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16. Abstract This is a compilation of material that was presented at the Third UMTA R&D Priorities Conference Workshops on Access for Elderly and Handicapped Persons. Part I deals with planning and regulation and includes discussions of the transportation problems of handicapped people and transportation policies and practices as they affect handicapped people. Part II, demonstrations and hardware, includes discussions of some of the concepts under development in the area of transportation for the elderly and handicapped hardware research and development to improve transit for elderly and handicapped travellers, and a critique of research concerning transportation for the elderly and handicapped. This volume contains five resource papers which can be found summarized in Volume I of this report along with summaries of other workshop sessions. Volume I also includes the proceedings of the general sessions and a listing of conference participants.			
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PREFACE

This report contains proceedings of workshop sessions 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. This volume contains the following:

Access for Elderly and Handicapped Persons Workshops

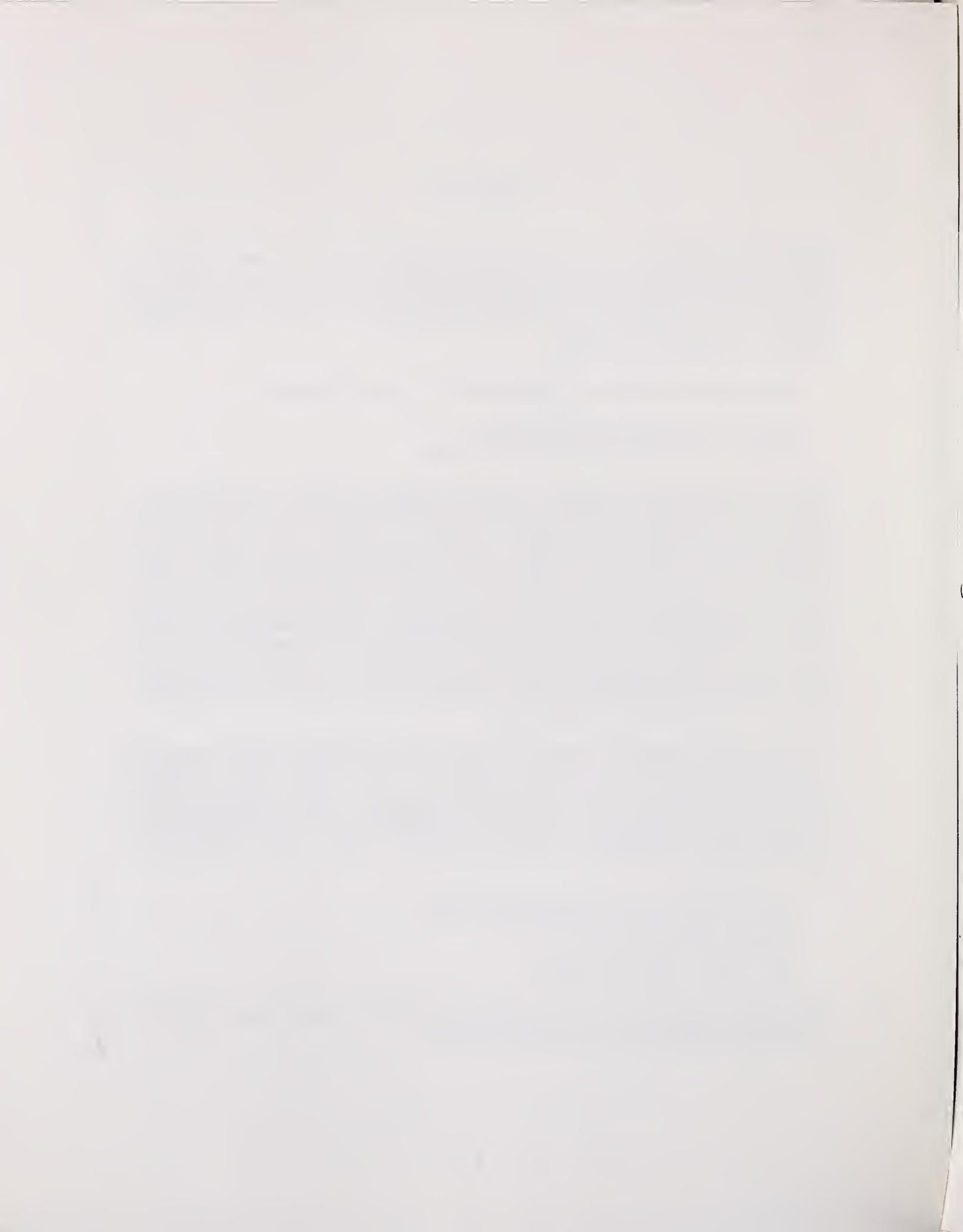
- Part I : Planning and Regulation
- Part II: Demonstrations and Hardware

These conferences are sponsored periodically by UMTA to enable them 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 purpose 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.

The volume containing proceedings of the general sessions and summarized reports of the workshops has been published by the Urban Mass Transportation Administration. However, because of the volume of papers, presentations, and discussions, detailed proceedings of the workshops have been compiled into separate reports by subject area. All of these documents are available from:

National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

When ordering copies of these reports from NTIS, please refer to the list of reports numbers and titles which follows.



1. Third UMTA R&D Priorities Conference, November 1978, Volume I: Proceedings of General Sessions and Summarized Reports of Workshops, DC-06-0157-79-1.

2. Third UMTA R&D Priorities Conference, November 1978, Volume II: Proceedings of Bus and Paratransit Technology Workshops, DC-06-0157-79-2.

Part I : Paratransit Integration

Part II: Bus Technology, Paratransit Vehicle Development, Flywheel Energy Storage System

3. Third UMTA R&D Priorities Conference, November 1978, Volume III: Proceedings of AGT and Advanced Systems Workshops, DC-06-0157-79-3.

Part I : AGT Socio-Economic Research and AGT Applications

Part II: AGT and Advanced Systems and Technologies

4. Third UMTA R&D Priorities Conference, November 1978, Volume IV: Proceedings of Service and Methods Demonstrations Workshops, DC-06-0157-79-4.

Part I : Pricing Policy Innovations

Part II: Conventional Transit and Paratransit Service Innovations

5. Third UMTA R&D Priorities Conference, November 1978, Volume V: Proceedings of UMTA Special Technology Programs Workshops, 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

6. Third UMTA R&D Priorities Conference, November 1978, Volume VI: Proceedings of Rail and Construction Technology Workshops, DC-06-0157-79-6.

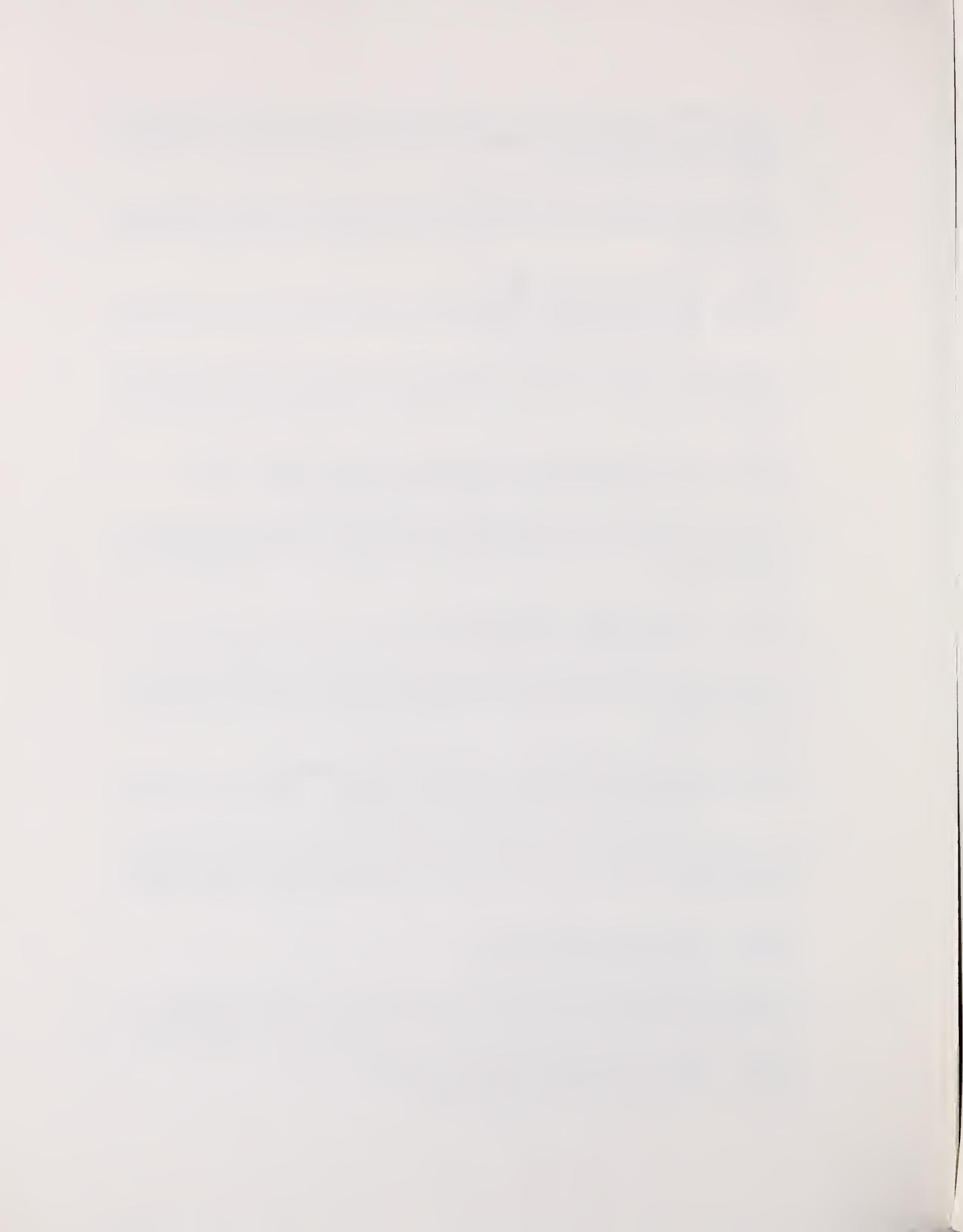
Part I : Railcars and Equipment

Part II: Construction Technologies

7. Third UMTA R&D Priorities Conference, November 1978, Volume VII: Proceedings of Transit Management Workshops, DC-06-0157-79-7.

