

APPENDIX A-1

Unofficial History of Federally Funded Research, Demonstrations and Training: Issues for Reconsideration

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The intent of this resource paper is to review the recent history of federal involvement in public transportation research and to lay out some of the critical issues which must be addressed in establishing a national agenda for public transportation research, demonstration and development, the charge to this meeting. Given the relatively recent and comprehensive assessment of research needs in public transportation which culminated in the 1987 TRB Special Report *Research in Public Transit*, this paper draws heavily from that source, indeed the first two sections of the paper principally summarize the historical review of the federal research activities and then the proposal for a new research program which emanated from that study. Certain anecdotal observations of Federal involvement in project selection, evaluation and information dissemination are made to illustrate the discussion. In the third section of the program the other major recent initiative in transportation research, the University Transportation Centers Program, is briefly described. Finally some of the key issues in structuring an effective national agenda for public transit research are outlined.

The Federal Role Over the Past Two Decades

The first point that needs to be clearly recognized is that over the past twenty years there has been a substantial amount of research focussed on public transit, with the Urban Mass Transportation Administration (UMTA) playing the lead role. Throughout the 1970's expenditures averaged some \$60 million per year, or about 1.5 percent of the industry's gross revenues. The sharp declines in transit research which occurred in the 1980's, to a low of \$22 million in 1986, about one-fifth of 1 percent of industry revenues, might well be seen as an inevitable reaction to the general perception that the research expenditures of the 1970's had not led to significant improvements in the operating position of the industry. Before considering new research initiatives it is essential to try to learn any lessons from the past which might prevent history from being repeated. While it is true that current research expenditures are extremely modest by the standards of the private sector, or indeed related public sectors such as highways, this is not a sufficient basis for concluding that they should be increased. Rather what is needed is to see whether research programs can be structured to be more effective than those which existed in the past, and whether demonstration projects emanating from such programs can be selected, evaluated and results disseminated to effect a positive change in the transit industry.

This discussion will focus on the UMTA research program since this continues to be the dominant source of funding for transit research, even though individual transit authorities, manufacturers and foundations do contribute to the total transit research picture. While there was a modest amount of transit research funded in the mid-1960's, principally aimed at demonstrations of fare reduction and service improvement strategies, federal transit research since the late 1960's can be, albeit somewhat grossly, characterized in three phases: large scale new technology (late 1960's - mid 1970's), strategies to improve existing systems (mid 1970's - early 1980's), and policy oriented to reduce subsidy requirements (1980's). Recognizing the generalizations involved, each of these phases is described briefly below.

Large Scale New Technology

Emanating from the New Systems Studies which occurred at the creation of UMTA, and in tune with the desire to re-channel engineers from the aerospace and defense industries into tackling pressing civil problems, UMTA's initial significant entree into research had a strongly technological bent. Programs such as personal rapid transit, tracked air-cushion vehicles and computer controlled dial-a-ride required vast sums of money but ran out of support before the promised major technological fixes to the urban transportation problem were realized. In the same era efforts to improve existing systems also had a technological focus, exemplified by the Transbus and the state-of-the-art rail car. The transit industry was extremely skeptical of this adventurous, technologically focussed research program, and was never really a party to it. These UMTA internally determined priorities were of little interest to the industry dealing with day-to-day operating concerns. While there appears to have been considerable focus on evaluation and dissemination of the results, this industry skepticism died hard -- it took years, sometimes decades, for parts of certain innovations to work their way into the mainstream of the transit industry. Some (such as mag-lev and computerized dial-a-ride) are beginning to emerge once again as "new" innovations.

Strategies to Improve Existing Systems

While the large scale technological research begun earlier continued in this phase, increasingly it was recognized that the pressing problems facing the transit industry also deserved a place in the research agenda. Thus while hardware research continued to receive a large share of the federal research budget, the service and methods demonstration program was substantially expanded and the National Cooperative Transit Research and Development Program (NCTRP) was launched to tackle shorter term research problems identified by the industry. Real progress was made during this period in closing the gap between the UMTA

research agenda and what the transit industry felt were the important research needs. During this time UMTA experienced its greatest success in terms of evaluating and disseminating results of research and demonstration projects. For example, the annual research program summaries "Innovation" started in this period (mid-1970's) but tapered off a few years later (1982 to 83). Other UMTA publications seemed to follow a similar pattern. However results from the more pragmatic, shorter term research projects still seemed to have little impact on the transit industry as a whole, with many demonstrations not being continued past the stage of UMTA funding.

As for new projects, there was some feeling that UMTA was heading toward more policy-based research. In UMTA research and demonstration program cutbacks some independent evaluations were stopped. In part this may have been due to lack of clear demand for the lengthy, complex reports that were often produced. As a result, many valuable lessons learned and new ideas were lost for future research and demonstration.

