories is between \$17 and \$23 million, depending on House/Senate Conference resolution yet to occur.

- Finally, my Office of Systems Development and Technology (officially still called the Office of Research and Development) is responsible for hardware and software technologies in support of the research and deployment of transit systems, products, and processes. Furthermore, responsibilities for Safety and System Assurance, Standardization and Technological Qualification of equipments, as well as implementation of new, untried systems in urban deployment, have recently been assigned to my office. The RD&D budget for this office during FY 1977 is expected to be between \$32 and \$35 million, pending Conference Committee resolution.

Within Systems Development and Technology, we derive the following objectives from the enabling legislation for pursuing research, development, and demonstrations (Slide 3):

1. In the field of conventional transit equipment and systems where the Federal Government incurs up to 80% of the capital costs, we will undertake R&D projects if we can (a) obtain a realistic life cycle cost reduction with equal or better service or performance, or (b) if we can improve performance and service at affordable costs; and if a delivery system for the product can be rationally identified.
2. We will support high risk, high technology R&D initiatives which promise significant potential productivity increases through the

introduction of automation into transit operations. We believe it is the role of the Federal Government to explore these longer term alternatives.

3. We will undertake RD&D projects which support improved service and potential cost reductions indirectly, such as standardization, regulations, safety, security, and reliability improvements; or which support national priorities such as central city revitalization, elderly and handicapped accessibility, energy conservation, or improvement of the environment.

Implicit in these objectives is the fact that if society and the Congress mandates a National Mass Transportation Assistance Program, then the Federal Government shall also formulate RD&D activities to support that assistance program.

An important distinction must be made here between Federal R&D in support of activities where the ultimate consumer, the customer of the product resulting from the R&D, is the Government itself and where it is not. In the former category are the Department of Defense, NASA, and our sister agencies, FAA and Coast Guard. These agencies can control the entire process from exploratory research to final product operational deployment totally by themselves. It is infinitely more complex and less well understood how the results of Federal RD&D can be delivered to the civilian sector, in our case the urban transit market, and become accepted innovation through the utilization of products and processes by the competitive free market process. This issue of developing a "delivery system" for the results of Federally sponsored R&D (or the issue of "commercialization"

as it is often referred to by ERDA) is probably more important to the success of any Federal R&D for the civil sector than the kind of R&D or the amount of R&D funding devoted to the activity. In the final analysis, the only measure of success or failure of a Federal civil R&D program is the number of ideas, products, and processes which become successfully adopted for operational use by the civilian sector.

The necessity for a "delivery system" and the recognition of its significance was always intuitively implicit in UMTA's RD&D activities, but it has obtained explicit articulation, endorsement, and support only during the past year of the program. An outstanding example of this new initiative is the current Downtown People Mover Program, about which I will have more to say later.

Portions of the UMTA R&D program underwent unparalleled analysis, assessment, and evaluation during the past fifteen months by a Secretarial Task Force within the Department of Transportation; by the Congressional Office of Technology Assessment resulting in extraordinary hearings by the Senate Transportation Subcommittee of the Committee on Appropriations last summer; continued evaluation by the Department of Commerce Experimental Technology Incentives Program (ETIP); and culminating last February in the first national R&D Priorities Conference, sponsored jointly by UMTA and the American Public Transit Association (APTA).

Some of the obstacles to and problem areas in UMTA's R&D program which were identified are as follows:

- Shifting priorities,
- Lack of credibility,

- Near term vs. long term objectives,
- Evolutionary vs. revolutionary R&D,
- Lack of continuity between UMTA's R&D and Capital Assistance programs, and
- Lack of a delivery system.

Some of these factors are illustrated here (Slide 4), which is the Congressional funding history of the UMTA RD&D program. The various shadings differentiate the hardware oriented System Development and Technology (lower portion), Service and Methods Demonstrations (middle portion), and Management, Marketing, Planning and Policy-Oriented Research (upper portion) components of our RD&D.

The annual funding levels, as well as the distribution of funds within each year represent two important factors: (1) National (and frequently international) policies as a reflection of the national mood and environment; and (2) the prevailing compromise between two extreme attitudes vis à vis national RD&D policies.

The two extreme attitudes (within a whole spectrum of opinions) may be described as follows:

1. High Technology Advocacy.

According to this extreme philosophy, all existing urban transit is the product of the 19th and early 20th centuries and has failed because our cities changed. Consequently, only the radically new, high technology systems with innovative service concepts and service levels hold out the promise of solving the "urban transportation problem".

2. No Technology Advocacy.

Under this advocacy, the "urban transportation problem" is viewed as a problem not at all amenable to technological solutions or even contributions to solutions. It is viewed primarily as an issue of social priorities, resource allocation, institutional change, and mostly as an economic problem where solutions can be found without introducing any new technology.