Part I : Management Systems Developments

Part II: Human Resources Development

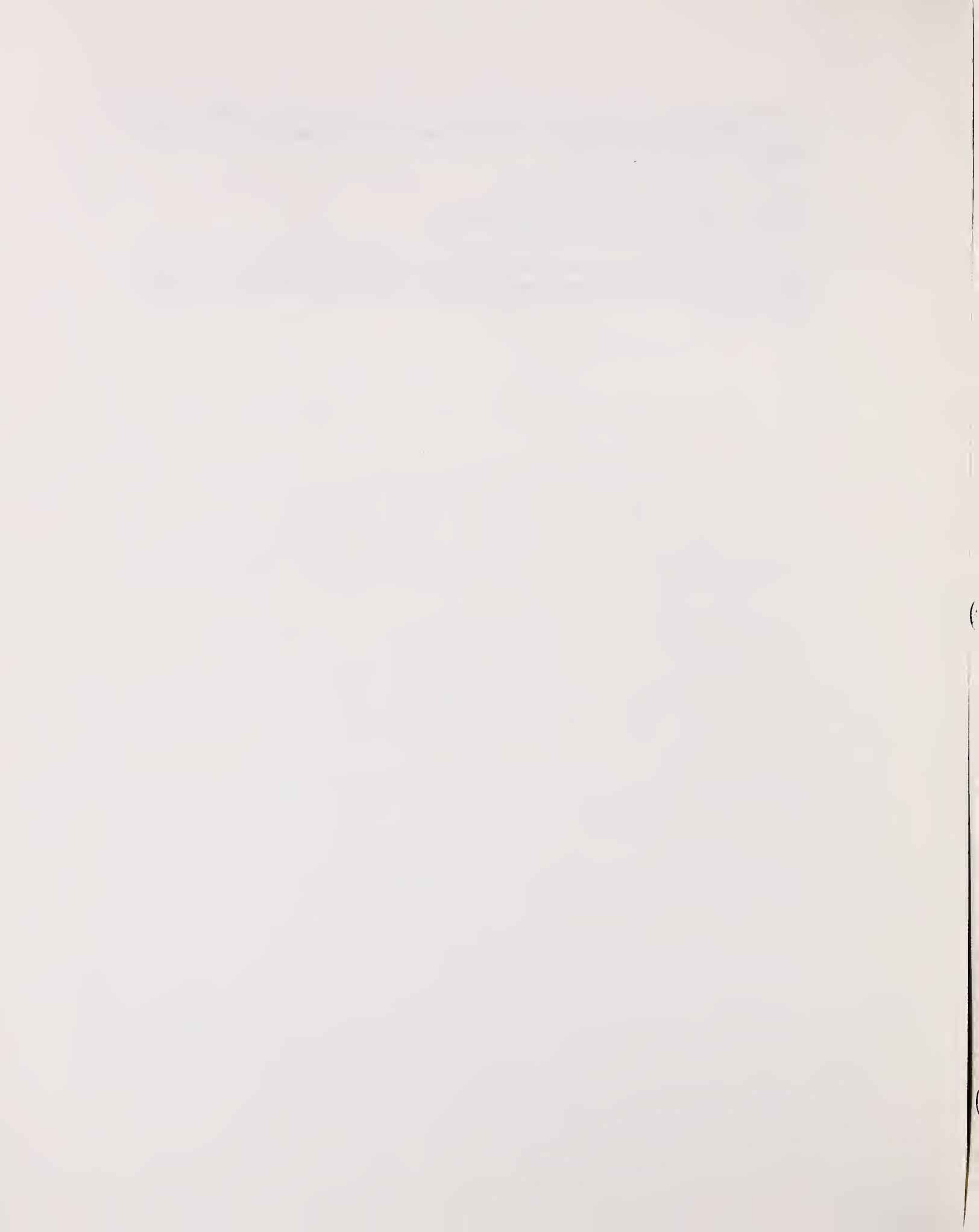


8. Third UMTA R&D Priorities Conference, November 1978, Volume VIII: Proceedings of the Access for Elderly and Handicapped Persons Workshops, DC-06-0157-79-8.

Part I : Planning and Regulation

Part II: Demonstrations and Hardware

9. Third UMTA R&D Priorities Conference, November 1978, Volume IX: Proceedings of the Urban Transportation Planning Workshop, DC-06-0157-79-9.



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

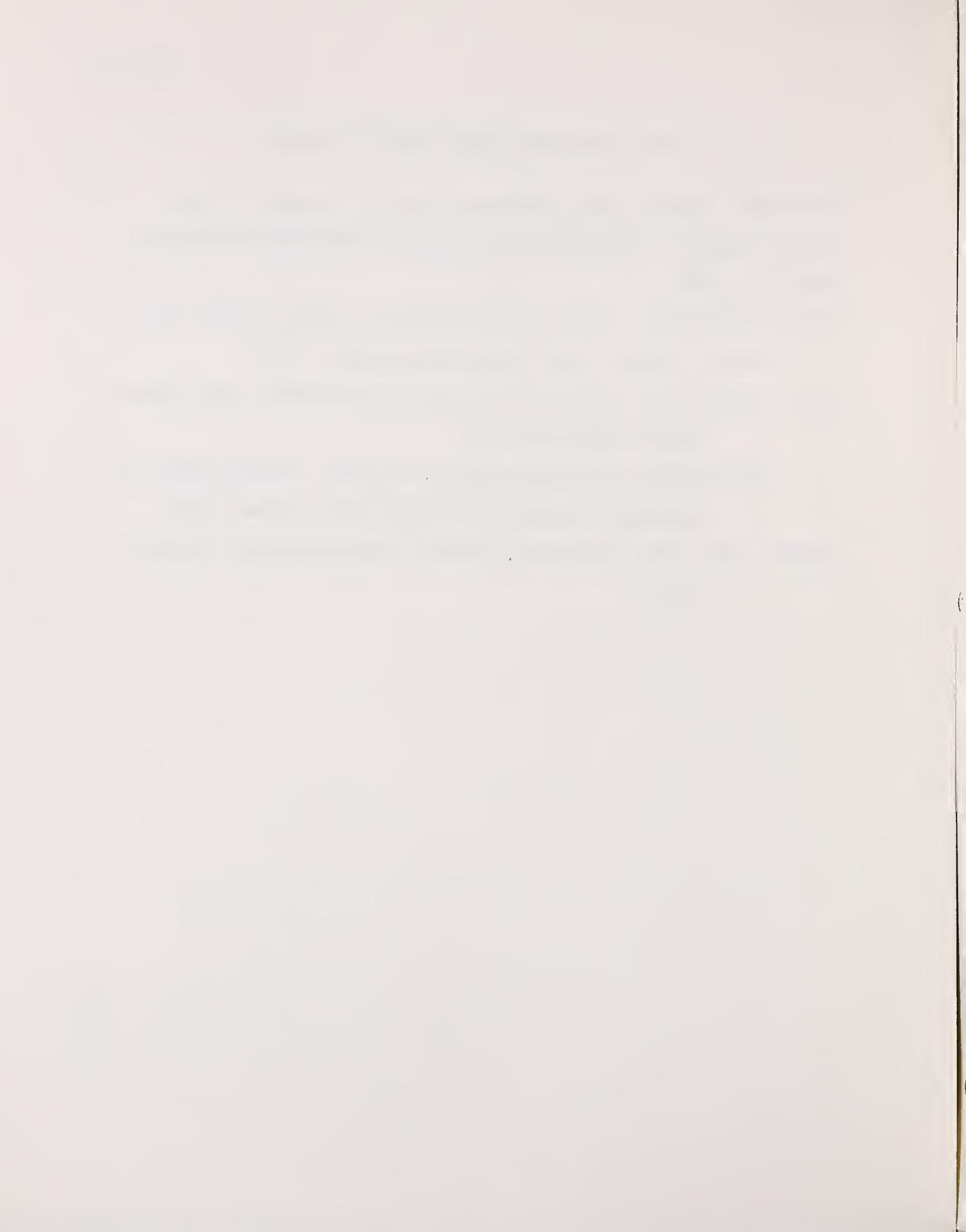
PEOPLE: *Ms. Cass*

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.

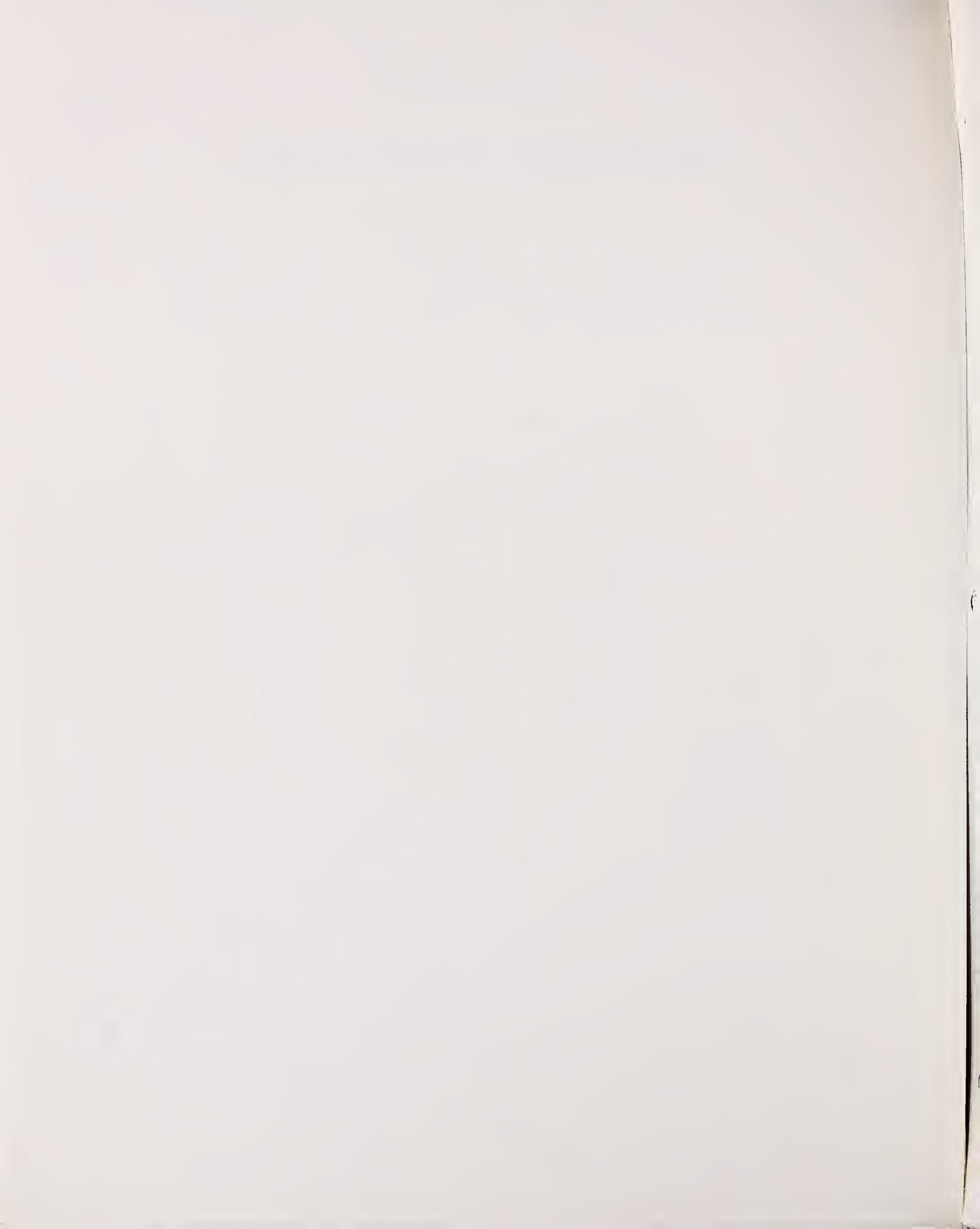
Reporter: *Bruce Spear*, Evaluation Branch, Transportation Systems
Center



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PATRICIA CASS
OFFICE OF SPECIAL PROJECTS
URBAN MASS TRANSPORTATION ADMINISTRATION

In 1972, I believe, maybe early 1973, I was charged with, by the then Secretary of Transportation, to assist the Urban Transportation Advisory Council to try and understand legislation dealing with elderly and handicapped people.

I quickly hired TSC, and together we tried to find out what elderly and handicapped people meant. We initiated a study, a very comprehensive study, to try to define what the words "elderly" and "handicapped" meant.

I have since changed that terminology to say transportation handicapped. I do not believe the Department is concerned with elderly people who do not have transportation problems.

