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Urban Transportation for Handicapped Persons: Alternative Federal Approaches

November
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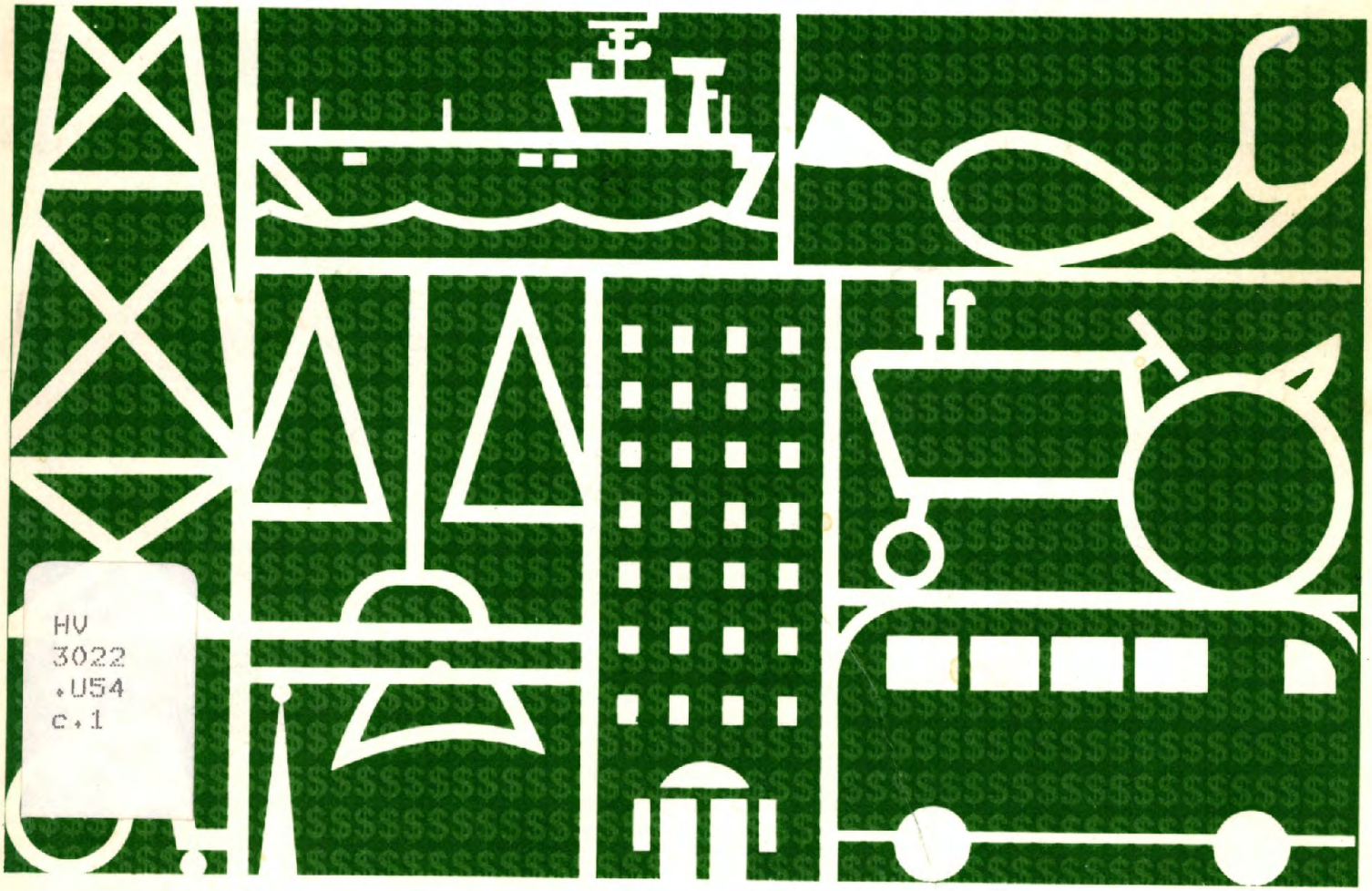

Congressional Budget Office
Congress of the United States

URBAN TRANSPORTATION FOR HANDICAPPED PERSONS: ALTERNATIVE FEDERAL APPROACHES

The Congress of the United States
Congressional Budget Office

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PREFACE

During this session, the Congress will likely consider legislation authorizing additional funds to finance improvements to urban transportation systems that would make their services accessible to handicapped persons. Alternatively, the Congress may need to articulate in greater detail how federally financed transit systems should comply with Section 504 of the Rehabilitation Act of 1973, which set the general requirement that such systems be accessible to handicapped persons. In either case, the Congress will weigh the effectiveness and costs of alternative ways of serving the special travel needs of handicapped persons. Under current regulations issued by the Department of Transportation (in consultation with the Department of Health, Education, and Welfare), these costs over the next 30 years could exceed twice the amount of total federal financial assistance now provided annually to public transportation.

The Congressional Budget Office (CBO) has prepared this report at the request of the Senate Budget Committee and the Transportation Subcommittee of the House Public Works and Transportation Committee. The paper explores the benefits and costs associated with alternative methods of serving the transportation needs of elderly and handicapped persons. In keeping with CBO's mandate to provide objective and impartial analyses, this study offers no recommendations.

The paper was prepared by David L. Lewis under the supervision of Damian J. Kulash, both of CBO's Natural Resources and Commerce Division headed by Raymond C. Scheppach. Appendix A was prepared by Nancy Lee Jones of the American Law Division of the Congressional Research Service.

The author is grateful for the assistance of Allen Kraus, G. William Hoagland, Richard Mudge, and Richard Weissbrod of CBO, and also of persons in government agencies, organizations of handicapped persons, transit companies, vehicle manufacturers, and research institutes.

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Alice M. Rivlin
Director

November 1979

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SUMMARY

In implementing Section 504 of the Rehabilitation Act of 1973, the Department of Transportation (DOT) recently issued rules specifying how urban public transportation facilities should be adapted to serve handicapped persons. The rules are based upon an interpretation of Section 504 that was developed by the Department of Health, Education and Welfare (HEW). They require transit systems to equip buses with lifts for wheelchairs, to install elevators in many underground and aboveground rail stations, and to modify rail cars to accommodate wheelchairs. While the program would be very expensive--$6.8 billion over the next 30 years--relatively few handicapped persons would benefit from it. The Congress is currently considering whether to fund these changes through reductions in other transit programs or through new appropriations—or whether to enact new legislation requiring DOT or HEW to modify their rules.

THE PROBLEM

More than 1 million physically disabled, blind, or deaf persons who live within a short walk of transit service cannot physically use it. Those who suffer the most severe problems are the 409,000 wheelchair users whose handicap poses exceptional problems for bus and subway operators attempting to serve them. Some wheelchair users who lack access to cars or are too poor to pay high taxi or ambulance fares find very few opportunities to visit friends, to shop, or to go to a doctor. An additional 4 million handicapped persons live near transit but find it difficult to use. The remainder of the approximately 30 million handicapped persons in the United States are physically able to use public transportation without pain or special difficulty.

THE ALTERNATIVES

Section 504 prohibits excluding handicapped persons from any federally financed program solely because of their handicaps. The language of this section, however, is brief and vague, and opinions differ as to its meaning when applied to transportation programs. Some representatives of handicapped persons argue that their civil rights require that bus and rail systems available to the general public should be equipped with elevators and lifts to enable persons in wheelchairs to use them. Only in this way can

handicapped persons feel themselves part of normal everyday life. Others, however, hold that special door-to-door transportation would provide less costly and more convenient services for a larger number of disabled persons. They also argue that, by serving more persons, separate door-to-door transportation would be more effective in assimilating handicapped persons into everyday activities such as school, where their interaction with the general public is on a higher level than in buses and trains.

This paper evaluates three alternative options for providing transportation services to handicapped persons living in urban areas. The first option—the Transit Plan—presents one possible outcome of the rules issued by DOT under Section 504. The second alternative—the Taxi Plan--calls for a number of small modifications on existing systems, and door-to-door public transportation for severely disabled persons. The third option—the Auto Plan--offers financial aid to severely disabled persons for the purchase of specially adapted automobiles, as well as door-to-door public transportation for those unable to drive cars. The three options are compared on the basis of costs and the number of persons who could be expected to benefit from the services. The modifications to transportation vehicles and the services required under the three options are outlined in Summary Table 1, and the corresponding costs and patronage are presented in Summary Table 2. The decision by the Congress will most likely be based on these factors as well as on the issues of civil rights and social integration of handicapped persons.

The Transit Plan

Over the next 30 years an estimated $6.8 billion would be needed to implement the DOT rules. This is equivalent to two and a half years of current federal expenditures for transit programs. Of the $6.8 billion, $2.2 billion would be for rail system modifications, the corresponding operating and maintenance costs, and door-to-door services in lieu of modifying stations and railcars. The remaining $4.6 billion would be spent on adaptations to transit buses and corresponding maintenance costs. A major portion of the latter amount would be needed to expand the current bus fleet. A larger bus fleet would be necessary for three reasons: buses equipped with lifts have fewer seats; they are out of service more often for maintenance; and new routes would have to be added connecting unmodified subway stations.

Enactment of the DOT regulations would, however, serve no more than 7 percent of all severely disabled persons. When the cost of implementing the DOT regulations is spread over this limited number of wheelchair users and other severely disabled passengers, the plan costs approximately $38 per

SUMMARY TABLE 1. ALTERNATIVE OPTIONS FOR SERVING THE TRANSPORTATION NEEDS OF HANDICAPPED PERSONS

Option	Public Transportation Adaptations	Door-to-Door Services
Transit Plan (DOT regulations)	Wheelchair lifts and special suspension that lowers the front steps on all new buses Bus routes extended to cover unmodified subway stations Elevators in key stations in half the cities with rail systems At least one car per train on subways and commuter rail systems and half the fleet of streetcars adapted for wheelchairs	Dial-a-ride vans for wheelchair users, and taxi subsidies for other handicapped persons, in half the cities with rail systems
Taxi Plan	Special suspension that lowers the front steps on all new buses Bus routes extended to cover all subway stations More handholds, priority seating, and seat-before-accelerate rule	Dial-a-ride vans for wheelchair users
Auto Plan	Special suspension that lowers the front steps on all new buses Bus routes extended to cover all subway stations More handholds, priority seating, and seat-before-accelerate rule	Dial-a-ride vans for wheelchair users Low-fare taxi service for severely disabled persons unable to use transit Capital assistance to permanently wheelchair-bound paraplegic and quadriplegic persons for purchase of specially adapted automobiles (with no personal income conditions)

trip. In contrast, transit trips by the general public cost, on the average, about $0.85.

The Taxi Plan

It is estimated that the Taxi Plan, which would emphasize door-to-door services, would serve 26 percent of all severely disabled persons as

compared to 7 percent served by the Transit Plan. Its potential users would be all those who have difficulty in walking to transit stops, waiting in bad weather, balancing on moving buses, and moving through crowds.

The option would cost $4.4 billion, 35 percent less than the Transit Plan. While the costs of transit adaptations are fixed and remain the same whether or not handicapped persons make use of the adapted services, the cost of door-to-door services varies with the number of persons who decide to use them. Plans built around specialized door-to-door public transportation cost about $7.62 per trip and serve those unable to use mass transit facilities, at one-fifth of the cost per trip associated with the Transit Plan. The Taxi Plan would also serve three and one-half times as many severely disabled people as the DOT plan.

Some have argued that transit adaptations are cheaper in the long run, since driver and vehicle costs for door-to-door service continue as long as service is offered, while station elevators, once installed, operate at little cost. But this ignores the annual costs of purchasing and maintaining buses with lifts, and of operating buses to connect unadapted subway stations. Taking these costs into account, the Transit Plan costs $7.38 per trip, even after all of the initial capital outlays are finished. This is still 87 percent higher than the recurring cost of plans emphasizing door-to-door public transportation, as shown in the last column of Summary Table 2.

The Auto Plan

By helping severely disabled persons to purchase and specially equip their own cars, the Auto Plan would offer exceptionally high quality transportation service to handicapped persons. Together with dial-a-ride service for severely disabled persons unable to take advantage of the specially equipped cars, it would serve about 316,000 more handicapped persons than the Transit Plan, but would cost approximately $477 million less.

CONCLUSION

The rules issued by DOT in implementing Section 504 of the Rehabilitation Act of 1973 would prove extremely costly and would benefit a relatively small number of handicapped persons. DOT has argued that legal restrictions, primarily Section 504 guidelines issued to all federal agencies by HEW, require that existing public transportation systems be made accessible. Court decisions based on Section 504, including a recent Supreme Court decision, give no definitive guidance on this question.

SUMMARY TABLE 2. PROJECTED PATRONAGE AND COSTS OF ALTERNATIVE OPTIONS FOR SERVING THE TRANSPORTATION NEEDS OF HANDICAPPED PERSONS, 1980-2010

Option	Number of Wheelchair Users and Other Severely Disabled Persons Able to Travel More	Percent of All Severely Disabled Persons Served	Total Net Public Cost (millions of 1979 dollars)	Total Net Public Cost per Additional Trip Made by Wheelchair Users and Other Severely Disabled Persons (1979 dollars)	Annual Net Public Cost per Additional Trip Made by Moderately Handicapped and Severely Disabled Persons After One-Time Capital Expenses Are Paid (1979 dollars)
Transit Plan (DOT Regulations)	103,585	7	6,841	38.08	7.38
Taxi Plan	363,044	26	4,447	7.62	3.94
Auto Plan	419,544	30	6,364	7.33	4.48

The second and third options outlined above compare favorably with the Transit Plan in terms of costs and patronage. The Taxi Plan would cost approximately $4.4 billion over the next 30 years as opposed to $6.8 billion for the Transit Plan; it would serve 26 percent as opposed to 7 percent of severely disabled individuals. Similarly, the Auto Plan compares quite favorably to the DOT plan in terms of patronage and costs. In the long term, however, once all initial capital outlays are finished, the Auto Plan would involve more budgetary outlays than either the Transit or Taxi Plans.

The estimates of total cost and cost per trip for the three options depend on the use that is expected to be made of the services. The projections given here for the Transit Plan are lower than those suggested by a DOT survey. The CBO projections take account of the lower patronage observed for existing transit services that have been adapted for handicapped persons, and also of the tendency of survey respondents to overstate the number of additional trips they would make if such services were provided.

The Taxi and Auto Plans would serve more handicapped people at lower cost than would the Transit Plan. This conclusion holds for a wide range of patronage projections; even if patronage were twice that assumed here, plans emphasizing door-to-door service and adapted autos would have a substantially lower cost per trip than the Transit Plan. At such high levels of patronage, however, the alternative plans would draw more heavily on public funds than the Transit Plan—that is, their total costs would be higher. This risk, however, appears small relative to the risk inherent in the Transit Plan; under that plan, if patronage were to fall below the projected level, the cost per trip of serving handicapped passengers who do not use transit at present would average $75 or more.

If the Congress wishes to offer handicapped persons transportation services that they can and will use, door-to-door services and specially equipped automobiles appear most promising. On the other hand, if the Congress views this as a civil rights issue and decides that all persons must be furnished equal access to existing public transportation services, the Transit Plan goes further than the other two in ensuring such equality.

CHAPTER I. INTRODUCTION

All *

Over the past two years, the Carter Administration has taken steps to bring federally financed public services into compliance with Section 504 of the Rehabilitation Act of 1973. The Congress enacted Section 504 in order to help disabled persons free themselves from the traditional bonds of debility—isolation, loneliness, unemployment, poverty, and discrimination. Section 504 is brief and general. It states only that:

> no otherwise qualified handicapped individual in the United States shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. 1/

To bring federal programs into compliance with Section 504, President Ford issued Executive Order 11914 directing the Department of Health, Education and Welfare (HEW) to establish specific guidelines for determining what practices constitute discrimination within the meaning of Section 504 (see Appendix A). In January 1978, HEW issued final guidelines and a timetable for the publication of regulations by the federal agencies. The key feature of the guidelines is the requirement that existing facilities be accessible to handicapped persons:

> A recipient [of federal funds] shall operate each program or activity so that the program or activity, when viewed in its entirety, is readily accessible to and usable by handicapped persons. This paragraph does not necessarily require a recipient to make each of its existing facilities or every part of an existing facility accessible to and usable by handicapped persons. 2/

1/ Public Law 93-112, 93d Congress, HR 8070, September 26, 1973.

2/ Department of Health, Education, and Welfare, Implementation of Executive Order 11914, Federal Register, January 13, 1979, Part V.

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PUBLIC TRANSPORTATION SERVICES

The Department of Transportation (DOT) has the responsibility to clarify these guidelines in administering programs for financial assistance to local transportation operators. Its regulations for that purpose took effect in July 1979. 3/ They require that:

- All buses purchased after July 2, 1979, must be equipped with features that enable wheelchair users to ride them;
- All buses must adhere to the Transbus design (Transbus is the name for a bus with a very low floor and one less step inside than present buses) as soon as it is manufactured; 4/
- Key stations, defined according to criteria in the regulations on subway and commuter rail systems, must be equipped with elevators within 30 years; Key stations on light rail systems must be equipped with elevators within 20 years;
- At least one car per train on subway and commuter rail systems must be adapted to allow wheelchair users to board. Half the fleet of streetcars must be accessible within 20 years;
- Where all changes are not completed within three years, each city must make available some form of temporary service (like fitting lifts to old buses, or supplying some form of temporary taxi service).

The regulations also permit operators of existing subway systems or light or commuter rail systems to provide handicapped persons with some

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3/ Federal Register, vol. 44, no. 106, May 31, 1979.

4/ Transit bus manufacturers have refused to bid for Transbus production contracts, claiming that a low-floor bus represents too large a financial risk and is technologically impossible to build. To investigate that charge, DOT commissioned a study by a technical panel of the National Academy of Sciences. That panel, in September 1979, agreed that Transbus represents considerable financial risk, and that its key components are unproven. Because of the uncertainty over the future of Transbus, this report assumes that Transbus will not form part of the Section 504 regulations.

form of bus or taxi service instead of adapting the rail system, if local handicapped persons and DOT agree to the alternative plan.

PENDING CONGRESSIONAL DECISIONS

The Congress now finds it necessary to address the economic and budgetary implications of the DOT regulations. The total costs of making the changes might be as much as $6.8 billion over the next 30 years, a sum equivalent to two and a half years of federal transit spending today. The expenditures would put pressure on other transit programs as they come due for reauthorization next year, unless the Congress provides additional funding. If the Congress instead delegates the financing to local governments, the result might be cutbacks in existing services and diminished patronage. Local governments would have the alternatives of increasing fares, reducing the level of transit services (with a corresponding decrease in patronage), or increasing local taxes and shifting resources into transit from other programs. Ultimately, local governments might be led to abandon federal transit aid, an action that would in turn imply reductions in service and in patronage.

Alternatives to the DOT approach will also be costly. In examining its options, the Congress will wish to promote the most beneficial transport services for handicapped persons in light of national social and economic objectives.

Alternatives

A wide range of possibilities exist for diminishing the travel problems of handicapped persons. Three alternatives that illustrate the range of possibilities are identified and examined in this report. The first alternative, the Transit Plan, embodies the rules that DOT issued in interpreting Section 504. While other responses to the DOT rules are possible on the part of municipalities and transit operators, this analysis focuses on one likely outcome. The second alternative, the Taxi Plan, illustrates a service relying heavily on taxis and other door-to-door services for handicapped persons, while also making relatively inexpensive improvements in bus and rail transit services. The third alternative, the Auto Plan, includes some of the door-to-door services and the bus and rail improvements of the Taxi Plan, but adds a program for financing specially adapted cars for severely handicapped persons.

Choosing a Policy—The Principal Issues

Section 504 has become a source of great controversy. A principal concern is the availability of adequate transportation to urban residents who are unable to use existing mass transit services—about 5 percent of all handicapped Americans. An additional concern is the integration of handicapped Americans into the day-to-day activities of American life.

The argument has been advanced by many transit authorities, and a number of handicapped persons, that services which take passengers from door to door help a far greater number of severely disabled persons than would the adaptations to buses and trains called for by DOT.

Others, notably those speaking on behalf of organized groups of handicapped persons, maintain that special door-to-door services are discriminatory and that Section 504 protects them against such discrimination by guaranteeing their right to use the same federally financed public services available to everyone else. It is not yet clear whether the Supreme Court will support this view, particularly where major and very costly changes in transportation systems would be required (see Appendix A). The court has not yet addressed this question specifically with regard to transit facilities.

The same organizations also argue that only by obtaining access to transportation facilities used by able-bodied persons can handicapped persons feel fully assimilated into society. Against them, others maintain that contact with the general public is most important for handicapped persons in schools, shops, offices, and factories, rather than in the transportation used to reach those places. Because many wheelchair users and other severely disabled persons cannot even get to transit stops, some question the value of devices such as lifts and elevators as applied to mass transit.

Much controversy has also arisen over costs. Those who favor door-to-door services often argue that they cost less to provide. Others who favor transit adaptations argue either the reverse, or that cost is not an issue where civil liberties and integration are concerned. There is no question, however, that either approach is very costly, and that pursuing one would reduce the financial means available to pursue the other. For this reason, the Congress will find it necessary to examine the trade-offs between adaptations such as those of the Transit Plan that equalize access to current services, and the creation of new services tailored to the special needs of handicapped persons. The ultimate decision will turn partly on the question of which objective is most appropriate: equality of access or usefulness of service. In choosing, the Congress will wish to consider the degree to which these objectives can actually be attained through particular transportation

programs. The three alternatives examined in this report help to illustrate some of the possibilities.

The examination of alternative policies begins in Chapter II. The chapter distinguishes among handicapped persons with and without transportation problems, surveys those problems, and examines in detail the difficulties handicapped persons have in using particular types of transportation. Chapter III sets out the three alternative plans for addressing these problems, including the plan based on the DOT regulations. The remaining three chapters compare the costs and benefits of the plans. In particular, Chapter IV presents forecasts of the number of moderately and severely disabled persons likely to use the services in each plan, Chapter V examines the associated costs, and Chapter VI compares the cost effectiveness of the plans.