Needless to say, neither extreme position can ever be adopted for a national RD&D policy but, since each position has some merit, a middle ground between the extremes is continuously being sought.

During the 1964-1970 period, the UMTA funding was characterized by relatively low levels of capital assistance and very low levels of RD&D funding. More important, the 1960's were characterized by racial, social, and urban unrest; by policies such as war-on-poverty, new towns, etc. There was a trend and a public desire to turn to the problems of our own people and our own cities. The process of disengagement in Viet Nam, accomplishments of our space program, and the subsequent curtailment of space and defense efforts paved the way to the 1970 amendments to the UMTA Act which significantly increased the funding level for the UMTA program reflecting a national commitment to revitalize our urban centers and finding a civilian outlet for our aerospace and defense production capacity.

The period of 1970 through 1973 was characterized by continuously increasing annual funding levels and a great desire to put the Nation's technological know-how to work in order to produce visible, tangible results in

operation in our cities at the earliest possible time. During this time, ambitious research and development projects were undertaken in conventional transit (bus and rail) as well as in new, innovative systems, such as Morgantown and the Urban Tracked Air Cushion Vehicle.

This was a period of great activity, enthusiasm, promises of results, and expectations. New companies were born or formed; the aerospace and automotive industry, as well as the traditional transit manufacturing industry, foresaw a newly created urban transit market rivalling the field of aerospace and potentially capturing a significant segment of the automobile market (replacing the second family car). There was a renaissance of urban rail beginning with San Francisco and Washington building new metros and Atlanta, Baltimore, Buffalo, and others planning theirs. Older cities (New York, Boston, Chicago, Cleveland, Philadelphia) were planning on rejuvenating their fleets, expanding their systems with new lines, and introducing the yet-to-be-developed Light Rail Vehicles. There were 40 or more communities in the U. S. at various stages of planning some application for some form of Automated Guideway Transit Systems (PRT or people movers or like systems).

Two factors contributed to the short duration of this period, each of which teaches a lesson and which, therefore, will be reviewed briefly as follows:

1. Overstimulation of the Urban Transit Market.

As increasing Capital Assistance funding became available during the 70's, the resultant demand increased even faster so that, in 1973 and since then, the demand has exceeded the available funds. Simultane-

ously, as labor rates and inflation increased both operating and equipment costs, and revenues failed to increase commensurately, partly because raising fares adequately was politically unacceptable and partly because the anticipated increase in passengers would take years to materialize, the operating deficit of transit increased alarmingly. Thus, capital intensive transit began to appear to many as the "bottomless pit" that no one can fill or afford.

2. The Apparent Failure of New Technologies.

The well publicized problems (technical, financial, contractual, and initial operational) of BART, Airtrans, and Morgantown introduced a credibility gap for new technologies among the public, the press, the Administration, and Congress. There was an almost universal conclusion that new transit technologies are expensive, unreliable, and do not work.

As a result, the period of 1974-75 is dominated by a retrenchment away from high technology, an increasing reluctance to take highly capital intensive initiatives, and the emergence of a desire to improve what we already have gradually with great emphasis on cost-effectiveness through better managerial and marketing techniques, service and operational improvements, and introduction of new, non-capital intensive concepts to transit systems. While Capital Assistance funding continued to increase and new legislation in 1974 even introduced operating subsidies at the Federal level for the first time, the RD&D funding was decreasing and, within the RD&D funding, a significant shift away from the hardware oriented research and development occurred.

Non-capital intensive solutions favoring paratransit, shared ride, carpooling, reserved bus lanes, contra-flow, bus priority systems, traffic management, considerations for auto-free zones, vanpooling, and jitneys came to the forefront of innovation. A Nation which was used to technological progress developed doubts about technology as the solution for its urban transportation problems. The irony of this development is that it was not technology that failed, but rather the method of its introduction, the unrealistic promises, and the general impatience which attempted to deploy complex, sophisticated new systems from laboratory research through full operational product development on our city streets in two to three years.

It is hard to understand how a highly industrialized society like the U. S., which witnessed the emergence and success of computers and automatic data processing taking ten to fifteen years and costing hundreds of millions of dollars, and which accepts a 5-year development cycle for a new line of automobiles at a cost of \$100 million or more (after three-quarters of a century of building similar automobiles) could become alarmed at the \$50 to \$60 million cost of total development and deployment of fundamentally new systems such as Airtrans and Morgantown and expect operational perfection two to three years after beginning the R&D.

One cannot escape observing that there is a fundamental incompatibility between technological change, which ordinarily takes ten to fifteen years from R&D to broad product acceptance, and the political and public attitudinal change which is often measured in two to four year increments. Governmental R&D planning and objective setting must find a way to bridge

or at least lessen the impact of this incompatibility, especially when it addresses problems or developments for the civilian sector.