We then funded a major research effort called Transportation Problems of Transportation Handicapped People to the tune of about two million dollars. The primary part of this research was a national survey to find transportation handicapped people and to define them. We conducted the survey in 1977. We found that five percent of the population living in urban areas over five years are transportation handicapped. That is 7.4 million people. We found that they have a variety of handicaps from fear of using transportation systems to the traditional handicaps that we always identify with the person in a wheelchair. Many have multiple handicaps. They may be blind and deaf and in wheelchairs. Or they may have fears and they may be unable to go up stairs, so there is a great multiplicity of problems.

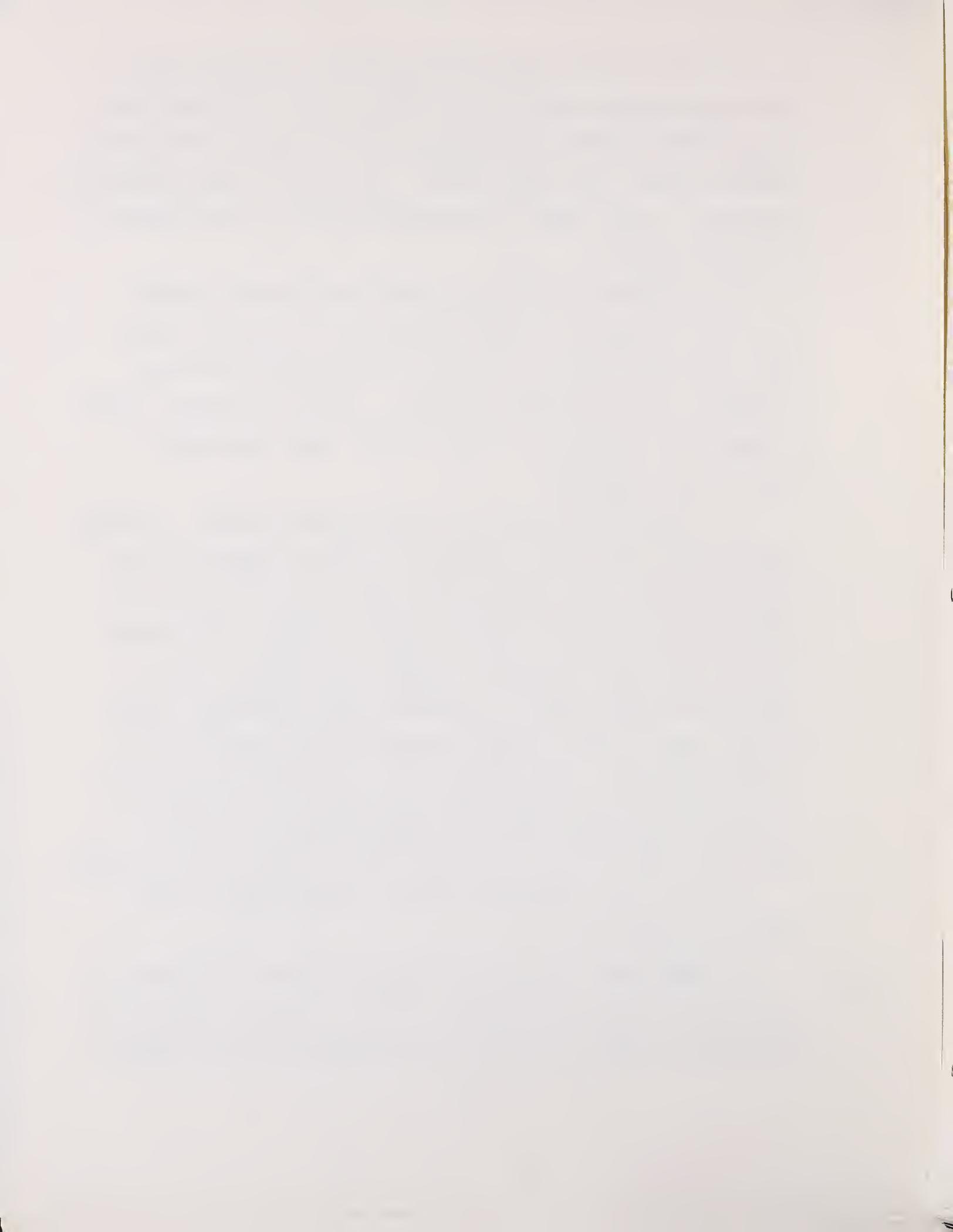
In this national survey we described to transportation handicapped people a variety of alternatives to serving their needs. These alternatives included an accessible, fixed-route transit system, rail rapid and bus. We added to that alternative shelters. We then added an accessible feeder to an accessible fixed-route system.

We described to them an accessible door-to-door system, and we also described to them an option of giving them money which they could use in a variety of ways to pay for transportation, either through modifying a vehicle or hiring a driver or whatever. We did not in any way hint that they might do this to buy a vehicle.

We did not also describe to them how much money. We asked them how many trips they would take on these systems which we had described to them, but systems which they had never seen before, and we came out with two kinds of trips. We came out with a thing we are calling a maximum conceivable, which is everybody that said they would take so many additional trips. We also came out with another ridership figure which we call barrier sensitive. If everybody said they would use that kind of system we filtered them and we found then what their barriers were and we found out if they really could use that system.

So we got two ridership numbers, barrier sensitive and maximum conceivable.

We found that 2.9 million people said that they would use an accessible fixed route system. When we filtered that down we found that only 1.4 million could actually use that system



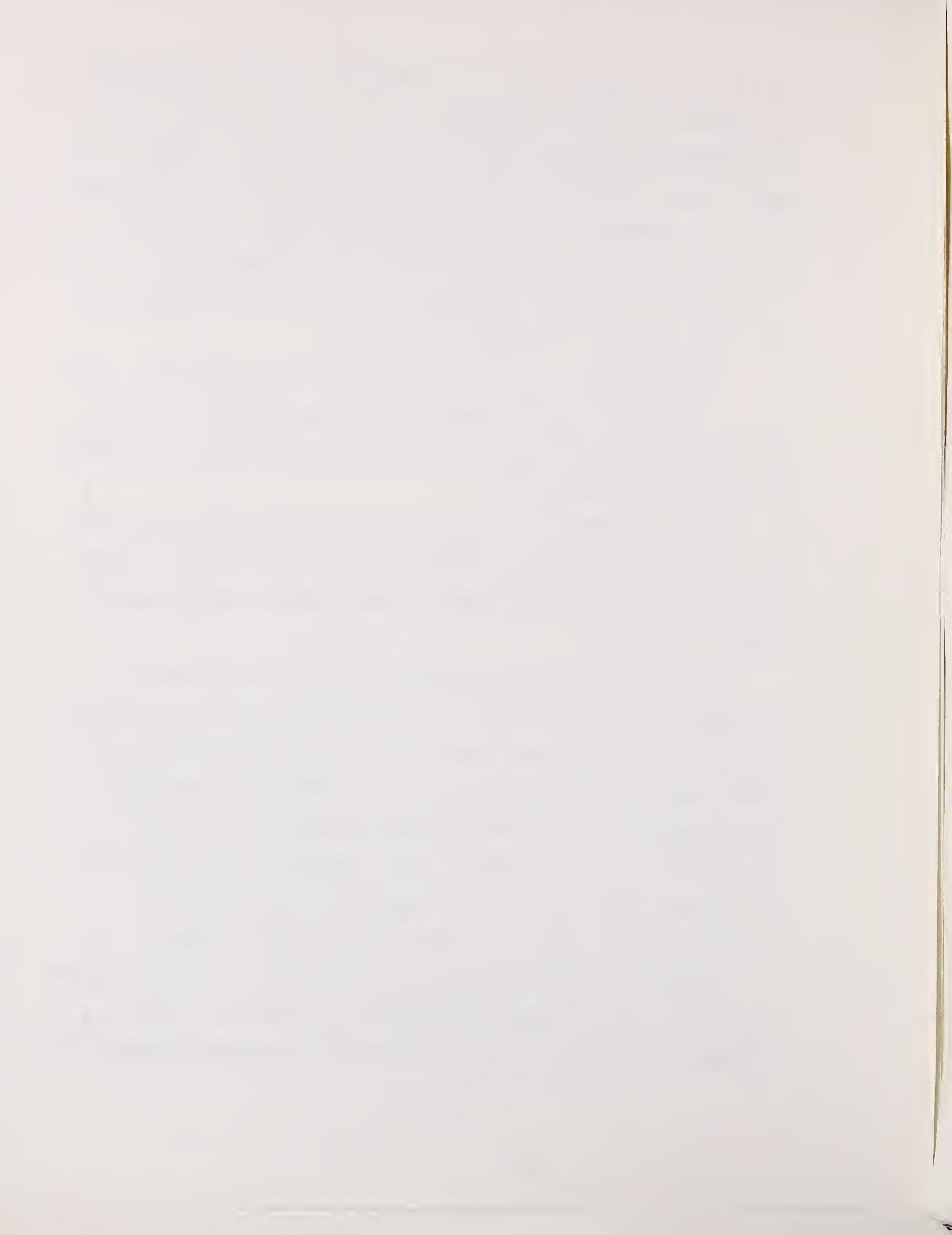
if it were available. We found that they said they would take an additional 9.7 million trips a month. When we did the barrier sensitive analysis, they could only take 4.6 million. We did the same thing with the shelter additive and then with the accessible feeder to the accessible fixed-route. And as you see, the accessible feeder to the accessible fixed-route, we have a little more increase in ridership and increase in people who said they would use that kind of a system.

We did the same thing with the door-to-door service. Again, we got a few more people. We did the same thing with the subsidy, and again, our ridership increased in the number of people who said they would use it.

What we couldn't do on this one was filter them. We only had one number, which is a maximum conceivable number. People said they would like the system, which is not really a system at all, of course.

Just for the sake of the APTA members in the audience, I have been dying to say this for a long time: APTA, as you know, has been publishing a series of articles on 504, and one of the points that they picked up from my national survey was that we asked transportation handicapped people why they were not working. People in APTA looked at this number and concluded only one percent said they are not working because of lack of transportation -- this one percent being 25,000 people.