An overview of the legislative and legal history of Section 504 is provided in Appendix A. Appendixes B through F provide supporting data and techniques for the analysis presented in the body of the paper.

CHAPTER II. THE TRAVEL NEEDS OF HANDICAPPED PERSONS

Handicapped persons face a variety of problems in using transportation. For some, travel is made difficult by illness or debility. For others, travel is practically impossible except with major assistance. The specific problems vary radically, depending upon health, income, age, access to a car, availability of family and friends, and residential location.

This chapter explores how transportation services can best be tailored to fit these diverse needs. It is divided into three sections. The first section makes a crucial distinction between the moderately handicapped persons, who are able to use mass transit facilities although with some difficulty, and severely disabled persons, who find these services impossible to use. The second section describes the array of transportation choices currently available to moderately handicapped and severely disabled persons. The third section identifies the ways in which current services fail to meet the needs of moderately handicapped and severely disabled persons.

This analysis provides the foundation for a discussion of alternative plans, developed in Chapter III. The costs and benefits of those options are the subject of the remaining chapters of the report.

THE POPULATION OF HANDICAPPED PERSONS

Handicapped Persons

The Rehabilitation Act defines a handicapped person as:

> any person who has a physical or mental impairment which substantially limits one or more of such person's major life activities, has a record of such impairments, or is regarded as having such an impairment. 1/

1/ Public Law 93-112, as amended in section III(a) of the Rehabilitation Act Amendments of 1974, 29 U.S.C. 706(b).

In 1974, 29.3 million Americans—14 percent of the U.S. population—were classified as handicapped according to this definition. In 30 years, at projected rates of population growth, the number may be 50 million. 2/ Not all of those defined as handicapped actually suffer handicaps in the use of public transportation; many can walk as far as the nearest bus stop, read and understand transportation schedules, climb stairs, keep their balance on a moving bus, and, in short, perform the physical and mental tasks necessary to make use of public transportation.

A more appropriate definition of handicapped persons in this context would include those who, because of medical problems or incapacities, experience more than average difficulty in using public transportation. This definition includes elderly people who find using public transportation difficult because of the natural effects of growing old, as well as persons with specific diseases and medical conditions.

According to this definition, an estimated 13.4 million persons are handicapped in the use of public transportation. 3/ About 7.4 million of them live in cities served by public transportation (see Figure 1). 4/ By the year 2010, their number is likely to grow by 70 percent. 5/ Of the 7.4 million handicapped persons living in cities, only 4.9 million are within half a mile of a bus stop. Of these, 689,000 live near subway stations. The 2.5 million handicapped persons living away from bus routes and subway stations would need plans built around flexible services like dial-a-ride, taxis, and privately owned autos.

This definition applies throughout the remainder of this report, unless otherwise stated.

2/ U.S. Department of Health, Education and Welfare, Limitations of Activity Due to Chronic Conditions, June 1977, Table 2, p. 14.

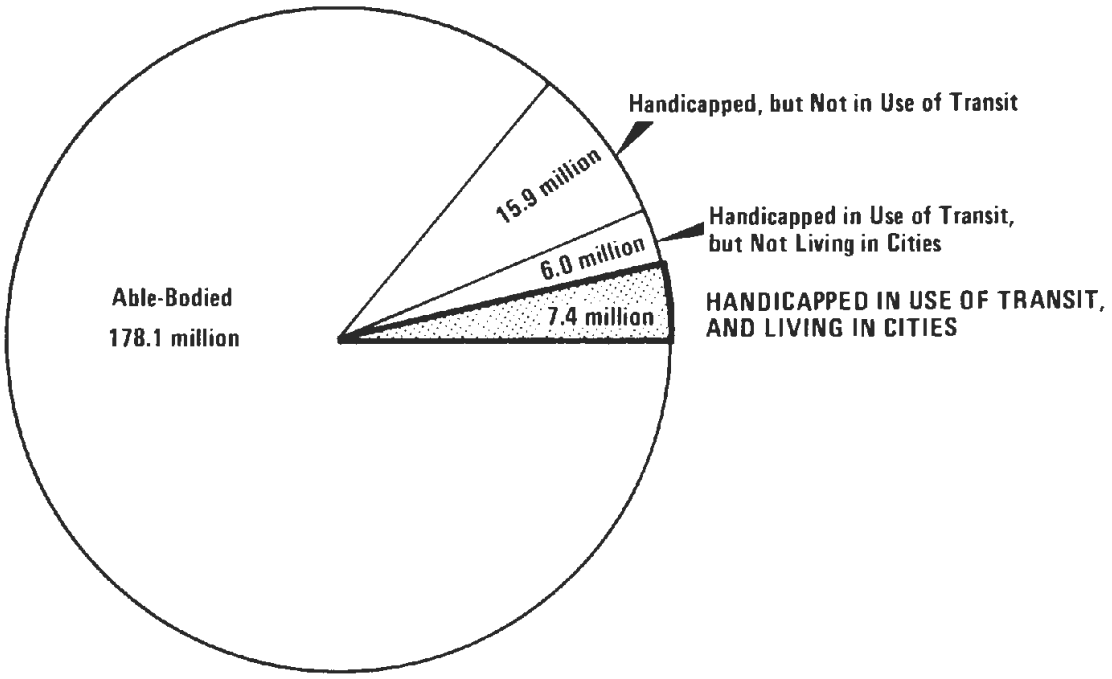
3/ U.S. Department of Transportation, Transportation Problems of the Transportation Handicapped, August 1976.

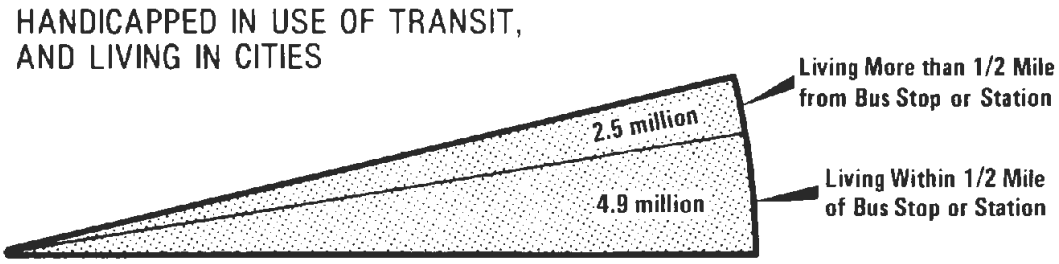
4/ U.S. Department of Transportation, Summary Report of Data from National Survey of Transportation Handicapped People, June 1978.

5/ Institute of Public Administration (for the Administration on Aging) Transportation for Older Americans—A State of the Art Report, April 1975.

Figure 1.

United States Handicapped Population by Category, 1977





SOURCES: CBO estimates based on U.S. Department of Health Education and Welfare, *Limitations on Activity Due to Chronic Conditions* (June 1977), Table 2, p. 14; U.S. Department of Transportation, *The Handicapped and Elderly Market for Mass Transit* (October 1973); U.S. Department of Transportation, *Technical Report of the National Survey of Transportation Handicapped People* (October 1978). The data are for various years from 1973 to 1978 and hence not strictly comparable.

The Elderly Among Handicapped Persons

While a great many handicapped persons are elderly, only a minority of elderly Americans are handicapped (see Figure 2). Of the 4.9 million persons who are handicapped in the use of public transportation but live near a bus stop or station (Figure 1), nearly half are more than 65 years old, as indicated in Figure 2. Yet only 22 percent of elderly people in those urban areas are handicapped. For most Americans, age alone does not appear to give rise to physical problems in using public transportation.

Even so, the number of elderly persons in the U.S. population is growing steadily and may double over the next three or four decades. The number of elderly persons suffering handicaps in the use of public transportation will, therefore, increase as well. 6/

Functional Disabilities Among Handicapped Persons

Persons who are handicapped in the use of public transportation suffer a wide range of problems. An examination of their functional disabilities in using various types of transportation suggests that they fall into two distinct groups, defined here as the severely disabled and the moderately handicapped. About 1.4 million people—19 percent of all handicapped persons in urban areas—are physically unable to use public transit services at all. 7/ It is not clear how many of them are severely disabled according to conventional medical criteria, but for the purposes of this report they may be counted as severely disabled. The remaining 6 million people can use transit services, but with difficulty. One-third of these persons, however, live more than half a mile from a transit stop. About 93 percent of all handicapped persons in urban areas are physically capable of using taxis. 8/

Severely Disabled Persons. Among the 1.4 million unable to use mass transit, about 278,000 use wheelchairs. 9/ For persons confined permanently

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6/ Institute of Public Administration, Transportation for Older Americans.

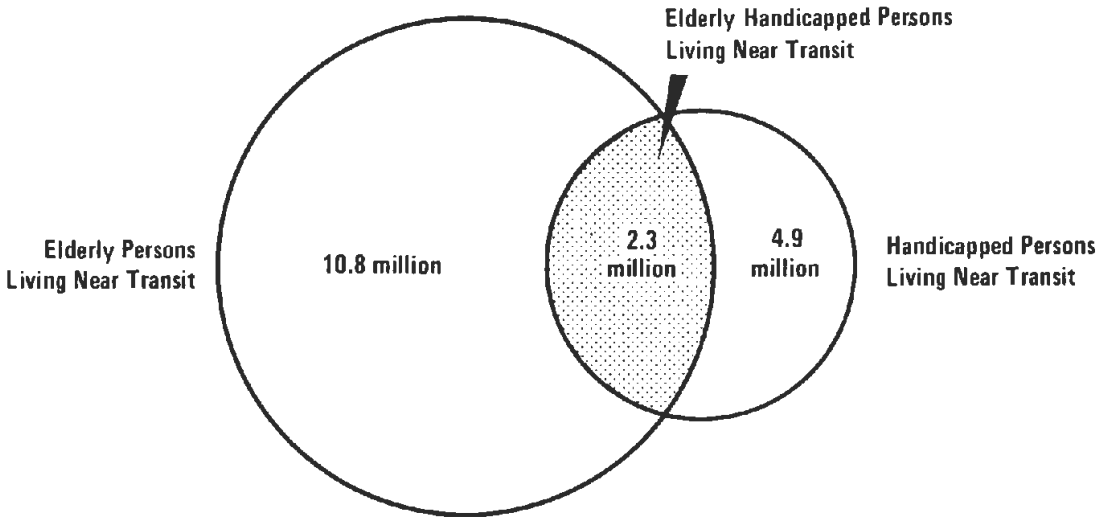
7/ U.S. Department of Transportation, Technical Report of the National Survey of Transportation Handicapped People, October 1978.

8/ Ibid.

9/ Ibid.

Figure 2.

Elderly, Handicapped, and Elderly Handicapped Persons Living Near Transit, 1977



SOURCE: U.S. Department of Transportation, *Technical Report of the National Survey of Transportation Handicapped People* (October 1978).

to wheelchairs, most existing public transportation is wholly inadequate. About 160,000 wheelchair users suffer from paraplegia, muscular dystrophy, amputation, and other conditions that confine them permanently to wheelchairs; they are unable to climb steps. 10/ In areas served by a subway system, an estimated 15,000 such persons use wheelchairs on a full-time basis. Most paraplegic persons can transfer from a wheelchair to a taxi. Younger ones can manage to use a wheelchair in conjunction with operating a car. 11/ It is a simple procedure to adapt the foot controls of a car to hand operation and to provide space behind the front seat to store a wheelchair.

About 40,000 handicapped persons suffer from quadriplegia, disabilities in the arms, trunk, and lower extremities. For the most part, they are younger persons with war injuries, or victims of accidents and birth defects who have been saved by recent advances in medical science. For them the use of existing transit facilities is extremely difficult. Merely getting to a bus stop, moving through crowds, and waiting in hot or cold weather can present health hazards. (Impairment of the nerves serving the sweat glands can make it dangerous to wait in hot weather.) The majority of quadriplegics have great difficulty getting in and out of a taxi unless it is a van equipped with a lift. Many use heavy motorized wheelchairs that cannot be folded for storage in a car. (A few quadriplegics with impairments above a certain cervical level cannot move their fingers and might use a mouthstick to dial for a taxi.) 12/

10/ The DOT national survey of transportation handicapped people found that 201,000 persons are confined permanently to a wheelchair. Information received from Dr. R. W. Hussey of the West Roxbury Veterans Administration Hospital suggests that among 201,000 persons, about 40,000 are quadriplegics with disabilities that extend both below and above the hips. This is confirmed in information received from W. G. Holsberg of the Veterans Administration.

11/ This was determined from conversations with several driving instructors who specialize in teaching disabled persons to drive, and from disabled persons who drive, in particular E'lise Brown of the Sharpe School, Washington, D.C.; Geri Sjipalo of the New York University Medical Center, Institute of Rehabilitation Medicine (Rusk Institute); and Dr. C. Krowthammer of Rockville, Md.

12/ Frank Hammond Krussin, Frederic J. Kuttee, Paul M. Ellwood, Jr., Handbook of Physical Medicine and Rehabilitation, 2d ed. (Saunders, 1971). Automatic telephones can reduce this problem considerably.

It is possible, however, for many quadriplegic persons to operate an adapted vehicle. A van can be equipped with a lift, with channels to lock the wheelchair into the driving position, and with power-assisted controls. Such adaptations make driving physically possible for nearly all but elderly or blind quadriplegics, and the minority who suffer total impairment of hand and finger movement. 13/

About 208,000 people use wheelchairs on occasion because of arthritis, debilitating diseases, or advanced age. Many have difficulty getting to a bus stop, but many appear capable of transferring from a wheelchair to a taxi and can use wheelchairs that fold for storage in the trunk of a car.

While 20 percent of severely disabled persons in urban areas are wheelchair users, another 1.1 million have difficulty walking as far as the nearest bus stop, waiting on their feet, climbing or descending stairs, and moving through crowds—difficulties that make it impossible for them to use transit. Many have arthritis and can walk only with the assistance of a walking frame or with the help of another person. For them, boarding a bus or walking down steps to a station platform appears onerous if not impossible.

Moderately Handicapped Persons. The remaining 6 million persons identified as handicapped in their use of transit can in fact use bus and train services, albeit with difficulty. Arthritis and other debilitating illnesses, or frailty brought on by age, make it difficult for them to climb steps, to maintain their balance as the bus or train accelerates, and to keep pace with the movement of crowds. Most are, however, able to use taxis.

13/ Among those excluded might be quadriplegic persons with acute cervical impairments at the C-5 spinal level and above, perhaps involving nerves that control respiration and other vital functions. Less than 5 percent of quadriplegic persons have injuries at the C-5 level or above.

A good example of an adaptation that enables a person with radically impaired movement of the arms to drive a car is the so-called zero effort steering system. Designed to reduce the amount of effort required to turn a steering wheel when the vehicle is stationary, it reduces the amount of force by the driver from 112-192 ounces at the rim of a 16-17" steering wheel to approximately 8 ounces of force exerted at the rim of a 12" diameter steering wheel.

TRANSPORTATION CURRENTLY AVAILABLE TO HANDICAPPED PERSONS

Severely disabled and moderately handicapped persons differ sharply in their functional abilities and accordingly in the range of transportation services they can use. Their transportation choices also depend on the state of their finances, their family and friends, their place of residence, and their attitude toward life in general.

Elderly and handicapped persons currently have four general types of transportation available to them in cities:

- Private automobiles;
- Public transportation;
- Transportation provided by social service organizations; and
- Commercial services for handicapped persons.

These services are described below, along with the uses and deficiencies of each.

Private Automobiles

Handicapped persons typically own fewer cars and are less likely to be licensed to drive than nonhandicapped persons. Two-thirds of them, however, some of them severely disabled and confined to wheelchairs, do own and operate cars. 14/ Handicapped persons make about 72 percent of their journeys by private auto (see Table 1). Many depend on others to drive them; while 16 percent of the daily journeys made by nonhandicapped persons are made as passengers in private cars, the corresponding share for handicapped persons is twice as large—34 percent. This means that the handicapped are often forced to schedule their journeys to accommodate those who drive them, making this mode of transportation sometimes relatively inconvenient.

14/ U.S. Department of Transportation, Technical Report of the National Survey of Transportation Handicapped People, October 1978.

TABLE 1. PROPORTION OF TOTAL DAILY TRIPS TAKEN WITH EACH MODE OF TRANSPORTATION BY HANDICAPPED AND NON-HANDICAPPED PERSONS, 1977

		Handicapped		
	Nonhandicapped a/	All Handicapped b/	With No Car Usually Available	With Car Usually Available
Percent of total trips by				
Car	78	72	26	85
As driver	62	38	2	66
As passenger	16	34	24	19
Bus	9	9	33	5
Subway	3	2	8	1
Taxi	1	3	7	2
Specialized service	—	1	1	1
Walking	5	7	23	3
Other	4	6	3	4
Total	100	100	100	100

SOURCE: Compiled by CBO from U.S. Department of Transportation, Technical Report of the National Survey of Transportation Handicapped People, October 1978, and U.S. Department of Transportation, Top-Line Presentation of Transportation Handicapped People Who Do Not Have a Car Available and Who Do Not Use Public Transit, February 1979. Unpublished Draft Tabulations.

a/ Persons aged 16 years or more living within half a mile of a transit stop.

b/ Persons aged 5 years or more living in urban areas.

Public Transportation

The 4.9 million elderly and handicapped persons who live near bus or subway services make about 11 percent of their trips with those services--about the same proportion as for able-bodied persons. Wheelchair users make hardly any use of conventional public transportation (see Appendix B).

A few transit systems operate services specially geared to the needs of persons confined to wheelchairs or otherwise unable to use public transportation. Some operate buses with wheelchair lifts, while others provide door-to-door service similar to taxi service, although typically requiring that the user make advance reservations and share the vehicle with other passengers.

Transportation Provided by Social Service Organizations

Most U.S. cities with populations of 50,000 or more are served by several projects operated by public or private nonprofit agencies that provide transportation for handicapped people. There are now more than 4,000 such services, most of them connected with programs administered by the Department of Health, Education, and Welfare. 15/ They tend, however, to have two major shortcomings. First, many of them carry passengers only to specific destinations, such as medical facilities. Second, most social service agencies offer transportation only to their own clients. The consequence is a considerable amount of unused capacity. 16/

Handicapped persons at present make about 1 percent of their daily journeys through such specialized services (Table 1). Wheelchair users, however, employ these services for 5 percent of their daily journeys (see Appendix B). Patronage could be expected to grow if there were greater coordination among the agencies and programs.

15/ Institute of Public Administration, Transportation for Older Americans—1976 Progress, Prospects and Potentials, November 1976.

16/ Joseph Revis and Betty Revis, Transportation and the Disabled: An Overview of Problems and Prospects, Institute of Public Administration, October 1976.

Commercial Services for Handicapped Persons

Some disabled people have no economical general-purpose transportation available to them, either from public transit services or from health, welfare, or charitable organizations. Many turn to taxi services. Virtually all cities have taxi services, and many of these are acquiring lift-equipped vehicles. Handicapped persons use private taxis for 3 percent of their trips despite their generally low incomes, while nonhandicapped persons use taxis for only about 1 percent of their total daily journeys (see Table 1 and Appendixes A and B). This willingness by relatively poor persons to pay for taxi service suggests that other transportation services are unavailable or inadequate for their needs. Wheelchair users, who generally find public transportation impossible to use, make five times more use of specialized services than persons with less severe handicaps, as shown in Appendix B. Persons with no car available to them make four times more use of taxis than those with access to a car (Table 1).

In addition, private companies (usually listed under "ambulance" in telephone directories) ofter van and limousine services, using vehicles equipped with lifts and operated by drivers who assist passengers from door to door. The fares tend to be very high, often as much as $45 a trip. 17/ Most persons cannot afford to use such services and restrict their use of them to the most essential trips or to group outings paid for by social and business organizations.

TRANSPORTATION PROBLEMS IN PERSPECTIVE: THE GAPS IN CURRENT SERVICES

Many handicapped persons seldom use public transportation services, in part because of the deficiencies described above. There are other reasons, however, and a deeper analysis is required before the kinds of improvements needed become apparent.

17/ For example, the A&A Ambulance Company (Wesley Transportation Ltd.) of Chicago offers special door-to-door service to wheelchair users at a fare of $45.00 base charge plus $2.00 per mile over five miles. (Regional Transportation Authority, Directory of Special Transportation Services in Cook, DuPage and Other Counties, March 1978). Some wheelchair users on Chicago's south side have no choice but to use this kind of service if they must go out to the doctor.

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Factors Governing the Frequency and Purpose of Travel

Health, age, income, and car availability all influence the extent to which handicapped persons make use of public transportation services. Such persons make an average of just under one trip a day, or about half the number made by nonhandicapped persons (see Table 2).

Generally, the more severe the handicap the less a person travels. Wheelchair users travel significantly less than individuals with other handicaps, and those with severe ambulatory problems travel significantly less than those who can walk more easily (see Appendix B).

Travel behavior is also closely related to income. A study made in Portland, Oregon, found that severely disabled persons earning less than $5,000 a year traveled less than half as much as persons with like handicaps

TABLE 2. FREQUENCY OF TRAVEL BY HANDICAPPED PERSONS: AVERAGE NUMBER OF TRIPS PER DAY, 1977

Purpose	Daily Trips by Handicapped Persons a/	Daily Trips by Nonhandicapped Persons a/	Additional Trips Made by Nonhandicapped Persons Relative to Handicapped Persons
Work	0.17	0.71	0.54
Shopping/personal business	0.32	0.51	0.19
Leisure/recreation	0.27	0.41	0.14
Medical	0.10	0.04	-0.06
School	0.09	0.12	0.03
All purposes	0.95	1.77	0.82

SOURCE: Based on data reported in U.S. Department of Transportation, Technical Report on the Survey of Transportation Handicapped People, October 1978. The DOT report gives total monthly trips. CBO has converted these numbers to daily trips per person, using population estimates in the DOT Technical Reports and applying a factor of 30.42 days per month.

a/ Persons aged 16 years or more living within half a mile of a transit stop.

earning more than $15,000. Severely disabled persons with high incomes tended to travel almost as much as able-bodied individuals. 18/ Conversely, those with low incomes, in particular elderly handicapped persons, appear to travel less than any other group (see Appendix C).