An example of this was the local Technical Advisory Office, set up with an UMTA Section 6 demonstration grant to provide technical assistance to 82 cities in Los Angeles County that had just begun to receive allocations of a local sales tax for transit. Many new approaches were tried. Several succeeded. Some failed. The final version of the report did not contain the full details of the findings such as the description of successes and failures. Thus valuable observations were lost to any who might read the report in hopes of developing variations of the concept for implementation.

Many of the demonstrations of this period, deemed mixed successes at the time, later became standard service types in some areas. Examples of these programs were paratransit and subsidized taxi services -- paratransit services have tripled since 1980.

Policy Oriented to Reduce Subsidies

During the past decade major changes have been made to the federal transit research program. First and foremost, the level of funding has been drastically reduced. The research program has been shifted away from hardware and technology to emphasize technical assistance for projects which are supportive of federal policy towards public transit, and specifically towards activities likely to reduce future subsidy requirements. The systematic scaling back of transit research has eliminated funding for many initiatives which were of little, or no, interest to the transit industry, but there emerged a strong feeling that the remaining research was following an agenda orthogonal to industry concerns. At the same time UMTA's belief in, and support for, the industry-initiated NCTRP research agenda dwindled -- and with it funds for the program. Growing disagreement

between the transit industry and UMTA on strategy for the industry and the role of federal government further undermined the potential for research findings to be applied in the industry.

In the mid-1980's, project selection was almost entirely policy-driven. Often these policies reflected neither the transit operators' specific needs or variances in local conditions. This sometimes resulted in "demonstrations" in reluctant or unwilling areas. A case in point was the selection of five sites for demonstration of private sector contracting. Only two of those sites (Snohomish County, Washington and Los Angeles) were able fully to implement the demonstration projects. Other sites ran into either labor or contractor problems, in part because UMTA selection criteria and funding conditions were not adaptable to local circumstances.

The transit industry refers to UMTA and other federal regulations as a key component in cost increases (running the gamut of Section 13(c), contracting requirements, Buy America, Civil Rights and others). However, Federal policies and regulations have often been a constraint to innovation as well. A case in point has been the entrepreneurial services program. Initially conceived to get private sector proposals for the provision of transit services utilizing Federal capital dollars as a "seed" for ongoing private sector support, some local projects encountered Section 13(c) labor constraints early on. Fortunately this program was able to be reconfigured to meet federal constraints, but the example of the impact of regulations on innovation is still relevant.

During this time, written information dissemination has been minimal and mostly focused through PPTN (the Public Private Transportation Network) and various UMTA workshops and symposia. The "hands on" approach of the PPTN, where experts are dispatched directly to a transit property or agency needing assistance, has great promise as a "user-friendly" information dissemination technique. To date PPTN has focused most of its assistance on implementation of major federal policy initiatives (such as privatization, suburban mobility and entrepreneurial services). The program could be strengthened if it supplied a cadre of experts in a variety of fields. PPTN technical assistance documents, while generally recognized as well-prepared and helpful, have shared a similar fate in that they have been targeted at assisting with major Federal initiatives, not always focussed on the broader arrays of issues facing transit operators.

In addition due to financial constraints, UMTA evaluation of demonstration projects has continued to be de-emphasized. While UMTA has occasionally provided funding for transit agency-sponsored projects (such as the Los Angeles bus service contracting demonstration), independent contractor evaluations (such as those done under the auspices of the Transportation Systems Center and by the Urban Institute in the early 1980's) have been rare.

While there have been major shifts in the federal transit research priorities over the past two decades, it would be hard to make a strong case that the federal program has had significant positive impacts on transit industry performance at any point in time. Several reasons might be advanced to explain this lack of effectiveness. First, at no point has the industry been in full agreement with UMTA's priorities, which have frequently been established without substantive input from the industry. In this context it is unlikely that even if good results emerge from research they will be readily embraced and adopted. Second, there has been a clear (and perhaps inevitable) tendency to put the best possible face on research and demonstration project results. This has made the industry even more skeptical about the real impacts of new strategies because of a perception that the written reports may not tell the whole story. Finally, for much of this period dissemination of research results in a form easily accessible to managers besieged with daily operational crises, was lacking. While real progress has been made on this front over this period, effective results dissemination will remain a challenge in any future transit research program.

Transit Strategic Research Initiative

The TRB special committee which was established to examine the strategic research needs of the transit industry identified three distinct types of transit research: technological, federal mission support, and problem solving. While UMTA had undertaken research (albeit with mixed success) of the first two types, it was concluded that the top priority for a new transit research program to meet the most critical needs of the industry was of the problem solving type.

To quote directly from the Executive Summary of the TRB Special Report 213, the committee recommended:

- Transit agencies should sponsor an operator-oriented, problem-solving research program focused on high-priority topics of common interest such as human resources management and maintenance.
- Program funding of approximately \$10 million annually could be provided through a mandated set-aside by local operators of 1/2 percent of their federal formula grants (Sections 9 and 18 of the Urban Mass Transportation Act of 1964 as amended) on which the required local match would be waived.
- The transit industry should seek legislation to authorize the set-aside and clarify that research by local transit agencies is an eligible Section 9 and Section 18 program activity.
- Transit agencies should play a dominant role in managing and implementing the research program through representation on a governing board to provide program policy guidance.