Remember, this was an open-ended question. We didn't lead them at all. Now, what I would like to show you -- when we did ask them if they would get benefits from these systems which



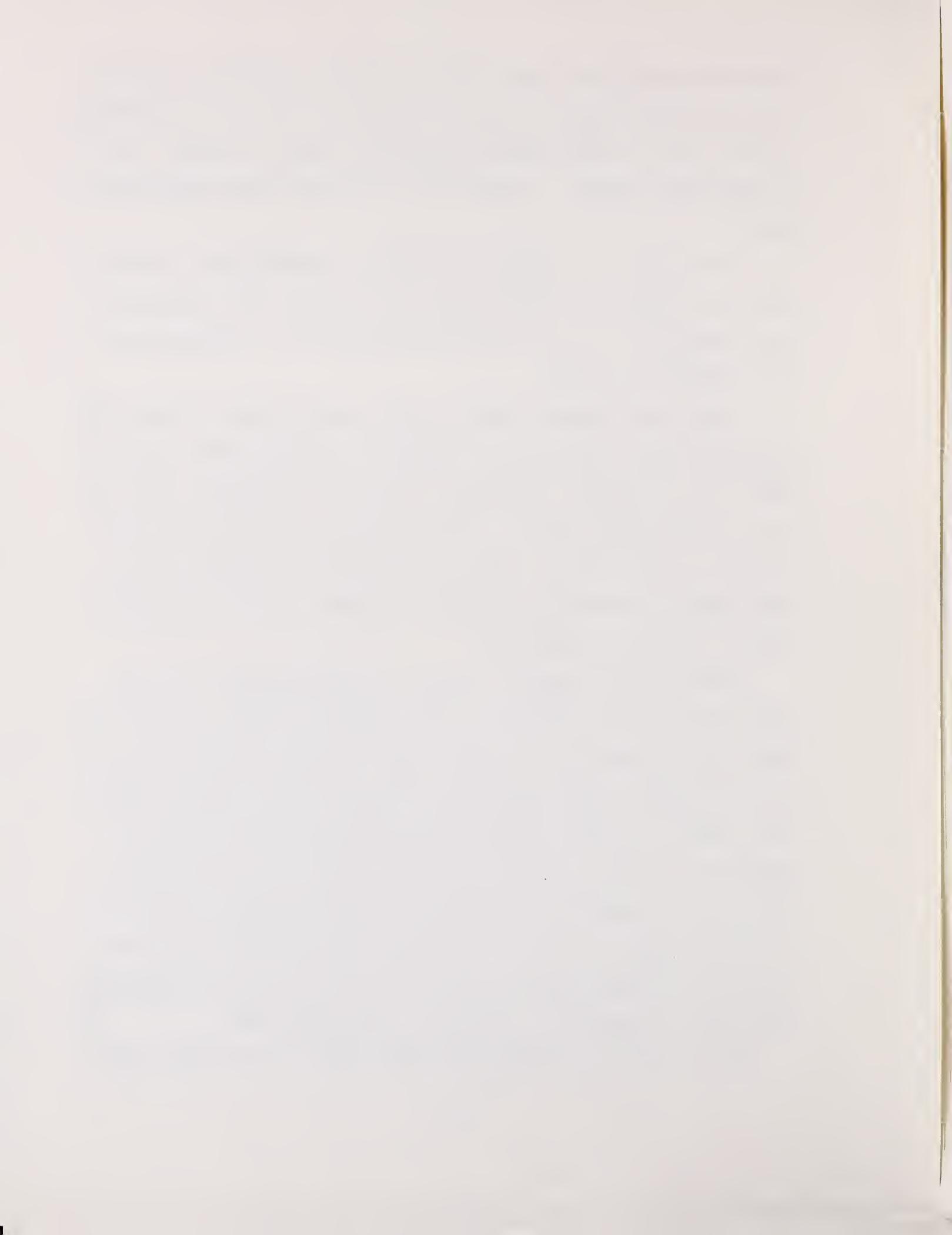
they did not see and we gave them a list of benefits, you will see that 262,000 people said that they would have the opportunity to get a job if there were an accessible transit system. That is not 25,000 people. I think that is a much more significant number.

As we went up through the different alternatives, we finally got to about half a million people who said they would have the opportunity to get a job if another form of transportation were available to them.

Using the ridership figures that you just saw, we have been doing some cost effectiveness analysis on Section 504. We have done it on the survey scenarios, the four descriptions, that we gave to handicapped people. We have done it on our best interpretation of 504, with a variety of interim services, and we have done an alternatives analysis, using a constant ridership under a variety of scenarios.

There are the results. Using the ridership and the descriptions from the survey, we ran a series of models using some basic cost assumptions. We used most of the costs that are now in the economic impact statement on the NPRM with some modifications where we didn't believe that those costs had been well thought out, and we found out that 1.8 billion trips would be served on an accessible fixed-route transit system at the end of thirty years, at a cost of \$1.17 a trip. That's the barrier sensitive ridership and the cost lowers as you use the maximum conceivable ridership to 57 cents a passenger trip.

But you are not giving very many trips. If you will look

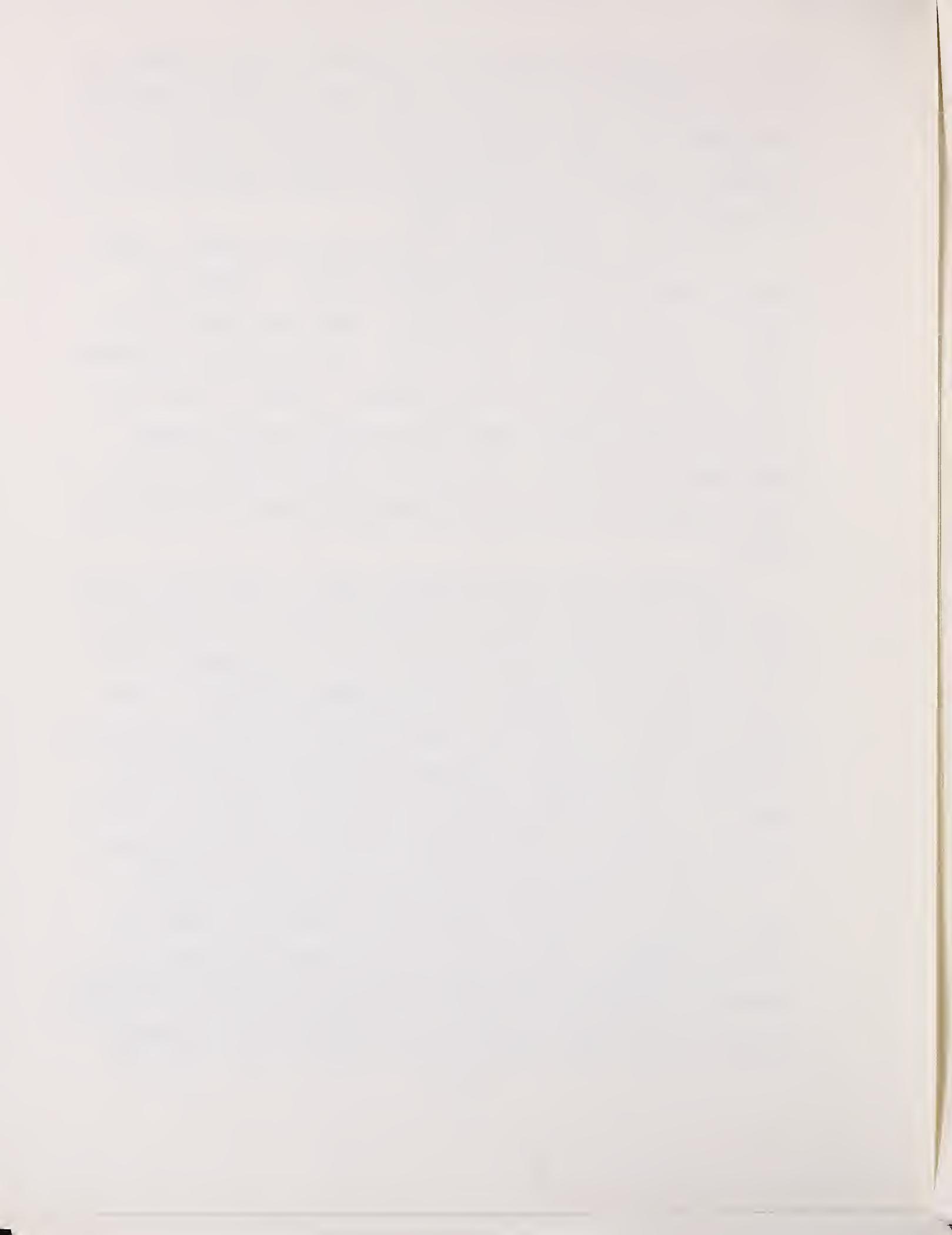


down to the door-to-door system, at the end of thirty years, in urban areas only, 4.6 billion trips would be served, but unfortunately at a cost of \$7.48 a passenger trip. But are we looking for trips or are we trying to provide mobility or are we worrying too much about the cost.

This is our interpretation of 504, with a variety of scenarios, over twelve, twenty and thirty years. I think the twelve is pretty absurd at this time. Let's just look at the interim service provided by a retrofit bus and private operators providing the service for an inaccessible subway, so your cost is \$1.35 for the barrier sensitive ridership, while maximum conceivable is 75 cents. You are not serving nearly as many trips as you saw. You would be serving them with a door-to-door system.

We did some sensitivity analysis where we used the constant ridership. We always took the ridership from the national survey, and we did this in a variety of ways. We discounted this at ten percent and we also did it at inflated dollars at six percent a year. At the end of thirty years you will see that the accessible option where the subway assessment in twenty years comes out to be 32 cents a trip in discounted, \$3.23 in inflated dollars, and \$1.17 in 1977 dollars. Still the cheapest option.

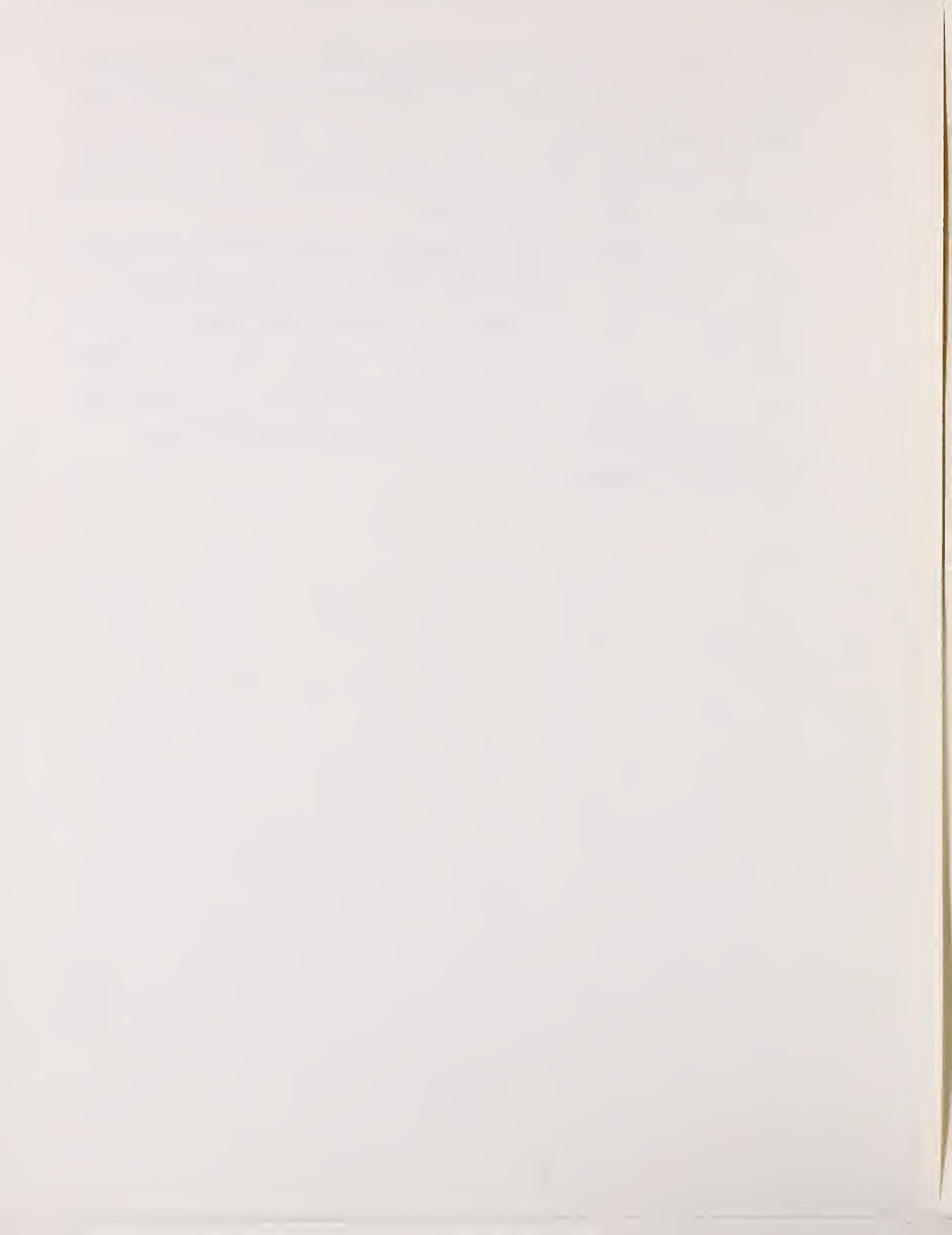
We have been modeling some other things also. We have been looking at -- what it would cost if we did not make the subway accessible, but provided another kind of service. We know what it would cost to make the subway accessible in twenty years. At 1977 dollars you would be paying \$5.39 a passenger



trip. However, if you extend your existing bus fleet over those subway route miles, we see that it would be in 1977 dollars, 94 cents a passenger trip.