Overshadowing all these factors is that of car availability. Handicapped persons who have a car available to them make 54 percent more daily journeys than those who do not own a car, or who do not have a friend or relative to drive them (Table 3). In a recent national survey, handicapped persons were asked to state how much more they would travel if they had no transportation problems. The results, summarized in Table 3, show that those who already have a car available for most of their trips would make hardly any extra journeys while those who usually do not have access to a car would travel 29 percent more, mainly for shopping but also for social and leisure purposes. 19/

Among handicapped persons who usually have access to a car, only about 6 percent of all trips are made by bus or subway, but handicapped persons without a car available to them make 41 percent of all their journeys by public transportation (Table 1).

When neither a car nor public transportation is available, handicapped persons either do not go out or must incur very high travel costs. Wheelchair users, in particular, are likely to stay at home unless there is a car available, as the statistics in Appendix B suggest. For essential journeys, such as visiting the doctor or going to school, handicapped persons often use taxis or private limousines, at fares as high as $45 a trip.

Why People Travel

Most of the difference in the amount of travel by handicapped persons relative to others is related to the fact that fewer of them have jobs. Handicapped persons make 75 percent fewer trips to work than do non-handicapped persons. Of the 7.4 million handicapped people living in urban

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18/ Urban Mass Transit Administration, Incidence Rates and Travel Characteristics of the Transportation Handicapped in Portland, Oregon, April 1977.

19/ U.S. Department of Transportation, Technical Report of National Survey of Transportation Handicapped People, October 1978.

TABLE 3. CURRENT TRAVEL BY HANDICAPPED PERSONS WITH AND WITHOUT CARS AND THEIR ESTIMATED NEED FOR ADDITIONAL TRAVEL, 1977

	All Handicapped Persons	Handicapped Persons Who Usually Have a Car Available	Handicapped Persons Who Usually Do Not Have a Car Available		
			Total	Who Can Now Use Transit	Who Do Not Now Use Transit
Thousands of handicapped persons in areas served by:					
Bus	4,940.0	3,213.9	1,726.1	882.9	843.2
Subway	689.0	448.3	240.7	117.6	123.1
Current daily trips per person	0.95	1.10	0.72	0.96	0.69
Desired additional daily trips per person	0.09	0.03	0.21	0.23	0.18
Total desired trips per person	1.04	1.13	0.93	1.19	0.87

SOURCE: Compiled by CBO from U.S. Department of Transportation, Top-Line Presentation of Transportation Handicapped People Who Do Not Have a Car Available and Who Do Not Use Public Transit, February 1979.

areas, only 1.1 million, or 15 percent, have jobs. 20/ The high incidence of retired persons among the handicapped population accounts for much of the lower employment. Even so, only 23 percent of handicapped persons of working age held jobs in 1977, compared to 64 percent in the able-bodied population.

Inability to get to work, however, does not appear to be a major reason why many handicapped persons do not have jobs. The principal reasons handicapped persons give for not working are home and family responsibilities, physical disabilities, and inability to work, according to a questionnaire summarized in Table 4. Indeed, only one handicapped person in a hundred gave lack of transportation as a reason for not working. 21/

Handicapped persons also travel much less for shopping and personal business than the nonhandicapped, as shown in Table 2. While difficulty in traveling is undoubtedly a major reason, the fact that they generally have less money to spend also weighs heavily. Persons who are handicapped in the use of public transportation earn significantly less money, on average, than nonhandicapped persons; the median income of disabled persons in 1977 was $5,500 a year, compared to $11,000 among able-bodied persons. 22/ Among persons of similar age and economic circumstances, the difference in the number of daily trips made by handicapped and nonhandicapped persons is smaller than the statistics in Table 2 suggest. 23/

20/ U.S. Department of Transportation, Technical Report of the National Survey of Transportation Handicapped People, October 1978.

21/ The finding that lack of transportation is not a principal reason why many handicapped persons do not have jobs seems to be borne out by other studies. See Abt Associates, Transportation Needs of the Handicapped, August 1969, and Arthur D. Little, Inc., Employment, Transportation and the Handicapped, July 1968. It should be noted that the transportation factor varies according to how the survey questions are asked. Up to 12 percent of handicapped persons who said they would use improved transportation services described to them in the recent DOT survey saw the opportunity to get a job as a potential benefit.

22/ U.S. Department of Transportation, Technical Report of the National Survey of Transportation Handicapped People, October 1978.

23/ See John C. Falcocchio, Estimates of Travel Demand for the Disadvantaged—Large Urban Areas, Prepared for 56th Annual Meeting of the Transportation Research Board, National Research Council, Commission on Sociotechnical Systems, January 1977 (Draft).

TABLE 4. REASONS FOR NOT WORKING AMONG TRANSPORTATION HANDICAPPED PEOPLE IN EMPLOYABLE AGE GROUPS (AGES 16-64), 1977: IN THOUSANDS

	Number	Percent
Keeping house/family responsibilities	1,438	49
Unable to work	1,042	36
Physical disability/ill health	813	28
Going to school/training	407	14
Lack school/training	60	2
Employer thinks too young/too old	50	2
Other personal handicaps	50	2
Lack of transportation	25	1
Total number of respondents a/	2,921	—

SOURCE: U.S. Department of Transportation, Technical Report of the Survey of Transportation Handicapped People, October 1978.

a/ Column does not add to total because people gave more than one reason.

CONCLUSIONS

The severity and magnitude of transportation problems confronting handicapped persons vary enormously depending upon access to a car, health, age, income, availability of family and friends, residential location, and personal attitudes. Some handicapped persons suffer a combination of acute functional disabilities, financial hardship, and friendlessness that render existing services radically less appropriate for them than for other handicapped persons.

Of highest priority are those who have nobody to drive them, are physically unable to drive adapted vehicles, use adapted transit, or get into conventional taxis, and cannot afford private lift-equipped van service. They probably include less than 5,000 persons.

Second in priority are quadriplegic and paraplegic persons with relatively less severe cervical impairments who could not use adapted transit facilities or could do so only with difficulty, but could operate adapted automobiles (with training) and can travel by lift-equipped taxis. Reliable estimates of their number do not exist, but informal estimates and the analysis in Appendix D suggest that they may include about 100,000 wheelchair users.

Of the 1.4 million persons physically unable to use transit, the remaining 1.3 million persons are confined to wheelchairs or suffer disabilities (such as amputation and severe arthritis) that make it extremely difficult or impossible to walk to a bus stop; many can physically use conventional taxis, but often restrict their travel to medical-related journeys because of high fares.

Fourth are 6 million persons who are moderately handicapped in the use of transit. They are physically able to use existing transit services, but only with difficulty. They do not require large-scale transit adaptations such as lifts and elevators, but would be greatly helped by modifications in the existing system such as lower steps on buses, more and better handrails, priority seats, and vehicles with smoother acceleration. These would enable persons with disabilities such as mild arthritis to use public transit more often.

CHAPTER III. POLICY ALTERNATIVES

This chapter outlines three alternative plans for serving the transportation needs of handicapped persons. The DOT regulations form the basis of one plan. The priority of needs identified in Chapter II guided the development of two other plans. Together, the three plans span the range of choices available to the Congress in deciding how best to cater to the travel requirements of handicapped persons. The three policy options, shown in Table 5, are compared and evaluated in the remaining chapters of this report.

The Transit Plan

The first plan, called the Transit Plan, complies with DOT's Section 504 regulations. It would require that all new buses purchased by transit operators in receipt of federal funds have wheelchair lifts and special suspensions that lower the front steps of the bus; that cities served by a subway system either install elevators in their key stations and modify their rail cars to serve wheelchair users, or offer dial-a-ride service and taxi subsidies; and that all cities with rail systems link up unmodified stations with some other accessible service. It requires similar adaptations by commuter rail and streetcar systems; key stations on such systems, one car per commuter train, and half the fleet of streetcars, must accommodate wheelchairs. This analysis assumes that half the cities with subway systems would choose to supply door-to-door service rather than install elevators.

As part of its ruling on Section 504, DOT requires transit operators in receipt of federal bus capital grants to purchase a specific bus design (Transbus) that features a lower floor and one less step than buses now in service. Because its production in the foreseeable future is uncertain, Transbus is not included in the Transit Plan analyzed here. Its possible effect on the Transit Plan is discussed briefly later in this report.

The Taxi Plan

The second alternative plan—the Taxi Plan—is not based on the DOT regulations; instead it offers alternative services, each tailored to the needs of individuals in the priority groups identified in Chapter II. It would supply lift-equipped dial-a-ride vans to serve wheelchair users from door to door,

TABLE 5. ALTERNATIVE OPTIONS FOR SERVING THE TRANSPORTATION NEEDS OF HANDICAPPED PERSONS

Option	Public Transportation Adaptations	Door-to-Door Services
Transit Plan a/ (DOT regulations)	Wheelchair lifts and special suspension that lowers the front steps on all new buses Bus routes extended to cover unmodified subway stations Elevators in key stations in half the cities with rail systems At least one car per train on subways and commuter rail systems and half the fleet of streetcars adapted for wheelchairs	Dial-a-ride vans for wheelchair users, and taxi subsidies for other handicapped persons, in half the cities with rail systems
Taxi Plan	Special suspension that lowers the front steps on all new buses Bus routes extended to cover all subway stations More handholds, priority seating, and seat-before-accelerate rule	Dial-a-ride vans for wheelchair users
Auto Plan	Special suspension that lowers the front steps on all new buses Bus routes extended to cover all subway stations More handholds, priority seating, and seat-before-accelerate rule	Dial-a-ride vans for wheelchair users Low-fare taxi service for severely disabled persons unable to use transit Capital assistance to permanently wheelchair-bound paraplegic and quadriplegic persons for purchase of specially adapted automobiles (with no personal income conditions)

a/ Where all adaptations are not completed within three years, the DOT regulations specify that each city must make available some form of temporary service on an interim basis. The DOT regulations do not demand any single form of interim service, and the possibilities range from fitting lifts to older buses (using those buses to serve rail stations as well) to coordinating existing social service agency transportation for this purpose, or providing some form of taxi service. Cities may not wish to introduce new wide-scale door-to-door service for this purpose, however, only to withdraw the service as they complete the transit adaptations. Rather, cities may wish to fit lifts to older buses, which would be more or less equivalent to accelerating the adaptation program; it would not alter the benefits and costs reported here for this plan. Where cities introduce temporary door-to-door service, the short-term costs and benefits reported in this paper would change, but not materially.

at fares and frequencies broadly equivalent to transit fares and frequencies. Other persons too severely disabled to use public transportation, but able to enter an ordinary taxi, would be offered subsidized taxi fares. For moderately handicapped persons, it provides for a special suspension on every new bus that would lower the front steps to make boarding easier. Other provisions of the Taxi Plan include priority seating on buses, more hand-rails, a seat-before-accelerate rule, and bus routes linking all subway stations.

The Auto Plan

The third alternative plan, the Auto Plan, would give a capital grant to paraplegics and quadriplegics to cover the purchase price of specially adapted private cars or vans. It also includes all the features of the second plan.

In all three plans, care is taken to ensure that handicapped passengers pay no more for public transportation service than prevailing transit fares. For those who may find travel at such prices prohibitive, assistance might be provided through existing federal income maintenance policies.

CRITERIA FOR COMPARING ALTERNATIVE PLANS

The Congress can evaluate how best to address the transportation problems of handicapped persons on the basis of a number of criteria:

- The number of handicapped persons who would find it possible to travel more by each alternative, and would actually do so;
- The extent to which each alternative tends to segregate handicapped persons from the rest of the traveling public;
- Total cost; and
- Cost effectiveness.

A principal concern in weighing the merits of each approach is the number of handicapped persons who would be enabled to travel, and who would actually do so. The Congress may also wish to distinguish between moderately handicapped persons who already have access to transit facilities and severely disabled persons who cannot use existing facilities. The Rehabilitation Act makes this distinction with reference to reducing employment barriers for handicapped persons.

Some alternatives--in particular, specialized dial-a-ride services--tend to segregate handicapped persons from the rest of the general public. A major concern of many handicapped persons who favor the approach adopted by DOT is to eliminate such segregation. If segregated systems can be expected to serve a larger number of the severely handicapped than adapted transit systems, the Congress may wish to consider either a trade-off in objectives in light of its own sense of priorities or the possibility of promoting both approaches.

The remaining chapters of this report examine in detail the benefits and costs associated with each of the plans outlined above. The aim is to bring into relief the trade-offs between objectives implied in the various courses of action open to the Congress.

CHAPTER IV. THE POTENTIAL USE OF ALTERNATIVE SERVICE IMPROVEMENTS

This chapter addresses the benefits likely to result from each of the three plans presented in Chapter III. It first examines the various strands of evidence as to the use that handicapped persons may be expected to make of the improved services under consideration. It then develops forecasts of the number of moderately handicapped and severely disabled persons likely to benefit from each of the three plans, relating the number of persons likely to gain from each plan to the priority of needs established in Chapter II. It finds that the Taxi and Auto Plans would serve more handicapped persons and, in particular, more persons with high priority needs, than would the plan based on the DOT regulations.

RECENT EVIDENCE ON THE EXPECTED USE OF ALTERNATIVE SERVICE IMPROVEMENTS

The information on which to base forecasts of the use that would be made of improved transportation services takes two forms:

- Surveys of handicapped people as to their preferences; and
- Data on the patronage of existing services available to handicapped persons.

Forecasts differ enormously, depending on which of the two sources of data is used. These are reviewed below, followed by CBO projections based on both kinds of data.

Survey Data

In 1975, the U.S. Department of Transportation commissioned a wide-ranging national survey of handicapped persons to explore their travel problems and their attitudes toward a range of possible improvements not yet available in many U.S. cities.

Both the number of handicapped persons who might use adapted mass transit services and the number who might use special door-to-door

transportation were estimated as part of the survey. 1/ The survey selected 1,500 handicapped persons for questioning. Interviewers described various transport improvements to them and asked whether they would use the improved services, and, if so, how many extra daily trips they would make.

Those who said they would use a service were then screened according to the nature of their handicaps. Only those were counted who were physically capable of using the service in question, or who would be able to use it if existing barriers were removed. For example, a person unable to use a bus because the steps are too high, and who cannot walk to the bus stop, would not be counted as a potential user of buses with lower steps--even if he said he would use them—if no service was offered that would help him get to the bus stop. 2/

While sound in many respects, this procedure for distinguishing between those who would and those who would not use the new services is questionable as a basis for making forecasts. Perhaps some persons identifying themselves as severely handicapped today would, with improved transportation services, overcome their disabilities and manage to get to a bus stop. Physical limitations are sometimes partly psychological. For example, a poor self-image acquired over many years of illness leads some people to use physical disability as an excuse for inactivity. 3/ While the survey analysts understandably felt unable to quantify these factors, they remain a cause for concern regarding the validity of the analysis.

The first part of the survey dealt with improved public transport services that would comply with the DOT Section 504 regulations. Respondents were told that:

- The steps at the entrances of buses would be made lower;
- More handrails would be provided at entrances and inside buses;
- Buses would have wheelchair lifts or ramps;

1/ U.S. Department of Transportation, Technical Report of the National Survey of Transportation Handicapped People, October 1978.

2/ Ibid.

3/ Conversation with and letter from Alex Eckmann, Institute of Public Administration, February 23, 1979.

- Handicapped passengers would be assured seats, and floors would not be slippery; and

- The fare for the service would be the same as present transit fares.

In areas served by subways and trains, respondents were told that:

- Elevators would be available to get them from the street to the platforms;

- Wheelchair users would be able to board the vehicles; and

- The fare for the service would equal present transit fares.

Handicapped persons were also asked if they would use a service that took them from door to door, employing vehicles equipped with wheelchair lifts and drivers who would give them necessary assistance. (Interviewers specified that passengers might need to place reservations a day in advance, and to that extent the service described was not exactly comparable to the one planned here.)

Adapted Transit Use. Nearly 3 million handicapped persons said they would use adapted bus and rail services. But only about 1.4 million of them were judged capable of doing so (Table 6). Of these 1.4 million, most were persons already physically capable of using public transportation, albeit with difficulty. Only 10 percent of those who do not use transit at present expressed an interest in, and were judged physically capable of using, the adapted service.

As noted earlier, more than 75 percent of those handicapped persons currently unable to use public transportation have difficulty walking more than one block without assistance—the minimum distance to most bus stops or subway stations. In addition, many fear crowded places like subway stations, and cannot wait standing for more than a few minutes. Such difficulties reduce the estimated number of potential severely disabled transit passengers to one-tenth of those who had said they would use adapted transit. While 129,000 wheelchair users within half a mile of a transit stop (32 percent of all wheelchair users) expressed interest in using adapted transit, only 6 percent of all wheelchair users would no longer face barriers to doing so. CBO estimates that 3,400 of those persons live near a subway station. 4/

4/ This estimate is based on the assumption that, as with the handicapped population in general, 14 percent of wheelchair users live near a subway station.

TABLE 6. NUMBER OF HANDICAPPED PERSONS EXPRESSING A DESIRE TO USE ALTERNATIVE SERVICES AND THOSE PHYSICALLY ABLE TO DO SO, 1977: IN THOUSANDS

Policy	Number of Persons Who Say They Will Use Service			Number of Persons Who Say They Will Use Service Who Are Judged Physically Able To Do So		
	Who Now Use Fixed-Route Transit	Who Do Not Now Use Fixed-Route Transit	Total	Who Now Use Fixed-Route Transit	Who Do Not Now Use Fixed-Route Transit	Total
Adapted transit service	1,299.4	1,621.9	2,921.3	1,299.4	143.9	1,443.3
Separate door-to-door service a/	N/A	N/A	4,697.1	N/A	N/A	2,787.5

SOURCE: U.S. Department of Transportation, Technical Report of the National Survey of Transportation Handicapped Persons, October 1978.

a/ The number of persons who said they would use a door-to-door service were not categorized by those who now use fixed-route services and those who do not. The survey indicates, however, that of those who said they would use a door-to-door service, 19 percent were not currently able to use fixed-route bus and rail services.

Door-to-Door Service Use. The analysis of attitudes toward door-to-door service indicates that about 2.8 million persons--37 percent of all handicapped persons living in urban areas--express interest in using this type of service and would not face barriers to doing so, as compared to 19 percent who might use adapted transit.

Moreover, 44 percent of all wheelchair users express interest in using door-to-door service and would not face barriers to doing so, as compared to 6 percent of wheelchair users who could and would use adapted transit.

The provision of door-to-door service thus removes some formidable barriers to the use of transit. But some handicapped persons who express a desire to use this form of service cannot do so because of special problems. These include difficulty in using a telephone and certain psychological aversions—neither of which can be resolved by door-to-door transportation.

The foregoing projections are based on the respondents' perceptions of how they might behave in situations of which they have no direct experience. Some analysts suggest, however, that people often overstate their intentions when asked a hypothetical question. One study found that some respondents claimed they would use a new service up to 60 times more than they actually did when given the opportunity. 5/ This exaggeration of intentions—known as noncommitment survey bias—is thought to occur because people often consider the advantages of a suggested improvement but not their true preferences, the costs, or the impracticalities. While the results of the DOT survey were adjusted to reflect the exaggerated response of persons who would have physical difficulty in using the improved services, this adjustment was far less than that found necessary in the study cited above.

Patronage of Existing Services for Handicapped Persons

The belief that the survey projections are too large finds support in the fact that the number of persons using existing adapted fixed-route transit and door-to-door systems is considerably less than that projected from survey responses.

Current Use of Adapted Transit Service. Patronage of buses and subways equipped with wheelchair lifts and elevators, in the few cities that

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5/ David Hartgen and Carol A. Keck, Forecasting Dial-a-Bus Ridership in Small Urban Areas, Transportation Research Board Record, 563, 1976 p. 53.

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run such services, averages between 2 and 5 trips per day; in St. Louis, where the most extensive accessible bus system is in operation, this amounts to one handicapped passenger for every 320 bus runs. 6/ A one-day survey in April 1978 found that 126 trips were made by handicapped persons who used the elevators in the Washington, D.C., subway system; this included 42 trips by wheelchair users. 7/ The data are based on very limited experience, in cities where only part of the transport system is modified for wheelchair users. Moreover, the lift equipment used on buses has proved to be highly unreliable; a few accidents have occurred in which persons in wheelchairs fell from the lift platforms. It is possible that use will increase as the number of adapted buses and subways grows nationally, and as the reliability and safety of the equipment improves. On the other hand, a survey of 60 wheelchair users in St. Louis suggests that the main reasons for low use of fixed-route buses adapted with lifts is not so much the lack of universal route coverage as the availability of a car, the inability to travel alone, and difficulty in getting to a bus stop. 8/ Moreover, as indicated in Chapter II, most handicapped persons wish to travel for shopping and leisure purposes, while bus routes in most cities are geared to carry workers to the central business district. The travel patterns of elderly and handicapped persons do not correspond well with conventional transit route patterns.

While findings in St. Louis and other cities must be regarded as preliminary, they give some indication that buses and subway stations equipped with lifts and elevators might not attract as large a number of handicapped persons as indicated by the DOT survey.

Current Use of Door-to-Door Services. Actual experience also indicates that the potential use of door-to-door services is less than that suggested by surveys. The DOT national survey indicated that between 37 and 63 percent of handicapped persons might make use of door-to-door services. Evidence from cities in which such services have been operating for some time, summarized in Table 7, shows that only about 11 percent of

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6/ Robert Casey, Overview of Fixed Route, Wheelchair Accessible Bus Services, Transportation Systems Center, November 1978.