As mentioned earlier, the year 1975 was a very significant one for urban transportation R&D in the U. S. If, in retrospect, one considers the years of 1970-73 as overambitious and the years of 1973-74 as overly cautious, then 1975 might be viewed as the year when rational thinking began to prevail and the rapidly swinging pendulum returned to its stable middle position where it will rest for a while. This, of course, remains to be seen.

During 1975, several of the early R&D initiatives bore fruit; Airtrans and Morgantown are in operation, Gas Turbine/Electric trains are operating in New York and Long Island, the Energy Storage Cars are carrying passengers in New York City.

It was partly these tangible results, coupled with national awareness and concern over the ever-increasing operating deficits (approaching \$1.5 billion annually) which resulted in a reversal of R&D appropriations during 1975 for Fiscal Year 1976. After three years of declining funding levels, there was a slight increase in the FY 1976 appropriations, and it is anticipated that the trend reversal will continue for FY 1977.

More important perhaps than the reversal of funding levels are the results of national debates and assessments of the Federal role, policies, and priorities that occurred during the year. The more important ones are as follows:

1. Near term vs. Long-term RD&D.

If one defines "near-term R&D" as that which produces operational deployment of results in five years or less, a trend was introduced for more emphasis on this type of near-term R&D. A large segment of UMTA's non-hardware oriented RD&D falls in this category; namely, the Service and Methods Demonstration Program and Marketing and Management Oriented R&D, as well as Urban Transit Planning Software Development. In conventional transit hardware, R&D in support of standardization, safety, cost reduction, and limited product improvement, as well as energy conservation oriented R&D and applications, will be emphasized. In innovative transit, emphasis will be shifted to improved reliability and service availability. Better understanding of socio-economic factors attendant upon introduction of transit automation is also being sought, and cost-reducing standardization of state-of-the-art systems is being pursued.

Nevertheless, there is a full recognition of the need for continued Federal R&D participation in the high risk, high technology activities which provide a baseline for new innovations to be introduced five years or more from now.

Slide 5 illustrates the split between near-term and long-term project funding. The two most significant results here are the distinction between near-term and long-term R&D--the two are often confused by trying to do long-term R&D under near-term commitments--and the recognition of the need for both.

2. Continuity of R&D and Capital Assistance Programs.

The UMTA Capital Assistance Grant Program is the natural delivery mechanism for UMTA's most promising R&D results. It is the Federal Capital Assistance Program that creates the urban transit market and Governmental policies do impact the market segment that competing transit alternatives can capture even through product selection is a local choice. Under Administrator Patricelli's leadership, and with his insistence, there is hardly an issue in UMTA in which the Office of Research and Development does not participate. And, just as we review alternative analyses or technical choices under Capital Grants, they review and pass judgment on proposed R&D Programs. This is how it should be. Furthermore, by assignment to the Office of Research and Development of the Safety and System Assurance, Standardization, and Technological Qualification functions, as well as the continuing responsibility for systems which transition from R&D to Capital Assistance, such as the Downtown People Mover, the bonds and the interdependence of the two offices have been immensely strengthened.

3. Responsiveness to the Needs of the Constituency.

There is a new dialogue between transit operators, taxicab associations, local communities, industry, and UMTA. There are workshops, consultative bodies, advisory meetings, and reviews held in connection with most of our R&D programs to obtain user input throughout the life of the project.

A proposed National Cooperative Transit Research Project, patterned on the highly successful National Cooperative Highway Research Program, is presently under review in the Department as a potential legislative initiative.

4. Improved Credibility.

It is a well known fact that major system development programs take several years--five to ten years is not uncommon for the sequence from R&D to urban deployment and successful operation. Yet, our political and democratic processes often introduce radical shifts in policy, objectives, or implementation, typically at two or four year intervals. This will sometimes upset the applecart for some programs. Nonetheless, it is a price well worth paying for our democratic processes. In some cases, we did let industry down by starting and then canceling programs. We did have credibility problems on our prediction of cost and schedule performance--we overpromised and underperformed in some cases--and some are of the opinion that "we couldn't have gotten there any other way". I do believe, however, that we have learned from these lessons; that we introduced self-discipline. Before any new start, we are examining the need, the anticipated cost/benefits, and the delivery system or method to bring the program to its full conclusion and beneficial deployment. I hope we are a bit more prudent, if sometimes more cautious and a little slower on our promises.

I feel UMTA's R&D program has been strengthened during the past year or two and we are proud of our accomplishments and are looking to the future with reasonably broad support and high confidence.

We have a respectable list of accomplishments as illustrated on the following three slides, and we are awaiting resolution of our FY 1977 Appropriations with high expectations that we will make significant technological contributions to improving the quality of life in our urban communities through the application of modern technology to mass transit.

This concludes my prepared statement. I will be happy to answer any questions you may have or begin my informal briefing on the program elements of our FY 1977 budget request.