I'm not saying that is what we are going to do, but it is an exercise to see various options.

My last graph is just a trade off between making a bus and subway accessible, to providing subsidy to the transportation handicapped. If you draw those two subsidy lines down you will eventually meet the accessible lines. But you have got a fixed cost on your subsidy if you are just paying for every trip, and so it goes quite far out of sight. We don't know how many trips will be served.



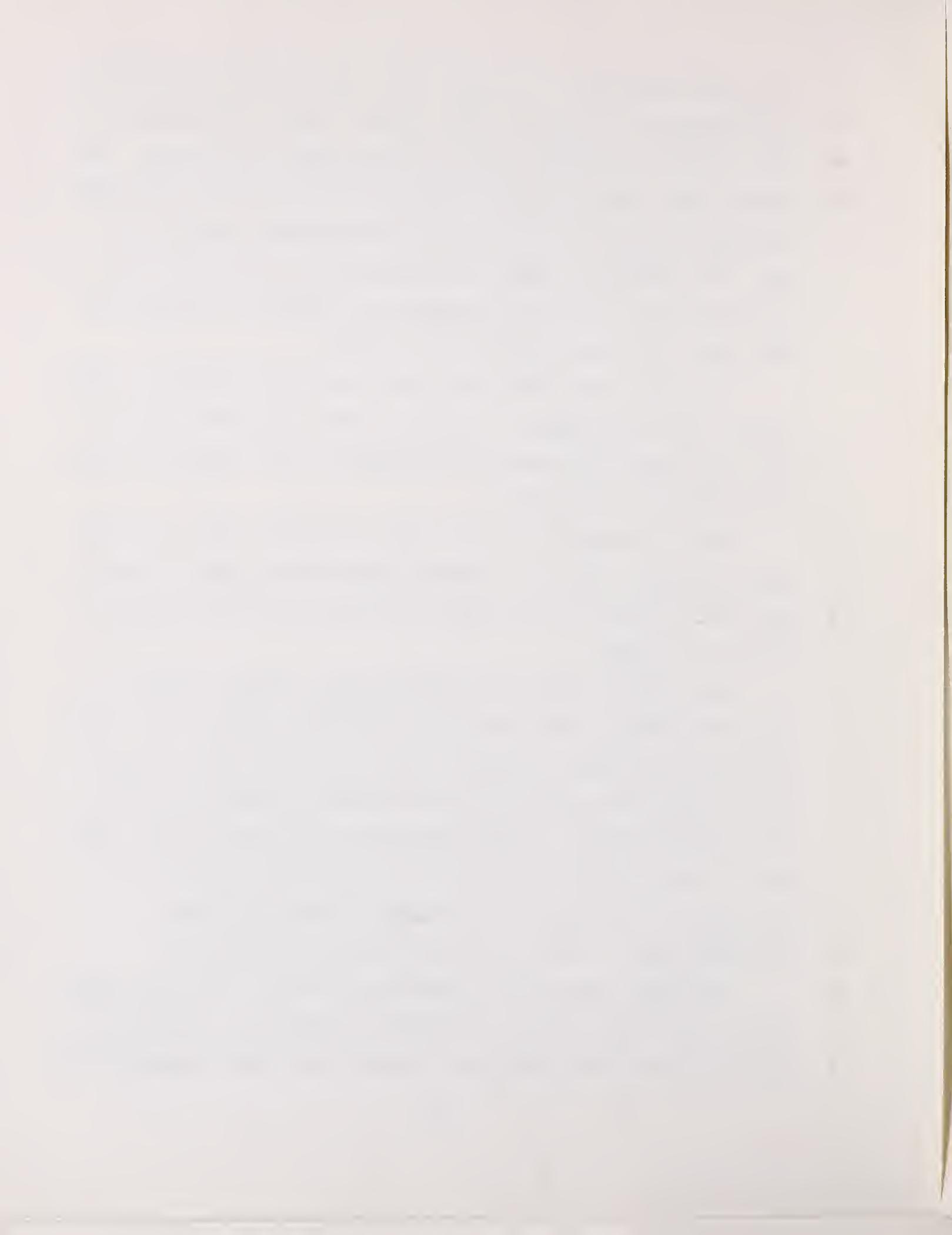
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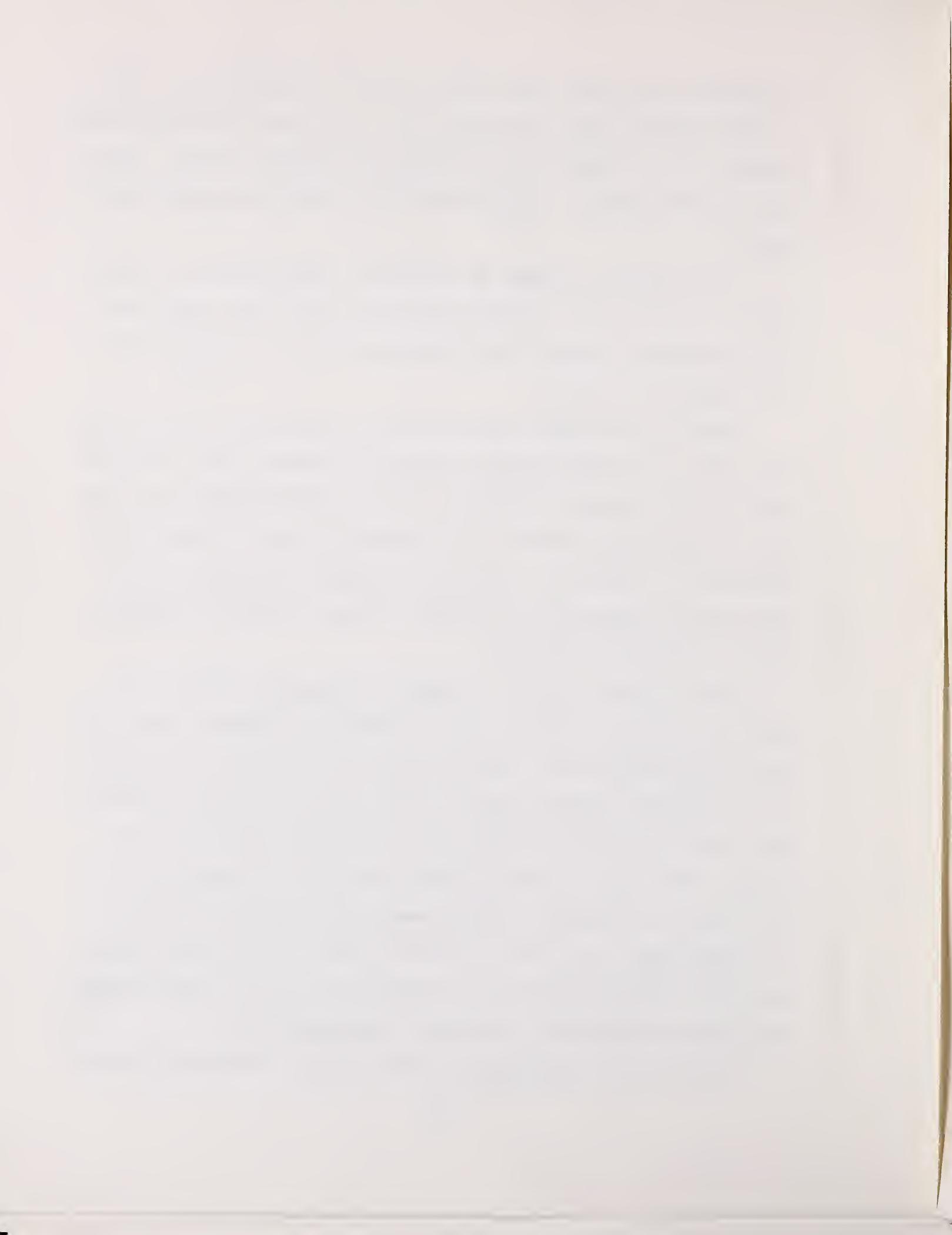
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LILLIAN LIBURDI
ASSOCIATE ADMINISTRATOR FOR POLICY, BUDGET AND
PROGRAM DEVELOPMENT
URBAN MASS TRANSPORTATION ADMINISTRATION

I thought some of the information or comments that were expressed yesterday at the round table session suggested that we in UMTA particularly, but you in the technological development aspect of the industry as well as in the operating side of the industry, think about policy implementation in a particular way. It was suggested that we in UMTA should think about the impact of our policy statements on operations in terms of technological availability and the ability to implement those policy statements in a reasonable way to meet the needs of operations. At the same time we should think about the impact that those statements have on the technological development or evolution of that development.

I am hopeful this morning that some of the comments I make will try to get at the latter, what impact our statement on 504, when we finally issue the regulation, will have on technological change that is necessary to come about to insure implementation. We certainly have considered some of the issues of availability of different kinds of equipment as we have been going through the regulation effort and as we are currently considering the kinds of issues and options we have to understand and recognize before we issue the final regulation.

I want to skip right to a section of the regulation which talks about policies and practices. That section suggests that accessibility is not just a matter of capital equipment and the

operating practices, but also suggests things like marketing, insurance and training that are necessary conditions for the whole service to fit together and to provide a truly accessible service for the patron.

Additionally, in the regulation there are sections which touch on public input especially from consumer organizations and existing providers of specialized services on behalf of the handicapped.

The regulation also requires grantees to prepare a staged transition plan to reach program accessibility within specified deadlines and we think in nonurbanized areas, these plans would likely be submitted with each application, rather than on the annual basis that we had suggested in the draft regulation.

I am setting all of that out because I want you to understand that there are different areas, not only the technological or hardware oriented efforts, that I would like you to focus your attention on.

Now, let me say one thing about the rule making process, because I think it is fair for you to know it. We are right now in the process of analyzing the information received from you in various testimony forms that were presented. It is expected that we will have an analysis of the docket completed within the next few weeks and that we will go into the preparation of issues and option papers that will enable us to make decisions about the information that has been presented and decisions about how the final regulations should look.

We will then probably have by mid-January, if the schedule

is able to be held to, a draft rule available for HEW's review and comments. That step is required by the HEW regulations, 45 days prior to publication. So, we are targeting publication hopefully by the end of March, 1979.

I would like to stress now some of the aspects of the regulation that I think have greater significance for the R&D community particularly. I think they have that significance because the regulations, in the status that you saw them in draft, and probably in their final form, can't be effectively implemented without substantial innovation, both technological and institutional, in certain design, development and deployment areas.