7/ Internal Washington Metropolitan Area Transit Authority (WMATA) Memorandum, Metro Station Elevator Survey, December/January 1978/1979, as quoted in Hearings Before a Subcommittee of the Committee on Appropriations, House of Representatives, Part 4, Department of Transportation and Related Agencies Appropriations for 1980.

8/ Casey, Overview of Fixed Route, Wheelchair Accessible Bus Services.

TABLE 7. REGISTRATION AND USE OF SPECIAL DOOR-TO-DOOR SERVICES BY ELDERLY AND HANDICAPPED PERSONS IN FOUR CITIES, 1977 AND 1978

	Kinston, N.C.	Portland, Ore.	Montgomery, Ala.	Danville, Ill.
Total population in area	23,000	379,310	134,000	42,600
Eligible population	2,860	21,000	18,600	7,500
Percent of total population	12.4	5.5	13.8	17.6
Registrants	700	5,900	5,500	3,500
Percent of total population	3.1	1.5	4.1	8.2
Percent of eligible population	25	28	30	47
Users as percent of registrants	61	26	15	35
Users as percent of eligible pop.	15.3	7.3	4.5	16.5

SOURCE: Compiled by CBO from Bruce D. Spear and others, Recent Evidence From UMTA's Service and Methods Demonstration Program Concerning the Travel Behavior of the Elderly and the Handicapped, October 1978.

the eligible handicapped population use the services. If the patterns of use observed in Portland and other cities were repeated elsewhere following nationwide implementation of similar door-to-door services, about 820,000 handicapped persons might use them, or 17 to 29 percent of the number predicted by the DOT survey.

An important factor in explaining the low use of existing dial-a-ride and low-fare taxi services is that many handicapped persons have access to cars. Using data from six cities, Spear and others found that on the average 41.5 percent of the door-to-door service users could otherwise have traveled by auto, either as drivers or as passengers. 9/ The DOT national survey reported that, of those who said they would use door-to-door service, 55 percent could otherwise have ridden in private autos and 37 percent had drivers' licenses—that is, about 69 percent of those interested in door-to-door service could use cars if they wanted to. If the data from actual experience is regarded as a more accurate indication of the use that would be made of door-to-door services by those with a car available, and the survey data (adjusted for the barriers mentioned above) are reconciled to reflect that assumption, the number of potential users of door-to-door services might total 1.5 million, or from 31 to 52 percent of the number of potential users reported by the survey.

Another factor contributing to the low patronage of dial-a-ride and low-fare taxi services is restrictions on their use. Some systems are restricted to certain hours, requiring the users to make reservations one or two days ahead. Some services place limits on the number of trips a user can make per month. In Portland, passengers must place reservations two days ahead, and in Danville handicapped passengers can make no more than $20 worth of trips a month. 10/

It should also be noted that many dial-a-ride services limit their patronage to fit the number of vehicles available. In Portland, a system of

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9/ Bruce D. Spear and others, Recent Evidence from UMTA's Service and Methods Demonstration Program Concerning the Travel Behavior of the Elderly and the Handicapped, October 1978.

10/ In Danville, nevertheless, no single class of passengers made even half the number of trips allowed. During a survey in Portland, from 36 to 52 percent of the users said they would make more trips if they did not have to call so far in advance; but these persons were thought to be overstating their intentions. A dial-a-ride service in Rochester, N.Y., that did respond at short notice generated far less travel than had been anticipated.

priorities was devised to adjust demand to supply—but so far the demand has fallen far short of expectations and the system has not been needed.

PROJECTED NUMBER OF PERSONS SERVED BY THE THREE PLANS

A forecast of the number of handicapped persons who might use improved transportation services should take into account both the exaggeration inherent in surveys and the underestimation inherent in projections based on the limited experience of the past. Together, these factors suggest that the potential number of users of adapted transit services and door-to-door transportation may be higher than that indicated by the current use of such services, but considerably lower than that projected in surveys.

Forecasting Approach

Past experience suggests that the use of nationwide door-to-door service might be about 17 percent of that suggested by the DOT survey. But most existing services require that the passenger plan each trip 24 hours ahead of time, and current rates of patronage reflect that inconvenience. When this element is eliminated and the DOT survey is adjusted to reflect only the physical difficulties that such a system would not remove, and the low use of existing services by persons with cars available (a pattern that is bound to continue in the future), patronage of actual door-to-door services might amount to about 50 percent of that suggested by the survey. Similarly, adapted transit services might attract approximately 50 percent of the patronage indicated by survey results.

The following forecasts assume that the number of potential users of all new transportation services will be about half that projected in the DOT survey. An exception is made for wheelchair users, whose patronage is estimated at two-thirds of that forecast in the survey. This is because of the greater propensity of wheelchair users to seek independence by switching away from the cars of relatives and friends.

These assumptions may still appear optimistic in the light of recent experience, particularly as applied to the use of adapted mass transit services. But they reflect judgments as to the cumulative impact of population growth over the next 30 years, changing family structure, federal policies that promote independent living arrangements for the handicapped (increasing the demand for various social services that once were provided by the nuclear family), and the possibility that some handicapped persons might overcome their psychological aversion to using transit, or to going out in general. They also reflect the liklihood that handicapped persons will find

more satisfaction in door-to-door transportation that requires no advance reservation than they do in current dial-a-ride services.

Table 8 presents the forecasts of numbers of handicapped persons likely to use each of the three plans. Plans geared to the DOT regulations appear to help fewer handicapped persons in general, and far fewer persons with the highest priority of needs—severely disabled individuals, including those confined to a wheelchair—than do plans emphasizing door-to-door services and specially adapted automobiles.

The Transit Plan

The DOT regulations require transit systems to make changes that would accommodate severely disabled persons. Yet most wheelchair users or otherwise severely handicapped persons who do not use transit today cannot get to bus stops and rail stations, or have difficulty in doing so; many cannot travel without the assistance of another person. Moreover, nearly 80 percent of the severely handicapped already have access to private cars. In total, only 14 percent of the handicapped persons helped by the Transit Plan would be among those severely disabled persons who are unable to use transit today. Of the country's severely disabled population, less than one-

TABLE 8. FORECASTS OF THE NUMBER OF MODERATELY AND SEVERELY HANDICAPPED PERSONS WHO WOULD BENEFIT UNDER THREE ALTERNATIVE TRAVEL PLANS, 1980-2010

Plan	Moderately Handicapped Persons a/	Severely Handicapped Persons b/	All Handicapped Persons
Transit Plan	638,386	103,585	741,971
Taxi Plan	592,000	363,044	955,044
Auto Plan	592,000	419,544	1,011,544

a/ Users of existing transit services who would make more trips.

b/ Persons currently not using mass transit.

tenth would use transit as a result of the DOT regulations as interpreted here. In particular, among the country's 409,200 wheelchair users, only 14,900 would use adapted buses, and only 2,077 would use adapted rail services. An additional 8,300 wheelchair users would use door-to-door transportation in rail cities providing it under this plan.

The vast majority of persons who would gain under the Transit Plan suffer only mild to moderate disabilities that do not prevent them from using transit today. They are those for whom travel is made difficult by high steps, slippery floors, and lack of handrails. If about one-third of these persons were led by the improvements to make more use of transit, 638,400 --10 percent of all moderately handicapped persons--would benefit from the DOT rules.

The Taxi Plan

A total of 955,000 handicapped persons would benefit from the Taxi Plan, 29 percent more than would gain from the Transit Plan.

Providing wheelchair users with door-to-door van service increases the number of wheelchair users who can travel more often fivefold. While 6 percent of all wheelchair users stand to gain from the DOT regulations as interpreted here, the Taxi Plan would help 29 percent or 119,000. The majority of those who would not use the service have access to cars, either as drivers or as passengers. Some others suffer from cervical impairments that make it hard to dial the phone.

An additional 176,000 severely disabled persons who are not confined to wheelchairs stand to gain from low-fare taxi service. Some may require wheelchairs occasionally, and many find it very difficult or impossible to get to a bus stop, but they are capable of getting in and out of taxis. In total, 26 percent of the severely handicapped stand to gain from the Taxi Plan, compared to 7 percent who might gain from the Transit Plan.

Other features of the Taxi Plan would allow 54,000 severely disabled but ambulatory persons to use buses for the first time. The plan would also extend bus routes to subway stations to ensure that persons who would otherwise require subway elevators would still receive transit service.

The Auto Plan

The third plan—providing specially adapted automobiles for paraplegic and quadriplegic persons confined permanently to wheelchairs—would

benefit even more severely disabled people. Some of those who would use door-to-door van service under the Taxi Plan would be enabled to purchase their own automobiles, reducing the need for expensive publicly owned vans quite sharply (see Chapter V).

Approximately 200,000 persons, or 50 percent of all wheelchair users, are permanently confined to wheelchairs. Of these, approximately 40,000 are quadriplegic persons and 160,000 are paraplegic persons or others who are disabled below waist level. About half of all paraplegic persons are too old to drive, while most quadriplegic persons are apparently under 65 and physically able to drive an adapted van. In total, 80,000 paraplegic and 36,000 quadriplegic persons could become auto users. This projection excludes a number of multiple amputees who use artificial limbs in lieu of wheelchairs. Their eligibility would increase the use made of this program.

About half the wheelchair users using dial-a-ride services in the Taxi Plan would be 65 or older. The majority of those under 65 would purchase a car instead of using the door-to-door service, leaving 50 percent fewer van users in the Auto Plan. Thus the Auto Plan would serve 65,000 more severely disabled wheelchair users than the Taxi Plan, increasing the number of wheelchair users that benefit from 29 percent to 43 percent of all wheelchair users.

ADDITIONAL TRAVEL RESULTING FROM ALTERNATIVE PLANS

Having estimated the number of persons likely to benefit from each plan, it remains to ask how much more mobile they would be as the result of improved transportation services. While they would make more trips than they do today, most handicapped persons would doubtless continue to travel much less than able-bodied persons.

The frequency with which handicapped persons make use of existing specialized services appears remarkably low, as indicated in Table 9. In Portland, Oregon, where door-to-door service is available (vans for wheelchair users and taxis for other severely disabled persons, both at low fares) the typical registrant makes 1.5 trips a month. Some 74 percent of the registrants do not use the service at all in a typical month, while about 3 percent use it on most weekdays. The low use made of such services in other cities is no less striking, as Table 9 indicates. In Danville, Illinois (where no advance reservation was required other than the normal wait for a taxi, but where a limit was placed on the number of trips a person could

TABLE 9. FREQUENCY WITH WHICH HANDICAPPED PERSONS MAKE USE OF DOOR-TO-DOOR PROJECTS IN SELECTED CITIES

	Percent of Project Registrants Who Make No Project Trips in a Typical Month	Percent of Project Registrants Who Make More Than Five Project Trips in a Typical Month	Average Number of Monthly Trips Made by Project Registrants	Average Number of Monthly Trips Made by Regular Project Users (Those Using the Project at Least Once a Month)
Portland, Ore.	74	9	1.5	5.8
Danville, Ill.	65	11	1.5	4.3
Montgomery, Ala.	85	3	0.5	0.6
Kinston, N.C.	39	28	4.3	7.1
Average	66	13	2.0	4.5

SOURCE: Bruce D. Spear and others, Recent Evidence from UMTA's Service and Methods Demonstration Program Concerning the Travel Behavior of the Elderly and Handicapped, U.S. Department of Transportation, October 1978 (updated).

make per month), service users made an average of 4.3 trips a month, and no single category (such as wheelchair users) made even half the number of trips allowed per month. 11/

Where adapted transit services exist, they tend to be used by the same two or three persons regularly. 12/ As such services expand and attract less regular travelers, however, the average monthly use of the service would surely decline to nearer the level of use observed above. Moreover, because of the lower quality of service inherent in fixed-route services, handicapped persons might be expected to use them less frequently than door-to-door services.

CBO has assumed that severely handicapped persons would make an average of five trips a month on door-to-door and transit services. While this appears more than the average use of door-to-door services in cities that have them today, it nonetheless means that wheelchair users would, on the average, make no more than 1.5 percent more trips than they do today if the Transit Plan was implemented, and up to 7 percent more if the Taxi Plan was adopted.

Those obtaining private cars or vans might be expected to make many more additional journeys than those limited to public transportation or taxis. No data exist to suggest exactly how great the increase might be. If recipients of adapted automobiles made twice the number of extra journeys that those using door-to-door and adapted transit services made, probably a conservative assumption, the Auto Plan would result in up to 17 percent more daily travel among wheelchair users. 13/

11/ Urban Mass Transit Administration, User Side Subsidies for Shared Ride Taxi Service in Danville, Illinois: Phase 1, Final Report, June 1977.

12/ Robert Casey, Recent Experience with Accessible Buses, Urban and Regional Research Division, Transportation System Center, U.S. Department of Transportation, August 1979.

13/ These estimates of additional total travel by wheelchair users are based on an existing trip rate of 0.69 trips per day. The estimation assumes that all projected trips would otherwise not have been made. In fact, many of the trips made by users of existing services for handicapped persons would otherwise have been made by another mode of transport. Thus, the estimates of increased total travel given here represent the maximum that might be expected; in practice, total travel might increase by less than half the estimated percentages. They are used here only for purposes of comparing the different plans.

The number of trips projected for each plan is given in Appendix E.

CONCLUSION

The analysis indicates that the Taxi and Auto Plans, built around door-to-door services and specially adapted automobiles, would benefit far more handicapped people—in particular severely handicapped people, who have the greatest needs—than the Transit Plan based on the DOT regulations. The first two plans would also permit handicapped persons to engage in much more activity away from home.

The relative costs of the plans are compared in the following two chapters.

CHAPTER V. THE COSTS OF TRANSPORTATION FOR ELDERLY AND HANDICAPPED PERSONS

Each plan has its unique cost characteristics, all closely linked to patronage. The cost of adapting public transportation facilities is broadly fixed, regardless of the use made of them by handicapped persons. The cost of door-to-door transportation, on the other hand, is relatively flexible; it depends heavily on the number of handicapped persons who use it. This means that, below a certain level of use, plans that emphasize door-to-door services will cost less than plans requiring adaptations in mass transit systems. The cost analysis that follows, taken together with the patronage forecasts presented in Chapter IV, indicates that the costs of door-to-door service could be less than those of implementing the DOT regulations.

THE PLANS COMPARED

The DOT regulations allow 30 years to implement certain elements of the Transit Plan (the rail station adaptations and the extended bus routes). It is convenient, therefore, to calculate total expenditure on each of the three plans at the end of 30 years, as a basis for comparison. This comparison will include operating as well as capital costs since some elements of the Transit Plan and all of the Taxi Plan and the Auto Plan could be implemented in much less time. Because some changes would require one-time expenditures (such as digging elevator shafts) a comparison is also made of the recurring costs, which may be a more useful guide to the longer-term financial implications of each plan. The comparisons are presented below.

The gross cost of the Transit Plan would be about $7.1 billion over the next 30 years (before allowing for extra revenue from handicapped passengers). This is equivalent to two and a half years of today's level of federal funding for transit. Gross expenditure on the Taxi Plan over that period would total about $4.8 billion, and that on the Auto Plan would come to about $6.7 billion, as shown in Table 10.

The level of patronage that might be expected for door-to-door services and adapted automobiles is such that both the Taxi Plan and the Auto Plan would fall below the Transit Plan in total costs. The cost of door-to-door van service is largely proportional to the number of persons expected to use the service. The same holds for subsidized taxi service and

TABLE 10. GROSS CAPITAL AND OPERATING COSTS OF THE THREE TRANSPORTATION PLANS, 1980 TO 2010: IN MILLIONS OF 1979 DOLLARS

	Transit Plan		Taxi Plan		Auto Plan	
	Total Cost at the End of 30 Years	Annual Recurring Costs	Total Cost at the End of 30 Years	Annual Recurring Costs	Total Cost at the End of 30 Years	Annual Recurring Costs
Public transportation modification costs						
Bus	4,873.5	181.2	382.8	23.2	382.8	23.2
Rail	832.9	7.0	—	—	—	—
Door-to-door service costs						
Dial-a-ride and taxi	1,404.1	51.1	4,444.2	161.6	2,798.5	101.8
Specially adapted autos	—	—	—	—	3,529.1	128.3
Total Costs	7,110.5	239.3	4,827.0	184.8	6,710.4	253.3

NOTE: The following assumptions were made: (1) rail stations are adapted in half the rail transit cities by 2010. Costs are assumed to total half the costs reported for key station adaptation in Table 15; (2) door-to-door services and the adapted automobile program are implemented in six years.

the purchase of adapted automobiles. The costs of the Transit Plan, on the other hand, would vary only slightly, regardless of patronage. The level of use that may be expected of door-to-door services is such that the total cost of providing them, plus the cost of public transit adaptations called for in the Taxi and Auto Plans (which amount to about 7 percent of the cost of transit adaptations called for by DOT), remains less than the total cost of implementing the DOT regulations.

Once all construction at rail stations had been paid for, yearly Transit Plan costs would go down to about $239 million a year in bus replacement costs, fleet expansion costs, and the associated operating and maintenance costs. These continuing costs are about 29 percent higher than those associated with the Taxi Plan, and about 5 percent below those of the Auto Plan. This excludes the added fuel and maintenance costs incurred by disabled private motorists under the Auto Plan, and extra revenue from fares paid by handicapped passengers.

Unless otherwise stated, all costs are expressed in terms of today's (1979) price levels. 1/

COSTS OF THE TRANSIT PLAN

The Cost of Adapting Buses for Wheelchair Users

The capital and operating costs of replacing the present bus fleet with a fleet of buses each equipped with a wheelchair lift depends on two factors:

- o Bus replacement costs; and
- o Fleet expansion costs.

The costs of changing over to lift-equipped buses would total $134 million a year for the first 12 years of the plan, and about $172 million a year thereafter, as shown in Table 11.

1/ Costs and benefits that occur in the present are usually regarded as relatively more important than costs and benefits that occur in the future. But the choice of an appropriate rate at which to discount the value of better transportation to future generations of handicapped people, as compared to the present generation, is arbitrary and would distract from key issues without elucidating others.

TABLE 11. AVERAGE ANNUAL COSTS OF ADAPTING TRANSIT BUSES: IN MILLIONS OF 1979 DOLLARS

	Period of Fleet Replacement with Wheelchair Lift (1981-1993)	Period of Fleet Replacement with Lowering Suspension (1981-1983)	Period Following Fleet Replacement with Wheelchair Lift (1994 Onward)	Period Following Fleet Replacement with Lowering Suspension (1994 Onward)
Bus replacement costs				
Capital costs	46	1	46	1
Operating and maintenance costs	34	1	44	2
Total bus replacement costs	80	2	90	3
Fleet expansion costs				
Capital costs	20	0	20	0
Operating and maintenance costs	34	0	62	0
Total fleet expansion costs	54	0	82	0
Total Costs	134	2	172	3

NOTE: The estimates in the table are based upon the following assumptions:

1. Buses are replaced after 12 years, and 4,583 are purchased annually.
2. Wheelchair lifts cost $10,000 each.
3. Buses equipped with wheelchair lifts cost $1,800 more to operate and maintain during the first year, and $800 more thereafter.
4. The average cost of a special suspension to lower the front of a bus is $300.
5. Buses equipped with a special suspension will cost 0.27 percent more to operate and maintain.
6. New lift-equipped buses cost $125,000 each; they operate 31,250 miles a year and cost $2.38 per vehicle mile to operate and maintain.
7. The national bus fleet will be expanded by 1.5 percent to restore lost seating capacity and lost scheduled bus miles, and by 2 percent because of more frequent maintenance of buses with wheelchair lifts. It will also be expanded by 0.13 percent to provide bus routes connecting with unmodified subway stations at an average annual cost of $3 million during the 30 years of expansion and $6 million thereafter.

Bus Replacement Costs. Transit operators typically replace a bus after about 12 years of revenue service. Although bus replacement has slowed considerably in recent years because of uncertainty over government procurement requirements, the difficulty should be overcome in 1980. Transit operators and bus manufacturers will then have a clearer picture of DOT plans regarding Transbus, and may begin replacing buses at the normal rate of 4,000 to 5,000 annually. The nationwide fleet of 52,000 buses should be replaced in about 12 years. Moreover, the nationwide bus fleet should expand over the next few years in line with the Carter Administration's mass transit policy. This paper assumes that the bus fleet might expand to about 55,000 buses by 1994, probably a low projection given recent proposals in the area of mass transit funding.

Buses equipped with wheelchair lifts are more expensive to purchase and maintain. At present the cost of a wheelchair lift is between $15,000 and $19,000, although many sell nearer the high end of this range. The high cost of lifts reflects the very small market for these devices. The plan under consideration would stimulate a large and stable market for lifts, however, and unit costs might well fall as a result. An average $10,000 price tag over the next 30 years does not seem unreasonable. The addition of $10,000 to the price of buses would add about $46 million a year to nationwide capital expenditure on bus replacement (Table 11).

The addition of wheelchair lifts also increases operating and maintenance costs. Operators currently find the lifts mechanically undependable and expensive to maintain. 2/

2/ Booz Allen and Hamilton, Inc., Transportation Consulting Division, Preliminary Assessment of the Feasibility of Mandating Lifts for New Buses Procured Prior to Transbus, March 1978. The St. Louis, San Diego, and Washington, D.C., transit authorities employ several extra mechanics and road supervisors to deal with faulty lift mechanisms, and several transit operators keep lift-equipped buses out of service because of their unreliability. A recent study of the St. Louis and San Diego experience suggests that maintenance costs, the costs of road calls, and operating costs together have increased by $0.053 per mile, or $1,800 per bus annually (after allowing for cost inflation since the time the data were gathered). This estimate excludes other costs associated with operating lifts. Bus drivers must be trained in the use of the equipment and in dealing with disabled persons; the new facilities must be advertised; and management must insure against injury to handicapped passengers. These costs might further increase revenue expenditures by 0.5 percent in the early years of the program.