- The transit industry, under the leadership of an organization like the American Public Transit Association (APTA), should assume primary responsibility for broadening industry support for the recommended research program, selecting an appropriate program administrative structure, and seeking the required legislation.

To illustrate the basic thrust of the problem solving research program the committee identified the following promising research topics: human resources management, service configuration and marketing, service delivery models, internal efficiencies, maintenance, equipment and innovative financing.

In the three years since the completion of the TRB committee report the pre-implementation phase has been conducted by the APTA Transit Research Task Force, and UMTA has proposals under study for major restructuring of the federal research program.

University Transportation Centers Program

Two years ago the \$10 million per year University Transportation Centers Program began. Because of its size and newness it seemed appropriate to describe it briefly in this paper, and to discuss its potential contribution for addressing the emerging transit research agenda.

The University Transportation Centers (UTC) Program was established by the U.S. Department of Transportation as a result of the 1987 Surface Transportation Assistance Act to provide research, education and technology transfer in all modes of transportation. After a competitive procurement ten University Transportation Centers, one per region, were selected for inclusion in the program and each developed a program of activities funded at the level of \$1 million per year per center (for the first two years of the program only \$500,000 per center was actually provided annually) with the same amount to be provided in matching funds. The program is now entering its third year of the initial four year authorization. At the full funding level half the funds are provided by UMTA and half by the Federal Highway Administration, thus this program represents a significant fraction of all UMTA research funds.

While in each region there is a designated university transportation center, this title is a little misleading since in most regions there are several universities involved in a consortium with a lead university. In general each consortium was created not only to provide breadth of expertise, but also to maximize the chance of each university receiving some benefit from the program. Unfortunately the existence of consortia places a premium on spreading program funds around each year, and this may impose a price in terms of effectiveness of the program. Highly worthwhile activities at one

university may be deferred in favor of more marginal activities at another university because of the desire to keep all universities funded. A related concern is that although each consortium is funded at an annual level of \$1 million, the size of individual projects may be below critical mass because of the premium placed on keeping all universities involved. Although each consortium has defined a program theme which should define the domain of activities, there is a strong tendency to keep the theme broad so that most activities can be included. Consequently there may be little synergism between the different activities underway in each regional consortium.

There are two other concerns raised by this program which are directly relevant to the topic of this paper. The first is that while DOT is responsible for program review, it is really up to the universities themselves to structure the research agenda, which may, or may not, be consistent with either UMTA's or the industry's views on what research priorities should be. Typically industry provides advice on priorities, but the universities may follow it, or ignore it, as they see fit. Because the structure of the program is a "bottom-up approach" it is unlikely that the UTC program will substitute for a coherent national research agenda either in transit or more broadly in transportation. The final issue is that universities may not be able to respond quickly to increased availability of funding for transit research, because many faculty have become more interested in other transportation research topics as funding availability has shifted away from urban transportation over the past decade. This was evident in the first and second years of the UTC program when much less than half the research was focussed on transit, even though UMTA provided substantial funding. While some faculty, and some universities, retain strong interest in transit research, and the fraction of transit research in the UTC program is now increasing, it would probably be unwise to rely exclusively on universities if a large new transit research program is to be mounted.

Issues for Consideration

To conclude this resource paper we will simply identify some of the important questions that deserve discussion in establishing a new research process and agenda. There are doubtless many more which will be added in the course of this meeting.

- How does the federal government develop a research and demonstration program agenda that is more in tune with transit operator needs and is implementable by them in the short term?

- How do the federal government and researchers further quantify improvements (for example, in mobility produced per dollar)? What are the keys to transit operator acceptance of these methods?

- The new federal policy calls for intermodal and multimodal research. How does UMTA position its research and demonstration program to better correspond to similar programs by FHWA?

- How does UMTA conduct outreach to make research and evaluation more customer-oriented? How can UMTA orient its efforts toward the user-friendly, instant consumption that transit agencies currently demand?

- Why has so little research been done (or at least implemented) to date in high-payoff activities such as timed transfer, labor innovations and marketing?

- Is the Federal government equipped to handle new research and development demands with the staff cutbacks that have taken place in recent years? If not, how can contractors be more effectively utilized to evaluate and disseminate results?

- How should research and demonstration projects be identified and evaluated for potential funding?

- How can UMTA research, demonstration and development programs be designed to foster local research combined with national evaluation and information dissemination?

- Given that the climate fostering "space age" technology in the 1960's and 1970's appears to be re-emerging (cutbacks in the defense and aerospace industries are leading to the need to redeploy these technical resources), how can we learn from R&D projects of the past in designing future approaches to new technology research, demonstration and evaluation?

- How can UMTA demonstration programs be redesigned to be adaptable to Federal regulations and constraints (or similarly, how can constraints be modified to foster innovative approaches and financing?)

- If UMTA's "satisfied customers" such as the authors of this paper are so critical, what does the rest of the industry think?