Let me skip to one of the specific sections of the regulation. It is Section 27.99, called the Program Policies and Practices Section. I think that particularly warrants special attention in your community because there are several software institutional problem areas that can be partially alleviated by some thoughtful design activities that you might consider undertaking.

For example, in that section there are safety and emergency procedures required. I think those procedures are obviously affected by vehicle and facility design, and that special integrity of the vehicles is influenced by accessibility of the features, such as lifts or ramps. Your support is necessary to the operator in terms of the concepts that you might be able to come up with that would enable them to develop procedures for safety and emergency operations that would be quite

different than those that they might now be looking at, based on current equipment or practices.

Intermodal coordination will depend, perhaps, on fare collection and intervehicle communication systems that permit easy and convenient multi-modal transfers. Certainly marketing for the handicapped might or could require mail or telephone systems that provide the same or better information, ticket purchase, and service available to the general public. I know that George Pastor and the Service and Methods Demonstration program have been intimately involved in creating new marketing concepts and certainly we would like to see that kind of activity continued.

Management supervision of accessible facilities and vehicles could be aided by careful placement and design of accessibility features, such as level change and wheelchair securing devices, and I think maintenance and security requirements should and must also receive special design attention if accessibility hardware is to be positively received by disabled travelers.

Just a side note, yesterday, when a number of us were out looking at the vehicles outside, a lot of comments were raised by people who I think represent some of the smaller communities in the country, saying well, why is all this lexan behind or protecting the driver. Let's think about the human factor in dealing with the handicapped passenger as well as in dealing with any passenger and try to tailor our vehicle design to this specific environment in which the passenger is going to be carried.

Labor agreements, and we heard Dan Maroney talk about some

of the labor union thoughts about those agreements, work rules and insurance coverage are likely to be affected by the nature and extent of employee involvement in handling disabled persons.

I am just throwing out thoughts based on our reading of the regulation and some of the testimony we have heard, and you can perhaps draw some of your own conclusions. I know Joe and John will, about some of the things we are suggesting.

The second section of the regulation appears early in Appendix A, and I think you should pay particular attention to it. It is entitled Beneficiaries. Service should accommodate the complete range of handicapped consumers who are not confined to their dwellings or who require hands on physical assistance to use transit services. Services should be available to persons who are semi-ambulatory and ambulatory with other disabilities: the deaf, the blind, the mentally retarded, and wheelchair users.

I think that section particularly suggests that designers should try to accommodate for multiple difficulties, multiple barriers. Some of the information Pat showed this morning is derived from, in fact, results of the survey into the kinds of disabilities that people have, and that we have to try to target and accommodate.

A third section, also in the regulation appendix, entitled Principles, offers guidelines that are intended to sensitize designers and planners to the perspective of handicapped travelers. Principles introduces the concepts of human factors into transit vehicle, facility and service design, so that a range of skills, body dimensions and capabilities of persons

with particular types of handicaps can be considered.

Planners and designers should look beyond key problems and analyze the total trip on a transit system to identify the complete sequence of barriers, such as the type of design evaluation Pat's study undertook, and encountered by each category of handicapped traveler. We think particularly that a system assessment is necessary to assure that improvements are introduced carefully to provide effective, predictable and contiguous services, if, in fact, the regulation comes out in a way that requires full accessibility of all systems.

Docket comments to -- or on the guidelines suggest to us the possible addition of two or more principles. That accessibility features -- especially elevators -- should be located and designed to be as convenient as possible, considering the lack of stamina, sensitivity to weather exposure, and other problems often associated with certain kinds of disabilities, and that systems should be reviewed with equal effectiveness and convenience in mind, rather than equal accommodations.

Now that is based on some of the comments that we have heard. Certainly those two principles will be evaluated in the context of the total issues in which evaluation will be made.

The Principles Section also expresses the perspective of the budget conscious transit operator and pragmatic handicapped groups. Simple, low-cost materials and designs for accessibility features are recommended when they are feasible and effective. So are operational and vehicle positioning changes in lieu of complex facility improvements.

In general, the regulation is not intended to mandate a particular solution or technology approach to achieve accessibility. I want to emphasize the importance of cost minimization as a design goal. We have had, certainly through the various articles we have seen, testimony we have taken, and our own internal discussions, quite a range of thought about whether our numbers are accurate or inaccurate. That is certainly relevant, but it is also interesting. Our approach is to try to deal with the issue that has been raised through the legislative action that Congress took in a way that we believe is cost effective.

At the local level, certainly, we have seen through the various elections in this past year, clear doubts expressed about the extensive expansion in transit subsidies, especially to meet the needs of the elderly and handicapped consumer. We think we have to try to balance those two concerns: the concern for the expensiveness, if that is the thought that is being expressed, of the kind of improvements that are required, and the concern of providing service that is necessary to meet the transportation needs of the handicapped consumer.

Several cost-limiting implementation strategies, we think warrant closer examination. Ways are needed to introduce life cycle costing into planning assessments of alternative accessibility approaches and intraproject equipment procurements. We want to learn how economies in scale can be introduced into the production and installation of accessibility features, such as elevators or retrofitted vehicle lifts. We want to learn about economies resulting from combining retrofit efforts with other

facility and vehicle design and modernization.

We are interested in standards, design and preventative maintenance testing procedures, funding and financing and other software or administrative procedures that UMTA or grantees might adopt to improve product quality, hasten delivery and otherwise help save purchase, maintenance and replacement costs.

Throughout the rule-making process, the appropriate rules of the Federal R&D will come under increasing scrutiny, and certainly some of that scrutiny was raised yesterday. Historically our technology development has involved research, design, some development, but very little deployment, particularly in this area. We think now that in fact of the 504 compliance issue, hard questions arise about the extent and nature of our involvement in the various aspects of this program to achieve that accessibility goal. Can the private sector undertake the risks of R&D? Can it organize itself to improve the reliability and quality of lifts, vans, and other hardware that are crucial to 504 compliance?

If the final regulation provides communities with more flexibility about the mix of line haul accessibility and specialized mobility services, should federal involvement become more important to assure research, development and deployment of accessibility hardware for the smaller remaining market? Can basic human factors research and in service hardware testing be conducted without federal effort to avoid duplication of efforts?

Are federal policies and rulemaking needed to avoid highly

peaking production, great uncertainties in procurement levels, and an overly differentiated market place? How can UMTA stabilize hardware design when our knowledge of improved features is increasing continuously?

These, and a series of other questions, are those we have tried to address as we focus on docket issues and the options that we have to address ourselves to prior to issuing the final regulation.

The hardware research and development that I referred to in a couple of general ways earlier is also crucial, we believe, to compliance success. The rulemaking process has revealed a number of policy-related topics that warrant our follow-up.

For example, and I think Dan Maroney and Ken Heathington and a couple of other people on the panel yesterday talked about it. We had two sessions yesterday about paratransit services, and the institutional mechanisms necessary to effectuate those services, the labor relationships that have to be addressed in order for those services to become real -- in place. Coordination of existing social services, and we are dealing now with the Department of Health, Education and Welfare, in an attempt to address how they expend their resources and in what ways we can encourage, if not force, coordination of those expenditures with existing public transportation activities.

Intermodal coordination -- in other words, the inter-relationship between rail, bus, paratransit and other services that might exist in the various communities; rural and small urban area communities and the relationship with intercity bus

operations; the involvement of private operators in the public transportation program, and user subsidy questions.

We certainly will need further field evaluations, documentation, cost effectiveness assessments, demonstrations and public input on a variety of these topics. Many of these topics are already in the policy development phase. We have draft policies being prepared, particularly with regard to the private carrier participation issue. We have draft regulations being prepared with regard to the rural and small urban program, as a result of the legislation recently enacted by Congress.

I am not here today to tell you what should be done as much as to raise questions about whether it should be done and how it can be done. I have tried to relate some of those questions to the guidelines so that you can see some of the dilemma that we face as we try to examine the issues and the options that are raised as a result of them, and I hope it enables us to recognize that we have a great deal more to undertake in the research, development and certainly deployment of various techniques as we address provision of transportation services for the elderly and handicapped.

I think timely success of the accessibility program can greatly enhance the image and the value of the research and development program activity, as various aspects of the various handicapped services can easily be related to some of the changes that will come about because of technological innovation, whether it is in the hardware or software area.

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 Socioeconomic 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

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JAMES BAUTZ
PARATRANSIT AND SPECIAL USER GROUPS
URBAN MASS TRANSPORTATION ADMINISTRATION

I would like to spend a very brief time this morning to go through some of the concepts that we have under development in the area of Elderly and Handicapped Transportation.

Incidentally, this will be a very brief coverage of the subject and if any of you are interested in further information, we have some reports which I would be happy to send to you. You may want to get on our mailing list for any future reports that come out. Also, if you have any recommendations about new things that might be tried or some areas that we might be deficient in, we would certainly welcome any recommendations you may have.

The first concept that I want to talk about is user side subsidy. These points (outlined on the viewgraph) give you an idea of what it is all about. User side subsidy is a concept whereby a subsidy is provided to individual passengers who are allowed to choose the mode or the operator that they like to use. The subsidies go directly to the user, and they can go out to a taxi company or in some cases a transit service, which best meets the desired trip purpose.

The User Subsidy has certain advantages: first of all, the sponsoring agency or group that wishes to provide the subsidy can pay only for the service that's actually taken. One of the problems of providing a service is running vehicles and paying drivers even if there is no demand. In this case, you only pay for the service that's used. The consumer can choose the

provider. This has some very positive advantages, particularly in areas where there is more than one provider.

One difficulty with contracting with private operators is that if one company gets all the business that is being provided in an area, it tends to drive competition out. It might drive people into bankruptcy. User subsidy allows the pie to be spread around a little bit by action in the marketplace and not be a decision wherein an exclusive contract is made with one provider.

Another advantage is that an individual calling for service has a lot better chance of getting service in a short time and a much better level of service. It's also very easy to administer.

We don't yet know what happens in large cities, we're trying to test this concept in larger cities, but in the cities that we are working with, we found it is very simple and very cheap to administer. It probably can be done by a person part-time in a small city.

We have demonstrations under way at this time in Danville, Illinois; Montgomery, Alabama; Kinston, North Carolina, and Lawrence, Massachusetts. We're testing the user subsidy through vouchers and also through tickets. Two of the cities have only taxi service, and two of them also have transit service. We will get a feel for the trade-offs between the taxi utilization and transit utilization.

We are finding that the taxis do, in fact, get an increase of about 10% in their business. It isn't just subsidizing current trips.

It's less costly and much easier to administer than a dedicated system. You don't have to buy buses and you don't have formal contracting.

We're finding that, of the target groups that we're dealing with -- everyone over the age of 60 or 62, and all handicapped persons -- about one-third can be expected to sign up for the service. The service will be utilized to a significant extent by five to ten percent of the target group. Particularly with the elderly, we find that about fifty percent, or in the case of Kinston, more like sixty or seventy percent actually drive their own cars.

We can control the subsidy, with a limit on the amount of subsidy or number of trips per month. Also, although these are all shared-ride services, the demand density is low and the amount of shared riding we actually get is limited.

The user subsidy is designed for situations of low-demand density. As the demand density rises, a dedicated system would be more efficient on a cost-per-trip basis. That trade-off is not an exact line. You have to analyze it on a case-by-case basis. But user subsidy works very well and actually provides a much cheaper cost per trip in low-demand density situations. I think our subsidies in Danville were around 75 cents a trip, and in Lawrence around a dollar a trip.