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Initially, therefore, additional operating and maintenance costs would be significant, perhaps an extra 12 percent of present total maintenance costs. But the short-term impact of changing over to lift-equipped buses is a poor guide to the longer term. Most new technology exhibits high initial maintenance problems. Moreover, driver training costs and marketing expenses decline in the longer term. 3/ Thus, while transit operators might experience a 12 percent increase in maintenance costs over the first year or so spent changing to lift-equipped buses, these costs should fall thereafter. By the time today's fleet of buses is replaced with lift-equipped vehicles (in about 12 years), additional operating and maintenance costs might be higher by about 5 percent, or $800 per bus annually. 4/ These estimates suggest that transit operators will spend an extra $34 million a year to maintain lift-equipped buses in the first 12 years of the plan, and about $44 million a year thereafter, as shown in Table 11. 5/

3/ Robert Casey, Overview of Fixed Route, Wheelchair Accessible Bus Services, U.S. Department of Transportation, November 1978.

4/ As a rule of thumb, maintenance costs may be expected to increase in proportion to the capital value of extra components added to a vehicle, in this case a wheelchair lift. The lift is assumed to increase the price of a bus by about 9 percent. The less-than-proportional increase in maintenance costs predicted here is thus optimistic, especially considering the delicate nature of lift equipment. Some analysts, nevertheless, consider this to be a pessimistic estimate. Its effect on the policy conclusions of the paper is examined in the final chapter.

5/ Robert Casey, in Recent Experience with Accessible Bus Service, U.S. Department of Transportation, August 1979, notes that the added workload for maintaining the lifts has resulted in an increase in the maintenance staff at several sites. In St. Louis, one extra mechanic was hired for every 26 lift-equipped buses. In Milwaukee maintenance staff was increased to allow for one extra mechanic for every 10 lifts; in Hartford, Conn., maintenance staff was increased to allow for four extra mechanics for 155 lift-equipped buses. The CBO-estimated increase in maintenance costs of $800 in the long term is equivalent to one mechanic for every 50 lift-equipped buses (assuming $40,000 per mechanic for labor and parts), representing a considerable improvement over present experience. An even more optimistic outlook for lift reliability is reported in the next chapter, together with its consequences for policy.

Altogether, it would cost about $80 million a year in extra capital and operating costs to replace the existing national bus fleet with lift-equipped vehicles, and an extra $90 million a year thereafter to retain them (Table 10).

Fleet Expansion Costs. Transit operators would need to increase the number of buses they own for several reasons:

- The unreliability of lifts keeps buses out of service more of the time, so that more buses are needed to ensure a fixed number of vehicles in operating condition;
- The installation of wheelchair lifts requires the removal of several seats, and thus more buses are needed to maintain seating capacity;
- In addition, all three plans call for bus routes linking adapted and unadapted subway stations, so that more buses would be needed for these supplementary routes.

The operation of the lift takes from 3 to 5 minutes, while existing schedules permit about 2 seconds per person for boarding. More buses would thus be needed to maintain existing schedules if wheelchair users ride adapted buses in large numbers.

Altogether the national fleet might expand by 3.5-4.0 percent--2 percent to cope with additional maintenance, 1.5 percent to restore system capacity and scheduled route miles to the minimum level necessary to maintain today's level of service, and by a small amount to extend routes to unadapted subway stations. These aspects are discussed separately below. 6/

6/ Developments in federal Transbus policy could change the costs reported here. Two recent studies of Transbus by the Commission on Sociotechnical Systems (NRC Transbus Study, 1979) and the Mitre Corporation (An Overview of Technical, Operational and Economic Characteristics, July 1979) found that:

- Transbus would cost 15 to 20 percent more to buy than today's buses;
- Transbus would cost about 3 percent more to operate and maintain than today's buses; and (Continued)

(1) Maintenance. About 10 percent of the national bus fleet is kept in reserve to ensure that the scheduled number of buses will be operating. In cities that currently run lift-equipped buses, the number of spare vehicles needed far exceeds 10 percent because of the unreliability of wheelchair lifts and the extra time needed to deal with delicate lift equipment. In St. Louis, a 25 percent reserve of spare vehicles was found inadequate to guarantee a scheduled number of lift-equipped buses in service. 7/ There seems little doubt that in the first few years of the plan, a large fraction of the lift-equipped vehicles would remain in reserve. Thereafter the situation should improve. As discussed above, technological problems with lifts would decline, and over the long term the number of spare buses needed should decline correspondingly. CBO estimates that, over the next 30 years, the number of reserve buses in the fleet would have to expand from 10 percent to 12 percent; this assumes that significant but no doubt possible improvements in lift technology would occur during that time.

(2) Capacity. The further fleet expansion required nationally to maintain present seating capacity would depend on the current use of buses at rush hour, as well as on the patronage by wheelchair users. New buses--

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- o Transbus, as specified, has one or two fewer seats than buses manufactured today (Advanced Design Buses).

Although these findings are contested by one potential manufacturer of Transbus, their implications for the costs of implementing Section 504 are substantial. If borne out, they suggest that implementation of the HEW guidelines and the DOT regulations with Transbus could cost considerably more than the costs reported above. Transbus would add $1.4 billion to bus replacement capital costs alone—and further amounts to operation and fleet expansion costs.

7/ At present, St. Louis keeps 75 percent of its 157 lift-equipped buses out of service because of unreliability. The average fraction of lift-equipped buses kept in reserve in 16 other cities is 36 percent, although some of these cities plan to schedule additional buses at a later time. See Robert Casey, Recent Experience with Accessible Bus Services.

so-called Advanced Design Buses (ADBs)--have less standing and seating capacity than earlier models. 8/

Even in cities where seating capacity was not a major concern, the extra time vehicles spent at bus stops to allow boarding by wheelchair-using passengers might still require the operation of additional buses. No cities have yet experienced enough use by wheelchair-using persons, however, to allow an estimate of the number that would be required. 9/

Of the ten transit systems currently operating more than ten wheelchair-lift buses, four have actually added buses to compensate for lost seats. 10/ This is due both to the lower seating capacity of Advanced Design Buses and to the additional loss of seats resulting from installation of

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8/ U.S. Department of Transportation, Transbus Operational, Passenger, and Cost Impacts, July 1976, p. 18. In addition, making room for wheelchairs reduces the number of seats. Taken together, these factors can result in a substantial reduction of total capacity in a new lift-equipped bus compared to the bus it replaces.

9/ Evidence submitted to U.S. DOT Docket No. 56, October 1978. Some transit authorities might contemplate expanding their bus fleets only marginally, perhaps on crowded long-distance commuter routes where a no-standing policy is common. Others might already have spare capacity during rush hours and could operate lift-equipped buses within existing standards of comfort and safety without adding to their fleets. Philadelphia authorities do not anticipate expanding their fleet for this reason. Milwaukee, on the other hand, with buses already pushed to capacity at rush hour, recently expanded its fleet by 20 percent to restore capacity lost in switching to Advanced Design lift-equipped buses. Other transit authorities also anticipate the need to operate extra buses if they change over to lift-equipped vehicles. In Cleveland a 9 percent fleet expansion (77 buses) would maintain existing service during crowded rush hour conditions, and in New York and Chicago a 5 percent fleet expansion would maintain present standards of comfort and safety.

10/ Letter from Robert Casey, U.S. Department of Transportation, Research and Special Programs Administration, Transportation Systems Center, October 1, 1979, and Robert Casey, Recent Experience with Accessible Bus Services, U.S. Department of Transportation, Urban Mass Transportation Administration, Office of Service and Methods Demonstrations, August 1979.

wheelchair lifts. The fraction of seats lost to wheelchairs varies from 0 to 6 percent. 11/ In most cases about 4 percent of the seating capacity is lost. In Hartford and New Haven, services provided by lift-equipped Advanced Design Buses provide about the same number of seats as before, representing an expansion in services of about 13 percent. The South Eastern Michigan Transit Authority added two wheelchair-lift buses for every 12 conventional buses previously operated—an expansion of 17 percent in the number of buses operated along those routes. 12/

Experience to date is insufficient to allow an accurate estimate of the likely increase in the national bus fleet that would follow upon the installation of wheelchair lifts. A consistent pattern has not yet emerged in the cities using them; where services have been increased, it is not possible to estimate how much should be ascribed to the wheelchair lifts as opposed to the lower seating capacity of the new buses. It is evident, however, that some fleet expansion would occur. On a conservative basis, this paper estimates that only a fraction of the seats lost to wheelchair space would be restored (a fleet expansion of 1.5 percent); this assumes that some buses would not be full at peak hours, and that transit operators and passengers would allow some additional standing at peak hours.

(3) Route Extension. Finally, about 300 additional buses would be required in cities with subway systems to connect stations, or less where some stations are provided with elevators, according to studies by DOT. 13/

Costs of Adapting Rail Systems for Persons Using Wheelchairs

Rail station adaptations required by the DOT regulations add substantially to the costs of the Transit Plan, but by how much is uncertain. In January 1980, DOT will publish an investigation of these costs ordered in Section 321 of the Surface Transportation Assistance Act of 1978. The findings below suggest that rail station adaptations could add $1.2 billion to $1.7 billion to the capital expenditures required to implement the DOT

11/ Casey, October 1, 1979, and Conversation with E. Kravitz of Grumman Flxible Corp., September 1979.

12/ Ibid.

13/ Chase, Rosen and Wallace, Inc., 504 Notice of Proposed Rulemaking--Special Sensitivity Analysis (prepared at the request of the Congressional Budget Office), January 5, 1979.

regulations, and $14 million to $49 million a year to operating and maintenance costs.

Estimates made so far vary widely. In June 1978, DOT estimated that it would cost $1.7 billion to adapt all rail stations to serve persons in wheelchairs. 14/ Operating and maintenance costs would be increased by $27.5 million a year. Local transportation authorities estimate the construction costs at from $3 billion to $3.8 billion, and put the increases in operating and maintenance costs at nearly $400 million a year (see Appendix F). In November 1978, consultants to DOT revised the initial estimates of capital costs upward from $1.7 billion to $2.8 billion, reducing the disparity with transit operators' estimates substantially. 15/ The disparity in operating and maintenance cost projections remains.

In June 1979, DOT issued its estimate of the cost of rail adaptations as part of its final regulation. The estimate included $1.8 billion for capital expenditures. The revised estimate apparently relies heavily on cost data from Boston which were lower than corresponding data from other cities. DOT will present a more refined cost estimate in its Section 321 report, now scheduled for publication in March 1980. The estimates appearing here combine plausible projections from all sources. The major adjustments made to them are described below.

Operating and Maintenance Costs Associated with the Adaptation of Subway Stations. A similar reconciliation of differences between DOT and transit authorities in their estimates of extra operating and maintenance costs suggests that these costs might increase by $32 million to $78 million per year. Spending might approach the high end of this range during the early years of the program, falling toward the lower end of the range as problems with the new technical devices are ironed out, and as new technology reduces the need for added station staff.

Consultants to DOT estimated that operating and maintenance costs will increase by $29,000 per station annually. Transit authorities, by contrast, suggest that annual expenditure on operating and maintaining urban rail stations could increase by as much as $480,000 per station, or

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14/ Federal Register, vol. 43, no. 111, June 8, 1978.

15/ Peat, Marwick, Mitchell & Co., The Cost of Making Urban Rail Transit Accessible to the Handicapped, November 3, 1978.

nearly 17 times the estimates prepared for DOT. The estimates submitted by the New York authorities, however, include the cost of operating backup elevators. The Chicago and New York authorities both appear to have estimated exceptionally high costs for the power and maintenance of elevators, perhaps assuming that handicapped persons will make more use of the elevators than is likely. Adjusting the estimates to remove the costs of maintaining backup elevators and exaggerated power and maintenance costs reduces the estimated cost of $480,000 per station per year by more than half to $230,000.

Difficulties of wheelchair users in crossing the horizontal gap between platforms and vehicles may require station staff to patrol platforms, at least until a mechanical device is invented that bridges the gaps automatically. The New York MTA considers mechanical gap fillers and car/platform leveling devices infeasible, and suggests instead that a platform conductor or guard be assigned to each platform at an annual cost of $99 million. Although carborne gap closing devices do not exist, the DOT regulations allow three years to develop them—too short a time when one considers the experience with lift mechanisms on buses. When gap closing devices become available, the labor savings in New York—which operates 6,296 of the 7,933 subway cars in the United States—will reduce costs as estimated by transit operators from $230,000 to $37,000 per station a year.

The Cost of Adapting Commuter Rail Cars. To bring a commuter rail system into compliance with the DOT Section 504 regulations, adaptations would be required on at least one car per train. Systems that operate with extensive switching and shunting would have to adapt all their cars in order to meet this requirement. In total, according to the DOT consultants' estimate, about 85 percent of the country's 3,944 commuter rail cars would require some kind of adaptation. About 2,042 cars would require mechanical lifts if operators elected not to erect high platforms at stations. Equipping a commuter rail car with one lift costs about $15,000 (two are needed per car, one on each side). Lift adaptation costs might therefore be about $65 million, as shown in Table 12.

Restrooms in long-haul commuter rail cars might need to accommodate wheelchairs although this is not strictly required in the regulations. Narrow interior doors between the vestibule and the passenger compartment must be widened. Such interior modifications would sacrifice seats inside the car, requiring an expansion of the commuter rail car fleet.

Together, these adaptations would cost about $235 million if rail authorities elected to install wheelchair lifts, and about $173 million if they decided to erect high station platforms instead, as shown in Table 12.

TABLE 12. ESTIMATED CAPITAL COST OF MAKING COMMUTER RAIL CARS ACCESSIBLE TO THE HANDICAPPED

	Cost Per Car (dollars)	Number of Cars	Total Cost (millions of dollars)
Mechanical lifts (2 per car)	30,000	2,042	61.26
Interior modifications	41,241	3,344	137.91
Fleet expansion because of lost seats in cars needing restroom renovation	700,000	50	35.50
Total (with lifts)	---	---	234.67
Total (with high-level platforms instead of lifts)	---	---	173.41

SOURCE: CBO and Peat, Marwick, Mitchell & Co., The Cost of Making Urban Rail Transit Accessible to the Handicapped, November 3, 1978.

The Cost of Key Stations

The DOT regulations do not require the adaptation of every station, but only so-called key stations—about 40 to 60 percent of all stations, including interchanges, terminals, and stations serving important concentrations of offices, hospitals, and shops. Key stations, which tend to be larger than others and located in built-up business districts, cost significantly more to adapt than smaller, outlying suburban stations. The cost estimates given assume that the average cost per key station might be 25 percent more than the average cost of adapting a typical station. The adaptation of key stations only would cost $1.2 billion to $1.8 billion in capital expenditures, while associated operating and maintenance costs might increase by $14

million to $49 million a year, as shown in Table 13. This estimate of capital costs falls about 20 percent below estimates prepared for DOT in November 1978. The estimates of added operating and maintenance costs are less than 10 percent of those estimated by the transit operators in October 1978.

The Cost of Door-to-Door Transportation in the Transit Plan

The Transit Plan assumes that half the cities with rail systems choose to provide an alternative service instead. It provides for two forms of door-to-door service: lift-equipped van service for wheelchair users offered at fares and frequencies comparable to transit fares and frequencies; and subsidized taxi service for all other handicapped persons.

Van Service for Wheelchair Users. Often called dial-a-ride, door-to-door van service is probably the most costly form of urban public transportation. Unlike transit service, in which vehicle movements are organized according to fixed routes and schedules, dial-a-ride vehicles must go wherever passengers wish, and at any time they wish to go. Also, dial-a-ride requires more staff for dispatching and supervision; dispatching alone adds 20 to 30 percent to the labor requirements of a typical door-to-door system. 16/ But the size of the van system needed, and hence its total cost, depends on the demand for the service; if eligibility is restricted to certain groups, its total cost can be kept within bounds.

The number of vans needed depends on the expected hourly use of the service, the average length of journeys, and the average number of passengers per seat (load factor). Dial-a-ride service typically operates at a very low load factor. Project Mobility, which is a dial-a-ride service in Minneapolis/St. Paul, operated at a load factor of 12 percent in 1978 (that is, only 12 percent of the seats were occupied at a given time). An analysis undertaken for DOT (Appendix D) indicates that if van service were provided at frequencies similar to those of transit services, they would operate with a load factor of 8 or 9 percent. On this basis, 169 vans would be required to serve the persons who could be expected to use this type of service (Table 14, see also Appendix D). At a price of $15,000 a van, the fleet would cost about $2.5 million.

But capital represents only a small fraction of the total cost of supplying a dial-a-ride service. It is a highly labor-intensive service, often

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16/ Reid Ewing, Demand Responsive Transit: Problems and Possibilities, Massachusetts Institute of Technology Ph.D Thesis, 1976.

TABLE 13. ESTIMATED CAPITAL AND OPERATING COSTS OF ADAPTING URBAN RAIL SYSTEMS FOR WHEELCHAIR USERS: (IN MILLIONS OF 1979 DOLLARS)

	Subway Systems		Commuter Rail Systems		Streetcar Lines		Total	
	Complete Adaptation	Key Station Adaptation	Complete Adaptation	Key Station Adaptation	Complete Adaptation	Key Station Adaptation	Complete Adaptation	Key Station Adaptation
Capital costs								
Stations	1,524-1,608	762-804	208-784	83-314	37-120	19-60	1,769-2,512	864-1,178
Vehicles	99-234	99-234	173-235	173-235	0-6	0-6	272-475	272-475
Total	1,623-1,842	861-1,038	381-1,019	256-549	37-126	19-66	2,041-2,987	1,136-1,653
Operating costs								
Annual costs after all adaptations have been made	25-28	10-11	9-27	3-9	1	0.5	35-56	14-21

NOTE: The table is based on the following assumptions: (1) that 40 percent of all subway stations are key stations; and (2) that 33 percent of all commuter rail and streetcar stations are key stations.

TABLE 14. COSTS OF DOOR-TO-DOOR LIFT-EQUIPPED VAN SERVICE FOR WHEELCHAIR USERS: IN 1979 DOLLARS

	Number of Vans Required	Initial Vehicle Cost (millions of dollars)	Capital, Maintenance, and Operating Cost per Year (millions of dollars)	Capital, Maintenance, and Operating Cost per Trip (dollars)
Transit Plan	169	2.5	12.2	24.50
Taxi Plan	1,654	24.8	119.7	16.80
Auto Plan	827	12.4	59.8	16.80

NOTE: The table is based on the following assumptions (see also Appendix D):

1. Average journey length in cities served by rail = 8 miles.
2. Average journey length in cities served by bus = 5 miles.
3. Vans cost $15,000 each and are replaced after 5 years. Although many vans are already in service, it is assumed that all vans are purchased new. This is thus a maximum capital cost.
4. Load factor = 0.085 passenger miles per seat mile.
5. Vans have 13 seats.
6. Vans travel 12 miles per hour in rush hours and 22 miles per hour in nonrush hours.
7. 22 percent of travel occurs during a two-hour weekday peak.
8. Wheelchair users require about three minutes each to board vehicles.
9. 1.2 passengers are picked up per request. This allows for travelling companions for 20 percent of wheelchair users.
10. Drivers earn union-level wages of $11.00 per hour, plus fringe benefits (see Table 15).
11. Passengers receive service, on the average, one-half hour after placing requests by phone, broadly comparable to the time they would spend waiting for buses and trains. Time spent traveling is also comparable to the time spent traveling by transit.

subject to union wage agreements. The cost of operating a dial-a-ride van for one year may equal that of operating a transit bus. Several dial-a-ride services had operating costs in 1978 of at least $21 per vehicle hour. 17/ This may not have included All of the ancillary costs such as fringe benefits, the cost of training drivers to deal with the problems of disabled persons, and marketing expenses. If allowances were made for these expenses, operating costs might total $33 per vehicle hour, as shown in Table 15. Overall costs, including depreciation, of operating the 169 door-to-door vans in the Transit Plan might total $12.2 million annually, or $24.50 per trip (Table 14).

Subsidized Taxi Services. Financial assistance for travel by conventional taxi is less costly than van service for those handicapped persons who are able to use ordinary cars. The most common type of taxi subsidy allows passengers to purchase travel vouchers from a public agency at a price well below their nominal value. The vouchers are used instead of money when paying for taxi rides, and the taxi firm redeems them from the subsidizing agency at full value.

The fare for an average taxi ride in the United States in 1979 was about $2.90, and taxi journeys of the same average length as subway journeys—about 8 miles—typically cost the traveler about $6.00 (Table 16). Administration costs and tips would add about 20 percent more to the cost for the subsidizing agency. Journeys of average length might cost the subsidizing agency about $3.48 a trip, while longer journeys—such as those that would otherwise have been made by rail—might cost about $7.08 a trip. The average subsidized trip might cost $3.98. An estimated 91,012 persons might use this program, each making about 60 trips a year, at a total cost of $38.7 million a year.

COSTS OF THE TAXI PLAN

The Cost of Door-to-Door Van and Taxi Service for Severely Disabled Persons in All Cities

An estimated 29 percent of wheelchair users in the urban United States could be expected to make regular use of van services that operated like taxis (Chapter IV). A total of 1,654 vehicles would be required (Table 14 and Appendix D). At $15,000 per vehicle, initial capital costs would total $25 million. As discussed above, however, the cost of door-to-door van

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17/ Peat, Marwick, Mitchell & Co., Final Report, CRW Model Review, November 13, 1978.