Another area we're very interested in is Coordination of Social Service Transportation. We started working in this area along with HEW when we found that special services for elderly and handicapped persons overlapped services are already being

provided under HEW programs. We felt that by coordinating and consolidating transportation we could have a much more efficient system that could give us many more trips for the amount of money that is being spent. We are looking at various approaches to doing this. HEW has five demonstrations under way, in rural areas and small cities.

We have a demonstration that's just getting under way in Pittsburgh, where the Port Authority of Allegheny County, the transit operator in Pittsburgh, is attempting to coordinate social service transportation in Allegheny County.

We have another demonstration in Mercer County, New Jersey, which includes the City of Trenton, to coordinate the social agency transportation there, and a project in New York City, run by the Vera Institute of Social Justice in Lower Manhattan. All of these are having varied degrees of success in pulling together funding programs. The ultimate goal is to come up with models that would be applicable around the country.

We don't really know yet what the best approach is, and I suppose there is no best. I think it's going to depend on a particular urban area. And, ultimately, what we'd like to do is work toward a policy on the federal level that will make it easier for the local areas to coordinate.

A GAO report that came out -- I guess about a year ago now -- indicated that there were no legal restrictions on coordination. In fact, if you talk to anyone in DOT or HEW, everyone's in favor of coordination, but there are significant problems, institutional and sometimes legal problems at the state

and local level that have to be overcome.

Some preliminary results we've found are that barriers to coordination can be overcome. This has been done, I think, with greatest success outside of our projects, through the efforts of very interested and capable people at the local level. It can be done, and don't let anyone tell you that it can't.

We found that agencies will contract with public transit operators. In the case of Portland, Oregon, the transit authority is running a door-to-door service for handicapped persons. They were able to get agency contracts to provide the service for \$3 a trip thus taking the load off of the social agencies.

Transportation provided by a public transit company is usually expensive. However, it has certain advantages. The public transit operators provide better training to their drivers and better service to the public. They usually are able to have more specialized equipment and larger equipment to handle groups.

We found in Portland, Oregon, that a large number of passengers prefer taxicabs because they feel taxis provide a more personalized service, shorter wait times and faster trips. However, a large number of other people prefer the transit-operated service because the drivers are much more sensitive to their needs and they took more time in handling them. So, there seems to be different markets for the types of service that you provide. Productivity, not surprisingly, is very low for these types of services, generally, under four trips per vehicle hour.

We feel that the transit company should be involved in

the coördination effort, even if the market is shared with a taxi operator and a private non-profit social agency.

Again, we are trying to move this experience to larger cities, where, not surprisingly, the problems are much greater.

Another area that we're looking at through demonstrations is the impact of putting lifts on buses to increase the mobility of handicapped persons. We have two demonstrations under way, one in Champaign-Urbana, Illinois, and one in Palm Beach County, Florida. Both sites will have fully accessible fleets. We want to see what will happen when an entire bus system is made accessible and what impact this will have on mobility. In addition, we're evaluating service provided in San Diego, California; Atlanta, Georgia, and St. Louis, Missouri. We are trying to find out how the technology works, what impact this has on the transit operator as far as maintenance of vehicles, and schedule reliability.

As a next stage, we'd like to see what types of complimentary specialized services could be introduced that might extend the area of coverage of the accessible system. We've got some preliminary results, although nothing really definitive has come out of the work we've been able to do so far because of the mechanical problems that we're having with the lifts. However, we did find that the demand density is very low, and this is confirmed by the research that's been done in this area.

We feel there are a lot of people that are very reluctant to ride on an accessible system because of psychological barriers, certain fears they have of riding transit. In order to

come to grips with some of these problems, we have a new project under development in Washington, D. C. for training of transit drivers who will be driving accessible buses. In addition, we are working with the George Washington University Rehabilitation Institute to set up an outreach program to try to assist the people that might possibly use an accessible system.

PATRICIA SIMPICH
OFFICE OF SOCIOECONOMIC AND SPECIAL PROJECTS
URBAN MASS TRANSPORTATION ADMINISTRATION

Mr. Chairman, fellow panelists, ladies and gentlemen. As you know, I represent UMTA's Office of Technology Development and Deployment. George Pastor is the Associate Administrator of UMTA who heads our shop. With regard to hardware research to improve transit for elderly and handicapped travellers, it is the role of our Office to support decision-making by providing options and by providing technological answers for improved access.

The Regulations we support were discussed this morning at the earlier session on accessibility. The most recent Regulation, announced on September 14, was the final Transbus specification. With that, our Office concludes seven years of research aimed at building a better bus for the riding public, including the elderly and handicapped. The specification incorporates a low floor (22 inches before kneeling), a four-inch kneeling feature at the front door, and a front door ramp or lift that permits access by wheelchair. A consortium of grantees has formed (Los Angeles, Philadelphia and Miami) to purchase the first 500 Transbuses, and the administrative work beginning the grant process has begun.

Research arising from the Transbus program continues. I will report briefly on these efforts as well as on other current research aimed at improving transit accessibility to the elderly and handicapped. I will describe our research efforts by mode -- bus, paratransit, rail, automated guideway -- and then

describe ongoing projects that pertain to more than one mode.

BUS

A review of the state-of-the-art of wheelchair lifts for standard buses was undertaken by Booz-Allen & Hamilton to report on the maturity of lift technology, the production capability of lift manufacturers, and the experiences with lifts at transit properties. Generally UTD has concluded that it is technically feasible to produce a good reliable transit lift but that whether a suitable one or how soon a suitable one will be available is the question.

Current the California Department of Transportation (CALTRANS) through a grant from our Office is installing four different lift designs into existing transit buses at four transit properties. CALTRANS will evaluate the lift in a controlled transit service. Lifts were selected for this project through a design competition. Lifts made by Transportation Design and Technology, Vapor, Williams Machine & Foundry, and Transilift have been selected and are currently being installed.

We have gathered much information about ramps. Our latest work on ramps began in the summer of 1978. Booz-Allen mocked-up the front end of a typical Transbus in order to obtain more refined information on the ramped-entry design. Over 50 people with transportation-related handicaps have participated in the research. Areas of study include ramp surfaces, edging, potential benefits of handrails on the ramps, and the discontinuity between the ramp and the bus floor. An important question Booz-Allen is asking is whether it is possible to make a direct transfer of

ANSI standards for buildings to transportation facilities and vehicles, where, for example, you have wheelwalls and space beneath cantilevered seats. A report will be published in March 1979 compiling the data on the test subjects, their demonstrated abilities, and correlations between what measurements say can be expected and what the test subjects have been able to do.

We have recently begun a project to bring into being an operating front door ramp that meets the production model Transbus specification. Feasibility of a ramp was demonstrated in the experimental Flexible Transbus. However, the resulting dimensions of the Transbus specification are different from the prototype vehicle. The ramp will be developed and tested and test results will be passed on to Transbus manufacturers to help them develop their own ramp. Our objective is to put the ramp through first-generation development before Transbus manufacturers start their ramp development efforts. We believe this will reduce initial problems in ramp operations in the first Transbuses.

PARATRANSIT VEHICLE PROGRAM

We also obtained information on ramp design in our Paratransit Vehicle program. Design and fabrication of two versions of a paratransit vehicle were completed and exhibited around the country during 1977 and 1978. The two vehicles have flat floors less than 12 inches above street level, and ramps extending 60 inches. Operation of the door and the ramp were mechanized, so the driver did not have to get out of his seat. One vehicle was designed by AMF (now SBL), and the other one by Steam Power Systems (now Deutcher Industries).

The thirteen exhibitions of the vehicles and resulting publicity have revealed a very high level of interest for putting such vehicles in service, on the part of the riding public as well as the taxi operators. Just last month in Dallas a woman stepped up with a \$9,000 check to purchase one for her husband, who was in a wheelchair.

The main achievement of this project was in the area of space utilization. The vehicles demonstrated that it is possible to accommodate four passengers in comfort, one of them in a wheelchair, in a vehicle of a size falling between a sub-compact and a compact passenger car.

Congress has appropriated funds to continue the paratransit vehicle program. Now that we have proved feasibility, we are interested in producing a product that will sell at a reasonable price and that can be easily serviced and maintained. We are currently evaluating proposals for design and fabrication of up to 3 additional paratransit vehicles, this time, pre-production prototypes. All designs must have wheelchair ramps and securement systems. Up to three contractors will be selected. By late 1979 we expect to have mockups and by late 1980 three prototypes per contract.

Continuing with another type of paratransit research, one project in the Office of Safety and Product Qualification has focused on the most used vehicle in the 16(b)(2) program -- the 10-to-16 passenger van. We have developed vehicle requirements and inspection techniques for the van resulting in a specification and acceptance inspection package that was based on the

market-availability of components. We noted areas where increased procurement costs for buying heavy-duty components would help reduce down-stream problems in service and maintenance. Our work has been forwarded to State Departments of Transportation for comment and for use if they desired.

RAIL

Rapid Rail -- Moving to the Office of Rail Technology, the Advanced Concept Train (ACT-1) program is intended to advance the state-of-the-art of rail rapid transit car design and construction and obtain lower cost for vehicles. Two cars have been built and are being tested at Pueblo. A major category for improvement is passenger comfort, and specific attention has been paid to improved accommodations for elderly and handicapped travellers. This attention included a dedicated section in one of the test cars with wheelchair space and on one seat an area for storing crutches or canes. ACT-1 also has an interior design aimed at improving the ride for those who stand. From the Grey Advertising study we learn that 45% of the transportation-handicapped have difficulty riding while standing in a rail transit vehicle, and 70% have difficulty standing while on a moving bus. We expect to use information from ACT-1 as we look for design solutions to these problems.

Light Rail -- I want to tell you about a wheelchair lift project to make the point that we do not always have success. The design turned out to be too complicated and costly and was not going to bridge the gap between the car and platform well enough. Also we questioned whether we would be able to accom-

modate the powered wheelchair.

Now we have begun again and will be requesting bids to design and fabricate a lift for light rail vehicles. We are planning to ask the contractor to study commuter rail vehicles also, to see if it is possible to have one design which, with modifications, would be acceptable to more than one type of vehicle.

Assessment of Inclined Elevator -- UMTA is seeking solutions to the problem of changing floor-levels in transit stations. The Grey Advertising study lists steps to and from the subway as the NUMBER ONE subway barrier. They prevent 62% of the transportation handicapped in subway areas from using the subway as much as they would like.

In Stockholm, one solution to the level-change problem is the inclined elevator, an elevator that travels at the same angle as, and right alongside, the escalator. Those in Stockholm carry up to 12 people. There are 36 inclined elevators in Stockholm, in 20 stations; some have been in place since 1964. An advantage of the inclined elevator is that it allows the handicapped traveller to remain part of the pedestrian mainstream.

Our Office sent to Stockholm a team of elevator and station-construction experts and Tom O'Brien of the Special Needs Office of MBTA to evaluate the inclined elevator's potential for use in this country. The team reported there are only minor code concerns and recommended one be demonstrated. They found the elevator used by mothers with perambulators, people with packages, travellers with dogs, as well as wheelchair-users.

A follow-up note: In the study completed this month on the cost of making rapid rail systems accessible as defined by Section 504, Peat, Marwick and Mitchell looked for existing United States stations where the inclined elevator might be useful; the firm estimated 850 probable sites.