TABLE 15. TYPICAL OPERATING COSTS FOR PUBLICLY OPERATED DOOR-TO-DOOR DIAL-A-RIDE SERVICE: IN 1979 DOLLARS

	Cost per Vehicle Hour	Percent of Total Cost per Vehicle Hour
Labor	16.20	49.3
Fringe benefits	5.67	17.3
Maintenance	4.35	13.2
Fuel	1.76	5.4
Other transport costs	0.32	1.0
Traffic	0.28	0.9
Insurance and safety	2.25	6.8
General and administration	1.24	3.8
Radio	0.28	0.9
Telephones	0.22	0.7
Marketing and advertising	0.19	0.6
Training	0.11	0.3
Total	32.87	100

SOURCES: CBO from survey of dial-a-ride operating costs by the DOT Transportation Systems Center, reported in Peat, Marwick, Mitchell & Co., Final Report CRW Model Review, November 13, 1978, and data for Project Mobility in Minneapolis/St. Paul, 1978, supplied by the Urban Mass Transit Association.

TABLE 16. SUMMARY OF TAXI TRIP COSTS

City	Average Trip Length (miles)	Fare		Trip Cost	
		First Mile	Additional Miles	Average Trip	Eight-Mile Trip a/
San Diego	4.1	$1.50	$0.70	$3.67	$6.40
Houston	4.5	1.25	0.60	3.70	5.45
Omaha	3.2	1.20	0.60	2.52	5.40
Denver	3.2	1.20	0.60	2.52	5.40
New York	2.3	1.35	0.70	2.26	6.25
Cleveland	3.1	1.35	0.60	2.61	5.55
Columbus	3.5	1.30	0.70	3.05	6.20
Average	3.4	1.31	0.64	2.90	5.90 b/
+20% for administration of subsidy program and tips				3.48	7.08 c/

SOURCE: Peat, Marwick, Mitchell & Co., Final Report CRW Model Review, November 13, 1978.

a/ Average subway trip length.

b/ Rail cities only (New York and Cleveland).

service is dominated by operating costs; annual (including depreciation) costs of running all the vehicles would total about $120 million according to the estimates in Table 14.

An estimated 176,000 severely disabled persons would be eligible for and would use taxis on a regular monthly basis under this plan (see Chapter V). At the unit costs reported above, the annual cost of operating the program would be $41.9 million.

The Cost of Adapting Buses For Handicapped Persons Able to Walk

The cost of adapting buses under the Taxi Plan falls radically below the cost of bus adaptations called for in plans based on the DOT regulations. The special suspension costs about $130 to $300 to install on a new bus, and considerably less to operate and maintain than a wheelchair lift. Transit operators could expect to spend $2 million a year over the next 12 years in extra bus replacement and maintenance costs, and about $3 million a year thereafter; this is only 2 percent of the cost of shifting to lift-equipped buses (Table 11). Extending bus routes to link subway stations would cost about $20 million a year in added capital and operating costs.

COST OF THE AUTO PLAN

The Auto Plan features a program of financial assistance to permanent wheelchair users, including paraplegic and quadriplegic persons, for the purchase of specially adapted cars, as well as van and taxi services for those unable to drive or use transit. It also includes provision for the limited transit bus improvements in the Taxi Plan.

Most paraplegic persons can drive conventional production cars with modifications. About 20 percent would require a van equipped with a lift. A small adapted automobile might cost about $5,500 and last about six years, while a suitably modified van costs about $15,000 and might last nearly 10 years. 18/ For 116,000 persons (Chapter IV), the cost would be about $128 million annually.

About half the users of van services in the Taxi Plan would be young enough and fit enough to drive adapted autos. Van service requirements under the Auto Plan would, therefore, be lower; about 827 vans would

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18/ Target Industries Driving Systems, Price List, effective February 1, 1979.

suffice, half the number required in the Taxi Plan. Van costs would be $60 million a year (Table 14).

Taxi subsidy costs would not change in the Auto Plan, since passengers fit enough to enter a conventional taxi would not qualify for the auto program. The public transportation adaptations called for in the Auto Plan are identical to those required in the Taxi Plan, and the associated costs would remain the same.

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CHAPTER VI. THE COST-EFFECTIVENESS OF ALTERNATIVE PLANS

If the Congress views the provision of transportation for handicapped persons as a question of civil rights, it will stress the need to provide them with access to existing public transportation services. Access can be improved by such means as adding lifts to buses and installing elevators in rapid transit stations. The Transit Plan goes farther than the other two plans described here in guaranteeing that handicapped persons will have such access.

If, however, the Congress views the question as one of how best to provide convenient, usable, or efficient transportation service to handicapped persons, then either door-to-door public transportation or specially equipped automobiles appear more-effective. This chapter compares the uses and costs of each plan, and the cost-effectiveness of the three alternative policies.

The first section compares cost per trip as a guide to the cost effectiveness of each option. The cost per trip of each plan changes in the longer term, as patronage builds up and as one-time capital expenses come to an end. Accordingly, both initial and longer-term cost per trip receive attention. Cost-per-trip comparisons also vary when the diverse nature of the functional disabilities of handicapped passengers is considered. Accordingly, this section compares cost per trip for moderately handicapped and for severely handicapped persons under each option.

These comparisons of cost per trip are also sensitive to the patronage that may be anticipated for each plan. The second section examines the sensitivity of the conclusions reached in the first section to changes in these forecasts.

The final section touches on some of the practical problems of the services considered here, and on the current state of federal policy toward door-to-door services and adapted automobiles.

COST PER TRIP

A useful guide to the cost-effectiveness of a new transportation investment is the sum of its capital and operating costs divided by the number of trips, or "cost per trip." This index ignores unmeasured factors

such as convenience and the satisfaction of using the same services as the general public. Indeed, a 35-cent journey to the shops by bus, after waiting 20 minutes in the rain for the bus to come, cannot compete in convenience with a 35-cent journey by dial-a-ride, involving a 20-minute wait in one's living room. But some wheelchair users might gladly risk a wait in bad weather in order to travel like other members of the general public, rather than use dial-a-ride service earmarked for wheelchair users only. These are matters of personal taste, however, and people also apply personal taste in choosing whether to travel and how.

Cost-per-trip comparisons can be misleading, however, if they are made without regard to the severity of a person's handicap. For example, a plan may appear to give good value for money overall, but serve relatively few severely disabled persons against a much larger proportion of less handicapped travelers. The same plan might appear much less cost-effective if the costs are related only to the limited number of severely disabled persons served.

A distinction must also be made between initial and long-term costs per trip. Some of the costs of adapting transportation services for use by handicapped persons occur only once, like digging an elevator shaft, while others, like power costs for elevators or wages for van drivers, recur every year. Cost-per-trip comparisons change in the longer term, therefore, as one-time costs end.

The Transit Plan

Of the 741,971 disabled Americans who, according to these projections, will get around more if the Transit Plan is adopted, 86 percent have handicaps that do not prevent them from using unadapted transit services; for these persons, changes required in the Transit Plan would make transit less difficult to use, enabling those with rheumatism, mild arthritis, and other debilitating conditions to patronize transit services more often. At present, it costs only about $0.85 per trip to serve a transit passenger. The Transit Plan, however, with its emphasis on heavy capital equipment geared mainly to the needs of wheelchair users, would enable moderately handicapped persons to make additional use of transit services at a cost of $10.54 per trip—as shown in the fourth column of Table 17. Only 14 percent of all handicapped persons who stand to gain from the Transit Plan have severe disabilities that prevent them from using unadapted transit services at all.

The costs of serving handicapped persons rise sharply when they are allocated among the severely disabled individuals for whom the adaptations

are mainly intended—to $38.08 per trip, as shown in the fifth column of Table 17.

The final two columns in Table 17 show the cost per trip of serving moderately and severely handicapped persons respectively, after all one-time investments have been paid for. These include, for example, the cost of subway adaptations. The costs of the Transit Plan still emerge as high compared to the alternative plans. This is explained by the high capital and operating costs associated with bus replacement and fleet expansion. About 4,000 to 5,000 buses, replaced and operated at greater expense because of special lift mechanisms and supplementary routes, would add substantially to costs every year. When the costs are allocated among moderately handicapped passengers, the cost per trip would be $8.46. For severely disabled persons, it would be $31.93.

The Taxi Plan

The Taxi Plan features relatively less costly changes to public transit that cater specifically to the moderately handicapped persons (and severely disabled persons who do not require a lift): a special suspension for buses to make boarding easier, smoother acceleration, more handrails, and priority seating. The improvements would serve about 10 percent fewer moderately handicapped persons than the Transit Plan but at a much lower cost per trip, as shown in the fourth column of Table 17.

On the other hand, the Taxi Plan would serve about 3.5 times the number of severely disabled persons served by the Transit Plan and at about one-sixth the cost. Specialized door-to-door services have a roughly constant cost per trip, regardless of patronage (see Chapter V). This leads to a profile of costs that is very different from that associated with the Transit Plan. The cost per trip to serve severely disabled persons under the Taxi Plan would be broadly equivalent to the average unit cost of offering dial-a-ride and taxi services or $7.62 per trip, much less than the cost of the Transit Plan. (The transit adaptations in the Taxi Plan would serve some severely disabled persons as well, and this cost is included in the figures quoted here.) Even after the payment of all one-time costs, which are much higher under the Transit Plan, the Taxi Plan would remain far more cost-effective. Where the Transit Plan would cost $8.46 per trip to serve moderately handicapped persons, the Taxi Plan would cost $0.46. And where the Transit Plan would cost $31.93 per trip to serve severely disabled persons, the Taxi Plan would serve 2.5 times as many at a cost per trip of $7.79 as shown in the last column of Table 17.

TABLE 17. BENEFITS, COSTS, AND VALUE FOR MONEY OF ALTERNATIVE TRANSPORTATION PLANS: IN 1979 DOLLARS

Option	Number of Moderately Handicapped Persons Able to Travel More	Number of Wheelchair Users and Other Severely Disabled Persons Able to Travel More	Total Net Public Cost (millions of dollars) a/
Transit Plan	638,386	103,585	6,841.4
Taxi Plan	537,333	348,157	4,446.1
Auto Plan	537,333	404,657	6,364.0

a/ Total capital and operating costs incurred over the next 30 years, minus revenue through fares from handicapped passengers.

b/ Costs allocated among additional trips made by all handicapped persons over the next 30 years.

(Continued)

The Auto Plan

The Auto Plan provides services identical to the Taxi Plan to moderately handicapped persons, and the cost for them would be the same. In serving severely disabled persons, however, its cost per trip would be less.

The Auto Plan supplies many persons with a private car—those who would otherwise use dial-a-ride service under the Taxi Plan. This results in substantially lower operating costs. Also, persons with access to their own cars travel more than those who must rely on public transportation so that in generating more trips (while serving more persons as well) the cost per trip of supplying each adapted automobile falls below the cost per trip associated with the Taxi Plan. If fuel and maintenance costs were included, however, the cost of the Auto Plan might exceed that of the Taxi Plan.

TABLE 17. (Continued)

Total Net Public Cost per Additional Trip Made by Moderately Handicapped Persons (dollars) b/	Total Net Public Cost per Additional Trip Made by Wheelchair Users and Other Severely Disabled Persons (dollars) c/	Annual Net Public Cost per Additional Trip Made by Moderately Handicapped Persons After One-Time Capital Expenses Are Paid (dollars) d/	Annual Net Public Cost per Additional Trip Made by Severely Disabled Persons After One-Time Capital Expenses Are Paid (dollars) d/
10.31	38.08	8.46	31.93
0.41	7.62	0.46	7.79
0.41	7.33	0.46	7.45

c/ Capital and operating costs per additional trip over the next 30 years allocated among the additional trips made by severely disabled persons during that period.

d/ Costs incurred every year once all construction is complete, allocated among the additional trips made annually.

DOOR-TO-DOOR VERSUS ADAPTED TRANSIT SERVICES: THE EFFECT OF UNCERTAIN PATRONAGE AND COSTS

To serve the travel needs of handicapped persons through modifications to mass transit systems would appear to be more costly than to provide specially tailored services. In particular, plans such as the Transit Plan, built around regulations issued by DOT to apply the provisions of Section 504, show not only higher total costs but also higher costs per trip than do plans that rely on specialized door-to-door services and adapted automobiles.

Patronage Uncertainties and Associated Cost-Effectiveness Risks

The differences in costs stem mainly from the use that handicapped persons are likely to make of the services. Most of the costs of adapting transit systems must be borne whether or not handicapped passengers are attracted to them. Thus the CBO forecast that about 88,000 severely disabled persons, on average, would be served under the Transit Plan (over its first 30 years) results in a substantially higher cost per trip for adapted transit service than does the forecast derived from the DOT national survey.

In contrast, the projected total cost of specialized door-to-door services depends heavily on the number of persons expected to use them. The upper curve in Figure 3 showing costs per trip under the Transit Plan drops very rapidly over the range of 0-450,000 persons served, while it falls relatively slowly in the range of 450,000-1,000,000. The curve showing cost per trip under the Auto Plan falls rapidly over the range of 0-150,000 but remains virtually constant thereafter. The two curves cross at a point of about 800,000 persons served. If fewer than 800,000 persons who do not use transit today were served, then door-to-door services and adapted automobiles would be a more cost-effective solution. Above that number, on the other hand, transit adaptations would be more cost effective. The number 800,000 is many time more persons than suggested by the present patronage of adapted transit, nine times more than forecast by CBO and six times more than projected by the DOT national survey.

The conclusion that transit adaptations are less cost-effective than door-to-door services and adapted automobiles appears to hold over a wide range of likely patronage. The second curve for the Transit Plan in Figure 3 shows the effect of assuming much lower costs than those in the upper curve. In particular, it assumes that lift maintenance costs would be only half as great, that no extra buses would be needed for maintenance purposes, and that the bus fleet would expand by only 0.5 percent to compensate for lost seating capacity. The Transit Plan would still have to attract 450,000 handicapped persons who do not use transit at present before the cost per trip would be as low as that of the Auto Plan—or three times as many as projected in a forecast based on the DOT national survey.

Financial Uncertainties and Associated Budgeting Risks

Many uncertainties are inherent in forecasts of patronage and of the costs associated with door-to-door services, adapted autos, and modified transit systems. Accordingly, it will be instructive to sketch briefly the implications of alternative forecasts. If the number of disabled persons using the services in the Auto Plan and the Transit Plan were to be twice those projected above, the cost of the Auto Plan would nearly double while

the cost of the Transit Plan would increase by only 10 percent. The Auto Plan would then cost $6 billion more than the Transit plan over 30 years, or $8 billion more if the costs of the Transit Plan reflected those of the lower curve in Figure 3. Even so, the cost per trip to serve severely disabled persons under the Transit Plan would still exceed that of the Auto Plan by almost three times (Table 18).

If, on the other hand, the demand for services in the two plans was half that projected above, the total 30-year cost of implementing the Transit Plan would exceed that of the Auto Plan by $2.7 billion (Table 18). This is because of the high proportion of fixed costs in the Transit Plan as compared to the Auto Plan.

Balancing the Risks

Even though a risk exists that Auto Plan and Taxi Plan costs would exceed the costs of the Transit Plan, this appears much smaller than the risk that relatively few would benefit from the Transit Plan. If the patronage of adapted transit systems were to fall below that projected in this report—an outcome no less likely than that patronage would exceed the projected level—the cost per trip could reach $75.52 or more (Table 18). This is not out of line with recent experience with adapted buses in St. Louis, where capital and operating expenses currently total $608 per trip. 1/

By contrast, the likelihood of attracting twice the projected numbers of severely handicapped persons under the Auto Plan, with costs double those estimated here, appears small; such a high level of patronage would imply that 68 percent of all persons in urban areas who are currently unable to use mass transit would choose to make regular use of services under the Auto Plan—an unlikely outcome in view of the extent to which cars are already available to handicapped persons today.

THE CONGRESSIONAL CHOICE

If the Congress views the choice among plans as one that turns on civil rights, and if it interprets the DOT regulations as an adequate protection of these rights, then legislative action will soon be required to secure the necessary funding. Alternatively, the financial burden could be placed on

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1/ Applied Resources Integration, Ltd., Draft Final Report, Evaluation of St. Louis Accessible Bus Service, September 1979.

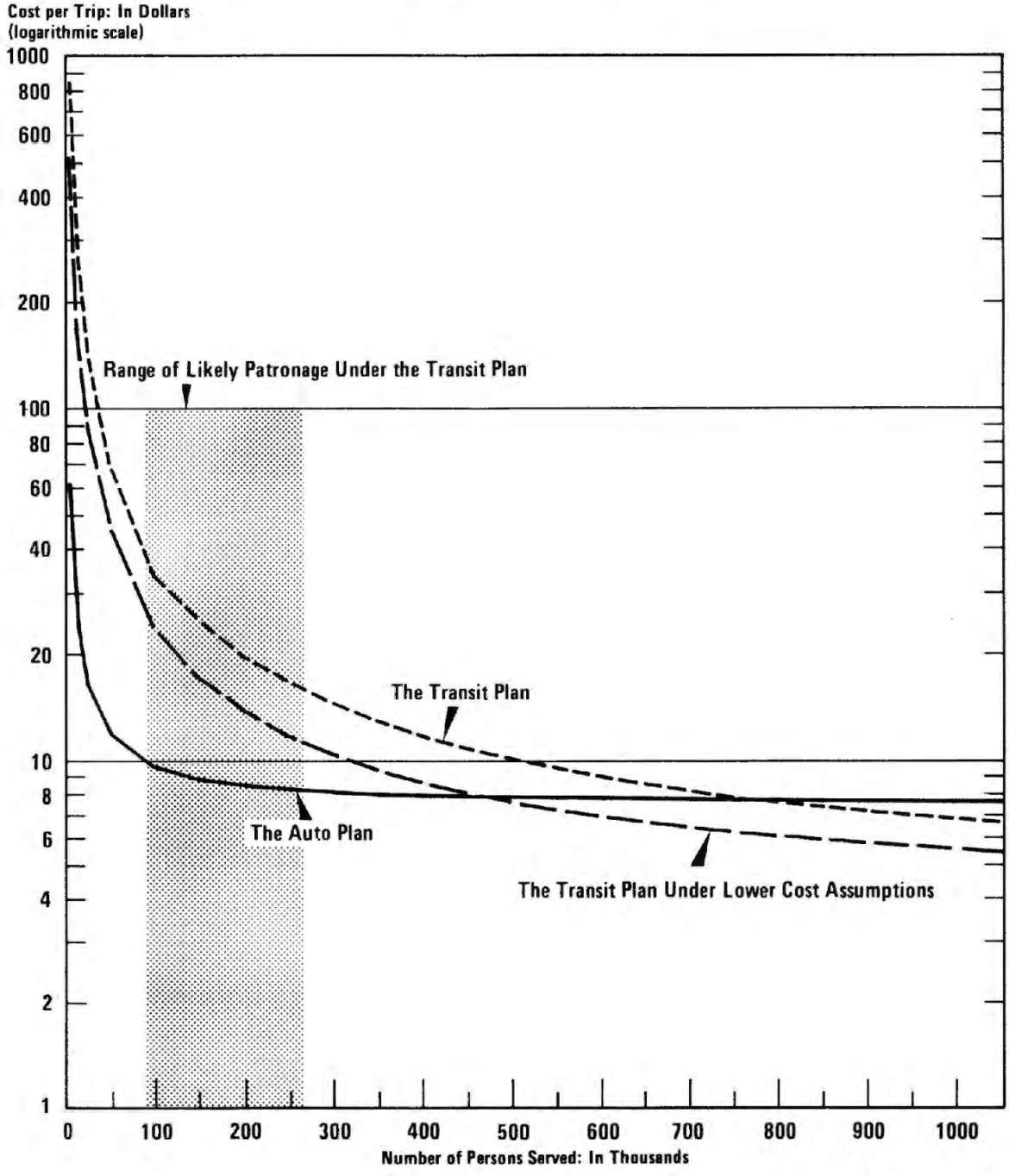
TABLE 18. NET PUBLIC COSTS OVER 30 YEARS OF SERVING SEVERELY DISABLED PERSONS UNDER THE TRANSIT PLAN AND THE AUTO PLAN, AT VARIOUS LEVELS OF COST AND PATRONAGE

	Total Cost (millions of 1979 dollars)		Cost per Trip (1979 dollars)	
	Transit Plan	Auto Plan	Transit Plan	Auto Plan
CBO projection	6,023	6,364	38.08	7.33
If patronage under each plan is half the CBO projection	6,179	3,529	78.15	8.13
If patronage under each plan is double the CBO projection	6,910	12,964	21.85	7.47
If Transit Plan costs are lower because of greater lift reliability and less fleet expansion for lost seating	4,186	---	26.47	---
If patronage under each plan doubles and Transit Plan costs are lower due to greater lift reliability and less fleet expansion	4,673	12,964	14.77	7.47

local governments, although this might result in curtailed transit service, higher transit fares, or other steps that would discourage transit use. If, on the other hand, the Congress wishes to move toward the Auto or Taxi Plans, which could serve more people, provide more convenient forms of service, and result in lower costs, then it will need to indicate that Section 504 should be interpreted in this fashion and also to provide the necessary funding.

Figure 3.

Cost per Trip of Serving Severely Disabled Persons Under the Transit Plan and the Auto Plan at Varying Levels of Cost and Patronage (over Thirty Years)



ADDITIONAL CONSIDERATIONS

Some additional steps would be required to overcome certain institutional barriers to the provision of the kind of door-to-door services discussed in this report. They would involve integrating public and private operators and union and nonunion labor in the provision of transportation services for the handicapped.

Some steps toward solving such problems have already been taken by federal agencies, and these could be developed further. For example, regulations issued by DOT in 1976 implementing the 1970 amendments to the Urban Mass Transit Act require that metropolitan areas provide services tailored to the transportation needs of handicapped persons in order to qualify for federal funds. Unlike the recent Section 504 rules, however, the 1975 regulations permit local areas to decide the type of services to supply; DOT specifies types of service only by way of example as a guide to planning. The services may include both transit adaptations and door-to-door transportation, with an important role suggested for private carriers. The 1976 regulations suffer, however, from lack of an effective enforcement mechanism, or a monitoring system. DOT now plans to phase out the 1976 regulations as the Section 504 rules take effect.

Another step in this direction was DOT's policy statement regarding the role of so-called paratransit services in federal transportation policy. (Paratransit services are forms of urban public transportation distinct from conventional transit, such as private taxis, dial-a-ride services, and jitneys.) The policy statement said of these services:

> The strength of our transportation system lies in its diversity, with each mode contributing its unique and inherent advantages and responding to different consumer demands at various levels of cost and quality of service. . . .our metropolitan areas with their varied forms, densities and travel patterns, require a mix of conventional and flexible transit services to serve different market needs. . . .Such a system offers promise of the greatest overall operating efficiency and effectiveness by exploiting the inherent advantages of each mode and providing a range of differentiated service options that respond to varying consumer demands.

It added:

> In many communities, large and small, paratransit can offer the best means of serving the needs of elderly, young and

handicapped persons, and those who do not own cars and have no convenient access to regular public transportation. 2/

Regulations to implement this policy have not yet been issued.

The Section 504 regulations, moreover, require that each city provide alternative services until reaching a certain target level of transit adaptation, thus promoting the development of door-to-door services, at least as a temporary measure.

In addition, the Department of Health, Education and Welfare (HEW) and the Veterans Administration have for some years supported research into special auto adaptations. They provide, albeit on a very limited basis, funds to help certain wheelchair users to buy adapted cars. DOT has limited its own involvement in such programs to ensuring that licensing procedures meet appropriate safety standards. 3/ The Congress might wish to see these two agencies expand and coordinate their efforts if it deemed an adapted auto program desirable. HEW also helps social service agencies provide transportation for its own clients (see Chapter II), but no step has yet been taken to coordinate these services with services funded by DOT.

2/ "Paratransit Services, Proposed Policy," Federal Register, vol. 41, no. 204, p. 46412.

3/ Ira Laster, Jr., Efforts of the Department of Transportation to Improve Transportation for the Handicapped (in) Personal Licensed Vehicles for the Disabled, Rehabilitation Engineering Center, June 1976.

APPENDIXES

APPENDIX A. LEGISLATIVE AND JUDICIAL HISTORY OF SECTION 504 OF THE REHABILITATION ACT OF 1973 PERTAINING TO TRANSPORTATION FOR HANDICAPPED PERSONS

Section 504 of the Rehabilitation Act of 1973, 29 U.S.C. sec. 794, basically prohibits discrimination, exclusion or denial of benefits against otherwise qualified handicapped individuals by any program which receives federal financial assistance or under any program or activity conducted by any executive agency or by the United States Postal Service. This section is similar to the guarantees given on the basis of race under Title VI of the Civil Rights Act and is the most important federal statute concerning discrimination against handicapped persons. Section 504 as amended states:

> 794. Nondiscrimination under Federal grants and programs. No otherwise qualified handicapped individual in the United States, as defined in section 706(6) of this title, shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance or under any program or activity conducted by any Executive agency or by the United States Postal Service. The head of each such agency shall promulgate such regulations as may be necessary to carry out the amendments to this section made by the Rehabilitation, Comprehensive Services, and Developmental Disabilities Act of 1978. Copies of any proposed regulation shall be submitted to appropriate authorizing committees of the Congress, and such regulation may take effect no earlier than the thirtieth day after the date on which such regulation is so submitted to such committees.

NOTE: This appendix is a verbatim reproduction of Congressional Research Service, "Section 504 of the Rehabilitation Act of 1973 Pertaining to Transportation for Handicapped Persons" as amended by memorandum to the Congressional Budget Office from the American Law Division, Congressional Research Service, entitled "Update of Report entitled 'Section 504 of the Rehabilitation Act of 1973 and Transportation for Handicapped Persons,'" July 30, 1979.

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Numerous cases have been brought under section 504 and regulations have been promulgated. Perhaps the major regulations to date are those promulgated by the Department of Health, Education and Welfare at 45 C.F.R. Part 84. More recently, final regulations implementing section 504 have been issued by the Department of Transportation. 1/ These regulations basically require recipients of financial assistance from the Department of Transportation to make their existing and future facilities and programs accessible to handicapped persons. They have been strongly criticized and suit has been filed to prevent the regulations from taking effect. 2/ This report will discuss the legal issues concerning transportation and section 504. First, the legislative history of section 504 will be examined in an attempt to determine whether Congress had considered the issue of access to public transportation. Secondly, cases which have been brought under section 504 concerning transportation will be discussed.

I. The Legislative History of Section 504 and Transportation for Handicapped Persons

The legislative history both on section 504 in general and on section 504 and accessible transportation in particular is very sparse. Joseph Califano, the Secretary of HEW, was quoted as stating that the "Congress enacted the legislation without legislative hearing and with virtually no floor debate in either House. There is thus little Congressional guidance on the host of complex issues raised by Section 504's far reaching prohibition against discrimination." 3/

Similar statements have also been made by other commentators and in one of the major cases under section 504, Lloyd v. Regional Transportation

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1/ 44 Fed. Reg. 31442 (May 31, 1979).

2/ 11 National Journal 1175 (July 14, 1979).

3/ Statement by Joseph A. Califano, Jr., Secretary of HEW, HEW News, April 28, 1977, at page 7. Quoted in A. Levitan, "Discrimination Against the Handicapped in Federally-Funded State Services: Subpart F of Rehabilitation Act Regulations," 12 Clearinghouse Review 339 (October 1978).

Authority. 4/ However, there is some language in the legislative history which may be of interest. 5/

The House Report and the House and Senate Conference Reports did not discuss section 504 in any detail; they merely described the section. However, in the Senate Report there was some language discussing the history of the legislation and its findings and purposes. It was stated there that hearings held as part of the Committee's consideration of the Rehabilitation Act of 1972 highlighted certain areas including:

> ...the lack of action in areas related to rehabilitation which limit a handicapped individual's ability to function in society, e.g., employment discrimination, lack of housing and transportation services and architectural and transportation barriers.... 6/

The Senate Committee on Labor and Public Welfare which considered the Rehabilitation Act of 1973 further stated that "The Committee reiterates its strong belief in the original purposes and format of the Rehabilitation Act of 1972." 7/

Similarly, the Congressional debate on the Rehabilitation Act of 1973 did not discuss section 504 in any detail. However, in a statement by Senator Dole, a co-sponsor of the Senate version of the Rehabilitation Act, the general goals of the Act were discussed. Senator Dole stated:

4/ T. Clark, "Access for the Handicapped—A Test of Carter's War on Inflation", 42 National Journal 1672, 1672-1673 (Oct. 21, 1978); Lloyd v. Regional Transportation Authority, 548 F.2d 1277, 1285 (7th Cir. 1977).

5/ The House Report, H.R. Rep. No. 244, 93 Cong., 1st Sess. (1973); the Senate Report, S. Rep. No. 318, 93d Cong., 1st Sess. (1973); the House Conference Report, H. Conf. Rep. No. 500, 93d Cong., 1st Sess. (1973); and the Senate Conference Report, S. Conf. Rep. No. 391, 93d Cong., 1st Sess. (1973), were searched for language on the intent of section 504. In addition, the debates in the Congressional Record were examined under H.R. 8070 which was the bill which became the Rehabilitation Act of 1973.

6/ S. Rep. 318, 93d Cong., 1st Sess. (1973).

7/ Ibid.

> The primary goal of this bill is to assist handicapped individuals in achieving their full potential for participation in our society....I believe this bill will work to the real benefit of America's disabled. This bill contains the State plan requirements, the individualized written programs, strong emphasis on research and training, and antidiscrimination provisions....8/

The most comprehensive discussion of Congressional intent concerning section 504 was found in the Senate Report to the Rehabilitation Act Amendments of 1974. Although section 504 was not amended by this Act, the definition of handicapped individual was and in the discussion of this change the Senate Committee on Labor and Public Welfare discussed Congressional intent regarding section 504.

> It was clearly the intent of the Congress in adopting section 503 (affirmative action) and section 504 (nondiscrimination) that the term "handicapped individual" in those sections was not to be narrowly limited to employment (in the case of section 504), nor to the individual's potential benefit from vocational rehabilitation services under titles I and III (in the case of both section 503 and 504) of the Act....Section 504 was enacted to prevent discrimination against all handicapped individuals, regardless of their need for, or ability to benefit from, vocational rehabilitation services, in relation to Federal assistance in employment, housing, transportation, education, health services, or any other Federally-aided programs. 9/

This Senate Report also noted:

> Section 504 was patterned after, and is almost identical to, the antidiscrimination language of section 601 of the Civil Rights Act of 1964, 42 U.S.C. 2000d-1 (relating to race, color, or national origin), and section 901 of the Education Amendments of 1972, 42 U.S.C. 1683 (relating to sex). The section therefore constitutes the establishment of a broad government policy that programs receiving Federal financial assistance

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8/ 119 Cong. Rec. 24589 (July 18, 1973) (remarks of Senator Dole).

9/ S. Rep. No. 1297, 93d Cong., 2d Sess. (1974), reprinted in 1974 U.S. Code Congressional and Administrative News 6373, 6388 (1974).

shall be operated without discrimination on the basis of handicap. 10/

Also, it should be noted that the issue of accessible public transportation was mentioned in the Congressional debates on the Comprehensive Rehabilitation Services Amendments of 1978. That Act, P.L. 95-602, added a section 505 to the Rehabilitation Act of 1973 which states in subsection (a)(1):

> Sec. 505. (a)(1) The remedies, procedures, and rights set forth in section 717 of the Civil Rights Act of 1964 (42 U.S.C. 2000e-16), including the application of sections 706(f) through (k)), shall be available, with respect to any complaint under section 501 of this Act, to any employee or applicant for employment aggrieved by the final disposition of such complaint, or by the failure to take final action on such complaint. In fashioning an equitable or affirmative action remedy under such section, a court may take into account the reasonableness of the cost of any necessary work place accommodation, and the availability of alternatives therefor or other appropriate relief in order to achieve an equitable and appropriate remedy.

The last sentence in this subparagraph was added as an amendment in the Senate debates. Senator McClure, who proposed the addition of this sentence, indicated that "(i)ts single function would be to insure that mammoth affirmative action remedies involving substantial construction could not be compelled in instances in which actual damages were comparatively small." 11/ Senator McClure further discussed the Rehabilitation Act implementation in the absence of a reasonableness test and quoted two newspaper articles which discussed the high cost of converting public transportation so that it would be accessible to handicapped persons. The import of this discussion is uncertain since the language of the amendment would not appear to change the requirements of section 504. The Transportation Department regulations which would require accessible public transportation were brought under section 504.

10/ Id. 6390.

11/ 124 Cong. Rec. S. 15664 (September 21, 1978) (remarks of Senator McClure).

The legislative history of a statute is often used to interpret the meaning of a statute 12/ but the use of legislative history of amendments to the statues, such as that contained in the Senate Report on the Rehabilitation Act Amendments of 1974 and the Comprehensive Rehabilitation Services Amendments of 1978, is sometimes given less weight in the interpretation of the original statute.

> Although comments about an earlier act in a legislative committee report on a subsequent bill are not part of the legislative history of the earlier act and therefore have less probative force than legislative history, they are entitled to consideration as an expert opinion concerning its proper interpretation. 13/

The issues relating to the cost of accessible transportation have also spawned comments outside of the legislative history. Perhaps one of the most interesting is one made by the sponsor of section 504, Rep. Charles Vanik. He was quoted as stating that "We never had any concept that it would involve such tremendous cost." 14/ The weight which should be given to statements like this in interpreting statutes is somewhat uncertain. The leading treatise on statutory construction has made the following statement:

> In recognition that there is no necessary correlation between what the draftsman of the text of a bill understands it to mean and what members of the enacting legislature understand and that the intent of the legislature is the determining consideration as compared to the views of draftsmen, their views are not generally considered proper grounds on which to base the interpretation of an act....However, if the draftsman's views were clearly and prominently communicated to the legislature when the bill was being considered for enactment, so as to give reason to believe that legislators' understanding of the bill would have been influenced by the draftman's communicated views and so as to be visible to others who are concerned to understand the meaning of the act, there is reason to invoke

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12/ See C. Sands, 2A Sutherlands Statutes and Statutory Construction, secs. 48.01 et seq. (4th ed. 1973).

13/ Ibid., sec. 49.11.

14/ T. Clark, "Access for the Handicapped—A Test of Carter's War on Inflation," 42 National Journal 1672, 1673 (October 21, 1978).

an exception to the general rule and attach weight to the draftsman's views. 15/

II. Cases Relating to Transportation for Handicapped Persons Brought Under Section 504

The cases which were found relating to transportation and handicapped persons under this section fall into three main categories: (1) those which discuss whether section 504 creates a private right of action, (2) those which discuss whether section 504 creates an affirmative duty, and (3) those which discuss more specifically the requirements of section 504 relating to transportation.

The issue of whether there is a private right of action under section 504 is one which has been the subject of much controversy. 16/ The leading case on this issue is Lloyd v. Regional Transportation Authority, 548 F.2d 1277 (7th Cir. 1977), where the Seventh Circuit Court of Appeals held that section 504 established an implied private cause of action. Lloyd was a class action suit brought by persons with mobility-related handicaps who alleged that the public transportation systems of two municipalities violated several federal statutes including the Rehabilitation Act of 1973). The Seventh Circuit Court of Appeals held that section 504 conferred affirmative rights and that a private right of action could be implied to vindicate these rights. In arriving at this holding the court noted that the language in sec. 504 closely paralleled that of section 601 of the Civil Rights Act of 1964 which had been held to provide a private cause of action by the Supreme Court in Lau v. Nichols, 414 U.S. 563 (1973). After this determination, the Court discussed Cort v. Ash, 422 U.S. 66 (1975), and the four factors set out by that case for determining whether a private remedy is implicit in a statute which does not expressly provide for one. It concluded that "Applying the Cort factors here leads to the conclusion that a private cause of action must be implied from section 504." At 1285. Similarly, the other three cases concerning transportation rights under section 504 and a

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15/ C. Sands 2A Sutherlands Statutes and Statutory Construction, sec. 48.12 (4th ed. 1973).

16/ For a detailed discussion of this issue see Note, "Enforcing Section 504 Regulations: The Need for a Private Cause of Action to Remedy Discrimination Against the Handicapped," 27 Catholic U.L. Rev. 345 (1978).

private cause of action also found that there was a private cause of action. 17/

The Comprehensive Rehabilitation Services Amendment of 1978, P.L. 95-602, added a section 505 which discussed remedies and attorney's fees to the Rehabilitation Act of 1973. Subsection (a)(2) of this section specifically provides:

> The remedies, procedures, and rights set forth in title VI of the Civil Rights Act of 1964 shall be available to any persons aggrieved by any act or failure to act by any recipient of Federal assistance or Federal provider of such assistance under section 504 of this Act.

Although there is some uncertainty concerning whether there is a private right of action under title VI of the Civil Rights Act, the Senate debates concerning section 505 discussed the issue and the following statement was made by Senator Bayh.

> I thank the distinguished Senator from California for taking time to make clear the continuing intention of Congress that private actions be allowed under titles VI and VII of the Civil Rights Act of 1964, title IX of the Education Amendments of 1972 and title V of the Rehabilitation Act of 1973. 18/

AFFIRMATIVE DUTY

Two cases were found discussing section 504 and transportation which provided that section 504 creates an affirmative duty. One of these cases is Lloyd v. Regional Transportation Authority which was discussed above. The other is United Handicapped Federation v. Andre, 558 F.2d 413 (8th Cir. 1977), which was a suit by mobility-handicapped persons and associations of disabled persons alleging that urban mass transit equipment which was purchased with Federal financial aid was not accessible to handicapped

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17/ Michigan Paralyzed Veterans of America v. Coleman, 451 F.Supp. 7 (E.D. Mich. 1977); United Handicapped Federation v. Andre, 558 F.2d 413 (8th Cir. 1977); Leary v. Crapsye, 566 F.2d 863 (2d Cir. 1977). It should be noted that one case which did not deal with transportation has questioned this holding. See Crawford v. University of North Carolina, 440 F.Supp. 1047 (M.D.N.C. 1977).

18/ 124 Cong. Rec. S. 15593 (September 20, 1978) (remarks of Senator Bayh).

persons and that this violated section 504. The Eighth Circuit Court of Appeals held that the plaintiffs were entitled to relief and stated:

> We adhere to the reasoning of Judge Cummings in his excellent analysis in the Lloyd appeal, and find that section 504 does create an affirmative duty on the part of these defendants. At 415.

The five cases found which discuss more specifically the requirements of section 504 relating to transportation varied widely. In Snowden v. Birmingham-Jefferson County Transit Authority, 407 F. Supp. 394 (N.D. Ala. 1975), aff'd 551 F.2d 862 (5th Cir. 1977), rehearing denied, 554 F.2d 475 (5th Cir. 1977), the court held that since persons confined to wheelchairs were permitted on county buses even though they had to have someone help them in and out of the bus, the action of the transit authority in purchasing with Federal funds buses which were not designed and equipped for passengers in wheelchairs was not violative of section 504. In Vanko v. Finley, 440 F. Supp. 636 (N.D. Ohio 1977), the court found that section 504 did not require that a regional transportation authority make all its buses accessible to persons in wheelchairs. The district court further stated:

> ...section 504 of the Rehabilitation Act of 1973, 29 U.S.C. sec. 794, does not require the immediate establishment of services comparable to those provided the general public. Instead, this section's prohibition of discrimination against the handicapped can be satisfied by the same substantial good faith progress in both the planning and implementation of transit programs for the mobility-handicapped that is sufficient for the purposes of the Urban Mass Transportation Act of 1964 and the regulations thereunder. Vague plans for the indefinite future and second rate transit for the mobility handicapped will not satisfy the mandate of these federal laws, but instantaneous conversion to a transportation system that is comparable in every minute detail is not required either. At 666.

A third approach was taken in Bartels v. Biernat, 427 F. Supp. 226 (E.D. Wisc. 1977). The district court there held that section 504 was violated by operating a mass transit system which was effectively inaccessible to mobility-handicapped persons and by attempting to purchase with federal funds new buses which were also inaccessible to these persons.

In Michigan Paralyzed Veterans of America v. Coleman, 451 F. Supp. 7 (E.D. Mich. 1977), the plaintiffs sought to prevent the Southeastern Michigan Transportation Authority from purchasing public transportation

vehicles which were inaccessible to handicapped persons. The court found that the plaintiffs could bring the action but found that factual issues concerning whether the buses which the transit company sought to purchase could permit a wheelchair option made the defendants' motion for summary judgment premature.

Finally, in Atlantis Community v. Adams, 453 F. Supp. 825 (D. Colo. 1978), the Colorado district court discussed an action brought to enjoin the delivery of buses which were not equipped to transport handicapped persons. The court found that the Rehabiltation Act provisions did not sufficiently delineate the duties of the federal officials to enable the court to give these officials directions.

In Southeast Community College v. Davis, 47 U.S.L.W. 4689 (June 11, 1979), the U.S. Supreme Court for the first time interpreted section 504 of the Rehabilitation Act. Although this case dealt with educational opportunities for handicapped persons, it does have implications for the area of transportation and the handicapped. In its decision of June 11, 1979, the Supreme Court found that section 504 would not preclude a public college from denying a hearing impaired person admission to a nursing program due to a handicap where this handicap might interfere with the ability to perform duties safely and further found that section 504 imposed no affirmative duties to provide modified educational opportunities in this situation. The Court specifically reserved judgment on two other issues which had been presented to it for resolution; that is, whether section 504 gives rise to a private right of action or whether, if this right is found, a handicapped person must first exhaust administrative remedies.

The Supreme Court began its analysis of the merits of the case with a discussion of the language of section 504 and noted that it did not specifically compel educational institutions"...to disregard the disabilities of handicapped individuals or to make substantial modifications in their programs to allow disabled persons to participate." At 4691. The Court focused on the requirement of section 504 that an "otherwise qualified handicapped individual" not be excluded from participation in a federally funded program and found that an otherwise qualified handicapped individual "...is one who is able to meet all of a program's requirements in spite of his handicap." At 4691. The regulations promulgated by HEW under section 504 were seen by the Court as supporting this interpretation. This aspect of the holding overruled the Court of Appeal's interpretation of "otherwise qualified" which the Supreme Court had characterized as "...prevent(ing) an institution from taking into account any limitation resulting from the handicap, however disabling." At 4691.

The Supreme Court then analyzed the issue of whether the college must take affirmative action which would dispense with the need for

effective oral communication. The plaintiff had suggested that she be given individual supervision by faculty members when she attended patients directly. She also argued that the College is not required to train her in all the tasks a registered nurse is licensed to perform but that section 504 would be applicable if she were able to perform satisfactorily some of the duties of a registered nurse or to hold some positions available to a registered nurse. This argument was supported by citations to HEW regulations which required covered institutions to make modifications in their programs to accommodate handicapped persons. 45 C.F.R. 84.44. The Court rejected this argument stating:

> We note first that on the present record it appears unlikely respondent could benefit from any affirmative action that the regulation reasonably could be interpreted as requiring....In light of respondent's inability to function in clinical courses without close supervision, Southeastern with prudence could allow her to take only academic classes. Whatever benefits respondent might realize from such a course of study, she would not receive even a rough equivalent of the training a nursing program normally gives. Such a fundamental alteration in the nature of a program is far more than the "modification" the regulation requires. At 4692.

The Court further noted that if the regulations were interpreted to require the extensive modifications necessary to include the plaintiff in the nursing program, "grave doubts" would be raised concerning the regulations' validity. The language of sections 501 and 503 of the Rehabilitation Act, 29 U.S.C. §§ 791 and 793, specifically includes affirmative action provisions applicable to federal agencies and contractors but the Court noted that:

> Section 504 does not refer at all to affirmative action, and except as it applies to federal employers it does not provide for implementation by administrative action....Here neither the language, purpose, nor history of §504 reveals an intent to impose an affirmative action obligation on all recipients of federal funds. Accordingly, we hold that even if HEW has attempted to create such an obligation itself, it lacks the authority to do so. At 4692.