Modification to Existing Escalators -- The Peat Marwick study found that 98% of the cost of making rapid rail accessible is attributable to placing elevators in stations. One ongoing research project could have a diminishing effect on that cost. In August 1978 UMTA signed a contract with Foster-Miller Associates of Waltham, Massachusetts, to design, fabricate and test an escalator-modification kit, to be applied to existing escalators, that would make the escalator accessible to the wheelchair user and other handicapped travellers. While modifying the escalator is no simple matter, we think it is worth a try, especially for stations where installation of elevators would be impossible or prohibitive.

AUTOMATED GUIDEWAY TRANSIT (AGT)

UMTA is sponsoring preliminary engineering activities in five cities as part of the national Downtown People Mover demonstration program. The cities are Houston, St. Paul, Los Angeles, Detroit, and Miami. With regard to the concerns of the elderly and handicapped traveller, the AGT vehicle floors are at the same level as the boarding platform and use by the traveller in a wheelchair appears to be common and present little problem.

We have developed design guidelines, however, that state

that downtown people-movers must be barrier free. The guidelines also identify accomodation of the elderly and handicapped as a recurring item to be placed on the agenda at progress review meetings throughout a DPM's development.

In all new vehicle developments in our Office accomodation of the elderly and handicapped is a design requirement.

SAFETY

Moving to safety research, CALTRANS has fabricated, under UMTA sponsorship, five securement systems similar in design to those on the market today and has tested them in crashes, using the standard wheelchair facing in the direction of travel and perpendicular to the direction of travel. The object of the crashtesting has been to learn how the wheelchair behaves under emergency conditions when held by the different fastening systems, and where best to attach the securement system to the wheelchair.

When we began this crash-testing project we believed the conventional wisdom that the wheelchair would disintegrate at $1\frac{1}{2}$ g's. That just isn't so. To date about 40 tests have been run. We are testing at 5 and 10 g's. The project's draft report is now being written. Also when the crashtesting was begun, there were those who questioned whether a securement system was needed for the wheelchair on the bus at all. CALTRANS field-tested normal bus operating conditions and emergency stops (not crashes) with a rider in a wheelchair and with the wheelchair brakes being locked, but with no additional securement system. A movie was made showing the effect of quick stops

and starts and turns. The movie makes clear the wheelchair user is indeed in a hazardous situation without something more than the wheelchair brakes to hold him stationary. I brought the ten-minute film and will show it at lunch today in the TSC Management Information Center.

UMTA joined the National Highway Traffic Safety Administration (NHTSA) in a project to design, develop, test, and demonstrate a seating-protection system that protects handicapped passengers in transit and school buses, in wheelchairs and not in wheelchairs, side-facing and forward-facing. NHTSA will be crashing four sizes of school buses (several of which are also sold as transit vehicles) and two large transit buses. The purpose of the crashes is to obtain crash-pulses to learn what forces the bus and the passenger experience during a crash. Output of this project will be one or perhaps several designs and a full-scale engineering mockup demonstrating how it protects a handicapped passenger.

Minicars, Inc., of Goleta, California, is the contractor for this project. They expect to test and re-test crash-protection designs until next summer, so if you have idea you think worth trying, send it to them or to our Office.

JOHN CRAIN
PRESIDENT, CRAIN & ASSOCIATES

My role is supposed to provide a critique of research concerning elderly and handicapped transportation and how this relates to the Service and Methods Demonstration Program, where that program is and where it might go next.

It seems like it's been about a decade now, that we've had this federal focus on special transportation for elderly and handicapped. It seems like about 1968 when the focus went off of transportation aspect of the poverty programs and toward transportation for elderly, and, on the heels of that, transportation for handicapped persons. Looking back over that period, it would seem more like it's been some kind of wild roller coaster ride rather than some organized program to solve this huge social problem, and a roller coaster ride which seems like it had just been filled with difficulties, uncertainties and anxieties for everyone who's been involved.

Not very long ago, I was in the late Al Bingham's office at AC Transit, shortly before he died, and he was terribly upset and concerned over his role as a transit operator, saying things like: "It seems to me, John, if we provide the proper vehicle at the curb, and it is an accessible vehicle, and they can board, my responsibility ends there." Then, he looked out the window and said, "But, I really don't know. It never occurred to me how anxiety-provoking this whole problem is." Shortly after that, he passed away. I don't know how much of a connection his death had with that anxiety, but I know that he was terribly upset at

at that time.

The point to all this, it seems to me, is that more so than any other program that I've been involved in, it has been a program of transportation planners and government decision-makers, not necessarily leading, but responding to events which have run over them. And I think that that will continue and I think the roller coaster ride will go on for some more years. And I'd like to comment about where the demonstration program might go in that context.

I think it's fair to say that this transportation problem, at this point in history, falls into these two categories of accessible equipment -- accessible fixed route, fixed schedule equipment, and demand responsive door-to-door special transportation. I think you can talk about those two things somewhat separately at least for a moment.

On the first, accessible fixed-route equipment, we have done a certain amount of hardware development and experimentation. As Jim Bautz has pointed out, there are two major demonstrations forthcoming of complete fleets with accessible equipment, in Palm Beach and in Champaign-Urbana. Some people have said, "Well, that's going to be irrelevant because accessible equipment has already been mandated; it doesn't make any difference what those demonstrations prove, the decisions have already been made."

I'm not totally sure that's the case. The issues at this point, about fully-accessible equipment are cost-effectiveness, and equipment performance. We're now going to get a round of information about the fledgling tests that have been going on,

tests of buses in San Diego, St. Louis, Santa Clara County, and so forth.

I think that the outcomes of these tests will begin to be known in January. At the January TRB meeting, there will be some reports, some cross-cutting analyses, of the amount of use of those accessible equipment. I think that report is going to say that the level of riding has been dismally low, but there are mitigating circumstances. There will be partial fleets and people couldn't really use partial fleets. There would be very bad equipment -- lifts that didn't work, lifts that people really couldn't use. But, regardless of these qualifications, at the time when the 504 Regulation finalization process is going on with DOT, I think there will be a round of data output which fuels the arguments against accessible equipment because usage is terribly low. There will be numbers quoted of very high costs per lift usage.

We were speaking last night over dinner about a very good presentation made last year at the TRB meeting by Mr. Goodson, formerly of EPA, about the process of government mandating certain requirements relative to environment and safety and industry's response to these requirements, and that it isn't always true that government says this will happen and industry follows. It's more like a negotiating process which goes back and forth over a considerable period of time, and the government always has to have enough credibility about what they're mandating to make it stick.

My belief is that the next round of imperfect results that

we obtain from the accessible bus demonstrations will probably slow down the mandating process. The handling of that data will be critical, of course.

I think this roller coaster is going to fly on in this area of accessible equipment. The demonstrations at best will only track along in parallel with the series of Federal and local decisions that are being made. I don't think the demonstrations will be in a position to lead the decision-making. I think that the greatest contribution that the SMD Program can make will be to report, as accurately as possible, the design of the accessible systems being offered and the actual rider behavior on these systems. We need to better understand the behavioral response in St. Louis, and San Diego, and as soon as information is available in Palm Beach and Champaign-Urbana, to obtain actual counts of usages per bus-mile and so forth.

We will need to do this in the most organized fashion and repeat this process every six months to continually measure what people are really doing when they are offered accessible buses. Certain policy analyses are now being conducted, estimating the national cost of the forthcoming DOT 504 Regulations. I think at this time, these analyses are still woefully inadequate. I think that there is a great and urgent need for the best possible policy analysis to determine what overall national options are and overall costs.

On the other side of the question, on the demand-responsive systems, I would like to spend just a second and discuss costs because I think it's the best way to relate these systems to the

accessible fixed-route system option. In California, which in size represents a tenth of the nation, we have this situation: government costs for mass transit deficits are around one billion dollars per year. The estimated cost of our demand responsive special transportation systems, provided by social service agencies, is about a hundred million dollars per year. This means we have these two transit systems in California, just like we have in Illinois and New Jersey and every place else. And our fixed-route mass transit system is about ten times larger than our second system, called the Social Agency Transportation System, as measured in government costs.

We have been talking about regional, demand-responsive systems, to fully support the door-to-door needs of the E&H group. What do we know about the cost of doing that? In the last few years we have put in place a number of these door-to-door systems, in cities where there is also a mass transit operation and where there are social service agencies with their transportation systems. Thus we have added an auxiliary system to fill in the gap, between the two existing systems to take care of the "unaffiliated passengers" who are not using either system.

We have pretty consistent figures on the number of people who will register for these new systems and the amount of trips that they will take, over and above the support they are getting from the social service agency systems. So, we can estimate pretty well, what the cost is if we did that in every urban area. I calculate a number like a third of a billion dollars a year for a national program such as that in every city we have a

regional door-to-door demand-responsive system for people not currently being served. The missing link, door-to-door service for the unaffiliated passenger, appears to cost another third of a billion. Whether or not the nation would come up with a third of a billion dollars annually, for that function, is not known. It seems to me that you must then attempt to improve coordination of the Social Service Agency System.

Additionally, we know that if you place a new government-regional system into being, it is axiomatic that the social service agencies which have provided that transportation all these years will tend to move their clients over to these new systems. This implies we must be prepared to fill in this gap at the cost of \$1/3 billion plus cover the one billion dollar cost as the social service agencies dump their clients onto the new transportation systems.

It seems to me that the focus of attention in the demand-responsive area has to be on coordination of social service transportation. I think this is what is happening. Almost every city in the country, in one way or another, is moving in the direction of this coordinated service.

One central issue is what we know about the efficiency of the United States one billion dollar Social Service Agency Transportation System. Is it sufficiently inefficient, such that, if it were better coordinated, it could pick up the entire gap? Is the one billion dollars we are now spending, if it were spent, with the greatest efficiency, sufficient to solve the entire problem? The studies that have been done in the Bay Area and in

Phoenix suggest not. Those systems are not that inefficient. These studies, and I believe others, suggest that although you gain maximum efficiency through coordination, there is still a gap.

Based on this, what is the best role for the demonstration program for the short term future? I think the most important thing to do in the next six months and year, or two years, will be to monitor and to try to describe and to model the coordinated Social Agency Transportation Systems as they are developing.

There is an urgent need, I think, for someone to access what systems are emerging across the country -- to describe and evaluate the Kansas City model and the Pittsburgh model and the other emerging models, and to classify these in a way that planners across the country can better understand what the variations are and what they can best copy in their area.

Again, those decisions about how best to develop these coordinated systems, will move faster than the demonstration program can lead. I think the demonstration program will be doing certain demonstrations in that area, as Jim Bautz has discussed -- in Pittsburgh, and San Francisco, East Bay and some other areas. But at best, they will be paralleling the national movement as it unfolds.

So, again, I think the biggest contribution that the SMD Research Group can make is to repeatedly assess what's going on, to scout out these systems which are emerging, to evaluate their pros and cons, and to get that information out in a form readable in Des Moines and Louisville as people make their decisions.

I'm reminded of an earlier time when there was a national focus of attention on the highway, on exclusive lanes for buses. Jim Bautz and Fon Fisher would periodically put out a little memorandum which told about these developments in New Jersey, in California, and elsewhere. It was that simple memorandum that got out and we all got a hold of it and passed it around among the cities, and it was most helpful in our attempts to classify and understand what everybody was doing at this time.

I think, again, this would be the greatest contribution that could be made relative to the issues of the transportation handicapped. I think there is a need for much improved policy analysis and national cost estimates of the kind of "back of the envelope" figures that I've been quoting today.

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