The Court specifically rejected arguments which had been raised by a Government amicus curiae brief that portions of the legislative history of the 1974 amendment to the Rehabilitation Act and the legislative history of the 1978 amendments indicating that section 504 required affirmative action were relevant. The Court stated that "...these isolated statements by individual Members of Congress or its committees, all made after the

enactment of the statute under consideration, cannot substitute for a clear expression of legislative intent at the time of enactment." At 4693, footnote 11.

The Court further noted that the "...line between a lawful refusal to extend affirmative action and illegal discrimination against handicapped persons will not always be clear." At 4693. For example, the Court observed that technological advances could be expected to enhance opportunities for handicapped persons and that these advances may allow handicapped persons to participate in programs "without imposing undue financial and administrative burdens upon a State." At 4693. However, the Court found that the types of adjustments in Southeastern's nursing program which were sought by the plaintiff were not required under section 504 and stated "(s)ection 504 imposes no requirement upon an educational institution to lower or to effect substantial modifications of standards to accommodate a handicapped person." At 4693.

The implications of the Supreme Court's decision could be quite far reaching, not only in the area of education but also in other areas such as transportation. The Supreme Court's discussion of affirmative action and illegal discrimination against handicapped persons could raise some questions concerning the rights of handicapped persons to accessible transportation under section 504. More specifically, although the Supreme Court indicated that there may be situations where a refusal to modify a program to accommodate handicapped persons would be unreasonable and discriminatory, the Court also noted that "(t)echnological advances can be expected to enhance opportunities to rehabilitate the handicapped or otherwise to qualify them for some useful employment. Such advances also may enable attainment of these goals without imposing undue financial and administrative burdens upon a State." At 4693. It could be argued that this language might indicate that the Supreme Court would balance the "financial and administrative burdens upon a State" against any argument that a program, such as a transportation system, must be modified to accommodate handicapped persons.

As was discussed above, two transportation cases were found which provided that section 504 creates an affirmative duty. In light of the Supreme Court's finding in Southeastern Community College concerning affirmative action, there is some doubt concerning the validity of this type of decision. However, it should be noted that the Supreme Court did find that "situations may arise where a refusal to modify an existing program might become unreasonable and discriminatory." At 4693. Therefore, although affirmative action, such as close, individual attention by a nursing instructor for a nursing student, would not be required under section 504, certain situations may arise where program modification would be required.

The reasoning of the Seventh Circuit Court of Appeals in Lloyd v. Regional Transportation Authority, supra, could also be questioned in light of the Supreme Court's decision in Southeastern Community College. In reaching its determination that there was a private right of action under section 504, the court in Lloyd relied heavily upon the legislative history of the 1974 amendments to the Rehabilitation Act. There is some doubt concerning whether the legislative history of the 1974 amendments is an appropriate indication of Congressional intent regarding section 504 since the Supreme Court in Southeastern Community College specifically rejected the use of this legislative history to indicate Congressional intent with regard to the requirement of affirmative action. It should be emphasized, though, that the Supreme Court specifically declined to determine whether section 504 gives rise to a private right of action. And, in addition, it could be argued that section 504 of the Rehabilitation Act which was added by the Rehabilitation, Comprehensive Services and Developmental Disabilities Amendments of 1978, P.L. 95-602, indicates that a private right of action may be found.

The Supreme Court's decision in Southeastern Community College v. Davis significantly limited the interpretation of section 504 from the interpretation given the sections in several lower court decisions. Although the Court's specific holding was quite narrow, it has broad implications for the general interpretation of section 504. The Court's decision in Southeastern Community College has already been cited in a brief asking for a preliminary injunction to bar the Department of Transportation's regulations under section 504 from taking effect.19/

III. Summary

Serious questions have arisen concerning the use of section 504 to provide for accessible transportation for handicapped persons. Many of these are left largely unanswered by the legislative history and the cases brought under section 504. However, there are some indications that transportation inaccessibility was considered as a form of discrimination that section 504 was meant to remedy. There are even fewer guidelines concerning exactly what is required for accessible transportation under section 504 and the few cases which have discussed this issue have arrived at divergent decisions.

19/ National Journal 1175 (July 14, 1979).

APPENDIX B. DAILY TRIPS TAKEN BY PERSONS WITH VARIOUS HANDICAPS, BY MODE OF TRANSPORTATION

TABLE B-1. DAILY TRIPS TAKEN BY PERSONS WITH VARIOUS HANDICAPS, BY MODE OF TRANSPORTATION, 1977

	Non-handicapped	Handicapped	Wheelchair Users	Users of Walking Aids	Persons with Visual Problems	Persons with Hearing Problems	Persons with Other Problems
Total daily trips per person	1.77	0.95	0.69	0.80	0.72	0.85	1.07
Percent of total trips by:							
Car	78	72	80	78	64	73	71
As driver	62	38	33	39	19	37	41
As passenger	16	34	46	39	45	36	30
Bus	9	9	3	9	12	8	10
Subway	3	2	—	0.3	0.1	1	3
Taxi	1	3	2	3	7	4	2
Specialized service	—	1	5	1	0.3	1	1
Walking	5	7	2	5	11	6	8
Other	3	6	9	4	6	7	5
Total	100	100	100	100	100	100	100

SOURCE: Congressional Budget Office from U.S. Department of Transportation, Technical Report of the National Survey of Transportation Handicapped People, October 1978. Totals may not add to 100 because of rounding. The Technical Report gives total monthly trips. Trip rates were calculated from population totals given in the Technical Report and converted to daily trips with a factor of 30.42.

APPENDIX C. DAILY TRIPS TAKEN BY ELDERLY AND NONELDERLY HANDICAPPED PERSONS, BY MODE OF TRANSPORTATION

TABLE C-1. DAILY TRIPS TAKEN BY ELDERLY AND NONELDERLY HANDICAPPED PERSONS, BY MODE OF TRANSPORTATION, 1977

	Non-handicapped	Handicapped	Nonelderly Handicapped	Elderly Handicapped
Total daily trips per person	1.77	0.95	1.25	0.61
Percent of total trips by:				
Car	78	72	71	76
As driver	62	38	42	31
As passenger	16	34	29	45
Bus	9	9	9	9
Subway	3	2	2	0.1
Taxi	1	3	3	5
Specialized service	—	1	1	0.20
Walking	5	7	7	8
Other	4	6	7	1
Total	100	100	100	100

SOURCE: Congressional Budget Office from U.S. Department of Transportation, Technical Report of the National Survey of Transportation Handicapped People, October 1978. Totals may not add to 100 because of rounding. Trips rates were calculated from population total given in the Technical Report, and converted to daily trip rates with a factor of 30.42.

APPENDIX D. ESTIMATION OF PATRONAGE BY HANDICAPPED PERSONS OF DOOR-TO-DOOR SERVICE, AND OF CORRESPONDING VAN REQUIREMENTS

Patronage Of Door-to-Door Service

A survey by the Department of Transportation of handicapped persons in 1978 found that the following numbers said they would use door-to-door service and physically could:

Wheelchair Users	Other Handicapped Persons
178,500	2,609,000

The CBO analysis described in Chapter IV indicates that about three-quarters of the wheelchair users and half of the other handicapped persons might actually use door-to-door service in any given month:

Wheelchair Users	Other Handicapped Persons
119,000	1,305,000

The Transit Plan. Under the Transit Plan, some cities served by rail would elect to provide an alternative service instead. It is likely that handicapped persons would negotiate for lift-equipped dial-a-ride service for wheelchair users, and for low-fare taxi rides for all other handicapped persons. According to the DOT survey, 13.9 percent of all handicapped persons live in cities served by rail. Assuming that door-to-door service users are distributed in the same proportion, the number of potential dial-a-ride and taxi users in rail cities is as follows:

Van Users	Taxi Users
16,597	182,023

If only half the rail cities are assumed to provide alternative services the estimates are prorated accordingly.

The Taxi Plan. All wheelchair users would be eligible for lift-equipped van service under the Taxi Plan. Other persons too severely disabled to use transit but capable of getting in and out of taxis, would be eligible for taxi

service. The DOT survey indicates that 19 percent of those who said they would use door-to-door service were physically unable to use transit, the numbers served are projected to be as follows:

Vans Users	Severely Disabled Taxi Users
119,000	175,563

The Auto Plan. The Auto Plan would supply paraplegic and quadriplegic wheelchair users with specially adapted automobiles. Approximately 200,000, or 50 percent of all wheelchair users, are permanently confined to wheelchairs. Of these approximately 40,000 are quadriplegic persons and 160,000 are paraplegic persons. About half of all paraplegic persons are too old to drive or are blind, while most quadriplegic persons are under 65 and physically able to drive an adapted van. (The number of quadriplegic persons who might be too old or otherwise unable to drive a car—4,000 persons—was estimated by CBO on the basis of informal advice from Dr. Hussey of the West Roxbury Veterans Hospital. In total, 80,000 paraplegic persons and 36,000 quadriplegic persons could become auto users.

Some of these persons would otherwise use van service under the Taxi Plan. Approximately half the 119,000 wheelchair van service users shown above are over 65 or blind, so that 59,500 would continue to use vans. Thus, the figures for potential use of door-to-door services, taxis, and adapted autos in the Auto Plan are:

Van Users	Taxi Users	Auto Users
59,500	175,563	116,000

Calculation of Van Requirements to Serve Wheelchair Users

The Model. A model of vehicle requirements developed for DOT was used to determine the number of vans needed to serve wheelchair users in each plan. 1/ The model is written as follows:

1/ Chase Advertising Inc., Chase, Rosen & Wallace, Inc., Smith and Lock Assoc. Inc., Cost/Benefit Model for the Analysis of Transportation Options For the Handicapped: Design specifications, February 28, 1977, rev. June 22, 1977.

$$\text{Number of Vans Needed} = \left[\frac{(\text{LNTH})\ (\text{RIDR})}{(\text{VCAP})\ (\text{LFAC})}\right] * \left[\left(\frac{(\text{TIME})\ (\text{VCAP})\ (\text{LFAC})}{(1800)\ (\text{LNTH})}\right) + \left(\frac{1}{\text{AUTO}}\right) + \left(2 - \frac{\text{TRAF}}{\text{AUTO}}\right) * \left(\frac{\text{TRAF}}{3600\ \text{ACCEL}}\right) * \left(\frac{(2)\ (\text{VCAP})\ (\text{LFAC})}{(\text{PRST})\ (\text{LNTH})}\right)\right] * (\text{FLOAT})$$

where

			Value Used
LNTH	denotes	Average trip length (miles)	a/
RIDR	denotes	Trip demands per hour (trips/hour)	b/
VCAP	denotes	Vehicle capacity (seats/vehicle)	13
LFAC	denotes	Load factor constraint (passenger mile/seat mile)	.085
TIME	denotes	Boarding/deboarding time per person (seconds)	200
AUTO	denotes	Average moving speed of vehicles (MPH)	12
TRAF	denotes	Maximum vehicle speed (MPH)	22
ACCEL	denotes	Average acceleration/deceleration rate (MPHPS)	2.25
PRST	denotes	Trips per demand request (riders/request)	1.2
FLOAT	denotes	Maintenance float factor (%)	12

a/ Average trip length is 8 miles in rail cities, 5 miles elsewhere.

b/ See Table D-2.

The first term in square brackets is the number of vehicle miles of service required to serve a given level of hourly patronage. The second term in square brackets is the time taken to travel one mile. The final term represents the number of extra vehicles needed for maintenance. A load factor is chosen that ensures enough vehicles being on hand so that passengers need wait no longer than they might for a bus or a train. The procedure for doing this is described later.

Peaking of Demand. In Cleveland, Ohio, typical of many dial-a-ride van services, 22 percent of demand occurs during a weekday peak of two hours, as indicated in Table D-1.

Hourly Demand and Van Requirements. The number of trips per hour is calculated by applying a trip rate of five trips per month to the numbers of wheelchair users and allocating the trips across the day according to the distribution in Table D-1. Hourly demand is shown in Table D-2.

Vehicle miles of service per hour is then calculated from the equation. The equation is also used to calculate the time taken to travel each mile, and combined with hourly vehicle miles of service to give van requirements in each period of the day. Van requirements are shown in Table D-2 for the

three plans. The number of vans to be purchased is equivalent to peak period van requirements plus 12 percent extra for maintenance (see text Table 16). Where half the cities served by rail are assumed to provide alternative service in the Transit Plan, the estimates in Table D-2 are prorated accordingly (see text Table 14).

TABLE D-1. ASSUMED PEAKING CHARACTERISTICS OF TRAVEL BY HANDICAPPED PERSONS

	Standard Rush Hours	Standard Nonrush Hours	Peak Hours of Travel	Night and Weekend Hours
Hours per year	1,391	1,802	520	2,862
Percent of daily patronage occurring in these hours	17.6	47.9	22	12.5

SOURCE: Congressional Budget Office, from data in Peat, Marwick, Mitchell & Co., Final Report, CRW Model Review, November 13, 1978, and from statement by Leonard Ronis, General Manager, Greater Cleveland Regional Transit Authority, before public hearing conducted by U.S. Department of Transportation on proposed Section 504 regulations, Washington, D.C., September 19, 1978.

Ensuring Adequate Response Times. The DOT model used here makes no explicit allowance for the number of vehicles needed to guarantee that passengers wait no longer for a van than they might wait for a bus or a train. But an alternative model, applied by consultants for DOT, to check whether these van requirements would be adequate, revealed that the equation used here, with a 0.085 load factor, produces more than enough vehicles to ensure comparable total travel times (wait plus ride time) to typical transit services. 2/

2/ Peat, Marwick, Mitchell & Co., Final Report CRW Model Review, Nov. 13, 1978. See also Urban Mass Transit Administration, Modeling Demand-Responsive Feeder Systems in the UTPS Framework, July 1978, for a description of the alternative procedures used.

TABLE D-2. HOURLY PATRONAGE AND VAN REQUIREMENTS AT DIFFERENT TIMES OF DAY

	Rush Hours	Nonrush Hours	Peak Hours of Travel	Night and Weekend Hours
Transit Plan a/				
Trips per hour	126.0	264.7	421.3	43.5
Numbers of inservice vehicles needed	90	189	301	31
Taxi Plan				
Trips per hour	903.4	1,897.9	3,020.8	311.8
Number of inservice vehicles needed	442	928	1,477	152
Auto Plan				
Trips per hour	451.7	949.0	1,510.4	155.9
Number of inservice vehicles needed	221	464	738	76

a/ Assuming all rail cities elect to provide alternative service.

APPENDIX E. PROJECTED NUMBER OF TRIPS MADE BY HANDICAPPED PERSONS UNDER EACH PLAN

TABLE E-I. PROJECTED NUMBER OF TRIPS MADE BY HANDICAPPED PERSONS UNDER EACH PLAN

	Millions of Additional Trips Made by Existing Mass Transit Users		Millions of Trips Made by Those Who Do Not Use Transit Today		Millions of Trips Made by All Handicapped Persons	
	Total Trips Made Over 30 Years	Total Trips Made Annually Once All Services Are Available	Total Trips Made Over 30 Years	Total Trips Made Annually Once All Services Are Available	Total Trips Made Over 30 Years	Total Trips Made Annually Once All Services Are Available
The Transit Plan (DOT regulations) Bus--12 years to implement Rail—30 years to implement	610.82	24.74	158.14	6.22	768.96	30.96
The Taxi Plan Bus--12 years to implement Door-to-door service—6 years to implement	504.47	21.31	583.67	21.78	1,088.14	43.09
The Auto Plan Bus--12 years to implement Door-to-door service—6 years to implement Adapted autos-6 years	504.47	21.31	868.30	32.13	1,372.77	53.44

NOTE: The table is based on the following assumptions: (1) Existing transit users making extra transit trips make an additional 3 trips per month. (2) New transit users make an additional 5 trips per month. (3) Door-to-door service users make 5 trips per month. (4) Adapted auto users make an extra 10 trips per month. (5) As adapted buses come into service, they attract 76 percent of the potential patronage when half the fleet is adapted, and 100 percent of potential patronage when all the buses are adapted. (6) Potential patronage of adapted rail service is proportional to the fraction of stations adapted.

APPENDIX F. A COMPARISON OF RECENT ESTIMATES OF THE COST OF ADAPTING URBAN RAIL SYSTEMS FOR WHEELCHAIRS

CAPITAL COSTS OF ADAPTING SUBWAY STATIONS FOR WHEELCHAIR USERS

Consultants to DOT have agreed with local operators that it costs about $3 million to adapt a subway station for wheelchairs, as shown in Table F-1. A comparison of recent estimates is given in Table F-2. These estimates were made independently, using different methods and judgments. A reconciliation of the differences reduces the estimate by one-third, to $2 million per station. The reconciliation is described below.

Adaptation of an underground or aboveground station for wheelchairs requires the installation of elevators giving access to each platform, and interior modifications such as the removal of platform obstructions, the widening of doors and turnstiles, and the modification of washrooms.

The purchase and installation of elevators accounts for most of the cost. It may require the purchase of land and the relocation of underground cables, telephone lines, and sewer pipes. Some of these costs cannot be aniticipated. Real estate prices vary from site to site, and the exact location of utility lines may not be known. In November 1978, consultant architects to DOT estimates that the cost of installing each elevator in a typical subway station might be $955,000, almost double the average estimate of local transit operators. 1/ The New York Metropolitan Transit Authority (MTA), for example, estimates that the average cost of installing an elevator in that city might be about $594,000. Stations in other cities would probably not present greater construction difficulties than those

1/ Peat, Marwick, Mitchell & Co., The Cost of Making Urban Rail Transit Accessible to the Handicapped, November 3, 1978.

TABLE F-1. AVERAGE CAPITAL COSTS OF MODIFYING A SUBWAY STATION: IN MILLIONS OF 1979 DOLLARS

	DOT Consultants' Estimate (November 1978)	Local Operators' Estimate (October 1978)	Percent Difference between DOT Estimate and Operators' Estimate
Estimate of cost of adapting a rapid rail station as of November 1978	2.88	3.12	8.3
Adjustments			
DOT consultants' elevator unit cost estimates replaced by New York estimate	1.87	3.12	66.8
Replace in operators' estimates DOT assumed safety standard (no back-up elevators)	1.87	2.11	12.8
Include in DOT consultants' estimate allowance for New York MTA structural modifications to platforms	2.11	2.11	0
Replace Boston MBTA estimate in DOT consultants' estimates	2.00	2.11	-5.21

SOURCE: CBO from U.S. Department of Transportation Docket No. 56, October 1978, and Peat, Marwick, Mitchell & Co., The Cost of Making Urban Rail Transit Accessible to the Handicapped, November 3, 1978.

anticipated in New York. Using the MTA figure in the DOT analysis reduces the estimated cost per station by about one-third, as shown in Table F-1. 2/

The New York estimate includes backup elevators for emergencies when a main elevator fails. Backup elevators double the cost of remodeling a typical station. But the DOT regulations do not require backup elevators, and the New York estimate can be accordingly reduced—bringing the combined estimate from local sources down to $2 million per station, as shown in Table F-1.

In estimating the cost of station platform modifications, consultants to DOT assumed that the regulations permit parts of a station platform to remain too narrow for persons in wheelchairs as long as some of the platform is usable. To proceed otherwise would require major structural modifications to buildings adjacent to many stations, adding substantially to costs. The New York authorities, however, state that in their stations numerous platform obstructions would not permit safe passage by wheelchair users, and allowed about $400,000 per station for this kind of work. A revision of the DOT consultants' estimates to reflect these costs in New York increases their estimate of average station costs nationally by about $250,000, as shown in Table F-1.

2/ The DOT analysis is based on a sample of 5 percent of all subway stations. Architects made surveys of the stations, and estimated the costs of adapting each. The results were extrapolated on a national scale with the following equation.

$$C=a+bE + u$$

where

C denotes total cost per station.
E denotes number of elevators required per station.
a denotes cost per station for interior modifications and exterior changes other than elevator installations.
b denotes cost per elevator.
u denotes random errors.

The constants a and b were estimated statistically to be $373,668 and $954,697 respectively. To adjust the DOT analysis, the value for b was replaced with the estimated cost of installing an elevator in New York of $565,000.

TABLE F-2. A COMPARISON OF RECENT ESTIMATES OF THE COST OF ADAPTING URBAN RAIL STATIONS TO SERVE THE HANDICAPPED: IN MILLIONS OF 1979 DOLLARS AND PERCENTAGE INCREASES

Source of Estimates	Subways	Commuter Rail Systems	Streetcars	Total
Capital costs				
DOT, June 1978	1,081.0	520.0	50.0	1,651.0
Transit operators, September 1978	1,897.1-2,708.1	1,019.0-1,068.7	131.3	3,047.0-3,808.1
Consultants to DOT November 1978	2,288.0	443.0	43.0	2,774.0
DOT, May 1979	1,380.0	359.0	51.0	1,790.0
Increase in annual operating costs				
DOT, June 1978	14.7	11.7	1.1	27.5
Transit operators, October 1978	362.0	27.7	2.8	393.5
Consultants to DOT November 1978	22.0	9.2	1.3	32.5
DOT, May 1979	10.0	4.0	0.4	14.5

SOURCE: Congressional Budget Office, from U.S. Department of Transportation Docket No. 56, October 1978, and Peat, Marwick, Mitchell & Co., The Cost of Making Urban Rail Transit Accessible to the Handicapped, November 3, 1978.

A final adjustment to the estimates prepared for DOT allows for its apparent overestimation of costs in Boston. 3/ Estimates prepared by the Boston authorities are only 25 percent as high as those of other large cities, because Boston is architecturally a relatively simple system with very few elevated stations (unlike New York and Chicago). The analysis prepared for DOT overstates costs in Boston dramatically. This adjustment make very little difference to the overall estimates, however, since costs remain dominated by the larger systems, is indicated in Table F-1.

3/ The DOT consultants' report states that the equation (as shown in footnote 2 of this appendix) is not suitable for extrapolating to individual cities. CBO has extended the equation in this way for comparative purposes only.

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